

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, August 4, 2006

HEADLINES:

- July Heat
- Update on Drought
- Fewer Hurricanes Expected
- 100 F in August?
- Almanac for August 4th
- 1866 Wisel Flood
- FACE
- Outlook

Topic: July, 2006 will be bookmarked in memory as a hot one...

The final days of July brought record heat in the form of daily maximum temperature and minimum temperature around the state. Several of these included daytime temperatures from the mid-90 F and higher and nighttime lows above 75 degrees F. Many communities reported daytime highs of 100 degrees F or greater as well...

Moose Lake and Sandy Lake on July 29th....100 degrees F  
Thief River Falls and Alexandria on July 30th....100 degrees F  
Moorhead on July 30th reported a record daily high of 104 degrees F  
Marshall and Red Wing on July 31st.....100 degrees F  
St Cloud, MSP Airport, and Redwood Falls on the 31st.....101 degrees F  
Wheaton on the 31st reported a record daily high of 104 degrees F  
Browns Valley on the 31st....107 degrees F, just missed their record

Heat Advisories were released by the National Weather Service as the Heat Index values ranged from 100 to 112 degrees F in many places. The National Weather Service in La Crosse, WI measured temperatures inside of a parked car (windows up) up to 124 degrees F on the 31st.

Overall July of 2006 ranked as the 5th hottest on a statewide basis, exceeded only by 1901, 1935, 1916, and 1936. For Duluth it was the warmest month on record dating all the way back to 1870, while for the Twin Cities it was the third hottest July, trailing both 1935 and 1936. For many other communities around the state July was in the top five historically. As a consequence, irrigation water use was very high, along with power usage for air conditioning.

Interestingly enough, the Meteorological Office in the United Kingdom reported that this July was the hottest ever there as well. Water restrictions were in place during most of the month.

Topic: Despite recent rains drought concerns prevail in MN....

The second meeting of the State Drought Task Force was held this week on Tuesday, August 1st. Over 40 people attended.

The USDA/NOAA Drought Mitigation Center placed portions of northwestern, north-central and east-central in a D-3 category this week, implying Extreme Drought with both agricultural and hydrological impacts. Much of the balance of the state falls into the D-2 (Severe Drought) or D-1 (Moderate Drought) class. Only a small portion of south-central and southeastern Minnesota was classified as abnormally dry (D-0).

Greg Spoden of the DNR-State Climatology Office showed rainfall deficits and relative rankings around the state since mid-May. Through July 31st, many areas are well short of historical averages, some by up to 4 to 8 inches. The USGS hydrologists, District Army Corps, and NOAA River Forecast Center hydrologists showed the sharp declines in reservoir levels and river stages that have taken place throughout the month of July. Though recent showers have helped to bump river stages to higher levels, they will likely recede rapidly with the onset of a forecasted warm and dry spell after the 7th of August (conveyed by the National Weather Service outlooks). So from a hydrologic standpoint the worst may not be over in terms of impacts on watersheds, low flows will remain a concern. Animation of the watershed status around Minnesota can be viewed at the State Climatology web site under...

[http://134.84.160.120/dow/weekly\\_stream\\_flow/sfcycle.htm](http://134.84.160.120/dow/weekly_stream_flow/sfcycle.htm)

USDA-Farm Service Agency reported that at least 38 counties intend to petition for emergency status through the federal program. Most are located in the northern half of the state, where crop yield reductions are initially estimated to run from 30 to 70 percent. The State Emergency Board will consider these cases at their meeting next Tuesday (August 8th).

Best Management Practices (BMPS) are being emphasized to encourage water conservation in many cities and rural communities, as flow levels may approach critical levels on some watersheds. Irrigators are seeking permission to increase summer allocations. The Twin Cities are continuing to emphasize water conservation best management practices when it comes to domestic and landscape uses, but city officials have not yet triggered mandatory water restrictions.

We should remember that drought rarely reverses itself abruptly. More often than not, history shows a gradual return to average hydrologic and soil moisture conditions.

Topic: Fewer hurricanes expected this year.....

Dr. William Gray and his staff at Colorado State University are noted for their seasonal hurricane forecasting expertise. They announced this week, that they expect fewer Atlantic Basin hurricanes this year, reducing their forecasted number from nine to seven as a result of cooler ocean temperatures than expected and increased wind shear potential at high altitudes. So far there have only been only three named storms in the Atlantic, Alberto, Beryl, and Chris.

MPR listener question: With most of August ahead of us what is the historical frequency of 100 degrees F in this month versus last month here in the Twin Cities?

Answer: Since 1891, 100 degrees F or greater temperatures have been recorded during 23 July months in the Twin Cities, a frequency of about 20 percent of all Julys. Over the same period only 4 August months have seen 100 degrees F temperatures, a frequency of about 3 percent, thus a very small probability exists that we will see another 100 F day. Interestingly enough, there has only been one year that brought a 100 F day in the month of September, that of September 10, 1931 when the mercury hit 104 degrees F.

Twin Cities Almanac for August 4th:

The average MSP high temperature for this date is 83 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 62 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for August 4th:

MSP weather records for this date include: highest daily maximum temperature of 102 degrees F in 1947; lowest daily maximum temperature of 64 degrees F in 1915 and 1952; lowest daily minimum temperature of 48 F in 1978; highest daily minimum temperature of 76 F in 1947; record precipitation of 2.65 inches in 1941. The Heat Index on this date in 1947 was a record 109 degrees F.

Average dew point for August 4th is 59 degrees F, with a maximum of 74 degrees F in 1959 and a minimum of 37 degrees F in 1923.

All-time state records for August 4th:

The state record high temperature for this date is 106 degrees F at Beardsley (Big Stone County) in 1947; the state record low temperature for this date is 29 degrees F at Tower (St Louis County) in 1972; the state record rainfall to today's date is 6.00 inches at St Francis (Anoka County) in 2002.

From "Minnesota Weather Almanac" (available in bookstores):

This Sunday marks the 140 Anniversary of the Wisel Flood in southeastern Minnesota. On August 6, 1866 a stationary weather front parked over southern Minnesota generated thunderstorms that produced up to 10.30 inches of rainfall in Sibley County. St Paul weather observers reported a rise of 4 feet in the Mississippi River. Many other areas of south-central and southeastern Minnesota received enormous amounts of rainfall as well. In Fillmore County tragedy struck as the Root River near present day Lanseboro rose so rapidly with the flash flooding that it swept away 30 pionner settlers to their death. Among them were members of the Wisel family in Preble Township, thus the storm took on the name of the Wisel Flood. The town of Houston was completely submerged and the nearby railroad tracks were under 7-8 feet of water.

Word of the Week: FACE

Another acronym used in scientific endeavors, this one stands for Free-Air Concentration Enrichment (FACE) technology. Studies of the effects of increasing greenhouse gases on crop production have been facilitated by using FACE technology to grow plants in open-air fields but with increased levels of carbon dioxide to mimic what might be the levels in the Earth's atmosphere by the year 2050. A system of tubes inject gases into the crop canopies as they grow and develop. At the University of Illinois they have been studying the combined effects of increased carbon dioxide levels, generally a crop yield booster, with increased ozone levels, generally a crop yield detractor. They are finding that the changing composition of the Earth's atmosphere may have a smaller fertilization effect on crops than previously thought. (Science magazine, June 30 issue).

Outlook:

Warm and more humid on Saturday with a chance for showers and thunderstorms in the northern and western sections during the day, and then statewide at night. Some thunderstorms may be severe. Lingering chance for showers on Sunday in the south and east. Cooler temperatures for Monday and Tuesday, with drier air. A warming trend by Wednesday next week, with a chance for showers during mid week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, January 6, 2006

HEADLINES:

- World weather highlights for the start of the New Year
- Gloomy weather in Minnesota
- Anniversary of the 1873 blizzard
- Question about small daily temperature ranges
- Almanac for January 6th
- What's cowshee and kaus?
- Outlook

Topic: World weather headlines from the first week of 2006....

On December 30th, Tropical Storm Zeta formed in the North Atlantic Ocean, about 1100 miles southwest of the Azores. Zeta was the 27th named storm of the record Atlantic Hurricane Season which ended over a month ago. It dissipated late on January 4th, but reformed on January 5th, and is expected to persist through Friday, January 6th. The storm records for the Atlantic Basin since 1851 show no other year with so many tropical storms as 2005. Further, only one other tropical storm has developed so late in the year ...that was Alice No. 2 on December 30, 1954. Alice later became a full-fledged hurricane before dissipating on January 6, 1955. Since Zeta is still present in the North Atlantic it may surpass Alice as the longest-lived January hurricane.

Japan continued to report record snows during the first week of January after recording a very snowy December. The mountainous areas of Hokuriku region reported additional snowfalls this week of 2.5 feet. They have already reported avalanches in the area.

The Chinese Meteorological Service reported this week that 2005 was a tumultuous and traumatic year weatherwise with death and economic loss associated with floods, droughts, blizzards, and tropical storms. Eight typhoons hit the China coastline, while in southern provinces up to 70 million people were affected by drought. Total weather related fatalities approached 2500 and economic losses topped \$25 billion, the largest total in 5 years.

The first week of 2006 also brought continued brushfires and heat waves to parts of Australia. Sydney reported its hottest New Years Day in history with a daytime high of 112 degrees F. As a consequence the beaches were quite crowded as were the walk-in health clinics with people suffering from the heat. Scores of brushfires were reported across Victoria and New South Wales.

Topic: Gloomy weather continues in Minnesota....

The National Weather Service Forecast Office in Chanhassen reports that for the period from December 24, 2005 to January 4, 2006 the percent possible sunshine was only 2 percent. On eleven days it was virtually zero while on New Year's Day it was reported to be 26 percent. Over the same 12 day period, the Weather Service in Duluth reported only 3 percent possible sunshine, while their office in Sioux Falls, SD reported nearly 10 percent possible sunshine over the same period. Average values for this time of year are 45 to 55 percent possible sunshine, so these are indeed significant negative departures.

The 12 day spell of gloomy weather, with a virtual absence of any direct sunshine (Dec 24, 2005 to Jan 4, 2006) in the Twin Cities has few analogies. Only winter of 1972 and 1992 show similar prolonged periods of gloominess according to solar radiation measurements on the St Paul Campus. On the other hand temperatures during this spell have been quite mild, averaging 15 to 20 degrees F above normal at the MSP airport. La Crosse has not dipped below the 30 degrees F mark since December 24th, a remarkable run of warmth for them. Such dramatic temperature departures this time of year are equivalent to having a run of 100 degrees F or higher for 12 days in July.

Topic: Anniversary of 1873 blizzard.....

This Saturday, January 7th, marks the 133rd anniversary of one of the state's most lethal blizzards. The New Ulm observer called it the "most violent snow storm" he had ever witnessed, as within seconds visibility was reduced to less than 20 yards by snowfall and winds of 45 mph. The storm raged from the 7th to the 10th of January. Wind chill conditions, though unmeasured back then, were very dangerous, and with the absence of any visibility farmers strung ropes between home and barn so they wouldn't become lost going to tend their animals. Still, 70 people lost their lives and hundreds of livestock perished as well. This three day blizzard was one of the longest lived of the 19th Century in Minnesota, leaving drifts over 10 feet high that blocked trains for days.

MPR listener question: How common are these extremely narrow daily temperature ranges we have been seeing of late? In the Twin Cities we have had four days recently which showed only a 2 degrees F temperature range.

Answer: Indeed, it is highly unusual to have a daily temperature range of only 2 degrees F or less. The long term frequency of such readings in the Twin Cities is less than one occurrence per year. Among all months of the year, such a small temperature range is most likely during December which shows twice the frequency of any other month. Other months which have exhibited such a narrow temperature range historically are January, November, and March. The May through August period has never shown such a narrow daily temperature range. There have only been five days since 1891 that show a daily temperature range of only 1 degree F,

the most recent of which was January 16, 1998 when the high was 23 F and the low 22 F in the Twin Cities.

Twin Cities Almanac for January 6th:

The average MSP high temperature for this date is 22 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 5 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for January 6th:

MSP weather records for this date include: highest daily maximum temperature of 49 degrees F in 1900; lowest daily maximum temperature of -14 degrees F in 1909; lowest daily minimum temperature of -27 degrees F in 1912; highest daily minimum temperature of 35 F in 1928; record precipitation of 0.40 inches in 1967. A record snowfall of 5.2 inches also occurred on this date in 1932. The snow depth on this date in 1969 was 20 inches.

Average dew point for January 6th is 6 degrees F, with a maximum of 33 degrees F in 1965 and a minimum of -34 degrees F in 1942.

All-time state records for January 6th:

The all-time state high temperature for today's date is 53 degrees F at Bird Island (Renville County) in 1900; the all-time state low for today's date is -55 degrees F at International Falls (Koochiching County) in 1909. The all-time state record precipitation for this date is 3.0 inches at Fergus Falls (Otter Tail County) in 1997. The all-time state record snowfall for this date is 19.0 inches at Hinckley (Pine County) in 1997.

Word of the Week: kaus or cowshee

This is the term often used by meteorologists when the weather is gloomy in the Persian Gulf region. It is the name given to a moderate southeasterly wind that brings high humidity and constant cloud cover in that region. Conversely, persistent cloud cover in our region is often accompanied by stalled weather systems with little wind.

Outlook:

Continued mild temperatures over the weekend with chances for snowfall and freezing drizzle, especially late Saturday and early Sunday. Temperatures will remain well above normal for much of next week, at least through Thursday. There will be an increased chance for precipitation on Thursday and Friday.

NFL playoff forecast:

Jacksonville at New England (Sat) upper 20s to low 30s F, partly sunny  
Washington at Tampa Bay (Sat) sunny with temperatures in the 50s F  
Pittsburgh at Cincinnati (Sun) partly sunny, temperatures in the 40s F  
Carolina at New York (Sun) chance of showers or snow, temps in the 30s F

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, January 13, 2006

#### HEADLINES:

- Warm Weather!
- Potholes!
- Weather Technology
- Question on winter fires
- Almanac for January 13th
- Finger drifts
- Outlook

Topic: Very warm run of weather across the state...

Since December 23rd of 2005, a period going back 21 days mean daily temperatures in Minnesota have been averaging from 14 to 22 degrees above normal, a remarkable run of warm weather. Indeed, over three dozen Minnesota communities have reported daytime highs of 40 F or higher during this period and many nighttime lows in the 20s F. The Duluth Weather Service Office has reported the warmest first 12 days of January, while International Falls has reported mean temperatures during the first 12 days that tie the record warmth of 1992. Some reported that the Rainy River east of Baudette and west of Clementson in Lake of the Woods County was running as the ice cover had broken up. This was the first time local residents had seen this type of thaw in January.

Examining the Twin Cities climate record it is difficult to find such prolonged periods of winter warmth. Checking the generally cold and snowy season of November through March, there are virtually no other periods in the climate record that equate to the current one falling in late December to early January time frame. And, further there are only 5 other analogous prolonged periods of warmth which have occurred in other cold months: 1920 starting in mid November; 1958 starting in mid February; 1973 starting in mid November; 1992 starting in mid February; and 1998 starting in mid February.

Topic: Potholes Galore!

There have been many stories in the media recently about the prolific number of potholes around the state, especially the Twin Cities Metro Area. Pavement cracks, expand and contract with temperature and off course allow infiltration of water. The abnormally high frequency of wet/dry and freeze/thaw cycles are to blame for much of this. Consider that since December 22nd (2005) here have been at least 18-20 daily freeze/thaw cycles in the Twin Cities area. Historically over this same period (December 22 to January 12) the average number of these freeze/thaw cycles is only six. There have also been seven days with measurable precipitation, so the pavement has been alternatiely wet/dry many times over.



It was my misfortune some years ago during a similar wimpy winter period to drive through a pothole and literally deflate and destroy two tires on my car. Not a pleasant experience at all. These pothole conditions are here earlier than normal this year, so it is going to mean a prolonged period of being extra careful when driving, especially at night.

Topic: Touting Technology in Weather

The Chinese Meteorological Service announced a huge increase in their cell phone weather subscription services this week. Partially the result of so much traumatic weather having occurred throughout the country in 2005, there are now over 33 million subscribers to the Short Message Service offered by the Chinese Weather Service. This provides forecasts and warnings to the public via cell phone messaging.

Ambient Devices showcased their new "forecasting umbrella" at a trade shows this past week. The umbrella is connected to their information network and when it receives a forecast calling for rain, the handle pulses blue light so you might be alerted to take it with you when you step outside. More devices can be found at the Ambient web site:

<http://www.ambientdevices.com/cat/index.html>

MPR listener question: The recent news coverage of January prairie fires in Oklahoma, Texas, and eastern Colorado, as well as a high fire danger in South Dakota and Nebraska makes me wonder if we have ever had serious fires in the Minnesota landscape during January. It has been warm and we have been losing our snow cover.

Answer: In a cursory look at the fire history in Minnesota, I can find only a handful of years when serious wildfires were reported in January, all associated with extremely dry preceding fall periods, and absence of winter snow cover. These years were 1849, 1931, 1958, and 1961. Certainly this year, most places had a wet fall as well as early season snow cover.

Twin Cities Almanac for January 13th:

The average MSP high temperature for this date is 23 degrees F (plus or minus 14 degrees F standard deviation), while the average low is 6 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for January 13th:

MSP weather records for this date include: highest daily maximum temperature of 48 degrees F in 1987 and earlier years; lowest daily maximum temperature of -14 degrees F in 1916; lowest daily minimum temperature of -34 degrees F in 1868; highest daily minimum temperature of 34 F in 1960; record precipitation of 0.36 inches in 1888. A record snowfall of 6.0 inches occurred on this date in 1967. The snow depth on this date in 1984 was a record 19 inches.

Average dew point for January 13th is 9 degrees F, with a maximum of 37 degrees F in 1947 and a minimum of -33 degrees F in 1982.

All-time state records for January 13th:

The all-time state high temperature for today's date is 60 degrees F at Lambertson (Redwood County) in 1987; the all-time state low for today's date is -50 degrees F at Bagley (Clearwater County) in 1916. The all-time state record precipitation for this date is 1.75 inches at Owatonna (Steele County) in 1999. The all-time state record snowfall for this date is 14.0 inches at Beaver Bay (Lake County) in 1874 and at New Richland (Waseca County) in 1910.

Words of the Week: Finger Drifts

This is used as much by people in transportation as well as meteorology. Snow drifts which occur along roadways and railroad tracks are often affected by the subtle features of topography or local vegetation patterns, particularly where the roadbed is below or level with the surrounding landscape. These features modify both the deposition and drift of snow, especially very light snow. Sometimes the result is that drifts accumulate in a fingerlike pattern across a roadway or railway, rarely causing an impassable blockage, but creating a considerable nuisance for driving nevertheless. Many northern and western counties have regularly occurring episodes of finger drifting as long as they have winter snow cover, as drifting will occur with winds as little as 15 mph.

Outlook:

Continued mild over the weekend with a slight chance of freezing rain or snow late Sunday and into Monday. A bit cooler on Monday, with a chance for snow. Temperatures will continue to average well above normal, with another chance for snow by Thursday and Friday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, January 20, 2006

#### HEADLINES:

- Absence of cold
- Prolonged cloudy period
- Biking in winter
- Warming trend for the winter months
- Almanac for January 20th
- What are Snow Cats?
- Outlook

Topic: Absence of cold.....

Minnesota's cold temperatures usually make headlines during the winter season in the National Weather Summary issued by National Weather Service each morning. However, this winter it has been so mild that Minnesota has hardly been mentioned. The coldest temperature in the 48 contiguous states on November 25, 2005 was -11 degrees F at Embarrass, so highlighted in the National Summary that day. It was not until 54 days later, the state was mentioned again when Cook, MN reported the lowest reading in the lower 48 states on January 17th this week with 0 F. On Thursday, Flag Island (Lake of the Woods) reported the lowest temperature in the 48 contiguous states with -15 F, so Minnesota made headlines two days in a row.

Some are vocal in the relief and even pleasure taken in this prolonged mild spell, but let's face it our national reputation is at stake here!

Topic: Cloudy period since Christmas.....

To be honest, for many of us the gloomy skies so dominant around the state since Christmas have translated into gloomy personalities. In the Chanhassen daily weather records we find that since Christmas Eve day (through January 18) the average daily percent possible sunshine has only been about 18 percent, further 14 days have seen zero minutes of sunshine. Similar examination of the Duluth record shows an average of 10 percent possible sunshine and 15 days with zero minutes of sunshine.

Even those who do not normally suffer from Seasonal Affective Disorder have had difficulty in coping with this. Don't forget to exercise and get some fresh air daily....many walk in well-lit malls, gyms, or large commercial buildings, so it doesn't have to be outdoors. Some use full spectrum lights when they read. Still others spend hours in the kitchen trying out new recipes, or taking on new craft projects...if you are really desperate to ignore the weather and get on with something productive, go ahead and start doing your taxes early!

Recently some sunshine has been in evidence for at least parts of the day, noted in the St Paul Campus solar radiation measurements....

<http://www.134.84.160.120/img/wxsta/solar.gif>

An the forecast calls for more sunshine in the coming week.

Topic: Biking in winter....

I have been a walking or biking commuter for nearly 20 years...and why not? It's good exercise for your body....it's economic....and it's good for the environment. But, having said that, I rarely bike in the winter months. Much to my surprise, the current issue of Alaska magazine has an interesting article about those who live inside the arctic circle and still bike during the winter months, even commuting to work daily. My goodness, these are hearty people. "Ice biking" as they call it takes courage, smarts, and the right equipment. There are several requirements for winter ice biking: the right clothing, layered, light, and warm, with bright or reflective stripes; the right shoes or boots (studded); mountain bikes are best as they accommodate wider tires; tires should be wide, soft and studded (see Words of the Week); you should have front and rear lights; presumably carry a cell phone in case you get stuck. Some cautions in cold weather: your bike's suspension system won't work well and greased parts will tighten up, making the pedals harder to crank and the handlebars harder to turn.

I found this topic interesting, but I am not really an advocate for biking in winter here in the Twin Cities. As opposed to Alaska, safety is a major concern here because of the varying circumstances. Motor traffic volume is much larger in the metro area, and road conditions can be highly variable, with snow, ice, black ice, potholes, etc. There are probably areas where biking is relatively safe, but its the other guy, especially the one behind the wheel of the car or truck that you need to worry about. Nevertheless I have noticed more bike riders during this mild winter than I ever have before.

MPR listener question: I have heard you remark about the strong trend for temperatures to be warmer than normal during the winter months. In which winter month is this trend the strongest?

Answer: Examining the statewide records for temperature, the warm signal is strongest in the months of December and February. Since 1990, five Decembers and five Februaries rank in the warmest ten statewide since 1895. December of 1997, 1999, 2001, 2002, and 2003 ranked in the warmest ten, while February of 1992, 1998, 1999, 2000, and 2002 ranked in the warmest ten as well. The most recent December (2005) ranked in the warmest 30 percent statewide, while the present month of January (2006) has been so warm (through the 19th) that it may end up being the warmest January in state history if the weather pattern continues to the end of the month.

Twin Cities Almanac for January 20th:

The average MSP high temperature for this date is 23 degrees F (plus or minus 15 degrees F standard deviation), while the average low is 6 degrees F (plus or minus 15 degrees F standard deviation).

MSP Local Records for January 20th:

MSP weather records for this date include: highest daily maximum temperature of 52 degrees F in 1908; lowest daily maximum temperature of -12 degrees F in 1984; lowest daily minimum temperature of -25 degrees F in 1984; highest daily minimum temperature of 35 F in 1921; record precipitation of 0.80 inches in 1982. A record snowfall of 17.1 inches occurred on this date in 1982. The snow depth on this date in 1967 was a record 22 inches.

Average dew point for January 20th is 4 degrees F, with a maximum of 36 degrees F in 1909 and a minimum of -38 degrees F in 1985.

All-time state records for January 20th:

The all-time state high temperature for today's date is 61 degrees F at Madison (Lac Qui Parle County) and Montevideo (Chippewa County) in 1944; the all-time state low for today's date is -57 degrees F at Embarrass and Tower (St Louis County) in 1996. The all-time state record precipitation for this date is 1.76 inches at Preston (Fillmore County) in 1988. The all-time state record snowfall for this date is 17.1 inches at the MSP International Airport in 1982.

Words of the Week: Snow Cats

This term normally refers to those treaded catepillar-like motor vehicles used to move snow in mountainous regions. But for those who like to bicycle during the winter months Snow Cats are a type of wheel rim that is roughly twice the width of a regular one and allows you to use low pressure, wide, studded tires to get around on your bicycle. These rims fit most mountain bikes and really improve traction and handling when run at inflation pressures of only 12 to 20 psi. More information can be found at.. <http://www.allweathersports.com/>

Outlook:

Chance of snow in the far north on Saturday, continuing warmer than normal temperatures but with relatively more sun next week. Windy on Sunday. Another chance for snow in the north on Tuesday, but generally a dry week coming up.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, January 27, 2006

HEADLINES:

- Preliminary Climate Summary for January 2006
- Cold Elsewhere
- Global Warming Signal?
- Almanac for January 27th
- Seeing a lot of Sikurluk and Pukak
- Outlook

Topic: Preliminary Climate Summary for January: WARM!

This January will undoubtedly be the warmest in the modern National Weather Service (post 1891) record statewide. Most communities are reporting a mean monthly temperature so far that is from 14 to 16 degrees F above normal. On a statewide basis we will end up with a mean monthly temperature around 25 degrees F, over 3 degrees F warmer than the record warm January of 1944 (21.7 F mean). Heating Degree Days (accumulation of daily temperature below 65 F) so closely related to our energy consumption for home and commercial heating, are only 60 to 70 percent of normal for the month, a blessing for us economically. Most communities around the state reported at least one day with temperatures in the 40s F and many reported days with temperatures in the 50s F. Extremes ranged from -22 F at Embarrass on the 21st to 59 degrees F near Winona on the 26th.

Minnesota reported the lowest temperature in the nation's lower 48 states only twice this month, and further many communities, including the Twin Cities have yet to see a reading below zero F. In fact, should we finish out the month that way, it will be only the third time in Twin Cities climate history without a January below zero F reading (the others in 1846 and 1990). In fact the 2006 mean January temperature may top the warmest all time of 28.0 F at Ft Snelling in 1846. The warmth of this month has been primarily due to very high minimum temperatures aided by persistent cloudiness. The average percent possible sunshine for the month in the Twin Cities area for example was only about half of the normal, around 25 to 30 percent because of frequent cloud cover.

Minnesota is not alone in experiencing the exceptionally warm January. Organizers of festivities associated with hosting the Super Bowl in the Detroit (MI) area have many concerns. Motown's Winter Blast festival featuring dogsled races, ice skating, and a giant snow slide may be in danger for lack of ice. Temperatures there are expected to remain in the upper 30s to low 40s F around the Detroit vicinity. Areas from Michigan across the Great Lakes and into the eastern Dakotas may all record or near-record warm January values of temperature.

Precipitation for the month has been generally less than normal,

even though it has been a cloudy month with fog, freezing rain, drizzle, etc. Snowfall has been lacking, with less than an inch reported in some southeastern counties and only a few inches elsewhere. Only the far north along the Canadian border and in the Lake Superior highlands have reports of over 10 inches of snowfall appeared.

Lastly, winds of over 40 to 50 mph on the 23rd and 24th of the month closed many roads due to drifting snow, including I94 between Fergus Falls and Moorhead, and Hwy 2 between Grand Forks and Crookston.

Topic: Cold elsewhere.....

Alaska reported temperatures in the -50 F range earlier this week, their coldest readings of the winter so far. Parts of northern Canada also reported lows of -40 F or colder this week. But the real cold weather hardship headlines have been coming from Eastern Europe and Asia where energy shortages and high prices have produced even cold indoor climates, with thermostats set at only 55 F. The arctic air has persisted in places for over a week and resulted in 130 deaths in the Ukraine alone, mostly homeless people with no shelter. Parts of central Russia have seen temperatures as cold as -72 F.

It was reported by the European media that in order to keep the chill at bay, Russian zoo keepers were giving wine three times a day to the monkeys, and they were providing wild boars, camels, and reindeer with regular shots of vodka. In fact, an animal trainer with the Yaroslavi circus gave vodka to the elephants to keep them warm. One had a bit too much and rampaged through the circus damaging a number of buildings. Wonder if that trainer lost his job?

MPR listener question: Do you think this extremely strange, warm January combined with several years of warm weather is a signal of global warming? Any hope of a real winter again?

Answer: I don't really know. There is no simple explanation for this unusually warm January. Global climate change may be playing a role, but I don't know how much. Earlier generations probably pondered the same questions at the end of January 1846, 1880, 1931, 1944, and 1990, all of which were extremely warm months. January of 1846 was followed by a dry, warm February, then a wet, warm spring; January 1880 was followed by a warm February and spring; January 1931 started what was to become the warmest year in the Minnesota climate record, with nearly every month above normal; January 1944 was followed by a warm February, then a cold March and April associated with a wet spring; and January 1990 was followed by a warm February and a very wet spring.

For those who love winter, unfortunately it looks like the warmth of January will continue through the first week of February across our region and there will be only a few chances for any

significant snowfalls.

Twin Cities Almanac for January 27th:

The average MSP high temperature for this date is 20 degrees F (plus or minus 14 degrees F standard deviation), while the average low is 2 degrees F (plus or minus 15 degrees F standard deviation).

MSP Local Records for January 27th:

MSP weather records for this date include: highest daily maximum temperature of 47 degrees F in 1934; lowest daily maximum temperature of -10 degrees F in 1915; lowest daily minimum temperature of -23 degrees F in 1950; highest daily minimum temperature of 35 F in 1944; record precipitation of 0.42 inches in 1916. A record snowfall of 3.8 inches occurred on this date in 1916. The snow depth on this date in 1982 was a record 22 inches.

Average dew point for January 27th is 1 degrees F, with a maximum of 35 degrees F in 1944 and a minimum of -32 degrees F in 1966.

All-time state records for January 27th:

The all-time state high temperature for today's date is 61 degrees F at Lakefield (Jackson County) in 2002; the all-time state low for today's date is -54 degrees F at Pokegama Dam (Itasca County) in 1904. The all-time state record precipitation for this date is 1.80 inches at Harmony (Fillmore County) in 1944. The all-time state record snowfall for this date is 18.0 inches at Hokah (Houston County) in 1996.

Words of the Week: Sikurluk and Pukak

These are words used in Greenland to refer to rotten ice, Sikurluk, and crusty snow, Pukak. The recent January temperatures have produced a good deal of rotten ice and crusty snow around our state. I even observed this in the Pelican and Detroit Lakes areas earlier this week. Normally those lakes are frozen solid with over 24 inches of ice, but some of the bays actually showed open water, and certainly plenty of rotten ice and crusty snow.

Outlook:

Continuing warm over the weekend with a chance for light snow around the state late Saturday through Monday. Warm and dry for much of next week, though not quite as dramatic as this past one. Another chance for snow appears on the horizon for next Thursday.



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, February 3, 2006

HEADLINES:

- Record warm month ends, more winter-like month begins
- Sign of the times
- Fujita Tornado scale reconsidered
- Sap weather-early start?
- New Book
- Almanac for February 3rd
- Jack Wax
- Outlook

Topic: January ends with a heavy, wet March-like snow on Tuesday....

The record setting warm January ended on Tuesday of this week. Rochester, MN not only reported the warmest January in history but the least ever January snowfall as well, with just 0.8 inches.

The month did not go quietly though as rain, freezing rain, sleet and snow blanketed the state on Tuesday night. Some places in central Minnesota received up to 5 inches of new snow, including Onamia and Elk River. The snow density (ratio of snow to liquid water) was highly variable, ranging from less than 2:1 at MSP Airport up to 14:1 in some central counties. The very dense snow was associated with high dewpoints, near the 30 degrees F mark, while the more abundant snow fell where temperatures were colder and dewpoints were in the low to mid 20s F.

Topic: February starts warm.....

The first two days of February have carried on the trend from January with temperatures averaging 15 to 22 degrees above normal around the state.

Both La Crescent and Winona were at record highs on Ground Hog Day. La Crescent reported a record high of 51 F while Winona reported a record tying high of 52 F, and Rochester fell one degree short of tying their record with a high of 47 F.

Unlike the consistency of January temperature however, it looks like February will be taking us for a rollercoaster ride, bringing in some colder than normal temperatures along the way. The jetstream is slowly evolving toward northwest flow from higher latitudes and will bring some below zero temperatures to the north this next week, along with colder than normal readings to the south.

Topic: A sign of the times...

Hertz Car Rental announced this week that they will no longer provide insurance coverage for acts of nature....windstorms, hail, tornadoes,

lightning, hurricanes, flash flooding, etc. Other car rental companies are expected to follow suit. Most personal auto insurance covers acts of nature if you carry comprehensive coverage. Apparently, part of the motivation for this change was the high volume of claims associated with the past hurricane season.

#### Topic Fujita Tornado Scale to be reconsidered

At the American Meteorological Society meeting in Atlanta this week, it was announced that the Fujita Scale used to classify the intensity of tornadoes will be revised. Studies have shown that the winds associated with F-3, F-4, and F-5 damages to structure may be set too high. Lower wind speeds actually cause the same level of damages. In addition reliance on the examination of damages to framed structures was called into question as an accurate way to assess the F-scale. A wider range of damage indicators will be considered. A proposed revised F-Scale will likely come out in 2007. More on this topic can be found at the following web site:

[http://www.wind.ttu.edu/F\\_Scale/default.htm](http://www.wind.ttu.edu/F_Scale/default.htm)

#### Topic: Sap weather

During MPR's Midday program this week, Jim from Mora called in with a question about the maple sap run this year. Maple trees last year did not yield much sap in central Minnesota, but this year's condition look like they will be conducive to a good sap run.

I looked into the climatic effects on this industry and found some interesting information. To have the potential for a good maple sap harvest, you need a good growing season (which we had in 2005) and adequate to surplus fall soil moisture recharge (which we also had in 2005). Then night and day temperatures should start oscillating below and above the freezing level (32 F) to stimulate pressure changes in the tree which then cause a sap flow. The ideal temperature range is 20s F at night followed by upper 30s to mid 40s F during the day. We recorded an unusual number of freeze-thaw cycles in January (25 in the Twin Cities area by my count) which should be conducive to a good sap flow. In addition sunny skies and light or calm winds help to maximize sap flow, so we'll have to see what February brings.

In Minnesota, sap flow most often occurs in March, but may linger as late as early May in northern counties. On rare occasions, I suspect this year to be one of them, it actually starts in February. The longer growing season in southern counties allows trees to produce and store more sugar than the shorter growing season in northern sections. During the sap runs, daytime temperatures of 50 degrees F or above are detrimental to sap quality because bacteria invade and multiply more rapidly producing a darker amber color. Higher temperatures also promote more rapid phenological development of the trees shortening the period to bud swelling, when maple sap goes off flavor or "buddy" and is no longer harvested. Lower temperatures in the 30s and 40s during harvest help

prevent sap fermentation.

This February and March sap runs should be significantly better than last year. Soil moisture has been adequate and frost depths shallower than normal, so tree roots have been able to take up moisture from the soil. In addition, temperatures have already oscillated enough above and below freezing. Now should temperatures fluctuate between the 20s F at night and upper 30s to 40s F during the day (5-10 degrees either side of freezing) this will stimulate further pressure changes in the tree (bark, stems, twig, and roots) and force the sap to run. Many are considering tapping their trees in February in anticipation of an early sap run.

Old sayings about the maple sap season:

"If the trees go into winter with wet feet, there will be a good sap season." (potential was good this year)

"Sap runs better by day than by night." (certainly, temperature rises sharply during the day assisted by the sun)

"Sixty-three percent of the sap is said to drop before noon." (the sharpest temperature rise occurs in the morning hours and winds usually pick up in the afternoon which slows the sap run).

I better stop this discussion and go have some pancakes with real maple syrup!

MPR listener question: I heard your book, Minnesota Weather Almanac will be out soon. Is it a weather history of the state? What was the most interesting thing you learned writing it?

Answer: Yes, the book will be out in April at most bookstores. I learned a great deal writing it and perhaps will share some of these stories in WeatherTalk from week to week. One of the first things I learned was that Minnesota's reputation as the American Siberia actually started with the winter of 1820 when the Ft Snelling soldiers suffered greatly during their first winter encampment at the juncture of the Minnesota and Mississippi Rivers. Forty soldiers died from pneumonia and scurvy, as below zero F temperatures dominated that winter.

Twin Cities Almanac for February 3rd:

The average MSP high temperature for this date is 21 degrees F (plus or minus 15 degrees F standard deviation), while the average low is 4 degrees F (plus or minus 15 degrees F standard deviation).

MSP Local Records for February 3rd:

MSP weather records for this date include: highest daily maximum temperature of 51 degrees F in 1934 (also it was 50 F last year); lowest daily maximum temperature of -13 degrees F in 1989; lowest

daily minimum temperature of -26 degrees F in 1996; highest daily minimum temperature of 35 F in 1991; record precipitation of 0.42 inches in 1943. A record snowfall of 3.4 inches occurred on this date in 1936 and 1976. The snow depth on this date in 1969 was a record 22 inches.

Average dew point for February 3rd is 3 degrees F, with a maximum of 32 degrees F in 1924 and a minimum of -37 degrees F in 1923.

All-time state records for February 3rd:

The all-time state high temperature for today's date is 65 degrees F at Browns Valley (Traverse County) in 1991; the all-time state low for today's date is -52 degrees F at Itasca State Park (Clearwater County) in 1996 and at Warroad (Roseau County) in 1936. The all-time state record precipitation for this date is 1.50 inches at Red Lake in 2000. The all-time state record snowfall for this date is 12.0 inches at Caledonia, Harmony, La Crescent, and Zumbro Falls in 1983.

Words of the Week: Jack Wax

Unlike our usual words of the week, this is not a weather, soil, or agricultural term at all and may not be well known outside the maple syrup industry. Jack Wax is a special treat often eaten at the end of the maple sap harvesting season during a "sugaring off party." Hot maple syrup from the evaporator is poured onto snow or crushed ice and eaten with the fingers as a treat. Sort of like an amber colored snowcone I suppose.

Outlook:

Partly cloudy and cooler this weekend. There will be an increased chance for snow later on Monday and Tuesday next week with temperatures trending downward. A better chance for statewide snowfall begins on Thursday, and may evolve into a significant event.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, February 10, 2006

HEADLINES:

- Winter is back
- Cold Weather Testing in Canada
- Ten years ago
- Question on February heavy snowfall
- Almanac for February 10th
- From the "Minnesota Weather Almanac"
- Canadian hardness gage
- Outlook

Topic: Return to Winter Reality.....

Following a record warm January as well as a warm first two days of February, we have suddenly plunged into winter-like weather with cold temperatures, biting winds, and snow. Since February 2nd, Minnesota has reported the coldest temperature in the 48 contiguous states on seven mornings, including -22 F at Baudette on the 5th, -20 F at International Falls on the 6th, -30 F at Embarrass on the 8th, and -20 F at Littlefork and Embarrass on the 9th. Though not record-setting these are cold temperatures more typical of Minnesota winter.

Topic: Cold Weather Testing....

The January warm spell reached into high latitudes over North America and was a source of apprehension for those on Baffin Island in Arctic Canada. Seems they have promoted themselves as the ideal cold weather testing ground for new products on the promise that winter weather will always provide very stressful and challenging low temperatures. The new Airbus model A380, the world's largest airliner with a passenger capacity of 555 was scheduled to be cold weather tested on Baffin Island this winter. But temperatures were not getting cold enough. Fortunately the return of arctic air this month has come just in time as engineers and pilots are testing the new Airbus this week in air temperatures of -20 to -30 degrees F and prospects for even colder weather on the way. How would you like to have that job?

Topic: Ten Years Ago....

On this date (Feb 10) 1996 northwestern Minnesota counties were hammered by a fierce blizzard (one of several during that winter). Thanks to fine forecasting by the Weather Service, there were no fatalities. However, traffic came to a halt as Interstate 94 was closed between Moorhead and Fergus Falls, Hwy 10 was closed between Moorhead and Detroit Lakes, and Hwy 2 was closed between East Grand Forks and Fosston. Hundreds of cars were stranded as people found shelter.

MPR listener question: What is the most snow that has ever fallen in 24 hours during the month of February?

Answer: It is unclear to me if you meant in the Twin Cities area or around the state. I will answer from both perspectives. For the Twin Cities, 8.8 inches fell on February 22, 1913 paralyzing the cities. On a statewide basis, 25 inches fell at Detroit Lakes on February 23, 1922.

Twin Cities Almanac for February 10th:

The average MSP high temperature for this date is 24 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 6 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for February 10th:

MSP weather records for this date include: highest daily maximum temperature of 47 degrees F in 1977; lowest daily maximum temperature of -8 degrees F in 1899; lowest daily minimum temperature of -23 degrees F in 1899; highest daily minimum temperature of 33 F in 1999; record precipitation of 0.60 inches in 1898. A record snowfall of 4.3 inches occurred on this date in 1953. The snow depth on this date in 1967 and 1969 was a record 20 inches.

Average dew point for February 10th is 9 degrees F, with a maximum of 37 degrees F in 1996 and a minimum of -25 degrees F in 1982.

All-time state records for February 10th:

The all-time state high temperature for today's date is 57 degrees F at Luverne (Rock County) in 1977; the all-time state low for today's date is -49 degrees F at Tower (St Louis County) in 1899. The all-time state record precipitation for this date is 1.69 inches at Montevideo (Chippewa County) in 1965. The all-time state record snowfall for this date is 20.0 inches at Pigeon River (Cook County) in 1939.

From the "Minnesota Weather Almanac" available soon in bookstores:

Heavy snowfall of 20 inches or more in 24 hours have occurred more frequently in March than any other month. The Minnesota climate data all the way back to the 19th Century show the following monthly distribution for snowfalls of 20 inches or more (statewide):

October - never

November - 7 storms

December - 3 storms

January - 11 storms

February - 7 storms

March - 16 storms

April - 2 storms

May - never

Words of the Week: Canadian hardness gage

This is not related to the fact that many Canadians pride themselves on their hardiness. This is a type of disk gage used for measuring snow hardness. The instrument is a spring-loaded rod with a disk attached at the tip. A gage attached on the side is calibrated for pounds per square inch to indicate resistance of the snow. It has been used most commonly on arctic and glacier expeditions. I presume this is needed to know what kind of load (pedestrian on snowshoes, or skis) the snow could take.

#### Outlook:

Chance of light snow and flurries in places over the weekend, with continuing more winter-like temperatures. A warming trend will begin on Tuesday, but probably be short-lived, as another cold front will bring a chance for snow and colder than normal temperatures towards the end of next week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, February 17, 2006

#### HEADLINES:

- Record snows in SE
- Lessons not learned
- Benchmark temperatures in the same year...it is possible
- Quote of the week
- Question on February cold
- Almanac for February 17th
- From the "Minnesota Weather Almanac"
- Trombe wall and thermosiphoning
- Outlook

Topic: Record snowfalls in southeastern communities.....

February 16th brought record snowfalls and difficult travel to southeastern Minnesota communities. Those reporting new record snowfall amounts included.....

Rochester 6.6 inches, La Crosse, WI 8.0 inches, Hokah 5.9 inches, Winona 5.7 inches, Caledonia 9.0 inches, Rushford 7.0 inches, Spring Valley 4.9 inches, and Albert Lea and Fairmont tied their record amount for the date with 4 inches, and 3 inches, respectively.

Topic: We are slow learners, more fraud in hurricane claims...

It was disturbing to read this week of the corruption, negligence, and fraud associated with the FEMA monetary aid to victims of last year's Hurricane Katrina. Government investigators reported that FEMA paid for \$438 per day lodging charges in New York City, \$375 per night stays in beachfront condominiums in Florida, and provided \$2000 debit cards to 900,000 applicants who filed false or duplicate Social Security numbers, or false addresses and names. This is especially deplorable in light of the lessons that should have been learned from the 2004 responses to hurricanes Charley, Frances, and Jeanne, when FEMA paid out on scores of funeral expense claims that were false or associated with people who died from totally unrelated causes.

Looks like FEMA will be subject to revised thinking on communications, chain of command, timeliness, and accountability as Congress wraps up its investigations into last year's performance.

Topic: Benchmark temperature readings in the same year!

On February 15, 1936 the temperature at Parshall, ND plunged to -60 degrees F to establish a statewide record low. Later that year, on July 6th the temperature at Steele, ND hit 121 degrees F, also a statewide record high temperature, producing a 181 degrees F spread over the calendar year.



There are at least four Minnesota communities with benchmark highs and lows (extremes) falling in the same year as well.

Location	Extreme Low Temp/Date	Extreme High Temp/Date
Big Falls	-52 F Jan 23, 1936	106 F July 6, 1936
Fergus Falls	-42 F Feb 16, 1936	110 F July 6, 1936
Ada	-53 F Feb 15, 1936	111 F July 6, 1936
Canby	-33 F Jan 22, 1936	111 F July 12, 1936

Topic: Quote of the week

"...it is fair to say humans make hopeless thermometers....if the temperature is 22 degrees C (72 F) and they are out in the sun, it will feel much higher to them." This was attributed to Mr. Tony Quayle of the New Zealand MetOffice as he was trying to appease city officials in Tauranga, NZ who were protesting that cool temperature readings from their airport station were not representative of the city center and were having detrimental effects on tourism in the city. The city officials wanted to move the official weather station from the airport into the city. These people obviously truly believe that we can do something about the weather, by moving the location of where it is measured!

MPR listener question: Isn't it somewhat unusual to have below zero temperatures in the second half of February?

Answer: Not at all. The average number of nighttime lows below zero F from February 15th to 28th in the Twin Cities is 3 to 4, while up north in places like Bemidji and International Falls it is 5 to 6 times.

Twin Cities Almanac for February 17th:

The average MSP high temperature for this date is 28 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 10 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for February 17th:

MSP weather records for this date include: highest daily maximum temperature of 55 degrees F in 1981; lowest daily maximum temperature of -12 degrees F in 1936; lowest daily minimum temperature of -20 degrees F in 1903 and 1936; highest daily minimum temperature of 36 F in 1998; record precipitation of 0.29 inches in 1972. A record snowfall of 3.8 inches occurred also on this date in 1972. The snow depth on this date in 1967 was a record 26 inches.

Average dew point for February 17th is 14 degrees F, with a maximum of 44 degrees F in 1981 and a minimum of -26 degrees F in 1942.

All-time state records for February 17th:

The all-time state high temperature for today's date is 66 degrees F at Pipestone (Pipestone County) and Luverne (Rock County) in 1981;

the all-time state low for today's date is -52 degrees F at Pokegama Dam (Itasca County) in 1903. The all-time state record precipitation for this date is 1.85 inches at Hokah (Houston County) in 1984. The all-time state record snowfall for this date is 13.0 inches at Beaver Bay (Lake County) in 1870.

From the "Minnesota Weather Almanac" available soon in bookstores:

Did you know that Professor William Payne of Carleton College in Northfield was the first Director of the Minnesota State Weather Service in the 1880s? He had a stormy relationship with the U.S. Signal Corps Office in St Paul and was constantly at odds with the chief there, Lt. Thomas Woodruff. All of this came to an end by 1891 when the National Weather Service established offices in the Twin Cities. But then a rivalry between the St Paul Weather Service Office and the Minneapolis Weather Service Office developed!

Words of the Week: Trombe Wall and Thermosiphoning

The Trombe Wall is a kind of thermal storage design feature, named for French engineer, Felix Trombe. It is comprised of a south-facing masonry wall, usually painted black or other dark color separated from the outside air by a glass wall with a spacing in between. As the masonry absorbs solar radiation it warms the air between it and the glass wall setting up a convective circulation. The warm air rises and passes through one-way vented openings in the top of the masonry wall to enter the interior rooms (sometimes assisted by a fan). This movement of the heated air is called thermosiphoning. A secondary source of heating simply comes from conduction of heat through the masonry (or sometime brick) wall to the interior side where it can provide heat even after sunset, since it may take 6 to 8 hours for the heat to move through the wall.

This time of year, with increasing daylength and higher sun angles, the heat gain on south facing landscapes or building walls is quite large, even if the air temperature outside is still quite winter-like.

Outlook:

Cold temperature regime is here for a time. Highs often in single digits to teens, with the coldest low temperatures of the winter so far. Chance of light snow flurries in the north later on Sunday. Some moderation of temperature starting on Monday, but remaining generally colder than normal. Another chance for snow late Wednesday and Thursday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, February 24, 2006

HEADLINES:

- Book promo
- Shallow frost and adequate soil moisture
- Underwater gliders
- Shape and size of snowflakes
- Historical February snowfall
- Almanac for February 24th
- From the Minnesota Weather Almanac, February blizzards
- Steam devils
- Outlook

My new book, "Minnesota Weather Almanac", published by the Minnesota Historical Society Press will be available in bookstores and online this April. It is a complete guide to Minnesota weather, featuring stories, fun facts, amazing extremes, scientific lessons, and the best questions from the MPR Annual State Fair Weather Quiz broadcasts on the Midday program. This book is an attempt to describe the history of the state's weather all the way back to 1806. Readers of the weekly newsletter "Minnesota WeatherTalk" as well as those who listen to us on Minnesota Public Radio should find it interesting reading.

Topic: Shallow ground frost

Even with the cold arctic air of last weekend, the depth of ground frost around the state is shallow compared with long term averages. Most locations are reporting frost depths of 12 to 20 inches, with only northwestern counties showing frozen soil below the two foot depth. This is at least a foot less than average for this time of year. In addition stored soil moisture ranges from 6 to 8 inches in the top five feet of soil. Both of these attributes are good signs for Minnesota agriculture as we look forward to the spring months. Hopefully, soils will be thawed and tillable during the month of April.

Topic: Underwater gliders

At the recent oceanography meetings of the American Geophysical Union scientists announced plans to use low powered underwater gliders to study ocean characteristics during hurricanes. The vessels can remain safely below the surface and measure the temperature profile of oceans, as well as salinity, pollution, and even wave heights during a tropical storm or hurricane. They can be dropped to the ocean surface from aircraft, then plunge to a safe navigation depth, survey and report on conditions during a storm. Some were apparently tested for this purpose two years ago during Hurricane Francis.

MPR listener question: I recently moved from TX to the Twin Cities

Metro Area, having earlier lived in IA and IL. I remember catching snowflakes that were fat and fluffy, almost like those you would cut out of paper when we were kids. The past two winters the snowflakes seem to look like fuzz. Are there no longer any large, individual flakes being formed because of our weird winters?

Answer: Indeed, we have not observed a great deal of snow this winter in the Twin Cities area at all. The structure of ice crystals, and the resulting structure of snowflakes is highly dependent on the temperature and moisture conditions of the atmosphere, and to some extent the wind. The more recent snows have fallen in cold temperatures and with considerable wind, both of which contribute to smaller aggregation of snowflakes, and perhaps this so-called snow fuzz you refer to. I do remember some large flakes falling in the winters of 2000-2001 and before that 1996-1997. We may yet see snowflakes of the shape and size you remember for we still have the month of March to go.

MPR listener question: It would appear that yet another February has gone by without much snowfall in the Twin Cities Metro Area. This is quite disappointing for those of us who like to cross country ski in the metro area's parks and golf courses. Does February ever produce the most monthly snowfall in the area?

Answer: The climate statistics show that average snowfall for February in the Twin Cities area is less than that of January, March, and December, but more than November and April. During the snow season (October through April) February has produced the greatest snow accumulation for the Twin Cities in only 16 winters since 1884, about 13 percent of the time. Those years and the February total snowfall are shown below:

1891 12.3"	1893 17.8"	1904 13.2"	1909 24.2"
1919 11.8"	1931 7.0"	1936 19.7"	1939 11.9"
1945 15.4"	1953 13.4"	1955 11.0"	1959 6.3"
1962 26.5"	1981 11.0"	1991 14.2"	2004 19.7"

Note winter of 1930-1931 and 1958-1959 produced hardly any snowfall with seasonal totals of only 14.2" and 19.1", respectively.

Twin Cities Almanac for February 24th:

The average MSP high temperature for this date is 30 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 12 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for February 24th:

MSP weather records for this date include: highest daily maximum temperature of 57 degrees F in 1931; lowest daily maximum temperature of -2 degrees F in 1967; lowest daily minimum temperature of -20 degrees F in 1967; highest daily minimum temperature of 42 F in 2000; record precipitation of 1.90 inches in 1930. A record snowfall of 3.8 inches occurred also on this date in 1962. The snow depth on

this date in 1967 was a record 27 inches.

Average dew point for February 24th is 16 degrees F, with a maximum of 44 degrees F in 1930 and a minimum of -34 degrees F in 1950.

All-time state records for February 24th:

The all-time state high temperature for today's date is 67 degrees F at Pipestone (Pipestone County) in 1958; the all-time state low for today's date is -46 degrees F at Red Lake Falls (Red Lake County) in 1955. The all-time state record precipitation for this date is 2.10 inches at Tower (St Louis County) in 1964 and at Beaver Bay (Lake County) in 1868. The all-time state record snowfall for this date is 19.0 inches at Beaver Bay (Lake County) in 1868.

From the "Minnesota Weather Almanac" available soon in bookstores:

The worst February winter storms to strike Minnesota came on February 13-16, 1866, and February 21-23, 1922. The 1866 blizzard struck violently and suddenly about 10 pm on the 13th and raged for three days, leaving 15-20 foot drifts of snow across southern Minnesota. Temperatures dropped by 30 to 40 degrees F during the storm and there was very little visibility. Many livestock perished, but most people remained safely indoors as a result of the storm striking at night. The 1922 storm brought thunder, lightning, rain showers, sleet, freezing rain, snow, and blizzard conditions as it developed over the 21st to 23rd of February. The ice storm hit mostly southeastern counties coating power lines and trees with thick ice that caused breakage and much damage. The observer at Grand Meadow (Mower County) called it "the worst ice storm" to ever hit that community, with "great damage to trees and power lines." Communities in western and northern counties received snowfall amounts that set new February records, many of which still stand today. Willmar reported 14 inches, Montevideo 19 inches, Morris 15 inches, Fergus Falls 13.2 inches, Milaca 22 inches, and Detroit Lakes a whopping 25 inches, still the statewide 24-hour snowfall record for February. Detroit Lakes picked up 43 inches of snow that month and reported a snow depth of 50 inches on February 28th.

There is speculation that the storms of February 25-26, 1843 at Ft Snelling and February 5-7, 1857 at Ft Ripley may have been blizzards on the same scale as those mentioned above. However, complete data on these storms is not to be found.

Words of the Week: steam devils, arctic vortices, frigid fog funnels

Very evident last weekend with the outbreak of arctic air across the state, steam devils are produced by convective eddies of condensed water vapor that rise from a lake surface and swirl upward through the overlying cold air (having arisen from the warmer lake body). The wind will often initiate a rotation in the steam, giving it a fingerlike appearance, similar to a dust devil on land. An arctic air mass overlying open water and accompanied by strong wind speeds are essential ingredients.

Winds were blowing across Lake Superior at 30-40 mph on Friday, February 17th, with air temperatures only ranging from -7 to -11 degrees F. The Lake Superior surface temperatures were 33 to 36 degrees F, thus 40 F or more than the overlying air. Under such conditions the water vapor being released by the lake surface readily condenses into tiny droplets and rises through the cold air to great heights. Steam devils have been observed from aircraft to rise as high as 1500 ft. They are very ephemeral in nature lasting only seconds to a few minutes before they evaporate in the dry, arctic air. On occasion these steam devils are called arctic outbreak vortices, or frigid fog funnels. Photos of such atmospheric phenomena are rare because they are so infrequent. Recent photos taken of these funnels over Lake Superior can be found on the web site of the Reader/Weekly in Duluth: <http://www.readerweekly.us> or our web site: [www.134.84.160.120](http://www.134.84.160.120)

#### Outlook:

Continued cooler than normal temperatures over the weekend with a chance for scattered light snow on Sunday. Warming trend by next Wednesday with an increasing chance for precipitation and more unsettled weather for the balance of the week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, March 3, 2006

#### HEADLINES:

- February Climate Summary
- International Weather Headlines
- March Blizzard of 1985
- Temperature extremes of March
- Almanac for March 3rd
- From the "Minnesota Weather Almanac"
- Blustery appropriate in March
- Outlook

#### ANNOUNCEMENT:

My new book, "Minnesota Weather Almanac", published by the Minnesota Historical Society Press (MHSP) will be available in bookstores and online this April. It is a complete guide to Minnesota weather, featuring stories, fun facts, amazing extremes, scientific lessons, and the best questions from the MPR Annual State Fair Weather Quiz broadcasts on the Midday program. This book is an attempt to describe the history of the state's weather all the way back to 1806. Readers of the weekly newsletter "Minnesota WeatherTalk" as well as those who listen to us on Minnesota Public Radio should find it interesting reading. The book can be pre-ordered on line via the MHSP web site:  
[http://shop.mnhs.org/moreinfomhspress.cfm?Product\\_ID=864](http://shop.mnhs.org/moreinfomhspress.cfm?Product_ID=864)  
or via Amazon.com

[http://www.amazon.com/gp/product/product-description/0873515544/ref=dp\\_proddesc\\_0/002-7889444-2929602?%5Fencoding=UTF8&n=283155](http://www.amazon.com/gp/product/product-description/0873515544/ref=dp_proddesc_0/002-7889444-2929602?%5Fencoding=UTF8&n=283155)

Topic: February Climate Summary for Minnesota

Following the warmest January in 160 years, most communities around the state reported a cool February, with mean monthly temperatures that ranged from 2 to 5 degrees F below the long term average. Where there was an absence of snow cover in southern counties, temperatures were close to the February normal. Coldest temperature reported in the state was -36 degrees F at Embarrass on the 18th, while the warmest temperature reported was 53 degrees F at Winona on the 2nd. Minnesota reported the coldest temperature in the contiguous 48 states eleven times during the month.

Most communities reported a dry February as well, with total precipitation that was less than normal. Only some northern counties received above normal amounts thanks to some heavy snowfalls. Those stations reporting heavier snowfall amounts during the month included Ada with 19.8 inches, Duluth with 23.4 inches, Itasca State Park with 18.2 inches, International Falls with 15.1 inches, and Floodwood with 16.5 inches.

Topic: International Weather Headlines This Week....

Despite recent widespread rains this week, East African countries like Kenya, Somalia, Ethiopia, and Burundi remain in severe drought, for some of these countries the worst in over three decades. The United Nations and charitable NGOs like Oxfam continue to ask for financial and food aid to alleviate the hunger and poverty in these areas. Among the agricultural losses that may be felt in the more developed nations, leaf tea production is down by up to 75 percent. This may have consequences for world tea markets since the African crop is used to produce a great deal of tea blends.

Arctic Canada communities on Baffin Island this week reported daytime temperatures ranging from 37 to 44 degrees F, values that are approximately 40 to 50 degrees above normal for this time of year and the highest seen in February for sixty years. In addition they reported measurable February rainfalls for only the third time since 1946, with wind gusts of 60 to 70 mph. They usually see February precipitation only in the form of snow or sleet. The storm and accompanying warm temperatures were poorly forecasted and motivated an education minister in Canada to suggest that a staffed weather forecast office be established for Baffin Island and north. The current forecast office for Arctic Canada is located in Edmonton, Alberta.

March began like a lion in England and Scotland, with high winds, cold temperatures and snow reported from many locations on March 1st. Snowfalls of 4 inches or more occurred in parts of Scotland, with lesser snowfalls in Wales and southwestern England. Blowing and drifting snow made for difficult travel and school closures in many areas.

Topic: The blizzard of March 3-4, 1985

A large winter storm brought mixed precipitation, strong winds, and blizzard conditions to the state on this date twenty-one years ago. Freezing rain, sleet, and glaze, accompanied by occasional thunder closed roads in SE Minnesota counties. The rest of the state was subject to very high winds, heavy snow accumulation and blizzard conditions. Winds gusted to 68 mph at Rochester, 71 mph at the Duluth Airport, and even 90 mph on the Duluth lift bridge. Zero visibility and drifts 6 feet high or greater closed I-94 between Minneapolis and Alexandria. Many businesses and schools were closed. Total snowfall accumulations were quite large and record setting for some communities. Amounts included 16.7 inches at MSP Airport, 18 inches at Duluth Harbor, 20 inches at Two Harbors, 22 inches at Canby and Morris, and 24 inches at Brainerd and Benson.

MPR listener question: I have heard you say that March shows the largest difference in temperature extremes historically in Minnesota, 88 degrees F for a high and -50 degrees F for a low. But what is the specific date in March with the largest statewide extremes of temperature?

Answer: March 18th shows the largest range in temperature of any date on the calendar. The statewide record high for that date is



84 degrees F at Canby (Yellow Medicine County) in 1921, while the statewide record low is -48 degrees F at Sawbill Camp (Cook County) in 1939, a range of 132 degrees on the same day of the year.

Twin Cities Almanac for March 3rd:

The average MSP high temperature for this date is 33 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 17 degrees F (plus or minus 11 degrees F standard deviation).

MSP Local Records for March 3rd:

MSP weather records for this date include: highest daily maximum temperature of 65 degrees F in 1905; lowest daily maximum temperature of 7 degrees F in 2002; lowest daily minimum temperature of -16 degrees F in 1839 and 1843; highest daily minimum temperature of 38 F in 1894, 1934, 1983; record precipitation of 1.19 inches in 1970. A record snowfall of 12.6 inches occurred also on this date in 1985. The snow depth on this date in 1962 was a record 21 inches.

Average dew point for March 3rd is 16 degrees F, with a maximum of 52 degrees F in 1983 and a minimum of -13 degrees F in 1978.

All-time state records for March 3rd:

The all-time state high temperature for today's date is 71 degrees F at Milan (Chippewa County), Montevideo (Chippewa County), St Peter (Nicollet County), and Winnebago (Faribault County) in 1905; the all-time state low for today's date is -42 degrees F at Embarrass (St Louis County) in 1996. The all-time state record precipitation for this date is 3.06 inches at Benson (Swift County) in 1985. The all-time state record snowfall for this date is 18.7 inches at Benson (Swift County) in 1985.

From the "Minnesota Weather Almanac" available soon in bookstores:

March of 1843 is without question the most significant monthly temperature aberration in Minnesota's climate record. Daily observations of temperature taken three times each day at Ft Snelling show a monthly mean value of just 4.7 degrees F. This is 27.4 degrees F cooler than the modern monthly mean (1971-2000) of 32.1 degrees F. Heavy snow cover was prevalent as nearly 50 inches had fallen on the landscape to that point of winter, and northwesterly winds were dominant. Twenty of the thirty-one days of the month registered temperatures below zero F, thirteen of which showed readings of -10 F or colder. The highest temperature measured during the month was only 27 F. Snowfall totaled about 12 inches, and the soldiers were very tired of the severe winter conditions by the end of the month. Incredibly even after 163 years of daily temperature readings eight March cold temperature records still stand from that terrible month of 1843.

Word of the Week: Blustery

This word is derived from Low German (blustern) and Serbo-Croatian (blizugati) words which mean to blow fitfully and violently like in a storm, referring to the wind. Technically, the National Weather Service forecasters have guidelines for using the term in public forecasts. These guidelines are described in a Rule of Thumb (ROT) memo: "With sustained winds of 15 to 25 mph and especially in gusty situations, the term blustery may occasionally be used." Winds of 15 to 25 mph under mild temperature conditions are sometimes described as "breezy", while the same winds under cold temperature conditions are described as "brisk."

It is not surprising to find that these terms (blustery, breezy, and brisk) are most often found in the public forecast statements during the transition seasons, particularly the months of March-May and October-November when wind speeds tend to be higher as contrasting air masses fight it out over our state.

#### Outlook:

Unsettled weekend weather will bring a mixture of precipitation to Minnesota starting late on Saturday. Chance for snow on Sunday, then again by the middle of next week, which looks to be quite stormy. Temperatures will generally hover slightly either side of normal for this time of year.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, March 10, 2006

#### HEADLINES:

- Earlier loss of lake ice
- Quote of the week
- Latin seasons
- Thunder and hail in March
- Almanac for March 10th
- From the "Minnesota Weather Almanac"
- COPD
- Outlook

#### ANNOUNCEMENT:

My new book, "Minnesota Weather Almanac", published by the Minnesota Historical Society Press (MHSP) will be available in bookstores and online this April. It is a complete guide to Minnesota weather, featuring stories, fun facts, amazing extremes, scientific lessons, and the best questions from the MPR Annual State Fair Weather Quiz broadcasts on the Midday program. This book is an attempt to describe the history of the state's weather all the way back to 1806. Readers of the weekly newsletter "Minnesota WeatherTalk" as well as those who listen to us on Minnesota Public Radio should find it interesting reading. The book can be pre-ordered on line via the MHSP web site: <http://shop.mnhs.org/browsemhspres.cfm> (browse under nature/environment) or via Amazon.com (search for Minnesota Weather Almanac)

Topic: Earlier loss of lake ice in northern states....

A study released this week documents that many lakes in Maine, New York, Wisconsin, Minnesota, and Alaska are losing their ice cover on earlier dates in the spring. Historical lake ice out dates were compared to those of more recent years. Having just come from a meeting on the Lake of the Woods and Rainy River watersheds, I can attest to the fact there is a good deal of concern expressed about these data, as well as some distressing trends in water quality and the populations of invasive species. Lake of the Woods ice thickness was thinner than average again this winter, following a trend of recent years. Climate records from nearby Baudette, MN show that 14 of the 20 warmest January through March periods over the last 100 years have occurred since 1981, a remarkable warm winter signal for the region.

Topic: Quote of the week....

"....I supported the flood control project and I want beauty, not a bunch of rip-rap..." Said property owner George Altamura of Napa, CA who sold a significant piece of his Napa Valley property to the local flood control and water conservation district (amounting to a \$750,000 purchase), so they could build a flood wall on it to

protect the city of Napa. Flood mitigation projects take the cooperation of all levels of government and private citizens as well. I suspect some of this type of negotiation is going on in New Orleans right now.

Topic: A Latin Interpretation of the Seasons

Hibernal, vernal, aestival and autumnal are the Latin adjectives for the four seasons, winter, spring, summer and fall. Later this month on March 20th we change over from hibernal to vernal with the Vernal Equinox as the sun passes over the equator on its migration north. Interestingly, many Minnesotans choose to hibernate (the verb form for spending the winter) in Arizona, Texas or Florida, then turnaround and aestivate (the verb form for spending the summer) in places like Detroit Lakes, Gull Lake, Pelican Lake and Lake of the Woods. That's what I call hibernating and aestivating in style.

MPR listener question: Thunder, lightning and hail were reported this week in both northwestern and southern parts of the state. Isn't this quite unusual for early March?

Answer: Historical data show that thunder and lightning occur during March in Minnesota with a frequency of 1-2 days per year in most places. Some spots in northern Minnesota hear thunder and see lightning during March about once every 2-3 years or so. Hail is more unusual, showing a frequency of only once every 5-6 years during March. All of these weather elements when they do occur in March, tend to come toward the end of the month and not during the first 10 days. Recall, that March 29, 1998 brought severe thunderstorms, hail and 14 tornadoes to southern Minnesota, a rare storm indeed.

Twin Cities Almanac for March 10th:

The average MSP high temperature for this date is 35 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 19 degrees F (plus or minus 11 degrees F standard deviation).

MSP Local Records for March 10th:

MSP weather records for this date include: highest daily maximum temperature of 56 degrees F in 1905 (60 F at Ft Snelling in 1838); lowest daily maximum temperature of -3 degrees F in 1948; lowest daily minimum temperature of -17 degrees F in 1948; highest daily minimum temperature of 38 F in 1977; record precipitation of 0.55 inches in 1913. A record snowfall of 4.2 inches occurred on this date in 1956. The snow depth on this date in 1979 was a record 22 inches.

Average dew point for March 10th is 18 degrees F, with a maximum of 43 degrees F in 1966 and a minimum of -29 degrees F in 1948.

All-time state records for March 10th:

The all-time state high temperature for today's date is 65 degrees F at Albert Lea (Freeborn County) and Luverne (Rock County) in 1967; the all-time state low for today's date is -44 degrees F at Itasca State Park in 1948. The all-time state record precipitation for this date is 2.10 inches at Winnibigoshish Dam (Itasca County) in 1892. The all-time state record snowfall for this date is 16.8 inches also at Winnibigoshish Dam in 1892.

From the "Minnesota Weather Almanac" available soon in bookstores:

Portions of northern Minnesota, including Duluth saw one of their worst blizzards on March 9–10, 1892. Sixty-mile-per-hour winds off Lake Superior not only provided ample water vapor to the storm but also dislodged and damaged the NWS rain gauge. The estimated snowfall total in Duluth was 13 inches, though the wind piled drifts more than 10 feet high, blocking some second-story windows. Leech Lake reported a station record 11.5 inches of snowfall, while Lake Winnibigoshish reported a state record snowfall for the date of 16.8 inches.

Word of the Week: COPD

This acronym is not a meteorological one but a medical one, standing for Chronic Obstructive Pulmonary Disease. COPD is a disease of the airways that leads to a slow, progressive loss of lung function. Among other things it includes chronic bronchitis and emphysema. It is estimated that over 14 million Americans suffer from this disease, and over 10 million suffer from it in western European countries.

So what's this got to do with weather? Plenty, as temperature, humidity and air quality all can aggravate the symptoms of this disease and put those who suffer from it under severe distress. The European Weather Center has instituted a special daily forecast product for health care providers that presents forecasted weather conditions in the context of risk to those who suffer from COPD. It is anticipated it will help health care workers to anticipate clinic workloads and also alert their patients to take preventative measures that diminish their exposure to detrimental weather conditions. An entire branch of the weather service is dedicated to a health forecasting program. Wonder if we will ever see that in our country?

Outlook:

Bumpy road ahead! Unsettled weather pattern over the weekend and early next week, with three different weather systems affecting Minnesota. Chance for rain, thunder, freezing rain, snow and sleet on Saturday, mostly in the west and north. The amount of water vapor carried into the state by this system will set the table for subsequent low pressure systems. The second system will come into the state later on Sunday, bringing mostly snow as the low center tracks south of us. Snowfalls may be significant accumulating Sunday night and during the day on Monday. Yet another system may bring precipitation by next Wednesday. Warm temperatures on Saturday will give way to a cooling trend carried forward into next week. Moderate to strong winds will also be evident

over the next five days.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, March 17, 2006

#### HEADLINES:

- Review of snow in March
- New Seasonal Outlook
- Minnesota ranks high in cold
- Almanac for March 17th
- From the "Minnesota Weather Almanac", St Patrick's Day
- "C" Weather
- Outlook

Topic: A Snowy Week and First Half of March....

All-time daily state snowfall records for the first half of March range from 15 to 24 inches, so why should it be so surprising that we have received such large amounts this week? Sunday night and Monday (March 12-13) brought large amounts of heavy, wet snow to parts of southern and central Minnesota. Many communities reported 9 or more inches. Hastings came in with 19 inches, while Red Wing reported 12 inches and Stillwater 11.5 inches. The snow was so wet, that the water content approached or exceeded 1 inch in many places.

The storm on Wednesday and Thursday (March 15-16) produced snowfalls of 5 to 8 inches in many areas of southern and eastern Minnesota. Red Wing and Mankato reported 6 inches, while Stillwater reported 7 inches. It was a drier snow than the one earlier in the week, with less water content. Nevertheless it added to a significant week of snow shovelling for many citizens.

Total snowfalls for the first half of March now exceed the averages for the entire month in many places, including:

15.2" at Eau Claire	20.3" at MSP airport	14.8" at Chanhassen
12.3" at Duluth	18.0" at St James	16.5" at Zumbrota
11.0" at Rochester	12.0" at Waseca	15.9" at Theilman

For a number of communities, including the Twin Cities, this March is the snowiest since that of 1989. In the MSP record, March of 2006 will rank at least 10th snowiest since 1884. Precipitation totals for the month already exceed the historical averages for many locations as well. Hastings with 2.23 inches, Zumbrota with 2.38 inches, Waseca with 1.99 inches, and Theilman with 2.08 inches are already well above normal for the month even if they do not receive another drop of precipitation for the rest of the month.

Topic: Climate Outlook for Spring...

The NOAA Climate Prediction Center released the new outlooks for spring on Thursday this week (March 16). In Minnesota, the period from April through June is seen as wetter than normal, with cooler than normal

temperatures in northwestern parts of the state. Elsewhere around the state temperature has an equal chance of averaging above or below normal over the three month period. Certainly wetness is a trend we have grown used to over the past several years, and it appears this spring will bring more of the same.

MPR listener question: I see Minnesota reported the lowest temperature in the lower 48 states again this week on Wednesday (Mar 15) when Hallock reported a morning reading of -15 degrees F, Thursday when Embarrass reported -7 degrees F, and Friday, when Hallock reported -9 degrees F. How does MN rank when it comes to reporting the lowest temperature in the nation?

Answer: We have spoken about this from time to time on Morning Edition as well as the Midday program. We don't really compare to Alaska, but among the other 49 states, MN usually reports a significant number of lowest temperatures in the nation during the course of the year, varying from 40 to 60 times. This frequency ranks us among the top five states in reporting cold temperatures, the others being CA, WY, MT, and CO, all with quite cold mountainous locations. Through the first 76 days of 2006, Minnesota has reported the lowest temperature outside of Alaska on 16 days. This week of course we have been reporting some of the greatest amounts of snowfall as well.

Twin Cities Almanac for March 17th:

The average MSP high temperature for this date is 37 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 21 degrees F (plus or minus 12 degrees F standard deviation).

MSP Local Records for March 17th:

MSP weather records for this date include: highest daily maximum temperature of 76 degrees F in 1894; lowest daily maximum temperature of 8 degrees F in 1941; lowest daily minimum temperature of -8 degrees F in 1941 (-17 in 1867 of the Pioneer Era); highest daily minimum temperature of 47 F in 1894; record precipitation of 0.89 inches in 1965. A record snowfall of 11.2 inches occurred on this date also in 1965. The snow depth on this date in 1967 was a record 21 inches.

Average dew point for March 17th is 20 degrees F, with a maximum of 51 degrees F in 1966 and a minimum of -18 degrees F in 1964.

All-time state records for March 17th:

The all-time state high temperature for today's date is 81 degrees F at Granite Falls (Yellow Medicine County) in 1894; the all-time state low for today's date is -33 degrees F at International Falls (Koochiching County) in 1897. The all-time state record precipitation for this date is 2.00 inches at Whitewater State Park (Winona County) in 1942. The all-time state record snowfall for this date is 23.6 inches at Collegeville (Stearns County) in 1965.

From the "Minnesota Weather Almanac" available soon in bookstores:



Without intending reference to the Irish gift for gab, arguably the windiest celebration day on the calendar in Minnesota is March 17, St Patrick's Day. Many communities host festivals, dinners, and parades. The capital city, St Paul has hosted a parade since 1967. Colorfully costumed people and decorated vehicles make their way from the Union Depot through downtown to Rice Park. Food abounds from various vendors offering traditional selections such as corned beef and cabbage and shamrock green beer.

The average wind speed in the Twin Cities on St Patrick's Day is 11-12 mph, but gusts of 40 mph or higher have been recorded. It is common to have to "hold on to your Irish hat" while watching or marching in the parade. The National Weather Service issued wind advisories for the St Paul parades in 1987, 1990, and 1999.

Word of the Week: "C" Weather

"C" is the designator for contact weather, meaning that pilots of aircraft have sufficient visibility to fly without instruments and use only visual reference to the ground surface.

Outlook:

Generally a quiet weekend weatherwise with partly cloudy skies and temperatures a few degrees below normal. Slight chance for snow early next week in southwestern sections, but no major storms are seen. A warming trend will start by midweek as the longer days and higher sun angle diminish the snow cover across the Minnesota landscape.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, March 24, 2006

HEADLINES:

- Anniversary of first U of MN weather closure
- Riding in a tornado for a record distance
- Significant International Weather Events of 2005
- Snow's effect on temperature
- Almanac for March 24th
- The Stirling Engine may stir solar energy
- Outlook

Topic: Weather closes the University of Minnesota in 1966...

On March 22-23, 1966, 40 years ago, a blizzard crossed the state bringing rain, freezing rain, thunder, and finally snow. Many power lines came down from the weight of the ice, and several communities reported 10 to 15 inches of snowfall, including the Twin Cities. Travel became impossible, and for the first time in its 100 plus year history, the University of Minnesota closed due to weather!

Topic: Severe Weather Oddity....from a USA Today story

Last week on March 12th severe weather struck several states including Missouri, where over 70 sightings of tornadoes were reported. One of these tornadoes destroyed a mobile home near Fordland, MO. In so doing it extracted a 19 year old young man, dressed only in his boxer shorts and carried him for some distance. The winds eventually deposited him in the soft grass of an open field. He was alive, but bruised and cut. In the aftermath, the National Weather Service storm survey crew calculated that he had traveled 1307 feet, a distance unsurpassed by any previous living victim of tornadic winds. Researcher Tom Grazulis, a noted tornado expert who wrote the complete history of such storms in the USA, remarked that the only cases of victims caught up in the violent winds and traveling a greater distance resulted in their deaths. So this Missouri man was lucky indeed.

Topic: Significant International Weather Events from 2005

The current edition of Weatherwise magazine describes some of the most traumatic and significant weather events of the past year. Though much attention in the USA was given to the terrible North Atlantic hurricane season and its impact on our country, other areas of the world were afflicted with severe weather events and episodes as well. Among these were....

Droughts in Spain, Portugal, Morocco, southern Africa, and Australia. Even the Amazon River Basin suffered from drought with low water flows and massive wildfires, the first time in decades such symptoms were in evidence.

Heavy summer rains caused flash flooding and mudslides in China and India. Mumbai India reported over 37 inches of rain in one day, with associated flooding that killed over 1000 people.

Hurricane Stan brought flooding and landslides to Central America and southern Mexico in October, resulting in at least 1500 deaths.

MPR listener question: I heard you say on Midday earlier this week that the chief reason March has the widest range in extreme temperatures here in Minnesota is because of the presence or absence of snow cover. How big is the influence of snow cover?

Answer: In a paper by Stephen Vavrus of the University of Wisconsin-Madison presented at a recent meeting of the American Geophysical Union, he argues that the presence of snow cover keeps the Earth's temperature about 14 to 18 degrees F cooler than it would be if no snow was present. This is a sizable difference. Here in Minnesota the presence or absence of snow cover, especially during the month of March when day length and sun elevation angle are increasing, shows a similar magnitude of effect on temperature. This week (Mar 17-24) in the year 2000 with no snow present, the Twin Cities average temperature was 42.6 degrees F, while this week (Mar 17-24) one year later in 2001, with 9 to 16 inches of snow cover, the Twin Cities average temperature was 29.6 degrees F, fully 13 degrees F cooler.

Looking at the all-time state temperature records for March, a high of 88 degrees F occurred on March 23, 1910 at Montevideo (Chippewa County) where there was no snow cover and in fact soils were quite dry from a winter-long drought (only 1.29 inches of precipitation during January through March). Conversely a low of -50 degrees F was observed at Pokegama Dam (Itasca County) on March 2, 1897 when there was a fresh snow cover of several inches.

Twin Cities Almanac for March 24th:

The average MSP high temperature for this date is 44 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 27 degrees F (plus or minus 11 degrees F standard deviation).

MSP Local Records for March 24th:

MSP weather records for this date include: highest daily maximum temperature of 76 degrees F in 1939; lowest daily maximum temperature of 14 degrees F in 1923; lowest daily minimum temperature of -8 degrees F in 1965; highest daily minimum temperature of 52 F in 1945; record precipitation of 1.06 inches in 1949 (1.44 at Ft Snelling in 1842). A record snowfall of 6.8 inches occurred on this date in 1996. The snow depth on this date in 1951 was a record 21 inches.

Average dew point for March 24th is 22 degrees F, with a maximum of 60 degrees F in 1945 and a minimum of -21 degrees F in 1974.

All-time state records for March 24th:

The all-time state high temperature for today's date is 86 degrees F at New Ulm (Brown County) in 1910; the all-time state low for today's date is -41 degrees F at Thorhult (Beltrami County) in 1974. The all-time state record precipitation for this date is 2.50 inches at Waseca (Waseca County) in 1966. The all-time state record snowfall for this date is 15.0 inches at Bird Island (Renville County) and Winona (Winona County) in 1937 and at Waseca (Waseca County) in 1966.

From the "Minnesota Weather Almanac" available soon in bookstores:

Spring snow melt floods are relatively common along the Red River Valley between Minnesota and North Dakota. When were some of the earliest on record. Geologic and soil evidence support large scale flooding in 1776 and 1790, but the first documented spring flood on the Red River is found in the daily journal of fur trader Alexander Henry who was camped there near Pembina in the winter of 1807-1808. He noted ice dams and flooding in his journal for April of 1808.

Word of the Week: The Stirling Engine.....

It was announced recently that utility companies in California will expand the use of solar generated electricity by using 40 ft tall curved solar dishes to collect the radiant energy from the sun and heat hydrogen gas that is sealed in a Stirling engine (an external heat engine). This piston-type engine is driven by the expansion and contraction of a sealed gas (hydrogen) as it is heated and cooled. The gas drives the engine's pistons which turn the shaft of an electrical generator. They hope to produce up to 500 megawatts of electricity at a Mohave Desert facility. This would be a significant contribution from renewable solar energy to the California power system, thanks to deployment of the Stirling engine, a device invented back in 1816!

Outlook:

Temperatures slightly cooler than normal over the weekend with partly cloudy skies. Chance of snow or rain late Sunday and into Monday, possibly lingering into Tuesday. Moderating temperatures that will slowly climb next week into the 40s F and possibly 50s toward the end of the week. Snow cover should rapidly diminish by next weekend.

To: MPR's Morning Edition

From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate

Subject: Minnesota WeatherTalk for Friday, March 31, 2006

Announcement: Don't forget the annual College of Agricultural, Food, and Environmental Sciences Classes Without Quizzes this Saturday, April 1st. Come to the St Paul Campus by 9:00 am and hear about many interesting topics such as, food safety, proper care of city trees, garden landscaping, trends in grocery stores, and lady bugs, among other topics. You can register at...

<http://www.coafes.umn.edu/Program.html>

#### HEADLINES:

- Preliminary March Climate Summary
- Trauma in Hawaii
- Emphatic warm signal in the season of long nights
- Blizzard on April Fools' Day?
- Almanac for March 31st
- From the "Minnesota Weather Almanac"
- What is medspiration?
- Outlook

#### Topic: Preliminary March 2006 Climate Summary

As usual, the weather of March was somewhat variable across the state. The mean monthly temperatures were close to normal, ranging from 2 degrees F warmer to 2 degrees F colder than the 30 year averages. Temperature extremes for the month ranged from 64 degrees F at Winona on the 11th to -15 degrees F at Embarrass on the 18th. Minnesota reported the lowest temperature in the 48 contiguous states six times during the month.

Total monthly precipitation was short of normal in most places, though end of the month storms brought significant precipitation to many western and southern counties. Those communities reporting over 2 inches for the month included Albert Lea, Waseca, Winnebago, Hastings, Preston, Spring Valley, Winona, and Zumbrota. The month was definitely ending on a wet note, as International Falls reported a new record of 0.94 inches of precipitation on the 30th.

Many places reported above average snowfall, most of which fell during the first half of the month. MSP International Airport reported 20.4 inches, while Duluth reported 12.5 inches and Rochester 11.1 inches. Others with above normal monthly totals included St James with 18.0 inches, Waseca with 12.2 inches, Grand Meadow with 12.7 inches, Winona with 11.8 inches, and Zumbrota with 16.5 inches. By the end of the month soils were thawing out and the landscape was shedding overwinter snow cover rapidly. Rains were combining with snow melt to elevate the flood risk along the Red River and its tributaries, where many flood watches and warnings were posted. The expected flood crest on the Red at Fargo, ND of 36.3 ft next Tuesday would be the 9th highest all-time,

while the expected crest of 16.5 ft at Wahpeton, ND expected on Sunday would be the 5th highest in history.

Topic: Traumatic in Paradise....

The National Weather Service in Hawaii has certainly been busy this past week with high wind forecasts, severe storms, and even snow and ice on the higher elevations of Maui. Local flooding from severe thunderstorms caused a pipe to burst and washed out a sewage treatment facility. Local officials diverted the raw, untreated sewage into a canal that discharges into the sea, however ocean currents washed it back onshore along Oahu's south beaches. Swimmers are warned to stay away and fishermen have been cautioned about taking any fish from the waters along those shores. Such conditions understandably have put a damper on the enthusiasm of recent visitors to the islands.

Topic: Yet Another Warm Winter.....

Historically in Minnesota the November through March period has been called the "heating season" or the "snow accumulation season." By either name the expectations are cold, snow, and frozen lakes. But recent trends in our Minnesota climate are going away from these expectations. Consider the nine most recent "heating seasons" and the calculated mean temperature over these months, then ranked relative to the distribution of statewide values since 1895, with 1 = coldest, and 112 = warmest.....

Heating Season	Mean Temp (F)	Ranking (since 1895)
1997-1998	24.2	106th
1998-1999	23.0	104th
1999-2000	26.1	110th
2000-2001	15.8	28th
2001-2002	24.9	109th
2002-2003	19.4	73rd
2003-2004	20.5	87th
2004-2005	21.3	94th
2005-2006	22.9	103rd

(median value is 17.8 F)

Only one heating season, 2000-2001, of the past nine ranks in the cold part of the historical distribution. The eight others rank in the warmest third of the distribution, and five of those rank among the warmest ten since 1895. The persistence of this warm signal is hard to ignore.

MPR listener question: Has Mother Nature ever pulled a fast one and produced a blizzard on April Fools' Day?

Answer: Actually, the most recent heavy snowfall on April Fools' Day was in 1985 when several communities reported a half foot or better, including 9 inches at Waseca, 10 inches at Litchfield and 15 inches at Hastings. But this was technically not a blizzard just a heavy snowfall. The only case of a blizzard

occurred back in 1896. The storm actually started with thunder, lightning, rain, and hail on the 31st of March, but then later in the day it turned into wind driven snow with little or no visibility, lasting through the night and into April 1st. Many western and central Minnesota communities reported 12 to 20 inches of snowfall, while St Cloud reported an incredible 32 inches of snow, one of the heaviest amounts in their history. I am sure people were too busy digging out to pull any pranks.

Twin Cities Almanac for March 31st:

The average MSP high temperature for this date is 46 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 29 degrees F (plus or minus 9 degrees F standard deviation).

MSP Local Records for March 31st:

MSP weather records for this date include: highest daily maximum temperature of 82 degrees F in 1986; lowest daily maximum temperature of 23 degrees F in 1924 and 1936; lowest daily minimum temperature of -1 degrees F in 1969 (-11 F at Ft Snelling in 1843); highest daily minimum temperature of 52 F in 1999; record precipitation of 1.25 inches in 1985 (1.90 inches at Ft Snelling in 1843). A record snowfall of 14.7 inches occurred also in 1985. The snow depth on this date in 1965 was a record 12 inches.

Average dew point for March 31st is 28 degrees F, with a maximum of 56 degrees F in 1986 and a minimum of -6 degrees F in 1969.

All-time state records for March 31st:

The all-time state high temperature for today's date is 84 degrees F at Wheaton (Traverse County) in 1963, at New Ulm (Brown County) and St Peter (Nicollet County) in 1968, and at St James (Watonwan County) in 1986; the all-time state low for today's date is -32 degrees F at Tower (St Louis County) in 1975. The all-time state record precipitation for this date is 3.00 inches at New London (Kandiyohi County) in 1896. The all-time state record snowfall for this date is 20.0 inches at St Cloud in 1896.

From "Minnesota Weather Almanac" available online and in bookstores:

Back to back years with April temperature extremes represent one of the quirks in Minnesota's climate history. On April 6, 1979 Karlstad (Kittson County) reported a morning low of -22 degrees F, the coldest April temperature ever measured in Minnesota. Just over one year later on April 22, 1980, Hawley (Clay County) less than 100 miles south of Karlstad reported an afternoon high of 101 degrees F, the highest April temperature ever reported in the state.

Word of the Week: Medspiration

This is the name of a satellite monitoring program of the European

Space Agency. Multiple satellites are used to measure the nighttime sea surface temperatures of the Mediterranean Sea and Atlantic Oceans among others. These data are used to update ocean forecasting models and numerical weather prediction models, as sea surface temperature has important effects on the atmospheric circulation. More on this subject can be found at the following we site.

<http://www.medspiration.org/>

#### Outlook:

Something to think about as April begins on Saturday..."if it thunders on All Fools' Day, it brings good crops of corn and hay." (thanks to Dave Ruschy). Saturday (April Fools' Day) should be generally warm and dry, then increasing cloudiness on Sunday with a chance for showers later in the day and into Monday in northern counties. Another chance for showers and thunderstorms later on Tuesday and Wednesday, possibly mixed with some severe weather. Temperatures will generally track warmer than normal most places.



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, April 7, 2006

HEADLINES:

- Comment on snowmelt flooding this week
- Flash flooding too
- Controversy with Canada
- Still cold in places
- April is the month for kite flying
- Snow on Easter Sunday?
- Almanac for April 7th
- From the Minnesota Weather Almanac
- the Ringelmann Chart
- Outlook

Topic: Comment on Red River Flooding.....

As the spring snowmelt flood crest has migrated south to north across the Red River Valley this week it has for the most part been well forecasted and managed by local and state officials as well as residents. Even though the flood crest at many communities ranked historically among the top 10, or even top 5 highest, the damages were held in check not only by recent actions, but by planning, projects and actions taken long ago. Following the great flood of 1997, many projects were undertaken to mitigate the potential damage of future Red River floods: diversions, dikes, removal of the most flood prone properties, the renovation of older flood control structures, and the planning and deployment of more effective strategies for community and citizen response have all come into play this week. All of those who had a hand in such endeavors over the years should be given a standing ovation as far as I am concerned....

Topic: Flash flooding too.....

Portions of central and southern Minnesota were hit with severe thunderstorms that brought hail, strong winds, and heavy rainfall late on Thursday, April 6th and early Friday, April 7th. Several roads were closed for a time, including some in the Twin Cities Metro Area. A number of communities reported new daily record rainfall amounts, including 2.58 inches at MSP airport, an inch at Rochester, 3.35 inches at Fairmont, 2.11 inches at Winnebago, 2.57 inches at Albert Lea, 2.26 inches at Preston, 2.10 inches at Browns Valley, and 2.84 inches at Jackson. For many this rainfall represents the heaviest ever measured for a single day in April.

Topic: Controversy With Canada

Climate change, particularly increasing temperature in the arctic latitudes is manifesting itself as shrinking ice cover and a longer summer navigation season across polar seas of the northern hemisphere. The Northwest Passage provides a shipping route linking the Beaufort

Sea off the north coast of Alaska and the Yukon Territory with Baffin Bay, the Davis Strait, and the North Atlantic. This passage involves navigating through an expanse of water that threads between the many islands of northern Canada. For shippers who carry cargo from north Pacific ports to north Atlantic ports or vice versa it is a much shorter route than negotiating the tropical oceans and traveling through the Panama Canal.

Blocked most of the time by thick ice, the Northwest Passage has typically only been available for ship traffic about one month per year, and that is just for icebreakers or specially hardened shipping vessels. However, climate change indicates it will be a useful shipping route for longer periods of the year with the continued shrinking ice cover, even to the point that average cargo vessels may be able to travel this route, shaving thousands of miles off their journey between ports.

The controversy revolves around Canadian sovereignty and their claim that the Northwest Passage is their inland waterway, similar in status to the Mississippi River in the USA. The American government considers the Northwest Passage an international strait, available to all and would prefer not to have to abide by any rules and fees imposed by Canada. Hopefully as time goes by, these differences will be worked out, but I suspect we'll hear more about this matter in the years ahead.

Topic: Still some cold spots.....

Even though temperatures across the state so far this month have been averaging warmer than normal, as high as 72 F at St James on the 5th, Minnesota has still reported the lowest temperature in the 48 contiguous states twice: 18 F at Park Rapids on the 4th and 10 F at Embarrass on the 5th. Both locations still have snow cover though it is rapidly decreasing.

Topic: Kite Flying Time

Though peak wind speeds in Minnesota are associated with the tornadoes and severe thunderstorms of summer, "average daily wind speeds" peak in the month of April. Most communities around the state report average wind speeds of 12 to 15 mph during this month. This makes for great kite flying weather, but also has implications for the farmer and the home gardener as exposed soils and vegetation can dry out very rapidly in the absence of adequate rainfall. Perhaps we don't need to worry about this as it looks like it is going to be a wet month.

MPR listener question: Has it ever snowed on Easter Sunday in the Twin Cities?

Answer: Given that Easter Sunday may fall anywhere between March 23 and April 25, it's logical to think that some of the Sundays may have been snowy. Since 1891 it has snowed a trace or more on Easter Sunday in the Twin Cities 16 times, most recently in 1996. Of those 16 times, 7 were March Easter Sundays and 9 were April Easter Sundays, the latest being April 18, 1965.

Twin Cities Almanac for April 7th:

The average MSP high temperature for this date is 51 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 32 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for April 7th:

MSP weather records for this date include: highest daily maximum temperature of 83 degrees F in 1991; lowest daily maximum temperature of 25 degrees F in 1923 and 1936; lowest daily minimum temperature of 6 degrees F in 1936; highest daily minimum temperature of 54 F in 1991; record precipitation of 1.72 inches in 1919. A record snowfall of 8.9 inches occurred also in 1923. The snow depth on this date in 1975 was a record 6 inches.

Average dew point for April 7th is 27 degrees F, with a maximum of 54 degrees F in 1991 and a minimum of 0 degrees F in 1936.

All-time state records for April 7th:

The all-time state high temperature for today's date is 91 degrees F at Canby (Yellow Medicine County) in 1991; the all-time state low for today's date is -16 degrees F at Tower (St Louis County) in 1982. The all-time state record precipitation for this date is 3.00 inches at Glenwood (Pope County) in 2001. The all-time state record snowfall for this date is 13.0 inches in Minneapolis in 1923.

From "Minnesota Weather Almanac" available online and in bookstores:

April is a month that can bring dramatic changes in the weather due to differing air masses. Canadian high pressure systems can still bring arctic air from high latitudes, witnessed at St Vincent in Kittson County on April 28, 1892 when the morning low was -2 degrees F. Conversely warm tropical air from a heat ridge of high pressure to the southwest can bring very hot temperatures as was the case at Hawley on April 22, 1980 when they hit an afternoon high of 101 degrees F. Sometimes a frontal system can bring a change in air mass that produces a huge swing in daily temperature. Such was the case on April 3, 1982 in southwestern Minnesota when a warm and sultry day brought a high temperature of 78 degrees F, along with a tornado watch, but following a frontal passage late in the day, the temperature plummeted to a low of 7 degrees F, a 71 F drop!

Word of the Week: Ringelmann chart

In the past we have discussed the use of the Linke scale to describe the blueness of the sky and the use of Munsell soil color charts to describe the color of soils. In a similar manner, Ringelmann charts were once used to make estimates of the density of solid matter (or particulates) being emitted from smoke stacks. An observer compares the grayness of smoke to a series of standard shaded diagrams (grided) mounted on a white background. The estimates are subjective

and can be confounded by whether the sky is clear or overcast.

The Ringelmann chart method was invented by Maximillian Ringelmann, a professor of Agricultural Engineering in Paris, France during the late 19th Century. Starting in the 20th Century Ringelmann charts were used in making inspections of power plants and industrial facilities to determine if their smoke emissions were within certain federal, state, or municipal guidelines. Today, emissions are measured by a variety of sensors that more precisely indicate the total quantity of particulates as well as the distribution of sizes.

#### Outlook:

Cooler and drier over the weekend with increasing clouds by Sunday night. Warm and humid trend will settle in next week bringing a return of higher temperatures and a chance for showers and thunderstorms from late Monday through Wednesday. This may include some heavy thundershowers.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, April 14, 2006

#### HEADLINES:

- Record warmth on the 13th
- Planting time
- Severe Weather Awareness
- New Satellite System Holds Promise
- Lion masculinity related to weather?
- How fast is spring?
- Almanac for April 14th
- What's a vectropluviometer?
- Outlook

Topic: Record warmth across southern MN on April 13th....

Many new record high temperatures were reported on Thursday this week as strong southwesterly winds and cloudless skies during the afternoon and evening allowed the landscape to heat up dramatically from morning lows in the 40s F to afternoon highs in the 80s F. Communities that reported new record high temperatures for the date included....

Albert Lea 88 F	Willmar 84 F	Faribault 84 F
Mankato 84 F (tied R)	MSP 84 F	Redwood Falls 85 F (tied R)
Rochester 82 F	St Cloud 81 F	St James 90 F

The 90 F reading at St James tied the statewide record high for April 13th set at Wheaton in 2003.

Later on Thursday, severe weather spread through eastern Iowa, southern Wisconsin, as well as central and northern Illinois. There were 19 reports of tornadoes, including 17 in Iowa, and scores of reports related to large hail and strong winds.

Topic: Ready to plant

The run of warm days following last week's rains have produced suitable temperature conditions for planting Minnesota crops. Soil temperatures have risen into the low to mid 50s F at the 4 inch depth, compatible for germination of small grains, as well as corn. On well drained and coarser textured soils some fields have already been planted this week. Next week the tractors will probably be at full throttle. Research has consistently shown benefits to early planting of these crops, especially after mid April.

Topic: Coming up Severe Weather Awareness Week....

April 17 to 21 is Severe Weather Awareness week for Minnesota. Many public service announcements will be made as well as a test of the siren system for storm warnings. It is a great time to check on the operation of your NOAA Weather Radio...make sure the batteries work,

the alarm settings work, and the volume is set to get your attention. If you don't have a NOAA Weather Radio go buy one as an Easter present for yourself. It is the best protection from severe weather.

New this year from the National Weather Service Forecast Office in Chanhassen is a web-based system called Graphiccasts. This provides hour by hour graphics of specific weather elements, including severe weather threats. You can learn more about it at the NWS-Chanhassen web site: <http://www.crh.noaa.gov/mpx/>

Topic: Satellite system may do away with the need for weather balloons

An interesting article in the April 7 edition of Science magazine highlights the upcoming deployment of six simple satellites known as Cosmic. Financed by the Taiwanese Space Agency the Cosmic system will lock in on the signals transmitted from 24 Air Force satellites that are already in orbit and used for Global Position System (GPS) navigation. The Cosmic receivers will examine how the atmosphere bends the radio waves coming from the other satellites. From these measurements they will be able to infer the vertical sounding of the atmosphere, that is the change in temperature, moisture, and pressure with height. For decades the world weather services have had to use twice daily launched radiosondes (weather balloons) to make these measurements and initialize their forecast models. This is a procedure followed by 900 to 1000 weather office locations all over the world, including the one at Chanhassen, MN. If the anticipated technology and knowledge provided by the Cosmic system materializes, there will no longer be a need to launch all of these weather balloons, a sizable cost savings to these government agencies.

The text from this article can be found at....

<http://www.sciencemag.org/cgi/content/full/312/5770/48>

Topic: Lion masculinity related to temperature?

A recent study of zoo lions across America conducted by the Field Museum in Chicago found that the length and thickness of a male lion's mane is related to the temperature where they live.... the colder the temperature, the longer and thicker the mane. This is important to the male lion as a more massive mane attracts more interest from the females. Hmmmm...this makes me think our lions in Minnesota zoos must be much more masculine looking than those in Georgia or Texas.

MPR listener question: Anybody ever measured how fast spring moves north in our state?

Answer: This question has been contemplated by the Minnesota climatology group on numerous occasions, usually about this time of year. Three separate measures of the northward migration of spring are described:

(1)Historically the dates for "ice-out" on Minnesota lakes (that is the date that lakes are free of any ice cover) ranges from early April in the south to early May in the north. This equates to a migration of about 15 miles per day going with latitude.

(2) A second method is based on the movement of the 45 degrees F isotherm for average air temperature (that is the average historical date for when daily air temperature starts to average 45 degrees F or greater in the spring). By the date sequence for the migration of this isotherm across counties, spring moves northward at 22 miles per day.

(3) Thirdly, the migration of spring can be calculated by the apparent movement of the sun between March 21 (the vernal equinox when it lies over the equator) to June 21 (the summer solstice when it lies over 23.5 degrees north latitude). Over that time period the overhead sun moves a total of 23.5 degrees latitude (from 0 degrees at the equator to 23.5 degrees N at the Tropic of Cancer) for a total of 1567 miles. This equates to an average of 17 miles per day.

Twin Cities Almanac for April 14th:

The average MSP high temperature for this date is 55 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 36 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for April 14th:

MSP weather records for this date include: highest daily maximum temperature of 89 degrees F in 2003; lowest daily maximum temperature of 32 degrees F in 1928; lowest daily minimum temperature of 18 degrees F in 1926 and 1928; highest daily minimum temperature of 64 F in 2003; record precipitation of 1.56 inches in 1983. A record snowfall of 13.6 inches from the same storm in 1983. The snow depth on this date in 1949 was a record 5 inches.

Average dew point for April 14th is 31 degrees F, with a maximum of 61 degrees F in 1976 and a minimum of 7 degrees F in 1928.

All-time state records for April 14th:

The all-time state high temperature for today's date is 94 degrees F at Benson (Swift County) and Milan (Chippewa County) in 2003; the all-time state low for today's date is -5 degrees F at Roseau in 1950. The all-time state record precipitation for this date is 2.95 inches at Northfield (Rice County) in 1886. The all-time state record snowfall for this date is 16.0 inches at Farmington (Dakota County) in 1983 and at Mankato (Blue Earth County) in 1928.

From "Minnesota Weather Almanac" available online and in bookstores:

Agriculture is one sector of the state's economy that is very sensitive to weather. In 2004, more than \$8 billion was earned from the state's crop and livestock production. Many of our Minnesota weather observers

are in fact farmers. Generations ago there were over 200,000 operating farms in the state. Today, there are about 79,000.

#### Word of the Week: Vectopluviometer

This is a special type of rain gage whose characteristics can be inferred from the name: vecto referring to speed and direction, pluvio is the Latin for rain, and meter meaning to measure. Thus this type of gage accounts for the inclination and direction of falling rain. Two types have been used: one type is a recording gage mounted to a windvane such that it always faces into the wind and catches rainfall coming from that direction. Another type is a series of four gages each oriented to a cardinal compass direction (E,W,N,S), such that the gage oriented most parallel to the trajectory of falling rain drops will capture the most water.

In case you are interested falling rain drops in April most commonly come from northwesterly, northeasterly or southeasterly directions.

#### Outlook:

Unsettled weather for the weekend, with a chance for showers and thunderstorms, perhaps even some severe weather in southern sections. Easter Sunday may be stormy in southern sections. Continued warm. Partly cloudy Monday, with somewhat cooler temperatures and a chance for showers or thunderstorms later on Tuesday and into Wednesday.



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, April 21, 2006

#### HEADLINES:

- Significant weather events of the week
- Acoustic rain gages
- Who usually gets April snows in Minnesota
- Almanac for April 21st
- Easter 1946
- Goldbeaters skin hygrometer
- Outlook

#### Topic: Weather Headlines This Week....

Record setting warmth occurred in Texas this week over Sunday, Monday, and Tuesday. Dallas-Ft Worth reported a record high of 94 F on Monday, April 17th, while Laredo reported a record high of 107 F on the same day. This mid-summer heat in April caused problems for the electric utilities as afternoon demand peaks produced rolling blackouts in some communities, leaving citizens without electricity for short periods of time.

A huge dust storm hit parts of China, South Korea and Japan on Sunday, Monday and Tuesday (Apr 17-18) this week. The choking dust was said to be the worst in the Beijing area since 2001. Buildings, cars, and sidewalks were coated with heavy yellow dust. Many health clinics and hospitals were busy treating people with respiratory problems. The Chinese Meteorological Service was taking measures to do some cloud seeding in order to promote rainfall that would settle the dust and clear out the air.

Wednesday brought a significant spring snowstorm to eastern Montana, Wyoming, and the western Dakotas. Sections of I94 and I90 were closed to traffic for a time, as some areas received 10-15 inches of new snow and winds produced marginal visibility conditions as well as snow drifts up to five feet in height.

The NOAA Storm Prediction Center in Norman, Oklahoma this week revealed that there have been over 275 tornado reports during April, the most ever for this month. There have also been over 560 tornado reports for the year so far, a record setting pace that may hold the potential to exceed the annual record of 1819 tornadoes nation-wide set in 2004.

#### Topic: New Seasonal Climate Outlook....

The NOAA Climate Prediction Center released a new set of seasonal climate outlooks on Thursday this week. With respect to temperature the May through July outlook favors cooler than normal conditions for the western Great Lakes area, including Minnesota. Rainfall is expected to be above normal across Minnesota, Wisconsin and the

eastern Dakotas.

Topic: Listening to the rhythm of the falling rain

Meteorologists and climatologists have grappled with the scarcity of data in the tropical regions of the Earth for generations, especially over the vast expanses of tropical oceans. In recent years, satellite systems have improved the detection and estimation of wind fields, temperature and precipitation. In fact over the Indian Ocean and parts of the African continent, researchers and operational weather services rely heavily on satellite derived estimates of precipitation from the European satellite system (Meteosat), rather than a network of rain gages or ship reports. However, these estimates can have large errors and cannot provide good measures of rainfall intensity.

Over recent years NASA's Tropical Rainfall Measuring Mission has come up with an acoustical way of measuring rainfall and rainfall intensity. Called the acoustic rain gage, this system makes use of submerged microphones attached to buoys. As it turns out raindrops striking the surface of the ocean are quite noisy and emit two types of sounds, the slapping sound of impact, followed by a ringing sound as air bubbles are trapped underwater by the splash. Small droplets are especially good at trapping air bubbles and therefore produce quite a ringing sound, while larger, high speed droplets make a distinct slapping sound as they strike the water surface. By tuning the instrument to discriminate among the various types of sound and integrate the signal over time, researchers hope to be able to accurately measure total rainfall and rainfall intensity over the oceans. These systems are being tested in the tropical Pacific, the South China Sea and the North Atlantic. It is estimated that more than two-thirds of the rainfall on Earth occurs between 35 degrees north and 35 degrees south latitude, an area of the planet which is inadequately equipped with measurement networks.

MPR listener question: Which places in the state receive the most average April snowfall and has any snowfall been observed around the state this month?

Answer: All northeastern locations consistently receive more April snowfall than other areas of the state. Three climate stations that report the highest historical average snowfall values for the month are: Gunflint Lake (Cook County) with 6.2 inches, Tower (St Louis County) with 5.5 inches, and Isabella (Lake County) with 7.0 inches.

Earlier this month on the 2nd snowfall was observed at some northeastern communities like Cook, Isabella, Gunflint Lake, and Duluth, though mostly just trace amounts. Otherwise it has been a snow-free April in Minnesota.

Twin Cities Almanac for April 21st:

The average MSP high temperature for this date is 59 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 38 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for April 21st:

MSP weather records for this date include: highest daily maximum temperature of 95 degrees F in 1980; lowest daily maximum temperature of 34 degrees F in 1893; lowest daily minimum temperature of 22 degrees F in 1966; highest daily minimum temperature of 59 F in 1926; record precipitation of 0.74 inches in 1912. A record snowfall of 4.8 inches in 1972. The snow depth on this date in 1924 was a record 2 inches.

Average dew point for April 21st is 34 degrees F, with a maximum of 60 degrees F in 1952 and a minimum of 11 degrees F in 1978.

All-time state records for April 21st:

The all-time state high temperature for today's date is 100 degrees F at Ada (Norman County) in 1980; the all-time state low for today's date is 0 degrees F at Hallock (Kittson County) in 1945. The all-time state record precipitation for this date is 2.49 inches at Warroad (Roseau County) in 1974. The all-time state record snowfall for this date is 15.0 inches at Lynd (Lyon County) in 1893.

From "Minnesota Weather Almanac" available online and in bookstores:

One of the nicest Easter Sundays in Minnesota history occurred on April 21, 1946. Under glorious sunny skies, most communities enjoyed temperatures in the 70s and 80s F that day with light winds. The winter ice cover left Lake Minnetonka on April 1st that year, and many were on their boats or in their canoes for Easter Sunday outings.

Word of the Week: Goldbeater's skin hygrometer

A hygrometer measures water vapor or humidity. There are several types, some of which we have discussed previously.

A goldbeater's skin hygrometer is rare, but may still be found on occasion. Goldbeaters hammer pieces of gold into gold leaves. These leaves are then separated from each other using goldbeater's skin which is prepared membrane of the large intestine from an ox. This material changes dimension as the humidity of the atmosphere varies. Therefore, it is sometimes used as the sensitive element in a hygrometer which translates minute changes (shrinkage and swelling) in the dimensions of the skin to a measure of atmospheric humidity.

Outlook:

Partly cloudy and pleasant weekend, great for Earth Day activities on Saturday. Increasing clouds for Sunday night with a chance for scattered showers early on Monday. A generally dry week coming up

with temperatures somewhat closer to seasonal averages.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, April 28, 2006

#### HEADLINES:

- Preliminary April Climate Summary
- Remembering April 1907
- Pains for the Insurance Industry
- Question about May rainfall
- Almanac for April 28th
- Historical May snows
- A 21-letter tongue twister
- Outlook

Topic: Preliminary Climate Summary for April

Mean monthly temperature for April was above normal at all Minnesota locations, ranging from 4 to 7 degrees F above normal. Extremes for the month ranged from 9 degrees F at Embarrass on the 8th to 90 F at St James on the 13th. Minnesota reported the coldest temperature in the 48 contiguous states just three times during the month.

Though it appears the month may end with some additional rainfall this weekend, most locations have been drier than normal this April, especially northern communities. Some southern areas have had above normal rainfall for the month, including over 5 inches at Lakefield, Albert Lea, Fairmont, Winnebago, Caledonia, Spring Valley, and Preston. Albert Lea has recorded its second wettest ever April with 7.13 inches (7.76 inches in 1999 is the record highest).

Only traces of snowfall were recorded across northern counties this month, somewhat unusual for April up north. Conditions were suitable for planting many crops and rapid progress was made in seeding small grains, as well as corn toward the end of the month, as soil temperatures averaged several degrees warmer than normal.

Nationwide the month of April produced a new record number of tornadoes with over 300 reported by the Storm Prediction Center. There have already been nearly 600 tornadoes reported in 2006 and we have barely started the severe weather season!

Topic: Cold, snowy April of 1907....

Ninety-nine years ago today, Minnesotans were digging out from a heavy April snow storm. 1907 brought the second coldest April of the 20th Century statewide and abundant snowfall to many areas. A snow storm on the 27th and 28th produced 10 to 16 inches of snowfall across southern sections of the state, including 13 inches in the Twin Cities area. Schools and roads were closed in portions of the state, something that was quite unusual for such a late April date. For those who had to be out in the weather the windchill conditions were in the single digits. Certainly gardening and farming activity

was set on the back burner, awaiting a warmer May.

Topic: Insurance Industry Reeling from 2005 Weather Disasters...

It was reported in USA Today this week that many insurers are cancelling homeowner policies in exposed coastal areas or refusing to write new insurance coverages as a result of last year's costly hurricanes. Over 500,000 homeowner policies are expected to be cancelled in Florida. No mention of the number of proposed cancellations in Louisiana.

Hurricane damages last year resulted in a record \$60 billion in claims payouts for the insurance industry. In some areas insurance premiums for property coverage are expected to rise from 19 to 24 percent.

MPR listener question: We have been somewhat dry in central Minnesota this month around the St Cloud area, less than 1.25 inches. The warm temperatures have dried the garden and I am already watering. Do you think May will bring more frequent showers, and what are the local and state record rainfall values for May?

Answer: It appears that April will end on the wet side this weekend as perhaps 1 inch of rainfall or more will occur across central Minnesota. That should help going into May. The outlook for the first week of May actually favors continued dryness though, so you may need to continue to water your garden in early May, especially if you have coarse textured soils.

The greatest May rain storm in the St Cloud area occurred as a thunderstorm on May 16, 1894 delivering 5 inches of rainfall. The most May rainfall ever in the St Cloud area was 9.68 inches in 1912, considerably above the long term May average of 3.40 inches. From a statewide perspective, Thief River Falls recorded a record May rainfall of 7.50 inches on May 29, 1949, while St Francis (Anoka County) measured a record monthly total rainfall of 11.88 inches in May of 1991.

Twin Cities Almanac for April 28th:

The average MSP high temperature for this date is 62 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 41 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for April 28th:

MSP weather records for this date include: highest daily maximum temperature of 91 degrees F in 2004; lowest daily maximum temperature of 34 degrees F in 1907; lowest daily minimum temperature of 26 F in 1907, 1958, and 1965; highest daily minimum temperature of 61 F in 1970; record precipitation of 0.80 inches in 1896; a record snowfall of 4.5 inches in 1994. The snow depth on this date in 1907 was a record 7.5 inches.

Average dew point for April 28th is 36 degrees F, with a maximum of 65 degrees F in 1970 and a minimum of 12 degrees F in 1956.

All-time state records for April 28th:

The all-time state high temperature for today's date is 95 degrees F at Lynd (Lyon County) and Winnebago (Faribault County) in 1910; the all-time state low for today's date is -2 degrees F at St Vincent (Kittson County) in 1892 (the latest below zero reading in the state). The all-time state record precipitation for this date is 3.58 inches at Red Wing (Goodhue County) in 1975. The all-time state record snowfall for this date is 11.0 inches at Stillwater (Washington County) in 1907.

From "Minnesota Weather Almanac" available online and in bookstores:

Minnesota climate history shows that three 12 inch snow storms have occurred in the state during the month of May: one at Leonard (Clearwater County) on May 3, 1954; one at Windom (Cottonwood County) on May 8, 1938; and one at St Cloud on May 17, 1890. These are the heaviest snows to ever occur during the month of May.

Word of the Week: Chronoanemoisothermal diagram

That's a mouthful, pronounced chrono-anemo-iso-thermal diagram. This refers to a graphic which depicts the average temperature for a given place at all hours of the day for each cardinal wind direction (east, south, west, and north). It is especially helpful in regions where the wind direction has great influence on local temperature such as around a large inland lake or sea coast.

Outlook:

Unsettled over the weekend with considerable cloudiness and a chance for rainfall, over an inch in places. Drier by late Monday, then another chance for showers Wednesday and Thursday next week. Temperatures will run close to seasonal normals most places.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, May 5, 2006

HEADLINES:

- Lawn cutting
- Wine, Weather, and Climate
- Follow the "Arctic Foxes"
- May's lowest temperatures
- Almanac for May 5th
- May is stressful to forecasters
- Holy Mackerel!
- Outlook

Topic: Cutting the lawn already.....

The abnormally warm April combined with the end of the month soaking showers certainly promoted grass growth. Recently, many have been busy cutting their lawns for the first time. Average dates for "spring green-up" when grass growth is sufficient to start cutting, varies from the first few days of May in the far south to the last week of the month in the northeastern counties. I don't know if these historical dates have been getting earlier in recent decades, but in England they have. A recent study published in the current edition of Weatherwise magazine documents that lawns in England are greening up 10 days to two weeks earlier in the spring than they did 20 years ago. Perhaps a sign of climate change. They hope to collect more data on this.

Topic: Wine, Weather, and Climate

Based on a recent study of the climatology associated with viticulture, some general climatic optimums for the production of wine grapes have been determined. The ideal mean annual temperature ranges from 57 to 61 degrees F, with a summer monthly maximum of about 72 degrees F and a winter monthly minimum of about 37 degrees F. Required rainfall ranges from 18 to 30 inches, depending on soil type and the distribution of moisture throughout the growing season. Relative high sunshine amounts are required during the ripening process, especially for red grapes. Winter dormancy allows many vines to withstand short period exposures to temperatures as cold as 0 degrees F, but in the spring as the vines begin to produce flower clusters, they can only tolerate temperatures as low as 28 or 29 degrees F without serious damage.

Warmer climates tend to produce wines of a higher sugar content (dessert wines), while cooler climates tend to produce a more crisp, higher acidity product that is made into a dry table wine. Nearly ideal temperature conditions are found in the Bordeaux Region of France, northern Spain, central and northern Italy, as well as the Napa and Sonoma Valleys in California.



Most wine producing landscapes in the world are located between 30 and 50 degrees latitude in both hemispheres. There are a few in tropical latitudes, such as in Bolivia, Kenya, and Tanzania but they are at higher altitudes where the climate is more favorable. The development of new cultivars, along with the fine tuning of management to fit soil types and microclimatic characteristics (limited exposure to wind, moderation effects of lakes and river valleys, orientation of sloping fields, etc) have allowed growers to expand grape growing to regions that were previously untested for wine production.

In Minnesota, wine production thrives in the Stillwater and Hastings areas of the St Croix and Mississippi River Valleys. Despite climate conditions which are far from optimal in terms of annual and wintertime temperatures, favorable summer temperatures, relatively abundant sunshine and adequate precipitation, along with some friendly microclimatic features allow the production of some very good wines.

Topic: Follow the "Arctic Foxes"

This month a team of four women will attempt a round trip crossing of the Greenland ice cap, a journey of over 800 miles. They would become the first British female team to do this and hope to raise awareness about the fragility of that polar landscape in the context of climate change. The first leg of the journey will be done by Nordic skis, at a pace of about 22-25 miles per day. On the return leg of the trip, they hope to utilize the persistent eastern polar winds and cross the ice on their Nordic skis assisted by Flexifoil powerkites, that will capture the winds overhead and drag them along at a pace equivalent to 55-60 miles per day. The United Kingdom Meteorological Office will be providing them with daily forecasts via satellite radio. You can follow their progress at.....

<http://www.arcticfoxes.co.uk/>

MPR listener question: What's the coldest temperature recorded in the state during the month of May?

Answer: On May 1st and 2nd of 1909, Pine River Dam (Crow Wing County) recorded a low of just 4 degrees F. April had ended with three successive days of snow, totaling 11 inches, so May started out with substantial snowcover and under a Canadian high pressure system, the temperature really dropped. Though we are expecting some cold temperatures in early May, they will be nothing like this.

Twin Cities Almanac for May 5th:

The average MSP high temperature for this date is 67 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 45 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 5th:

MSP weather records for this date include: highest daily maximum temperature of 89 degrees F in 2000; lowest daily maximum temperature of 39 degrees F in 1944; lowest daily minimum temperature of 27 F in 1989; highest daily minimum temperature of 67 F in 2000; record precipitation of 1.84 inches in 1991; a record snowfall of 0.3 inches also in 1991. There have only been three measurable snows on this date since 1891.

Average dew point for May 5th is 39 degrees F, with a maximum of 68 degrees F in 1949 and a minimum of 8 degrees F in 1929.

All-time state records for May 5th:

The all-time state high temperature for today's date is 97 degrees F at Angus and Crookston (Polk County) and Argyle (Marshall County) in 1926; the all-time state low for today's date is 10 degrees F at Canby (Yellow Medicine County) in 1951. The all-time state record precipitation for this date is 4.38 inches at Two Harbors (Lake County) in 1950. The all-time state record snowfall for this date is 4.6 inches at Virginia (St Louis County) in 1931.

From "Minnesota Weather Almanac" available online and in bookstores:

Believe it or not the second weekend in May often presents a stressful time for Minnesota's meteorologists. It's the state Fishing Opener, and everybody asks for the weather forecast about a week ahead of time. Though most say that the weather can dictate the success or failure of a fishing expedition, the reality is that Minnesota fishermen head for the lakes and streams that weekend regardless of the weather, unless they die first! The forecast simply provides guidance on what to wear and what kind of beverages to bring (alcoholic or otherwise). In contrast, there are fewer requests for Mother's Day forecasts, because most of these ladies are being taken out to dinner on that day.

Words of the Week: Mackerel Sky and Mackerel Breeze

Well, why not a fishy word? We've got the Minnesota fishing opener coming up soon (next Friday and Saturday, May 12-13 on Rainy Lake for the Governor), again coinciding with Mother's Day weekend (I wonder who takes credit or blame for that one). Mackerel is an edible ocean fish with a greenish, blue striped back and a silvery belly. I remember as a boy using small mackerel as bait for sharks when I was fishing with my Dad and uncle in California. One time we even caught a shark with one.

Anyway, on occasion a weather observer may note the appearance of a mackerel sky, when high level or medium level broken, wispy cirrus cloud or cumulus clouds align in such a way that in combination with the blue sky they present an image not unlike the scales on the side of a mackerel. In another context, fishermen may occasionally refer to a mackerel breeze, which is

a wind strong enough to ruffle the water surface and favor the catching of mackerel. This is similar to what Minnesotans call a walleye chop.

#### Outlook:

Partly cloudy over the weekend with near normal temperatures. Generally dry most places and some frosts in the northern areas. Somewhat cool next week, with an increasing chance for scattered showers Monday through Wednesday as cloudiness associated with low pressure to our north will persist for much of the week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, May 12, 2006

HEADLINES:

- Climatology of hurricanes
- Fishing Opener
- Anniversary of first meteorological balloon measurements
- International weather headlines
- Peak hail season
- Almanac for May 12th
- Coldest Mother's Day
- What's a DRUM monitor?
- Outlook

Topic: Struggling with climatology of hurricanes

An article in this week's edition of science highlights discussion from the 27th Conference on Hurricanes and Tropical Storms. Last year's publication of two articles documenting an upward trend in hurricane intensity and its potential link to global climate change has sparked a reinvigorated effort to develop a hurricane climatology from historical records. It appears that tropical storm and hurricane frequency has fluctuated widely over the past one and a half centuries, but establishing temporal trends is difficult because of changes in the amount and quality of data gathered over the years. Since 1960 some researchers argue that though overall tropical storm frequencies may be relatively unchanged, the incidence of strong Category 3, 4, and 5 storms appears to be growing. This remains an open question, but with the number of hurricane researchers increasing, perhaps there will be definite conclusions on this hypothesis soon.

Topic: Fishing Opener this weekend....

Looks like the weather will be a bit chilly and wet for the Governor's Fishing Opener on Rainy Lake. Highs in the low 50s F with lows in the mid 30s F and a chance of showers are in the forecast there. At least the winds should be dying down on Saturday. It was only two years ago for the Fishing Opener (2004) that morning lows were in the 20s F. So, it could be worse!

Topic: An Anniversary for Balloon Measurements of the Atmosphere

This past Tuesday (May 9th) marked the 144th anniversary of the famous balloon ascents of British scientists James Glaisher and Henry Coxwell. They made 18 ascents in a gas filled balloon, the first of which was on May 9, 1862. They were the first to carry meteorological instruments aloft to make measurements of the character of the atmosphere. They established that nocturnal inversions were common and that lapse rate (change in temperature with altitude) can vary dramatically. They read their instruments on night ascents by wearing miner's lamps (the balloon was filled

with highly combustible hydrogen!). In one famous ascent to an altitude of 30,000 ft, Glaisher lost consciousness and Coxwell, who was groggy and had numb, frozen hands, still found a way to pull the valve-cord hard enough with his teeth so that enough gas was released to allow them to descend back to Earth.

Topic: Weather headlines this week....

Both India and Pakistan reported early season heat waves this week. India reported temperatures as high as 110 degrees F, and the weather station at New Delhi has recorded a daytime high of at least 102 F each day since April 25th. Many homeless people have suffered and died. The government closed elementary schools for the summer a week early. In Pakistan over 30 people have died as temperatures have reached as high as 116 degrees F there.

In England this week it was reported that a yellow veil of dust was covering everything. With prevailing easterly winds, citizens wondered if this material was coming off the European continent. The British Meteorological Service traced this dust to a couple of potential sources: ash from wild fires over Russia that have been burning over recent days; and pollen from Denmark which reached its peak this week when air quality monitors recorded an abundance of birch pollen grains.

MPR listener question: When is the peak of the hail season in Minnesota?

Answer: This date varies around the state, but in general historical data show the peak period for hail to occur is the last week of May and first full week of June.

Twin Cities Almanac for May 12th:

The average MSP high temperature for this date is 67 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 46 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 12th:

MSP weather records for this date include: highest daily maximum temperature of 90 degrees F in 1900 and 1961; lowest daily maximum temperature of 42 degrees F in 2005; lowest daily minimum temperature of 28 F in 1946; highest daily minimum temperature of 62 F in 1896 and 1944; record precipitation of 1.52 inches in 1906; a record snowfall of 0.2 inches in 1946.

Average dew point for May 12th is 40 degrees F, with a maximum of 67 degrees F in 1983 and a minimum of 10 degrees F in 1989.

All-time state records for May 12th:

The all-time state high temperature for today's date is 98 degrees F at Hallock (Kittson County) in 1900; the all-time state low for

today's date is 11 degrees F also at Hallock (Kittson County) in 1946, a rare occurrence for a community to hold both state records for a given date. The all-time state record precipitation for this date is 4.48 inches at Warroad (Roseau County) in 2004. The all-time state record snowfall for this date is 2.5 inches at Babbitt (St Louis County) in 1953.

From "Minnesota Weather Almanac" available online and in bookstores:

May 12, 1946 brought the coldest Mother's Day ever to Minnesota. The early part of the month had been favorable for grass, gardens, and farm crops, but on that Sunday morning lows from the teens to the 20s F brought a hard and damaging freeze. Many grain crops suffered from frost, vegetables and fruits were killed, and garden flowers were frozen. A state record low of just 11 degrees F was set at Hallock in Kittson County. Though afternoon highs reached the 50s F most places, low winter-like clouds brought sprinkles and even some sleet to places. The Twin Cities reported a record 0.2 inches of snowfall during the early morning hours. It was a good day for soup or stew indoors and certainly not a good day to take mom out for a picnic.

Words of the Week: DRUM monitoring

This is perhaps only a common jargon term to those who work in air quality measurement and assessment. DRUM (Davis Rotating-drum Universal size cut Monitoring) is a acronym for an instrument commonly used to sample aerosols in the atmosphere. Typically eight clock driven drums of different size diameters collect particles on grease-coated mylar substrates that cover the outside circular surface. The substrates may differ, and the air jets that draw samples of the atmosphere may vary in speed, to allow each drum to collect different size particles out of the atmosphere (typically ranging from 0.07 to 15 micrometers in size). The drums rotate slowly and are collected weekly or monthly for analysis of size and composition. Aersols measured include nitrates, sulfates, phosphorus, and other elements. Typically collections peak in the morning and evening when atmospheric inversions keep the concentrations of these elements high near the surface.

Outlook:

Cloudy, breezy, and cool over the weekend with a chance for light scattered shower activity. Drier next week, but remaining cooler than normal most days, with a chance for showers by Wednesday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, May 19, 2006

HEADLINES:

- Cold morning on May 18th
- Slow agricultural progress
- New climate outlooks
- Cyclone Day
- Mt Everest Weather
- Question on rainy Mays
- Almanac for May 19th
- Hot May of 1934
- Nytting Times
- Outlook

Topic: A cold morning on May 18th.....

For the first time since April 8th, Minnesota reported the coldest temperature in the 48 contiguous states when Big Fork recorded a low of just 32 degrees F on Thursday morning. Hibbing and International Falls both reported morning lows of 34 F.

Topic: Agricultural progress slowed.....

The wetness of the first half of May has slowed planting progress, especially so on the soybean crop. Many soils were too wet for tillage or planting. In addition early crop development has been slowed by cooler temperatures. For a number of days soil temperatures were only in the 40s to low 50s F. Warmer temperatures next week should promote more rapid germination and crop development and expectations are that most of the state's soybean crop will be planted by then.

Many alfalfa fields now stand two feet or taller. The abundant moisture has produced some lush growth, though many fields are also full of dandelions. Warmer weather will probably push development to the bud stage next week and some growers will think about first cutting.

Topic: New climate outlooks.....

Not much to say about the Climate Prediction Center outlooks for June through August. Across Minnesota they call for equal chances of warmer or cooler, as well as wetter or drier during the period.

Topic: 90 years ago...the birth of Cyclone Day...

On May 20, 1916 about 7:00 pm an F2 (113-157 mph) tornado passed by Codell, KS unroofing a house and destroying a number of barns. The funnel was approximately 400 yards wide and on the ground for 15 miles. A year later on the same date, but about 45 minutes earlier (6:45 pm) an F3 tornado (158-206 mph) with an immense cone approximately 1000 yards in diameter passed by Codell destroying many barns and two homes.

Then on May 20, 1918 about 8:15 pm an F4 tornado (207-260 mph) with a diameter of about 800 yards passed through Codell destroying many town buildings. Fortunately no one was killed in Codell, but the tornado was on the ground for 60 miles and ended up killing 65 people.

After being hit by tornadoes on the same date and near the same time of day for three consecutive years, many Codell residents chose to move away. Those who stayed commemorated this unusual sequence of weather by naming May 20th, Cyclone Day. Previous to these storms, Codell had recorded only one tornado, and since that time they have had eight others. Cyclone Day has continued to be observed by generations of Codell residents.

One further note, May 20th has not produced many tornadoes in Minnesota, though one of the first documented occurrences happened on this date in 1876 when the observer at Fort Ripley (Crow Wing County) reported a tornado on the ground near the fort.

Topic: Mt Everest weather has been favorable for climbers.....

The month of May historically offers the best weather for climbers to conquer Mt Everest, the world's tallest peak. Such was the case this week as it was reported that 42 climbers from 11 different countries successfully reached the peak in good weather. "Good weather" is a relative term for Mt Everest, as wind speeds this week were only 25-45 mph at the summit and the temperatures were downright balmy in the teens F!

MPR listener question: As rainy as this month has been, have any weather observers reported May precipitation records so far?

Answer: No. Actually the number of rainy days has certainly been more than normal for most, but the total amounts have not exceeded any monthly records. Observers at Crookston, Leech Lake, Babbitt, Pine River Dam, and Zumbro Falls have all reported amounts that already exceed the average for the entire month of May. Some have reported over 4 inches so far, but remember historically some station records show total May rainfall values of over 12 inches. The wettest ever May on a statewide basis was 1938 with an average rainfall of 6.24 inches among all climate stations. As recently as 2004 it rained 13.21 inches at Hokah (20 days with rain) during the month of May.

Twin Cities Almanac for May 19th:

The average MSP high temperature for this date is 69 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 49 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 19th:

MSP weather records for this date include: highest daily maximum temperature of 89 degrees F in 1977 and 1978; lowest daily maximum temperature of 43 degrees F in 1971; lowest daily minimum temperature of 33 F in 1961; highest daily minimum temperature of 64 F in 1977;



record precipitation of 0.99 inches in 1925; a record snowfall of 0.2 inches in 1971. There have been only three snowfalls on this date, occurring in 1892, 1924, and 1971.

Average dew point for May 19th is 45 degrees F, with a maximum of 65 degrees F in 1989 and a minimum of 11 degrees F in 1926.

All-time state records for May 19th:

The all-time state high temperature for today's date is 104 degrees F at Redwood Falls (Redwood County) in 1934; the all-time state low for today's date is 16 degrees F also at Cascade River State Park (Cook County) in 1929, at Tower (St Louis County) in 2000, and at Embarrass (St Louis County) in 2002. The all-time state record precipitation for this date is 4.17 inches at St Francis (Anoka County) in 1996. The all-time state record snowfall for this date is 8.6 inches at Grand Rapids (Itaca County) in 1971.

From "Minnesota Weather Almanac" available online and in bookstores:

May of 1934 was terribly hot, the 2nd hottest in Minnesota history (1977 was a few tenths warmer on a statewide basis). As a measure of how warm that May was, thirteen statewide high temperature records still exist from that month, including a 112 degrees F reading at Maple Plain taken on the 31st.

Words of the Week: Nyitting Times....

This is the jargon used by Australian native peoples to refer to the ancient ice ages. A period when most of the landscape was covered by ice and fire was unknown to their ancestors. It was a cold period when heavy clothing was mandatory, far different from the Australian environment of today.

Outlook:

Near seasonal temperatures over the weekend with a chance for showers and thunderstorms on Saturday. Warmer temperatures next week with a chance for showers and thunderstorms by Wednesday and Thursday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, May 26, 2006

HEADLINES:

- Record warm minimum temperatures on Wednesday
- Early rooftop measurements
- Urban trees
- Memorial Day snows?
- Almanac for May 26th
- 75th Anniversary of the 'Empire Builder' tornado
- Cyclostyle map
- Outlook

Topic: Record warm minimum temperatures on May 24th

Abundant water vapor brought in by southwesterly winds on Wednesday this week raised the dewpoints well into the 60s F. This humid air combined with persistent cloud cover held overnight minimum temperatures in the 60s F and in some cases produced record warm values. MSP International Airport reported a record warm minimum of 67 degrees F, Rochester a record 63 degrees F, Eau Claire a record 65 degrees F, and Redwood Falls tied their record of 63 F.

Topic: Up on the Roof

During the infancy of the National Weather Service in the late 19th century, observational networks were established and maintained by the U.S. Army Signal Service. Guidelines were quite stringent for locating instruments in suitable exposures, maintaining and calibrating instruments and filing reports. Failure to perform duties using these guidelines was not tolerated. Sergeants and corporals who failed to adhere to these guidelines were reduced in rank to first-class privates, while first-class privates were reduced to second-class for similar violations.

One of the exposure guidelines advocated for decades was to place the instruments (primarily thermometers and rain gages) on the rooftop of a tall building. This was indeed the case for the Twin Cities climate record as it shows rooftop placement of instruments on the U.S. Court House Building in Minneapolis (Marquette and 3rd St) from November of 1890 to April of 1938. This location essentially measured the climate 105 ft above street level. In addition, even when the Weather Service moved to the MSP airport location, rooftop readings were made from the 1930s until nearly 1960 at elevations that ranged from 30 to 40 ft above ground level.

So what are the consequences of these rooftop measurements? A number of studies have shown that temperature records kept for such locations are consistently higher than those kept near the ground. Some studies show average differences of 1 or 2 degrees F, while other studies show differences of several degrees, especially

where overnight inversions are quite common, or where the radiative properties of the building produce a great deal of heat storage and reradiation which affects the air temperature. In all cases, rooftop readings are warmer than those taken in standard exposures 5 ft above the ground. This means that in climate change detection studies and forecast verification studies researchers must be careful to correct for observations that are based on rooftop measurements. It is interesting to note that in the private sector and various school systems around the country there is a marked increase in the number of rooftop measurements, likely producing a positive temperature bias in their reports.

Topic: Urban trees-How much soil volume do they need?

Since this is Arbor Month, why not consider a question arborists have tried to answer for decades. Historically, urban foresters have blamed inadequate soil volume for the premature death of container trees or those planted in limited boulevard areas surrounded by pavement. An investigation done by Arthur DeGaetano and Stephen Hudson of the Northeast Regional Climate Center at Cornell University in New York has shed new light on this tree question. They developed new methods for estimating required soil volume to sustain trees in the urban environment, a useful tool for landscapers. These procedures consider: (1) tree species and dimensions (crown diameter); (2) soil water holding capacity; and (3) annual climatic data. The climatic data are used to estimate the soil moisture recharge by precipitation, as well as compute the daily and seasonal water use by the tree. Stressful soil water deficits due to inadequate precipitation are computed for recurrence intervals of 1/10 years, 1/20 years and 1/40 years using the frequency distributions in local climatological data. Thus, researchers could determine the maximum soil moisture deficit that occurs every 40 years and factor this into consideration of soil volume requirement to sustain the health of the tree through such a stressful period.

The results show that all factors studied have an effect on the required minimum soil volume, but the tree crown diameter and the recurrence interval for soil moisture deficit seem to have the most pronounced effects. For example, a tree with a crown diameter of 28 ft will require 20 times the soil volume (nearly 10 cubic meters) of a tree with a crown diameter of 7 ft (which needs only about 0.5 cubic meters of soil). This difference is magnified even more if the desire is to plant a tree in a soil volume which would allow it to withstand a precipitation deficit of a magnitude that occurs only once every 40 years. All of this assumes no supplementary watering, where tree longevity is solely based on rainfed conditions. In urban areas with poor quality soils, there is an even larger increase in the minimum soil volume required to sustain a healthy tree over many decades. In some cases, depending on tree size, up to 20 cubic meters of soil volume might be required. Researchers also point out that these methods have value in determining the maximum size tree which a predetermined soil volume can support.

Using local climate data with such an approach will help arborists,

landscape designers, homeowners, and city planners make wiser decisions about the planting of trees in the urban landscape. I wonder if this is going on in some Minnesota communities.

MPR listener question: Has it ever snowed on Memorial Day?

Answer: Observed on May 30th from 1868 to 1970, and then as the last Monday of May since 1971 Memorial Day (formerly known as Decoration Day), is somewhat difficult to track when it comes to weather history. Nevertheless, the Minnesota records show that the Twin Cities has never recorded snowfall on this holiday. On a statewide basis, Decoration Day of 1897 (May 30th) brought snowfall to some northern Minnesota Counties, from a trace amount to 0.1 inches at Bemidji, where the temperature hovered in the 30s and 40s F most of the day. Then, in the more modern record, Memorial Day of 1992 (Monday, May 25th) brought some snow to southern Minnesota locations, from trace amounts at Alexandria, Wadena, Owatonna, and Gaylord, to as much as 1.3 inches at New Ulm, where temperatures hovered in the 30s and 40s F. Whew!

Twin Cities Almanac for May 26th:

The average MSP high temperature for this date is 71 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 52 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 26th:

MSP weather records for this date include: highest daily maximum temperature of 96 degrees F in 1978; lowest daily maximum temperature of 45 degrees F in 1906; lowest daily minimum temperature of 34 F in 1992; highest daily minimum temperature of 72 F in 1911; record precipitation of 1.31 inches in 1906 (2.53 inches in 1861). Snow has never been recorded on this date.

Average dew point for May 26th is 47 degrees F, with a maximum of 69 degrees F in 1959 and a minimum of 27 degrees F in 1907.

All-time state records for May 26th:

The all-time state high temperature for today's date is 103 degrees F at Tracy (Redwood County) in 1914; the all-time state low for today's date is 20 degrees F at Cook (St Louis County) in 1961 and at Tower (St Louis County) in 2000. The all-time state record precipitation for this date is 3.48 inches at Grand Meadow (Mower County) in 1978. The all-time state record snowfall for this date is 2.0 inches at Kelliher (Beltrami County) in 1970.

From "Minnesota Weather Almanac" available online and in bookstores:

Tomorrow, May 27, 2006 marks the 75th Anniversary of famous "Empire Builder" tornado that struck Moorhead, MN in 1931. This F3 (158-206 mph winds) first struck around 4:20 pm and moved along the ground for a distance of 40 miles. In its path was the "Empire Builder" train moving along the tracks at 55 mph near Sabin in Clay County. It was

struck broadside by the tornado and five coach cars were lifted from the tracks and thrown 80 feet, injuring 57 passengers and killing one. This rather dramatic event made national headlines.

### Words of the Week: Cyclostyle Map

In the late 19th century many Army Signal Corps Offices produced a daily weather map for posting in the local telegraph or railway office and for duplication by the local newspaper. The cyclostyle consisted of a box containing a bed-plate covered with zinc which showed an outline map of the United States, an inking board, roller, pen, ink vial, and paper. Station data were plotted on the map by hand showing temperature, pressure, and wind. Then a dotting pen was used to trace lines through equal values, much like the modern computer generated synoptic weather maps you see on the Internet today. These hand generated maps required an artistic touch to create.

### Outlook:

Continued warm and humid into the Memorial weekend with an increasing chance for showers and thunderstorms by Monday and Tuesday. Continued high humidity with relatively high dewpoints and rather sultry conditions for late May. The month may go out on a wet note, as did April.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, June 2, 2006

HEADLINES:

- ANNOUNCEMENT
- Preliminary May Climate Summary
- People's University in June
- Alaska getting warmer than we are
- Question on the Hurricane Season
- Almanac for June 2nd
- Wettest June in History-1914
- What's a paleosol?
- Outlook

ANNOUNCEMENT: A SCREENING OF THE NEW AL GORE MOVIE "AN INCONVENIENT TRUTH" WILL TAKE PLACE AT THE LANDMARK THEATER IN EDINA ON THURSDAY, JUNE 8TH AT 8 PM, FOLLOWED BY A DISCUSSION. THIS IS SPONSORED BY THE MINNESOTA PLANETARIUM AND SPACE DISCOVER CENTER. MORE INFORMATION AT [HTTP://WWW.MPLANETARIUM.ORG/NEWSEVENTS.HTML](http://www.mplanetarium.org/newsevents.html)

Topic: Preliminary Climate Summary for May

Most areas of the state reported near normal average temperature for May, though some were as much as 2-3 degrees F warmer than normal. Except for the north shore area, several locations reported some temperatures in the 90s F during the month. St Cloud and Wadena reported a high of 98 F on the 28th, highest reading for the month anywhere in the state, while Embarrass reported a low of just 17 F on the 21st, coldest for the month. Minnesota reported the lowest temperature in the nation on two dates the 21st and 22nd.

Precipitation was mostly less than normal around the state. A few northeastern locations had above normal rainfall. However, the month ended with most area farmers hoping for more rainfall in June.

Topic: The People's University at the new Minneapolis Library

Several free courses begin this month at the People's University held at the new Minneapolis Public Library (300 Nicollet Mall) Night courses will be offered on wide ranging subjects: Poetry of African-American Women; Space Science; the Archaeology of Mill City; the Music Scene; the Immigration Debate; Photography of Art; and Severe Weather in Minnesota. Yes, I will be teaching the last one in three sessions on Monday nights, starting June 12th at 6:15 pm. Those interested in any of these courses can contact Friends of the Public Library at: 612-630-6155; [friends@mplib.org](mailto:friends@mplib.org) or visit the web site: [www.friendsofmpl.org](http://www.friendsofmpl.org)

Topic: Alaska getting warmer....

A report from the University of Alaska-Fairbanks documents that average annual temperatures of interior Alaska have warmed by as much as 3.5 degrees F since 1950, while winter average temperatures have warmed as much as 6.0 degrees F. This level of warming in the winter is nearly twice what we have seen here in Minnesota. But then it is clear that the higher latitudes are warming at a more rapid rate in recent years. The warming in some parts of Alaska has been enough to cause the loss of permafrost so that lakes and ponds formerly perched on top of frozen ground are disappearing.

MPR listener question: Has there ever been a hurricane on the first day of the Atlantic hurricane season?

Answer: The Atlantic Hurricane Season runs from June 1 to November 30 according to the NOAA National Hurricane Center. Early hurricanes and tropical storms have occurred in the three months preceding June 1st, while late hurricanes and tropical storms have occurred in the three months following November 30. The earliest observed hurricane was on March 7, 1908, while the latest was January 5, 1955, though tropical storms have been observed as late as February 4th.

Examining the tropical storm (winds 39-74 mph) and hurricane (winds over 74 mph) records since 1851 I can find no detected hurricanes on June 1st, but I do find records of one tropical storm on that date in 1873, the only such case.

Bear in mind that besides the March 7, 1908 hurricane, there has been one tropical storm in April (Ana on April 21, 2003) and there have been 12 tropical storms in May, most recently Arlene on May 8, 1981. There have also been two hurricanes in May, a category 1 (74-95 mph) on May 20, 1889 (before names were assigned), and a category 3 (111-130 mph) named Able on May 21, 1951. So, though the peak season for tropical storm development in the Atlantic Basin is June through November, such storms have formed in any month of the year since records began in 1851.

Twin Cities Almanac for June 2nd:

The average MSP high temperature for this date is 74 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 53 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for June 2nd:

MSP weather records for this date include: highest daily maximum temperature of 93 degrees F in 1940; lowest daily maximum temperature of 44 degrees F in 1945; lowest daily minimum temperature of 35 F in 1946; highest daily minimum temperature of 70 F in 1923; record precipitation of 2.00 inches in 1897. Snow has never been recorded on this date.

Average dew point for June 2nd is 48 degrees F, with a maximum of 73 degrees F in 1944 and a minimum of 22 degrees F in 1994.

All-time state records for June 2nd:

The all-time state high temperature for today's date is 105 degrees F at Fairmont (Martin County) and New Ulm (Brown County) in 1934; the all-time state low for today's date is 20 degrees F at Ely (St Louis County) in 1947. The all-time state record precipitation for this date is 4.50 inches at Mankato (Blue Earth County) in 1885. The all-time state record snowfall for this date is 5.0 inches at Virginia (St Louis County) in 1945, most ever snowfall on a June day.

From "Minnesota Weather Almanac" available online and in bookstores:

The wettest June in state history occurred in 1914. Average monthly rainfall across the state was 8 inches and a number of rivers reached flood state. All-time June rainfall records were set at Grand Meadow with 14.45 inches, Morris with 12.53 inches, Pine River Dam with 12.64 inches, Wheaton with 10.54 inches, Windom with 11.06 inches, Winona with 14.12 inches, and Zumbrota with 12.94 inches. For some of these communities it rained on 22 days during the month.

Word of the Week: Paleosol

This term refers to a buried or ancient soil. Its character and composition (minerals, organic matter, etc) may infer information about past environments because climate is an important factor in the soil forming process. Sometimes paleosols assist in the reconstruction of past climates beyond the record of traditional measurements such as temperature and rainfall.

Outlook:

Partly cloudy skies over the weekend with warmer than normal temperatures. Slight chance for widely scattered showers both Saturday and Sunday, but generally dry. A better chance for showers and thunderstorms by Monday and Tuesday next week, then cooler weather, with temperatures falling back to near normal values.



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, June 9, 2006

#### HEADLINES:

- Climate and Energy Use Trends
- Warm Weather Trend This Spring
- Anniversary of Rapid City, SD Floods
- People's University Last Call
- Al Gore and "An Inconvenient Truth"
- Almanac for June 9th
- From The Minnesota Weather Almanac
- Friagem?
- Outlook

Topic: Climate Driven Energy Use: Opposite Seasonal Trends

We have spoken on Morning Edition and Midday about the trend toward warmer than normal winters in Minnesota over the past several years. One measure of this trend can be found in an examination of the heating season, the period from November through March when we consume the most energy for heating our homes and commercial buildings. Heating Degree Days (HDD) are calculated as the difference between the daily mean temperature and a base value of 65 degrees F. For example on a mid-winter day when the daily mean temperature is 20 degrees F, an HDD value of 45 is accumulated. For eight of the past nine heating seasons HDD accumulations have been significantly less than normal, averaging about 85 percent of the historical average for the Twin Cities. Of the past nine years, the only colder than normal winter that produced above average seasonal HDD was 2000-2001, and that was only a slight deviation. Most recently the 2005-2006 heating season in the Twin Cities produced only 83 percent of the normal HDD. Certainly fewer HDD have helped our pocket books absorb the impact of higher energy costs in recent years.

Conversely, during the summer season, Cooling Degree Days (CDD) provide a measure of energy demand for running fans and air conditioning systems. CDD are calculated based on the difference between mean daily temperature and a base value of 65 degrees F. For example a mean daily temperature of 72 degrees F yields an accumulated CDD value of 7. During the summer season over 95 percent of the seasonal CDD accumulation comes in the months of May through September. Over the past nine summers, seasonal CDD have averaged about 110 percent of normal. One summer produced historically normal CDD (that of 2000), two summers (1997 and 2004) were cooler than normal (less CDD) and six summers have been significantly warmer than normal. Four of the past five summers (2005, 2003, 2002, 2001) have averaged 31 percent more CDD than normal, producing a high demand for energy. You cannot help but consider how essential air conditioning has become to our

lifestyle in Minnesota.

Topic: Warm weather trend this spring in Minnesota

Earlier this week, local Twin Cities broadcast meteorologists referred to the string of 16 consecutive days with maximum temperatures of 80 degrees F or higher (May 23 to June 8) as marking the warmest such period in the local climate record. Indeed, the average daily temperature over this period has been 75 degrees F, about 11 degrees F above average. However this warmth is equally marked by high nighttime temperatures during this period. The average daytime maximum temperatures have been 12 degrees F warmer than normal, thanks to the string of 80 F days, but the average nighttime minimum temperatures have been 11 degrees warmer than normal as well. In fact the daily average minimum temperature in the Twin Cities since the vernal equinox (March 21st) has been a record high of 47 degrees F, quite a long and remarkable trend in minimums.

Topic: Rapid City, SD Flash Flood 34 Years Ago

Over a six hour period the evening of June 9, 1972 the Black Hills area around Rapid City, SD received up to 15 inches of rainfall. This huge rainfall stressed the Canyon Lake Dam which failed at 10:45 pm that evening and sent a wall of water down Rapid Creek and through the city. The flood crest on this watershed was more than 10 times as high as the previous record crest. Over 1300 homes were destroyed, 3000 people injured, and 238 killed. The rainfall intensity of this storm has not been observed since that time thankfully.

Topic: The People's University at the new Minneapolis Library

Several free courses begin this month at the People's University held at the new Minneapolis Public Library (300 Nicollet Mall) Night courses will be offered on wide ranging subjects: Poetry of African-American Women; Space Science; the Archaeology of Mill City; the Music Scene; the Immigration Debate; Photography of Art; and Severe Weather in Minnesota. Yes, I will be teaching the last one in three sessions on Monday nights, starting June 12th at 6:15 pm. This course will deal with severe winter storms, spring snowmelt floods, and summer convective storms. Those interested can contact Friends of the Public Library at: 612-630-6155; friends@mplib.org or visit the web site: [www.friendsofmpl.org](http://www.friendsofmpl.org)

MPR listener question: What do think of the new Al Gore movie, "An Inconvenient Truth?"

Answer: It provides insight into how Al Gore became an environmentalist. It is important to remember he is not a scientist, but he has certainly made awareness and education about global climate change the central theme of his adult life. The movie contains some excellent visualizations and presents some aspects of the science in an effective manner. However, some features of the discipline of science, such as hypothesis testing and framing confidence and

uncertainty of results are not dealt with. In addition all branches of science have minority opinions, but in the climate sciences these people are called "skeptics" or "contrarians" in an effort to taint them. Gore advocates political action and environmental stewardship with vigor. One of the best things about the film comes at the end when a list is presented of meaningful actions and behaviors that individuals can do for themselves regarding environmental stewardship. That's probably enough said, but certainly this movie will invoke a discussion of environmental ethics among all who see it.

#### Twin Cities Almanac for June 9th:

The average MSP high temperature for this date is 75 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 56 degrees F (plus or minus 6 degrees F standard deviation).

#### MSP Local Records for June 9th:

MSP weather records for this date include: highest daily maximum temperature of 95 degrees F in 1911, 1973, and 1976; lowest daily maximum temperature of 56 degrees F in 1908 and 1998; lowest daily minimum temperature of 39 F in 1915; highest daily minimum temperature of 73 F in 1959; record precipitation of 2.33 inches in 1927.

Average dew point for June 9th is 52 degrees F, with a maximum of 74 degrees F in 1947 and a minimum of 23 degrees F in 1972.

#### All-time state records for June 9th:

The all-time state high temperature for today's date is 102 degrees F at Faribault, Albert Lea, and Mankato in 1985 and at New Ulm in 1911; the all-time state low for today's date is 23 degrees F at Fort Ripley (Crow Wing County) in 1877. The all-time state record precipitation for this date is 7.20 inches at Willmar (Kandiyohi County) in 1895. Snow has not fallen on this date in the state.

From "Minnesota Weather Almanac" available online and in bookstores:

The year 1917 is the coldest statewide in the Minnesota climate record. On June 12th of that year, the pack ice on Lake Superior around Duluth Harbor finally disappeared, the latest date ever for such an occurrence. Two other notable warm season weather related events in Duluth history: July 4, 1876, ice cream was made with the ice harvested from the harbor waters after an especially chilly summer night; August 31, 1949 a trace of snow was recorded at Duluth, the only occurrence of snow ever noted during the month of August statewide.

Word of the Week: Friagem

We have no equivalent for this term used in South America to refer to an invasion of an arctic air mass that drops both the temperature and the dewpoint significantly. Often times such air masses last

for periods of three to five days and may bring welcome relief from hot and humid conditions. Certainly a friagem type air mass dropped down over Minnesota this week on Thursday, lowering our daytime temperatures by 10-15 degrees F and our dewpoints by 20 degrees F. "Very refreshing air" according to most citizens.

#### Outlook:

Cooler over the weekend with a chance for widely scattered showers in the south early Saturday, but generally dry for the weekend. Chance for widely scattered showers later on Sunday as well. Generally partly cloudy skies next week and near normal temperatures, with a chance for showers and thunderstorms again by late Wednesday and Thursday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, June 16, 2006

HEADLINES:

- Atmosphere Affects European Climate
- Temperature's About Face
- Being prepared is good for retailers
- Few tornadoes in June
- Almanac for June 16th
- Anniversary of tornado outbreak in 1992
- CALIPSO
- Outlook

Topic: It's the atmosphere more than the ocean.....

In the most recent American Scientist magazine, Richard Seager of Columbia University argues effectively that it is atmospheric circulation that moderates Europe's climate more than the ocean circulation known as the Gulf Stream. In fact the heat transported poleward from the midlatitudes by air currents exceeds that by the oceans several fold. The consequences are according to Seager's work that a slow down in the thermohaline circulation of the North Atlantic would likely result in a few degrees change in mean temperature but not the onset of a new ice age as proposed by other scientists studying climate change. It is an interesting read.

Topic: Temperature's About Face

After summer like temperature conditions prevailed for a period of 17 days, Mother Nature did an about face starting on June 9th, bringing very cold temperatures to the Minnesota. Daytime temperatures fell from the 80s F into the 50s and 60s F over June 9, 10, and 11. Rochester set a new record for the coldest daytime high on June 10th when the mercury only reached 59 degrees F. In addition the coldest ever daytime temperatures for June 10th were reported from Montevideo with 54 F and Collegeville with 58 F.

The cold air mass brought very low minimum temperatures as well. Minnesota reported the lowest temperature in the 48 contiguous states on June 10 (25 F at Embarrass), June 11 (26 F at Embarrass), and June 12 (32 F at Grand Marais). The spell was shortlived as temperatures rebounded into the 70s and 80s by June 13th.

Topic: Preparations for the Hurricane Season Fuel Retail Sales

An article in USA Today this week provided evidence for increased retail sales in the Gulf States due to anticipation of another busy tropical storm and hurricane season. After two consecutive punishing seasons with several landfall hurricanes, many residents are taking steps to be better prepared. Sales of portable generators, ready to eat meals, satellite based cell phones, tarps, coolers, flashlights,

aluminum shutters, and back-up data services have soared. Some state officials have stated that the level of preparation is unprecedented. Though not mentioned I would guess that sales of NOAA weather radios in these states is probably on the rise as well. Heavy rains from tropical storm Alberto earlier this week were a definite wake up call that the North Atlantic hurricane season is here.

MPR listener question: Why so few tornadoes this year in Minnesota?  
I have heard reports of only two.

Answer: Indeed, Pete Boulay of the Minnesota State Climatology Office has recently written about this on our web site. Both tornadoes reported on May 7th were weak ones and occurred in Polk County.

www.134.84.160.120

The last time we had so few by this date was 1999, but that year ended up with 36 tornadoes. Since 1999 we have seen an average of 50 tornadoes in the state each year, with a record number 74 in 2001. Last year there were 68 reported.

Nationwide the trend in tornadoes is down for June, with only 49 reports so far. Of course that could change dramatically as sometimes these storms appear in outbreaks of severe weather that span several states.

Twin Cities Almanac for June 16th:

The average MSP high temperature for this date is 78 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 58 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for June 16th:

MSP weather records for this date include: highest daily maximum temperature of 97 degrees F in 1933; lowest daily maximum temperature of 60 degrees F in 1972; lowest daily minimum temperature of 43 F in 1961; highest daily minimum temperature of 72 F in 1933; record precipitation of 2.16 inches in 1935, one of only four rainfalls of 2 inches or greater observed during the entire Dust Bowl decade of the 1930s.

Average dew point for June 16th is 54 degrees F, with a maximum of 73 degrees F in 1921 and a minimum of 32 degrees F in 1980.

All-time state records for June 16th:

The all-time state high temperature for today's date is 106 degrees F at Beardsley (Big Stone County) and Wheaton (Traverse County) in 1933; the all-time state low for today's date is 23 degrees F at Embarrass (St Louis County) in 1999. The all-time state record precipitation for this date is 4.98 inches at Willmar (Kandiyohi County) in 1967. Snow has not fallen on this date in the state.

From "Minnesota Weather Almanac" available online and in bookstores:

June 16, 1992 (14 years ago today) brought one of the worst tornado outbreaks to Minnesota and the last F-5 tornado (winds over 261 mph). Between 4:00 and 9:00 pm at least 22 tornadoes touched down across southwestern counties (65 were reported nationwide). The strongest and most destructive was an F-5 that traveled 16 miles from near Leota in Nobles County to Chandler in Murray County. Much of Chandler was destroyed, with 40 homes lost and 47 damaged. A check from a Chandler home was later found in Willmar, 95 miles away!

Word of the Week: CALIPSO

For scientists, this does not refer to a Caribbean dance. It is an acronym for a new satellite system that monitors the Earth's atmosphere: Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations. It is designed to measure the depth, altitude and areal extent of aerosols in the atmosphere, including fine particulates. Such measurements will be important in understanding both the warming and cooling effects of aerosols, many of which are produced by humans.

Outlook:

Chance of showers and thunderstorms Saturday, more so in the central and south than in the north. Start time temperatures for Grandma's Maraton in Two Harbors should be around 60 degrees warming into the low 70s F, with light WSW winds. There is a 30-40 percent chance of showers falling on the runners. Generally warmer than normal next week with another chance for showers by Wednesday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, June 23, 2006

#### HEADLINES:

- Lightning safety
- Seasonal outlook
- NAS statement on warming
- Listener question on warm summers
- Almanac for June 23rd
- From the "Minnesota Weather Almanac"
- Jokulhaups?
- Outlook

Topic: Reminders on lightning safety....

This week has been designated Lightning Safety Awareness Week by the National Weather Service. They have put out numerous public safety announcements. Many simple rules can be important. When lightning is present,

STAY INDOORS, PREFERABLY AN INTERIOR ROOM  
UNPLUG HOME APPLIANCES  
STAY OFF THE PHONE AND AWAY FROM PLUMBING FIXTURES  
STAY OFF PORCHES AND AWAY FROM WINDOWS AND DOORS  
HEAD THE BOAT INTO SHORE AND GET OFF  
IF IT CATCHES YOU IN YOUR VEHICLE, STAY THERE

Topic: Latest Climate Seasonal Outlook

The Climate Prediction Center's latest outlook favors warmer than normal temperatures across our region for the July through September period. They further state that during this period there are equal chances for above or below normal rainfall. It may prove to be a real asset to Minnesota agriculture this year that we have above normal stored soil moisture, estimated at 6-8 inches in the top five feet of soil. This will come in handy for any prolonged dry periods during the growing season.

Topic: National Academy pronounce Earth is warming...

This week a panel of scientists representing the National Academy of Science announced that according to their studies the Earth is warmer than it has been in 400 years and possibly warmer than it has been in 2000 years. They noted that the rate of warming seen in the past few decades is without peer in the past several centuries. The NAS panel was requested to make a case in the context of the Bush administration's reluctance to take more aggressive measures to curb greenhouse gases.

MPR listener question: It seems to me like each summer has been warmer the normal here in the Twin Cities for the past ten years. Is this true? When was the last time we recorded a colder than normal summer?



Answer: Four of the past five summers have been significantly warmer than normal, but summer 2004 was on average 2.5 degrees F colder than average. Of the past ten summers only 1996 and 2004 can be counted as measurably colder than normal, so we have been seeing a trend toward the warm side.

Twin Cities Almanac for June 23rd:

The average MSP high temperature for this date is 80 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 60 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for June 23rd:

MSP weather records for this date include: highest daily maximum temperature of 99 degrees F in 1922 and 1937; lowest daily maximum temperature of 63 degrees F in 1957 and 1963; lowest daily minimum temperature of 44 F in 1972; highest daily minimum temperature of 80 F in 2005 (one of only 23 times the Twin Cities low temperature has not fallen below 80 F); record precipitation of 1.81 inches in 1919.

Average dew point for June 23rd is 56 degrees F, with a maximum of 72 degrees F in 1919 and a minimum of 30 degrees F in 1972.

All-time state records for June 23rd:

The all-time state high temperature for today's date is 104 degrees F at Springfield (Brown County) in 1937; the all-time state low for today's date is 27 degrees F at Sandy Lake Dam (Aitkin County) in 1917. The all-time state record rainfall for this date is 5.47 inches at Reads Landing (Wabasha County) in 1940.

From "Minnesota Weather Almanac" available online and in bookstores:

The only instance of a widespread frost on the summer solstice was in 1992 (June 20). Over three dozen weather observers around the state reported frost, with many damaged corn fields. The four day period from the 20th to the 24th was one of the coldest June episodes in Minnesota history. On the 22nd daytime highs were as much as 30 degrees below normal as Duluth Harbor reported only 49 F, Two Harbors and Grand Portage reported 51 F, Brainerd and the Gull Lake resorts reported a high of 55 F, and Rochester reported their lowest ever daytime maximum temperature for the date of 57 degrees F.

Word of the Week: jokulhlaups

There is an Icelandic word that is pronounced either "yer-kul-hlops" or "joo-kool-hops" and refers to glacier outburst floods. The word combines jokul meaning glacier with hlaup meaning flood. These types of floods result when dams of water and ice give way when volcanic eruptions occur under glaciers or ice sheets. They can be quite destructive, moving large quantities of ice, rock, and sediments

very quickly across the landscape. Some scientists are concerned that with continued high latitude warming, melting glacial ice will pose more of a threat as it accumulates behind ice and rock dams.

#### Outlook:

Generally moderate temperatures over the weekend, a few degrees cooler than normal with a chance for scattered showers and thunderstorms on Saturday and mostly in eastern sections on Sunday. Some warmer weather by Tuesday, with a dry week ahead.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, June 30, 2006

#### HEADLINES:

- June climate summary
- Dryness is a concern
- July 4th weather
- Almanac for June 30th
- Short growing seasons in the northeast
- Saddle and Col
- Outlook

Topic: Preliminary Climate Summary for June 2006

With few exceptions most areas of the state reported a drier than normal month of June. Some received only about half of the historical average rainfall. About one third of the days during the month brought rainfall, but mostly in small doses. There were some exceptions as Lamberton reported 4.26 inches ( a month's worth of rainfall) on June 5th, while Waseca reported 2.97 inches and Mankato 3.06 inches on June 10th.

Fortunately, there were not too many days of extremely hot weather. Temperatures for the month were near normal to a few degrees warmer than normal. Extremes ranged from 92 degrees F at Worthington, Canby and Marshall on June 3rd to just 25 degrees F at Embarrass on June 10th. Minnesota reported the lowest minimum temperature reading in the contiguous 48 states five times during the month. Crops made good progress, though some were showing signs of moisture stress.

Topic: Dryness sets in.....

Many areas show a significant rainfall deficit since May 1st, especially in the western and northern areas. Red Lake Falls, Hibbing, Alexandria, Moorhead, and Willmar have all reported less than 50 percent of normal rainfall since May 1st. This equates to an deficit of 3 to 4 inches of rainfall. Thankfully, stored soil moisture values are still 5 inches or more in the top 5 feet but some crops are showing signs of moisture stress as their root systems have not yet fully developed. Unfortunately a trend toward warmer temperatures and less than normal rainfall is forecasted for the first half of July.

MPR listener question: What can you tell us about the past weather for the 4th of July in Minnesota?

Answer: Independence Day in Minnesota has a reputation for being warm and humid most of the time. The highest Heat Index occurred in 1949 when 18 communities reported values of 110 to 115 F, while the statewide record temperature was set at Pipestone in 1936

with a reading of 107 degrees F. The last exceptionally warm July 4th was in 1989 when most areas of the state reported temperatures well into the 90s F.

July 4th 1972 brought frost to northern Minnesota counties and even daytimes highs barely made the 60s F. In 1876 residents of Duluth made ice cream for the 4th using ice harvested from the harbor because it had been so cold the night before.

It rains on the 4th about every 2 years out of 5, though it has only rained twice in the last 10 in the Twin Cities area. There have been cases of heavy thunderstorm rains washing out fireworks displays, as happened at Milan in Chippewa County in 1995 when they recorded just under 10 inches of rainfall. And of course the most recent famous July 4th storm was in 1999 when a derecho wind storm devastated the Boundary Waters Canoe Area with winds of 70 to 100 mph.

As for the coming 4th of July next Tuesday, it looks like it will be dry, with highs in the 70s to low 80s F, low dewpoints and light northerly winds.

Twin Cities Almanac for June 30th:

The average MSP high temperature for this date is 82 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 62 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for June 30th:

MSP weather records for this date include: highest daily maximum temperature of 100 degrees F in 1931; lowest daily maximum temperature of 56 degrees F in 1959; lowest daily minimum temperature of 47 F in 1892; highest daily minimum temperature of 82 F in 1931; record precipitation of 1.56 inches in 1978. The highest Heat Index on this date ranged from 108 to 114 degrees F in 1921, 1931, and 1949. In each case heat related stress caused some mortality.

Average dew point for June 30th is 58 degrees F, with a maximum of 76 degrees F in 1955 and a minimum of 36 degrees F in 1965.

All-time state records for June 30th:

The all-time state high temperature for today's date is 109 degrees F at Canby (Yellow Medicine County) in 1931; the all-time state low for today's date is 24 degrees F at Pine River Dam (Crow Wing County) in 1925. The all-time state record rainfall for this date is 5.34 inches at Faribault (Rice County) in 1901.

From "Minnesota Weather Almanac" available online and in bookstores:

Cotton and Meadowlands reported a low of 32 degrees F on June 30, 1982, while Tower reported a low of 27 degrees F. In fact many

areas in St Louis County have very short frost-free growing seasons. The median frost-free growing season at Cook is just 97 days, 96 days at Floodwood, 91 days at Cotton, and only 50 days at Tower. This makes it quite difficult for the home gardener.

Word of the Week: Saddle or Col

For generations this was the term used to refer to a trough of low pressure situated between two high pressure cells. This can be viewed on today's upper air weather maps. During the summer months it is often in the saddle area of pressure that thunderstorms will develop, providing a breeding ground of converging surface winds and lift.

Outlook:

Temperatures generally warmer than normal over the weekend with enough instability to produce showers and thunderstorms into early Saturday. Mostly dry on Sunday, with increasing clouds late and a chance for showers and thunderstorms carrying over into Monday. July 4th should be dry and pleasant and much of next week should be mostly dry with temperatures a few degrees above average and a chance for showers late in the week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, July 7, 2006

#### HEADLINES:

- Dryness continues, watering tips
- Weather cooperation in Korea
- Congratulations to the Judy family
- Question on 100 degrees F temperatures
- Almanac for July 7th
- Anniversary of a hot day...
- Turbonada?
- Outlook

Topic: Dryness continues.....

Though soil moisture deficits are not extreme, the lack of rainfall in areas is having some visible effects. Crops and native vegetation are showing signs of wilting or lack of lush growth. The Drought Mitigation Center designates that portions of northern and western Minnesota are only abnormally dry, however areas to the west and southwest in SD and NE are in moderate to severe drought classes. The total rainfall since May 1st in some areas (Alexandria, Hibbing, Moorhead, and Brainerd) is less than 50 percent of average and many areas, including the Twin Cities, show only about 60 percent of normal rainfall over the same period.

With the outlook favoring a warm and dry first half of July, it is important to remember some water conservation tips:

- water plants and gardens at night or very early in the morning to minimize evaporation losses.
- use mulch around some plants to minimize water loss from the soil.
- adjust your lawnmower to a higher setting as the longer grass keeps root systems shaded.
- direct downspouts and other runoff towards shrubs, hedges and trees that can utilize the water.
- try to water at a rate that matches the infiltration rate of your soil....perhaps with a soaker hose.

Topic: Cooperation in Korea....

Although North Korea has provoked a negative reaction from the international community with their recent long range missile tests, it is interesting to note that they are cooperating with South Korea to open a new weather forecasting center. Known by many Asian citizens as a holy place, Mount Kumgang in North Korea is visited by over 300,000 South Koreans each year. However,

forecasting the weather for the area is problematic and has not been handled very well in the past. Now officials from both countries are getting together to deploy new technologies and do a better job of weather forecasting in promotion of the tourist industry there. A new weather forecasting offices is planned for this mountainous region.....an indication that at least meteorologists from the two countries can successfully sit down together and negotiate!

Topic: Congratulations.....

Hearty congratulations are in order for the Judy family of Forestburg, SD, a little over two hours west of Pipestone, MN. Their family has been taking daily weather observations there since January 1, 1890. They recently received the Family Heritage Award from the National Weather Service for over 100 years of service. The award carries Thomas Jefferson's name as he was the firsts President to acknowledge the valuable contributions made by those who routinely recorded weather observers. Only eleven families out of the 11,000 National Weather Service Cooperative Observers have been so honored. Two families in Minnesota have achieved the distinction of 100 plus years of service: the Opjorden family of Milan, MN (still going strong today) and the Atkin-Stoffel family of Farmington, MN who ended their service in August of 2003 after recording their first observations in April of 1888.

MPR listener question: When was the last summer with multiple 100 degrees F readings in the Twin Cities metro area?

Answer: The last time multiple readings of 100 degrees F or higher occurred in the Twin Cities metro area was the summer of 1988. There were four days with high temperatures of 100 F or higher. Before that the previous such summer was that of 1955. The all-time record frequency of 100 F days was in 1936 with nine.

Twin Cities Almanac for July 7th:

The average MSP high temperature for this date is 83 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 63 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for July 7th:

MSP weather records for this date include: highest daily maximum temperature of 101 degrees F in 1936; lowest daily maximum temperature of 65 degrees F in 1918; lowest daily minimum temperature of 44 F in 1891; highest daily minimum temperature of 80 F in 1936; record precipitation of 3.00 inches in 1955. Also on this date in 1955 an F4 tornado (winds from 207-260 mph) moved 20 miles across the landscape in Lincoln and Lyon Counties. It destroyed many farmes, killed one person, injured 13, and caused about \$1 million in damages. On this date in 1973 the Heat Index

reached 105 degrees F in the Twin Cities.

Average dew point for July 7th is 61 degrees F, with a maximum of 79 degrees F in 1957 and a minimum of 38 degrees F in 1934.

All-time state records for July 7th:

The all-time state high temperature for today's date is 108 degrees F at Browns Valley (Traverse County) in 1988; the all-time state low for today's date is 24 degrees F at Tower (St Louis County) in 1997, the lowest temperature ever recorded in the month of July. The all-time state record rainfall for this date is 5.00 inches at Elgin (Wabasha County) in 1990.

From "Minnesota Weather Almanac" available online and in bookstores:

Seventy years ago, on July 6, 1936 the afternoon high temperature reached 114 degrees F at Moorhead, MN tying the all-time state record set on July 29, 1917 at Beardsley (Big Stone County). Thankfully the temperature fell by 41 degrees to an overnight low of 73 degrees F, still warm by many standards, but cool enough to sleep in those non-air conditioned times.

Word of the Week: Turbonada

This is a Spanish term for a thundersquall or short-lived thunderstorm that may produce waterspouts. It is particularly used in forecasts for the coastal regions. The closest Minnesota analogy is probably the occasional small thunderstorms that trigger waterspout formations on Lake of the Woods or the Upper and Lower Red Lakes.

Outlook:

Continued warm into the weekend, with a chance for showers and thunderstorms on Saturday, especially in northern areas. Somewhat cooler weather on Monday, followed by an increasing chance for much needed showers over the remainder of next week..



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, July 14, 2006

HEADLINES:

- Heat Wave of 1936
- IRS recovers from the weather
- Expressing the statistics of temperature
- Almanac for July 14th
- 1881 tornadoes
- Elephant Snot
- Outlook

Topic: 70 Years Ago.....A Devastating Heat Wave...

Seventy years ago today, the Twin Cities reported its all-time record high of 108 degrees F.

Also on July 14, 1936 over 30 Minnesota communities were reporting afternoon temperatures of 100 degrees F or greater. The state was in the grip of the longest and most intense Heat Wave of record, lasting from July 4th to July 18th. During that interval, Pipestone reported 15 days with temperatures of 100 degrees F or higher, while Moorhead reported a state record tying high of 114 degrees F on the 6th. During this spell, Duluth reported 100 F on the 7th, 102 F on the 12th, and an incredible 106 F on the 13th, the only times the city has ever reported temperatures at or above the century mark.

The persistence and intensity of this heat wave combined with an ongoing drought took a toll on agriculture, native vegetation, livestock, wildlife, fisheries, river transportations and human health. Navigation on the upper Mississippi River was brought to a halt by low water levels. Water temperatures in lakes and streams rose above the 85 degrees F mark, killing trout and other species. Crops burned up, livestock were sold off or died, trees wilted and died, and wildfires flourished around the Minnesota landscape, producing a smoky and hazy atmosphere.

This 15 day heat wave caused the deaths of 750 to 800 Minnesotans statewide, mostly attributed to heat prostration back then. The National Weather Service estimated the statewide death toll at 759, but there were undoubtedly a number of deaths in rural settings that were not included in this number. Specifically in the Twin Cities area local corners from Hennepin and Ramsey Counties reported the daily deaths during the heat wave as the following...

Date	High Temp deg F	Low Temp deg F	Minneapolis deaths	St Paul deaths
7/12	106	83	8	8
7/13	105	86	34	25
7/14	108	72	22	49

7/15	98	64	19	6
7/16	98	73	1	4

This heat wave exceeded those of 1894, 1901, 1913, 1916, 1921, 1931 and 1934, and was only rivaled by that of 1830 at old Ft Snelling. Further it has been unequaled since that time, although the summer of 1988 overall proved to be hotter. Coping with the 1936 heat wave and drought was extremely difficult...there was no air conditioning, little chilled water, and medical facilities were lacking compared to today's standards. Ample well water, shade, and ventilation helped.. sleeping on lawns or screen porches provided some respite too. Because of honed survival skills developed out of coping with the economic depression of the 1930s perhaps people dealt emotionally with this heat wave better than we would today....

Topic: A Resolute IRS Recovers From the Weather

Last month's tropical deluge over Washington, D.C. flooded out the lower levels of the Internal Revenue Service Building with up to 20 feet of standing water. Water has been pumped out and the damages have been assessed. It may cost tens of millions of dollars to fully recover. The building will likely remain closed until the end of the year, but the IRS insists there will be no disruption in workload and scheduled audits. Perhaps some taxpayers are disappointed to hear this news!

MPR listener question: I heard you say that normal temperatures hardly ever occur in Minnesota. Is the median value of daily temperature more representative than the average value?

Answer: Temperature ranges are so large in Minnesota that sometimes people ask if the mean value is very representative. Would the median value, that value right in the middle of the historical daily distribution be more representative, or would the mode value, that is the most frequently observed value be more representative? In terms of today's temperature values in the Twin Cities...the table below shows all of the distributional statistics, bearing in mind that range in high temperature for July 14 in the Twin Cities is 108 degrees F to 59 degrees F and the analagous range in lows is 50 to 79 degrees F.....

Mean High	Std Dev.	Median Value	Mode Value	Mean Low	Std Dev.	Median Value	Mode Value
83 F	7 F	83 F	83 F	63 F	6 F	64 F	64 F

As you can see, they are all similar for this time of year.

However, if we examine the daily temperature statistics for January when the standard deviations (variations) are larger, we can get a different picture.....the range in high temperature for January 15th in the Twin Cities is 43 to -14 degrees F, while the range in low temperatures is 33 to -32 degrees F. The distributional statistics for January 15 are..

Mean High	Std Dev.	Median Value	Mode Value	Mean Low	Std Dev.	Median Value	Mode Value
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21 F 14 F 23 F 32 F 4 F 15 F 6 F 6 F

With the greater relative variability, the numbers differ more in the winter season than the summer season.

Twin Cities Almanac for July 14th:

The average MSP high temperature for this date is 83 degrees F (plus or minus 7 degrees F standard deviation), while the average low is 63 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for July 14th:

MSP weather records for this date include: highest daily maximum temperature of 108 degrees F in 1936; lowest daily maximum temperature of 69 degrees F in 1952; lowest daily minimum temperature of 50 F in 1930; highest daily minimum temperature of 79 F in 1980; record precipitation of 3.17 inches in 1915.

Average dew point for July 14th is 60 degrees F, with a maximum of 76degrees F in 1995 and a minimum of 40 degrees F in 1930.

All-time state records for July 14th:

The all-time state high temperature for today's date is 111 degrees F at New Ulm (Brown County) in 1936; the all-time state low for today's date is 30 degrees F at Alborn (St Louis County) in 1930. The all-time state record rainfall for this date is 4.30 inches at Milaca (Mille Lacs County) in 1970.

From "Minnesota Weather Almanac" available online and in bookstores:

On July 15, 1881 between 2:00 and 6:00 pm an outbreak of six tornadoes sped across the southern Minnesota landscape killing 24 people and injuring 123. Two of the tornadoes were F-4 (winds over 207 mph) and nearly a half-mile in diameter. The pathways of these storm systems were unusual, oriented from northwest to southeast. In New Ulm 47 buildings were destroyed and 200 damaged.

Words of the Week: Elephant Snot

I am borrowing this terminology from the excellent article by C.B. Bylander in the current issue of the Minnesota Conservation Volunteer. He writes humorously about fishing words used by Minnesotans. This is the time of year we start to see fresh water algae appear in greater abundance in Minnesota lakes. Called spirogyra, the algae can appear as a green scum, mass of green goo, or more disgustingly as elephant snot. These algal blooms are triggered by warmer waters and nutrients such as nitrogen and phosphorus discharged from the surrounding landscape. Certainly the drought and heat wave conditions around the state have lowered lake levels and warmed water temperatures considerably. So indeed we may see the formation of more elephant snot in coming weeks.

## Outlook:

Very hot over the weekend, with 90s and even 100s F during the daytime. Some cooling by Monday, but still very much warmer than normal. A chance of showers in the north late on Sunday and somewhat cooler on Monday and Tuesday. Another chance for showers later on Wednesday and Thursday of next week, but temperatures will continue warmer than normal most of the week. Optimistically, a cooler and wetter pattern may materialize by the following weekend.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, July 21, 2006

#### HEADLINES:

- Temperature Extremes Reached
- Drought and Heat in England
- Minnesota Drought Situation and Information Resources
- New Seasonal Climate Outlook
- Question on Derechos
- Almanac for July 21st
- Dry Summers = Busy Fall Fire Season
- Deasil and Withershins
- Outlook

Topic: Reaching both ends of the thermometer.....

Last Saturday and Sunday were hot around the region. The mercury broke the century mark at a number of locations including...

Moorhead 103 F    Ortonville 102 F    Brainerd 102 F  
Wheaton 101 F    Canby 100 F    Grand Rapids 100 F  
Fergus Falls 100 F    St Paul (Holman Field) 100 F  
Duluth (Sky Harbor Airport) 100 F

For most these were the highest temperatures measured in over ten years. A cold front brought drier air to the state on Monday night as dewpoints dropped out of the mid to high 70s into the 40s and low 50s F. Canby even reported a dewpoint as low as 32 degrees F. As a consequence Tuesday morning brought a record-tying low of just 50 degrees F at Sioux Falls, SD and a new record low of 50 degrees F at Browns Valley, MN.

Topic: Hot in England as well....

The coverage of the British Open Golf Tournament this week has made it clear that this summer has brought drought and heat to the English as well. Air conditioning is rarely available in the United Kingdom, so hot weather is difficult to cope with. On Wednesday the 19th a new July temperature record was set at the the Wisley Royal Horticultural Society Gardens in Surrey when they hit an afternoon high of 98 degrees F. There have actually been several days of 90 degrees F or higher this summer and the Brits have had to water the garden far more frequently. Certainly the condition of the grass at the Royal Liverpool Golf Club shows signs of stress as they play the British Open this week.

Topic: Drought is officially declared.....

The U.S. Drought Monitor Program of USDA and the National Oceanic and Atmospheric Agency has officially designated northwestern, north-central, and east-central portions of Minnesota to be in a severe drought.

Other northern and central counties are designated as moderate drought and the southern counties are shown as abnormally dry. See web site.....

<http://drought.unl.edu/dm/monitor.html>

The drought was further enhanced by the recent period of hot temperatures which motivated state agencies to call a meeting of the Minnesota Drought Task Force, a group formed in the 1980s to enhance coordination and communication among public and private sector groups. This group is hosted by the DNR Division of Waters. Historically drought has been shown to severely impact the state's agriculture, forest resources, water supply, water quality, river navigation, tourism, and utilities (especially power generation). All of these interests have a stake in discussing ways to mitigate drought impacts.

USDA Farm Service Agency already reports that 14 counties are prepared to petition for federal emergency disaster declarations as crop production has been dramatically reduced. Most of these counties are in northwestern and central Minnesota. There is speculation that the number of counties seeking such assistance may double as the drought is expected to hang on into August.

The USGS reports that the volume of flow on many rivers in the state is in the 20th percentile category or lower. On some rivers flows are in the lowest 10 percent of historical measurements for this time of year, while on portions of the St Croix River, the flow has never been lower in July than it is now. Historical flow data on Minnesota's watersheds are available from the USGS web site....

<http://water.usgs.gov/waterwatch/?m=real&w=map&r=mn>

The low flow situation on Minnesota's watersheds favors more development of algal blooms, slows the transition times through locks and dams for boats and barges, and threatens power generation by companies that rely on water intake from the rivers. It is expected that water conservation practices will be widely emphasized around the state, and further that the DNR will be suspending permits for a number of surface water appropriators, though not as many as were done in 1988.

In addition to the big fire in the BWCA (Cavity Lake Fire) which has already consumed over 34 square miles of landscape, the threat of wildfires remains very high in much of central and northern Minnesota. For the year to date there have been over 1200 wildfires in the state. Fire restrictions and wildfire locations can be found at...

<http://www.dnr.state.mn.us/forestry/fire/index.html>

The ongoing drought situation can be monitored on our climate web site.....

www.134.84.160.120

by going to the Climate Journal Section or the Drought Information Resources Section.

While the Drought Task Force met on Wednesday this week, the southern third of Minnesota was receiving beneficial rainfall from a series of thunderstorms. Though most amounts were less than an inch, some areas picked up 1-3 inches including Waseca 2.37", Fairmont 2.83", Owatonna 2.12", Winnebago 2.03", Grand Meadow 2.39", and Rochester 1.83". Unfortunately much of central and northwestern Minnesota which desperately needed the rainfall was left high and dry. More on this, plus a radar depiction of the rainfall can be found at...<http://www.134.84.160.120/doc/journal/rain060719.htm>

The Drought Task Force noted that the NOAA Climate Prediction Center outlook for the region favors persistence of drought conditions into the fall season. The Task Force will continue to meet every two weeks.

Topic: New Seasonal Climate Outlooks...

The Climate Prediction Center outlook for Minnesota favors continuation of warmer than normal temperatures for August through October. Such conditions will help drought persist in places. The rainfall outlook over the same period suggests equal chances for above or below normal values. The rainfall deficits in parts of the Minnesota landscape are such that only 150 to 200 percent of normal precipitation will help alleviate drought conditions on some lakes and streams.

MPR listener question: I have heard you talk about the large scale straight-line wind storms in Minnesota known as "derechos"...the type of storm that caused the blowdown in the BWCA in July of 1999. When is the peak time for such storms?

Answer: Derechos have occurred in every month of the year across the USA, but they are primarily found during the May through September period in our state. Historically, nearly 40 percent of these storms in Minnesota have occurred in the month of July. They are rare and we often go several years without seeing any.

Twin Cities Almanac for July 21st:

The average MSP high temperature for this date is 84 degrees F (plus or minus 7 degrees F standard deviation), while the average low is 64 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for July 21st:

MSP weather records for this date include: highest daily maximum temperature of 105 degrees F in 1934; lowest daily maximum temperature of 69 degrees F in 1927 and 1947; lowest daily minimum temperature of 49 F in 1947; highest daily minimum temperature of 79 F in 1983; record precipitation of 1.36 inches in 1951. On this date in 1983 the Heat Index hit 108 degrees F.

Average dew point for July 21st is 61 degrees F, with a maximum of 78 degrees F in 1983 and a minimum of 40 degrees F in 1947.

All-time state records for July 21st:

The all-time state high temperature for today's date is 113 degrees F at Milan (Chippewa County) in 1934; the all-time state low for today's date is 34 degrees F at Angus (Polk County) in 1947 and at Ft Ripley in 1871. The all-time state record rainfall for this date is 7.83 inches at Chaska (Carver County) in 1987.

From "Minnesota Weather Almanac" available online and in bookstores:

Summer droughts can often lead to dangerous fall fire seasons in Minnesota. Such was the case in 1844, 1854, 1871, 1894, 1910, many of the 1930s, 1976, 1980, and 1988. In 1976, Ortonville in Big Stone County reported only 2.76 inches of rainfall for the June through August period, and only 6.37 inches for the entire year.....a state record low amount. Prairie wildfires were very common that year.

Words of the Week: Deasil and Withershins

These terms are derived from ancient Gaelic words and though rare are still occasionally used in Wales and Scotland. Deasil, also deiseal or dessil (pronounced dezil or des-hal) means righthanded or clockwise, but climatologically it means sunwise - in the same direction as the sun. When facing south towards the equator the sun moves left to right or clockwise. The Celts thought this was a natural procession and that moving in this direction was a charm or good omen. Before marriage ceremonies, participants would march around the church three times in a clockwise manner to bring good luck. Similarly before a battle, people might walk the deasil carrying a lighted torch around the soldier(s) before their engagement in combat.

Even today, roundabouts in England run in a clockwise direction and some attribute this to the heritage of the deasil, or the charm of moving with the sun.

Withershins or widdershins is a term of similar age, which means counterclockwise or contrary to the sun's movement. To move widdershins from place to place is considered unlucky or disastrous. In old England, fishermen would not approach a favorite fishing spot by moving withershins (against the sun), but would circle around to approach in a clockwise manner.

Outlook:

More seasonal temperatures in store for the weekend with a chance for widely scattered showers in the central and north. Another chance for showers statewide is seen for the midweek period of next Wednesday and Thursday.....



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, July 28, 2006

HEADLINES:

- Heat waves
- Drought worsens in places
- Urban Heat Island Effects
- Almanac for July 28th
- 1917 Heat Wave
- Sunburned Walnuts
- Outlook

Topic: Heat waves persist in many places.....

Over half of the USA landscape has been subjected to excessive heat so far this month. The Midwest, West, Great Lakes Region, Northeast, and Southeast States have all had their share of heat and humidity. Even Death Valley where the average July daytime high temperature is 114 degrees F has seen average highs this month of 121 degrees F. In the Twin Cities we have already seen 14 days this month with highs of 90 F or higher and overnight lows have not fallen below the 70 F mark on eleven dates.

But parts of England, France, Spain, and Germany have also reported excess heat this month. Portions of central and southern France have seen temperatures in the high 90s to low 100s F, with up to 40 heat-related deaths reported.

Topic: Drought generally intensifies....

Though rainfall and thunderstorm activity has picked up around the state since last week, the amounts have not brought a great deal of relief to the dry Minnesota landscape. Most places have reported less than 0.5 inches. Temperatures have continued to average several degrees warmer than normal.

The USDA and NOAA Drought Mitigation Center analysis shows worsening conditions in many portions of the state. They place the northwestern, north central, and east-central sections of the state in a D3 category (extreme drought), and many of the other counties in D2 (severe) and D1 (moderate) categories. Only portions of southeastern, and south-central Minnesota are in the D0 (abnormally dry) category.

MPR listener question: What is the so-called urban heat island and how is it evident in and around the Twin Cities?

Answer: The noted climatologist Helmut Landsberg was one of the first to use this term and describe how the development of an urban area modifies the local environment. Urban areas host a higher concentration of atmospheric pollutants, present rougher surface terrain which affects wind fields, and are composed of

different surface materials which affect heat storage and convection.

Some local effects related to the urban heat island of the Twin Cities are: Longer frost free growing season, 15 to 25 days longer than in the surrounding rural areas of Anoka, Scott, Carver and Dakota counties. Earlier green-up of lawns and gardens in the spring. Later freeze up in the fall of local area lakes than in surrounding rural counties. Average wind speeds that are 10 to 20 percent less than in surrounding rural areas. Generally higher average temperatures and less heating degree days are evident in the Twin Cities when compared with surrounding rural areas. Average precipitation is peculiar because MSP airport values appear to be less than those of the suburban communities surrounding the Twin Cities downtown areas. This was first noted in a 1973 study by Don Baker of the Department of Soil, Water, and Climate and then State Climatologist Earl Kuehnast who reported on the spatial distribution of rainfall in the Metro area. Of course using a single rain gage to report the precipitation climatology of an urban area is not wise.

Twin Cities Almanac for July 28th:

The average MSP high temperature for this date is 83 degrees F (plus or minus 7 degrees F standard deviation), while the average low is 63 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for July 28th:

MSP weather records for this date include: highest daily maximum temperature of 100 degrees F in 1955; lowest daily maximum temperature of 64 degrees F in 1991; lowest daily minimum temperature of 50 F in 1981; highest daily minimum temperature of 76 F in 1916; record precipitation of 1.48 inches in 1942.

Average dew point for July 28th is 61 degrees F, with a maximum of 76 degrees F in 1949 and a minimum of 40 degrees F in 1934.

All-time state records for July 28th:

The state record high temperature for this date is 113 degrees F at Beardsley (Big Stone County) in 1917; the state record low temperature for this date is 31 degrees F at Albion (St Louis County) in 1934; the state record rainfall to today's date is 6.67 inches in Minneapolis in 1892.

From "Minnesota Weather Almanac" (available in bookstores):

Today and tomorrow July 28-29, mark the 89th anniversary of perhaps the hottest days ever in western Minnesota. The all-time high temperature for tomorrow's date (July 29) is 114.5 degrees F at Beardsley (Big Stone County) in 1917. This also represents the state maximum temperature record. While Beardsley reported

a state record high (tied by Moorhead on July 6, 1936), other reports included 110 F at Moorhead, 109 F at Red Lake, 108 F at Thief River Falls, Crookston, and Fergus Falls, 107 F at Argyle and Warren, 106 F at Ada, Bagley, Canby, Campbell, and Detroit Lakes, 105 degrees F at Itasca State Park and Fosston, 104 F at Park Rapids and Pine River Dam, 103 degrees F at Roseau, Morris, Montevideo, and Little Falls, even 102 degrees F at Brainerd, Grand Rapids, and Lake Winnie in the lake district of the Upper Mississippi River. It was also a very humid period with overnight lows staying in the low to mid 70s F, but the National Weather Service did not report Heat Index values (combined effects of temperature and humidity) back then. This heat wave was shorter in duration, 5 to 10 days than that of July 1936 which was 14-18 days. Nevertheless there were a number of heat prostration related deaths around the state though not as many as in 1936.

Words of the Week: Sunburned walnuts

Yes, according to University of California research walnuts can become sunburned. In fact during the current heat wave in California some growers are spraying their walnuts to protect them from sunburn. The combination of sun and heat can produce a mold growth inside the shell and can also discolor the outside making it difficult to market the crop. This is one of the few crops in the world that is subject to sunburn loss!

Outlook:

Very hot weekend coming up with rather high dewpoints that may push the Heat Index over 105 F in places. Heat watches and advisories will likely continue in places through Monday. Chance for scattered showers and thunderstorms early Saturday. Continued hot on through Monday, with some areas pushing the 100 F mark. A chance for showers again Tuesday and Wednesday with moderating temperatures closer to seasonal averages.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, August 11, 2006

#### HEADLINES:

- Drought on Hold
- Rwanda Weather Services Get a Gift
- Pollution and Cloud Cover
- Frost-Free Dates on the Calendar
- Almanac for August 11th
- Wettest Ever Month at Two Harbors
- Zonal Flow
- Outlook

Topic: Drought on Hold in Places....

The latest assessment from the Drought Mitigation Center shows that across most of northern and central Minnesota drought conditions have remained about the same over the past week, while across southern counties rainfall totals from 1 to 5 inches brought much relief and boosted crop conditions. Soil moisture remained short to very short in central and northern counties, along with very low volumes of stream flow. Thankfully, some of these areas were getting significant showers on Thursday this week, with over 1 inch in the East Grand Forks area. The outlook for the mid-August period favors more frequent chances for rainfall over these areas of the state as well.

In parts of Australia a six year drought has prompted the Premier of Queensland (Peter Beattie) and the Archbishop (John Blathersby) to call for a week of prayers to bring divine intervention and end the dryness. As a result political and church leaders are organizing an interdenominational week of prayers in churches and public places.

Topic: A Gift to Rwanda's Meteorological Office.....

This poor central African country had been suffering from drought this year, then an abrupt turn around brought intense rainfalls and flash floods. Their meteorological services just received a gift from the United Nations of \$10,000 worth of weather forecasting computer systems and upgrades to enhance their ability to keep farmers informed on changing weather. Their Meteorological Office reports that they have six new staff meteorologists on board, all of whom trained in other countries, but are committed to bringing modern weather services to Rwanda.

Topic: Smoke, Aerosols, and Cloud Cover....

An article in the August 4th edition of Science magazine documents the relationship between cloud cover and the release of urban industrial pollution and smoke from biomass burning. It appears that such pollution may contribute to an overall increase in mean cloud cover of 5 percent. This may have implications for the

hydrologic cycle as well as climate change model projections, as cloud cover generally restricts the daily temperature range.

MPR listener question: I have heard you say that summer frosts are common in northern counties like St Louis, Beltami, and Itasca. But are there summer dates that have remained frost-free across those northern areas over the past century or so?

Answer: On a statewide basis it is quite difficult to find any dates on the calendar that show no frost measurements (temperatures of 32 F or colder). I can only find three. There has never been a frost documented anywhere in the state on July 17, July 21, and August 8th. My opinion is that there probably have been frosts somewhere in the state on those dates, but we have not had instruments there to record them.

Twin Cities Almanac for August 11th:

The average MSP high temperature for this date is 80 degrees F (plus or minus 7 degrees F standard deviation), while the average low is 60 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for August 11th:

MSP weather records for this date include: highest daily maximum temperature of 97 degrees F in 1947; lowest daily maximum temperature of 65 degrees F in 1964 and 2004; lowest daily minimum temperature of 47 F in 1968 and 2004; highest daily minimum temperature of 77 F in 1947; record precipitation of 1.19 inches in 1900. The Heat Index on this date in 1947 was a record 103 degrees F.

Average dew point for August 11h is 57 degrees F, with a maximum of 73 degrees F in 1959 and a minimum of 33 degrees F in 1982.

All-time state records for August 11th:

The state record high temperature for this date is 105 degrees F at Wheaton (Traverse County) in 1947; the state record low temperature for this date is 28 degrees F at Tower and Embarrass (St Louis County) in 1997; the state record rainfall to today's date is 8.06 inches at Hastings (Dakota County) in 1945.

From "Minnesota Weather Almanac" (available in bookstores):

We normally think of the decade of the 1930s as extremely hot and dry across the state. Very few record rainfall amounts were reported during that decade. However, for the Two Harbors climate station, August of 1939 stands out as extremely wet. They recorded their all-time greatest single day rainfall event with 5.25 inches falling on the 9th. In addition August of 1939 is the wettest month on record there over the past 114 years with a monthly total of 10.86 inches.

Words of the Week: Zonal Flow

Sometimes meteorologist will use this term in describing a relatively quiet or benign period of weather, with little frontal system activity. The term really refers to the regional wind pattern and means that the wind field is parallel to the latitude bands, running west to east. While zonal flow is often associated with pleasant, quiet weather, most Minnesotans know, storminess is often associated with stronger polar or equatorial wind components.

Outlook:

Looks like the Garlic Festival at Howard Lake along Highway 12 in Wright County on Saturday will be greeted by partly cloudy skies and a chance for late afternoon showers and thunderstorms. There will be increasing cloudiness around that state by Saturday night, and most areas will have a chance to see showers and thunderstorms develop. Heavier showers may occur on Sunday and carryover into early Monday. Drier on Tuesday and Wednesday with warmer temperatures by Thursday and another chance for showers.

To: MPR's Morning Edition  
From: Mark Seeley  
Re: Minnesota WeatherTalk, Friday, Aug 18, 2006

THOUGH I AM AWAY THIS WEEK AND WILL NOT DO A RADIO COMMENTARY, I THOUGHT I WOULD SEND OUT A MINNESOTA WEATHER TALK NEWSLETTER ANYWAY! DON'T FORGET TO JOIN US AT THE MPR BOOTH (INTERSECTION OF JUDSON AND NELSON) ON THE OPENING DAY OF THE STATE FAIR (AUG 24) AT 11:00 AM FOR THE MIDDAY BROADCAST OF THE 10TH ANNUAL MINNESOTA WEATHER QUIZ!

HEADLINES:

- The Sunday Effect
- Anniversary of 1904 Tornado
- How Dry August Can Be
- Almanac for August 18th
- What's a Turkey Tower?
- Outlook

Topic: The "Sunday Effect"

This term was coined in the 1970s by atmospheric chemists who found that air quality in urban areas seemed to have a distinctive pattern based on day of the week. Best air quality tended to occur with higher frequency on Sundays (when traffic and industrial activity was relatively minimal), and the worst occurred on Wednesdays (during the peak of the work week). Further studies have found that there are also patterns of sunshine, temperature and precipitation that may be correlated to day of the week as well. A recent study in England (Wilby and Tomlinson in *Weather*, July, 2000) showed the highest frequency of sunny days in the winter falls on Sunday and the lowest frequency on Wednesday, though this pattern is less evident since the U.K Clean Air Act of 1968.

Studies of temperature and precipitation patterns associated with day of the week have produced mixed results. Some cities show lower precipitation on Sundays and higher precipitation during mid-week. However, a recent study by Cerveny and Balling (*Nature* 394, 1998) showed increased weekend rainfalls in the coastal northwest Atlantic as a result of advection of air pollutants from the inland areas during the work week.

From "Minnesota Weather Almanac" (available in bookstores):

This Sunday marks the anniversary of a remarkably destructive storm which passed through both Minneapolis and St Paul in 1904. It is thought that this storm started near Aberdeen, SD about 6pm as what is now known as a mesoscale convective system or cluster of thunderstorms. Later the storm intensified over Renville County and moved east through McLeod, Carver, Hennepin, Ramsey and Washington Counties. Severe damages occurred in Glencoe, Waconia, Excelsior, St Louis Park, Hopkins,

Minneapolis, St Paul, and Stillwater. It was estimated that as much as \$1.5 million in damages occurred, with 15 storm related fatalities. Anemometers at the Weather Bureau in downtown St Paul registered wind gusts up to 110 mph, while an unofficial anemometer on the roof of the Pioneer Press building registered winds of 180 mph before it blew away.

The storm peaked after sunset, between 8:30 and 10:00 pm, and rainfall was so intense, over an inch per hour, that observations about the character of the storm are not conclusive. No funnel was observed in the Twin Cities, but some of the damages provide evidence of tornadic-like winds. In fact some evidence in the Waconia area and the destruction of portions of the High Bridge in St Paul, indicate perhaps an F-4 tornado (winds of 207 mph or higher). Greenish-yellow clouds and hailstones were reported. A total of 2.56 inches of rainfall occurred over 24 hours in St Paul, with 1.23 inches coming in only 35 minutes. The evening dewpoint in St Paul was a sultry 70 degrees F.

Being a Saturday night, patrons of the Tivoli and Empire Theaters in St Paul became alarmed and sought shelter in nearby stone buildings as glass windows broke and roofs were torn off. It took Northwestern Telephone Company over a week to restore phone service to 7000 customers.

MPR listener question: I have been hearing more and more about how dry areas of central and northern Minnesota are. What is the driest August in the state climate records?

Answer: Indeed, many parts of central and northern Minnesota remain quite dry, though recent rains have helped, with 1 to 2.5 inches falling in some northwestern counties.

The driest August on a statewide basis was in 1930, when the average rainfall for all reporting communities was just over one inch. The driest August for an individual community was probably Beardsley in west-central Minnesota (Big Stone County), which recorded only 0.01 inches in 1969. The driest August in the Twin Cities climate record was 1925, with only 0.20 inches.

Twin Cities Almanac for August 18th:

The average MSP high temperature for this date is 81 degrees F (plus or minus 7 degrees standard deviation), while the average low is 61 degrees F (plus or minus 7 degrees standard deviation).

MSP Local Records for August 18th:

MSP weather records for this date include: highest daily maximum temperature of 98 degrees F in 1976; lowest daily maximum temperature of 62 degrees F in 1924; lowest daily minimum temperature of 41 degrees F in 1977; highest daily minimum temperature of 77 degrees F in 1916; record precipitation of 2.26 inches in 1907. Highest Heat Index value (combination



of temperature and humidity) 108 degrees F in 1995.

Average dew point for August 18th is 59 degrees F, with a maximum of 79 degrees F in 1995 and a minimum of 37 degrees F in 1950.

All-time state records for August 18th:

Scanning the state climatic data base: the all-time high for this date is 107 degrees F at Browns Valley (Traverse County) in 1976; the all-time low is 24 degrees F at Tower (St Louis County) in 1975. The greatest amount of rainfall on this date was 5.78 inches at Artichoke Lake (Big Stone County) in 1935.

Words of the Week: Turkey Tower

This is the name given to a tall, narrow cumulus cloud that develops and falls apart rapidly. It often occurs when convective updrafts suddenly break through a cap layer (inversion) of warm air aloft. I assume that the name is derived from their sometimes turkey-like appearance.

Outlook:

Generally dry and pleasant weather over the weekend and into the opening week of the State Fair.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, August 25, 2006

HEADLINES:

- State Fair, Quiz Time, and Severe Weather Outbreak
- Satellite Study of Intense Thunderstorms
- Eastern Europe Heat
- Tornado Anniversary
- Question on Labor Day Weather
- Almanac for August 25th
- Wettest Night at the Fair
- Emissary Sky
- Outlook

Don't forget to test your knowledge of weather at the MPR web site State Fair section where the 10th Annual Midday Minnesota Weather Quiz is posted. You can go to....

[http://minnesota.publicradio.org/cgi-bin/quiz\\_weather.pl](http://minnesota.publicradio.org/cgi-bin/quiz_weather.pl)

The State Fair began on Thursday, one of the stormiest days of the year so far...

7 reports of tornadoes from south-central Minnesota, mostly in Nicollet and Le Sueur Counties. Three of these tornadoes were confirmed, each with damages and one death at Kasota. There were over 70 reports of large hail, up to baseball size in Northfield. There were also several reports of non-tornadic wind damages. For south-central counties this was the most widespread severe weather outbreak since August 9, 1999.

In addition many areas reported record rainfall amounts, including Rochester with 2.77", Alexandria with 2.39", St Cloud with 2.35", Eau Claire (WI) with 1.07", Dodge Center with 4.75", St Charles with 3.55", Hokah with 2.80", Elgin with 4.49", Caledonia with 2.14", Faribault with 2.93", and Zumbrota with 3.42", among many others.

Topic: NASA scientists study intense convective storms....

A paper in the recent edition of Science magazine describes how scientists are using the Tropical Rainfall Measuring Mission (TRMM) satellite of NASA to study intense thunderstorm activity. The regions where Earth's most intense thunderstorms form include the central and southern plains of the United States, central Africa, and southeastern sections of South America, including Brazil and Argentina. The extreme character of some of these thunderstorms is impressive: cloud tops over 65,000 feet, 300 to 400 flashes per minute of lightning, cloud top temperatures colder than -180 degrees F, and severe thunderstorms observed at latitudes above 60 degrees F in Canada and Northern Europe. As these satellites accumulate data a better determination of

thunderstorm climatology across the Earth will be possible.

Topic: Eastern Europe Swelters.....

Heat waves which gripped the United States and Western Europe during July have moved onto Eastern Europe this month. Over this past week many countries there reported near record or record-setting temperatures, both in the form of hot days and very warm nights. Trapani, Italy reported 104 degrees F, while Sandanski, Bulgaria registered 102 degrees F. For tourists vacationing in Greece and Turkey, nighttime lows remained in the 80s F making for some very unpleasant sleepy weather.

Topic: Hutchinson tornado anniversary.....

One of the first tornadoes ever recorded in McLeod County struck on this date (Aug 25) in 1875. An F2 (113-157 mph) tornado carved a path through Hutchinson, destroying farms, homes, and other buildings. It carried bundles of the small grain harvest over 1 mile in distance. Fortunately there were no deaths.

Also on this date in 1937 another F2 tornado traveled over 4 miles near Wheaton in Traverse County. It too destroyed some homes and barns, and killed one rural resident.

As recently as last year, this date brought tornadoes to Wilkin and Otter Tail Counties. Historically only about 12 percent of Minnesota's tornadoes occur in the month of August.

MPR listener question: The Labor Day Weekend marks the end of summer for most families in Minnesota, as the vacation season ends with the children going back to school. Has it ever snowed in the state over the Labor Day weekend?

Answer: No, that would be depressing wouldn't it! It did snow a trace in Duluth on August 31, 1949, but the Labor Day Weekend that year was September 3-5. The next earliest observation of snowfall in the state was on September 14, 1964 at International Falls. Though snow has not occurred on the Labor Day Weekend, there have certainly been frosty days, for example on September 1, 1974 over 30 Minnesota communities reported freezing temperatures, including St Cloud with 29 F, Jordan with 32 F, Brainerd with 28 F, Zumbrota with 32 F, and Tower with 23 degrees F. That was the earliest termination of a growing season in Minnesota during the 20th Century.

Twin Cities Almanac for August 25th:

The average MSP high temperature for this date is 79 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 59 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for August 25th:

MSP weather records for this date include: highest daily maximum

temperature of 94 degrees F in 1948; lowest daily maximum temperature of 60 degrees F in 1958; lowest daily minimum temperature of 46 F in 1958; highest daily minimum temperature of 74 F in 1948; record precipitation of 1.51 inches in 1960. The Heat Index on this date in 1948 was a record 102 degrees F.

Average dew point for August 25th is 58 degrees F, with a maximum of 75 degrees F in 1990 and a minimum of 26 degrees F in 1934.

All-time state records for August 25th:

The state record high temperature for this date is 102 degrees F at St Vincent (Kittson County) in 1886; the state record low temperature for this date is 25 degrees F at Little Fork (Koochiching County) in 1915; the state record rainfall to today's date is 5.08 inches at Pokegama Dam (Itasca County) in 1941.

From "Minnesota Weather Almanac" (available in bookstores):

Undoubtedly the wettest episode of weather in Minnesota State Fair history occurred the night of August 30-31, 1977. The MSP International Airport reported over 7 inches of rainfall, while the Barnyard at the State Fairgrounds recorded nearly 5 inches, most of which came between 8:30 and 10:00 pm, washing out the Grandstand Show that night and leaving the fairgrounds ankle deep in water. A remarkable rainfall intensity of nearly 3.0 inches per hour was measured by the National Weather Service. Bloomington, Mendota, and Minnetonka also reported over 7 inches of rainfall, with hundreds of basements flooded, and millions of dollars in damages reported.

Words of the Week: Emissary Sky

Emissary derives from the Latin word emissarius which means to send out to scout, to explore, or to spy. So what does this have to do with the sky. This term refers to cirrus clouds, the high clouds composed of ice crystals, which appear as single clouds or groups of clouds out ahead of the approach of weather fronts. Thus their appearance is like that of scouts leading the cavalry across the frontier landscape. Storms typically follow these high cirrus clouds within 24 hours.

Outlook:

Near normal temperatures over the weekend with partly cloudy skies. A warming trend will begin a mostly dry week of weather on Monday.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, September 1, 2006

HEADLINES:

- Last weekend for the State Fair Weather Quiz
- Tremendous Typhoon
- Preliminary Climate Summary for August
- Question on Minnesota Tornadoes
- Question on daily temperature range
- Almanac for September 1st
- Orthodox Conditions?
- Outlook

Don't forget to test your knowledge of weather at the MPR web site State Fair section where the 10th Annual Midday Minnesota Weather Quiz is posted. You can go to....

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The State Fair closes at the end of Labor Day (Monday, Sept 4).

Topic: The National Weather Service Open House in Chanhassen...

On Saturday, September 16th from 10:00 am to 2:00 pm the National Weather Service Forecast Office in Chanhassen will host a public open house. This is a great opportunity to meet the staff there and see firsthand the technology used to measure and forecast the weather. Bring your NOAA Weather Radio to be programmed by their staff and also bring a food donation for the local food shelf, so you can enter a raffle drawing. This is a rare opportunity and I encourage you to visit this great facility.

Topic: A Tremendous Typhoon...

Super Typhoon Ioke was passing by Wake Island and heading toward Iwo Jima in the Western Pacific Ocean this week. It is a remarkably strong storm, with wind gusts to 195 mph and wave heights up to 50 feet. It has also been quite long lasting, maintaining Super Typhoon Status for six days (winds above 155 mph). Thankfully it has remained well off shore from many islands, though it may be headed eventually for Japan.

Topic: Preliminary Climate Summary for August, 2006

Following a very hot July, temperatures generally moderated during August. For most communities the average monthly temperature was just 1 or 2 degrees F warmer than normal. A few locations in the northern counties actually reported slightly below normal monthly average temperatures. The extremes were 103 degrees F at Browns Valley on the 1st to just 33 degrees F at Embarrass on the 22nd.

August was a wet month for most of the state, except the far north, where a summer long rainfall deficit continued. Many central and

southern locations reported rainfall totals in excess of 4 inches. At the U of MN St Paul Campus, we recorded 8.60 inches of rainfall this month, a record value for August. Dodge Center is reporting 8.99 inches and Elgin 8.43 inches, both close to record August values at those locations as well.

The month delivered severe convective weather, with tornadoes, hail, and strong, damaging straight line winds. It was somewhat unusual that northern counties did not report a frost this month, though Embarrass did report the coldest temperature in the lower 48 states with a value of 33 degrees F on the 22nd.

MPR listener question: I heard a report that the tornado last Thursday night in Le Sueur and Nicollet Counties was an F3 intensity (winds 158-206 mph) and traveled 30 miles on the ground. How unusual are F3 tornadoes, especially ones that travel 30 miles or more?

Answer: Historical data show that less than 1 in every 10 Minnesota tornadoes is rated F3 or greater in intensity. In fact in recent years it has been less than 1 out of every 20 that has been that strong. Historical data also show that a tornado path length of 30 miles or more is extremely rare, with a frequency of less than two out of every 100 tornadoes. Tornado path length can be very long, such as the 67 mile path of the March 29, 1998 Comfrey tornado, or the 80 mile path length of the April 5, 1929 tornado that crossed Hennepin and Anoka Counties before passing into western Wisconsin.

MPR listener question: The average temperature spread between the daytime maximum and nighttime minimum temperatures appears to be rather narrow this month. Is this highly unusual?

Answer: Yes, for the month of August the average daily temperature spread is about 20 degrees F. Certainly anything less than 15 degrees F is unusual, and less than 10 degrees F is rare. All the cloud cover probably contributed to a narrow range this month. There have been months such as November 1944, when the average daily temperature range was less than 10 degrees F in the Twin Cities because of the dominance of cloud cover.

Twin Cities Almanac for September 1st:

The average MSP high temperature for this date is 78 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 58 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for September 1st:

MSP weather records for this date include: highest daily maximum temperature of 97 degrees F in 1913; lowest daily maximum temperature of 59 degrees F in 1951; lowest daily minimum temperature of 36 F in 1974; highest daily minimum temperature of 74 F in 1937 and 1953; record precipitation of 3.29 inches in 1942. The Heat Index on this date in 1953 was a record 103 degrees F.

Average dew point for September 1st is 56 degrees F, with a maximum

of 75 degrees F in 1960 and a minimum of 30 degrees F in 1946.

All-time state records for September 1st:

The state record high temperature for this date is 101 degrees F at Beardsley (Big Stone County) and Winona in 1913 and at Tracy (Lyon County) in 1922; the state record low temperature for this date is 23 degrees F at Tower in 1974 and 1994; the state record rainfall to today's date is 7.70 inches at Nett Lake (St Louis County) in 1973, on their way to a monthly record of 12.38 inches.

From "Minnesota Weather Almanac" (available in bookstores):

Snowfalls in September are rare across the state. Among Minnesota climate stations only a small number have had snowfall totals in excess of 4 inches for the month. September of 1942 brought the most snowfall, most of it falling on the 25th and 26th of the month. Snowfall accumulations were remarkable for so early in the season:

4.0" at Beardsley  
4.1" at Virginia  
4.6" at Wadena  
5.0" at Grand Meadow and Wheaton  
5.5" at Morris and New Ulm  
6.0" at Detroit Lakes, Itasca State Park, and Willmar  
7.5" at Long Prairie  
8.0" at Bird Island  
9.0" at Sauk Center

These are some of the largest totals ever observed in September. Whew! Minnesotans who relish the fall season must have been shocked.

Words of the Week: Orthodox conditions

Record-setting weather measurements and events are viewed with a critical eye by the meteorological community. New highs, new lows, record rainfall or snowfall, record wind speeds, and other elements are carefully scrutinized before they are accepted as official. One of the requirements is that the measurement or observation must meet the criteria of orthodox conditions. That is the observation or measurement must meet certain instrumental, exposure, or observational standards. A new temperature record must be measured by a standard instrument (thermometer or thermistor) that is shielded from the direct effects of the sun, while a new rainfall record must come from an official rain gage. Thus, orthodox conditions implies that the measurement or observation has complied with standard procedures.

Outlook:

Looks like the closing weekend of the State Fair may be cool and wet. Widely scattered showers will be common on Saturday, especially in southern sections. There is a continuing chance of showers on

Sunday and early Monday. Temperatures will average a few degrees cooler than normal. Much of next week looks to be dry.



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, September 8, 2006

#### HEADLINES:

- NWS Open Houses
- Rare September Wind Storm
- Winds Change in the Fall
- Question on Optimal Temperatures
- Almanac for September 8th
- 1991 Brought a Wet September
- Mysterious Forms of Precipitation
- Outlook

Topic: Don't Miss the National Weather Service Open Houses.....

On Saturday, September 16th from 10:00 am to 2:00 pm the National Weather Service Forecast Office in Chanhassen will host a public open house. This is a great opportunity to meet the staff there and see firsthand the technology used to measure and forecast the weather. There will be hourly weather balloon launches, demonstrations of instruments, a weather jeopardy game, and chances for boy and girl scouts to earn their weather badges. Bring your NOAA Weather Radio to be programmed by their staff and also bring a food donation for the local food shelf, so you can enter a raffle drawing. Prizes include a new NOAA weather radio, or a backyard rain gage. This is a rare opportunity and I encourage you to visit this great facility.

And for those in Southeastern Minnesota, the National Weather Service Office in La Crosse, WI will hoest an open house from 2:00 to 7:00 pm on Thursday, September 14th. They will highlight how they deal with severe weather situations, as well as how they make forecasts.

Topic: Rare September Derecho (day-ray-choo) in 1942

On September 11, 1942 a thunderstorm system brought a straight-line wind storm (called a derecho) to Minnesota, carving a 30 mile wide path of damage west to east from Yellow Medicine County to Chisago County. Winds up to 66 mph were recorded at Willmar, and up to 70 mph at Monticello. Over 650 barns were destroyed and 1700 homes damaged, but no funnel clouds or tornadoes were reported. The storm ushered in a cool, fall air mass, as temperatures dropped up to 18 degrees F in one hour at Willmar. Derechos are relatively uncommon in Minnesota when compared to tornadoes or severe thunderstorms. Their highest frequency falls in the months of May through July. A September storm of this type is exceptionally unusual.

Topic: A Change in the Wind

Fall brings a change in prevailing winds across the state. As we have discussed before, the dominant wind directions in Minnesota are northwesterly and southeasterly, except for Duluth and northshore areas which sees a significant frequency of easterly winds during the summer months (cooler and heavier air moving off Lake Superior towards

the warmer land). September and October are transition months, when the southerly wind components diminish in frequency and the northwesterly components increase in frequency until they become fully dominant for the November through March period.

This has been occurring already this month. Sharp contrasts in overnight minimums are in evidence as a result. Overnight minimums have ranged from the mid 60s in southern counties with warm moist and moderate southerly winds to the 30s in northern counties with light dry northwesterly winds. The southerly winds awaken our memory to those balmy days of summer, while the northwesterly winds sometimes create anxiety attacks about the impending season of "layered clothing."

MPR listener question: I just turned 83 years old. As a life-long resident of St Paul I have come to the conclusion that my optimal operating temperatures are 75 degrees F during the day (I don't sweat working in the yard and keep my energy level up), and 55 degrees F at night (very comfortable for sleeping with just light covers). But these conditions hardly ever seem to occur. Am I right?

Answer: Indeed you are correct. In the Twin Cities climate records only about 12 to 14 days each year show the precise combination of temperatures that you favor....or perhaps favor you is more correct. Interestingly, June is the month with the highest frequency of these temperature conditions you like so much, while September shows the 2nd highest frequency of such conditions. So I imagine you'll find some days enjoyable this month. I hope I am still able to work outside when I am 83 years old.

Twin Cities Almanac for September 8th:

The average MSP high temperature for this date is 76 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 56 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for September 8th:

MSP weather records for this date include: highest daily maximum temperature of 99 degrees F in 1931; lowest daily maximum temperature of 54 degrees F in 1929; lowest daily minimum temperature of 40 F in 1995; highest daily minimum temperature of 74 F in 1931; record precipitation of 0.99 inches in 1961.

Average dew point for September 8th is 55 degrees F, with a maximum of 73 degrees F in 1947 and a minimum of 25 degrees F in 1995.

All-time state records for September 8th:

The state record high temperature for this date is 105 degrees F at New Ulm (Brown County) in 1931; the state record low temperature for this date is 20 degrees F at Red Lake (Beltrami County in 2000; the state record rainfall to today's date is 5.54 inches at Young America (Carver County) in 1991.

From "Minnesota Weather Almanac" (available in bookstores):

On September 7-8, 1991 thunderstorms brought damaging winds and

heavy rains to parts of central and northeastern Minnesota. In parts of St Louis and Carlton Counties rainfall totaled over 5 inches causing mudslides and backing up sewer systems. In central Minnesota, Young America, New London, Campbell, and Elk River all reported over 5 inches of rainfall, with flooded basements and roads. Near Glenwood in Pope County an observer recorded 11 inches of rain. That month of September proved to be one of the wettest ever, ranking 8th highest since 1895. New London recorded 11.30 inches for the month, the 2nd highest monthly total in their climate record (June of 1983 brought 14.97 inches).

#### Words of the Week: Occult Precipitation and Serein

Occult precipitation is the term used to refer to moisture deposition that is not induced by rain falling from clouds, but comes from fog or dew deposition onto leaf surfaces, sidewalks and other easily visible surface features. This time of year the frequency of fog and dew increases over what it was during the summer months. Though not very significant in terms of adding moisture to the soil, such conditions delay the heating of the surface by the sun's radiation, because a good deal of the sun's energy is consumed in evaporating the water droplets that have accumulated overnight.

A second form of mysterious precipitation is called serein, coming from a french word meaning clear or bright. This term refers to a fine rain falling from an apparently clear sky. Such conditions can occur when rain drops are blown out of a cloud formation that is upwind some distance from where the observer is standing. The high winds can deliver the rain drops to the landscape tens of miles downwind from the cloud formation.

#### Outlook:

Generally a cool period coming up. Chance for some showers in southern sections over the weekend. Temperatures will average cooler than normal with some overnight lows in the 30s F up north. A chance for scattered showers later on Monday, and Thursday of next week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, September 15, 2006

HEADLINES:

- El Nino Forms
- Beneficial Worms
- Fall Color Update
- Unusual Delivery from Tropical Storm Ernesto
- Question on Recent Cold Spell
- Almanac for September 15th
- Flash Flood of Two Years Ago
- What's Bucketing?
- Outlook

Topic: El Nino Forms

The NOAA Climate Prediction Center reported that El Nino has formed in the equatorial Pacific Ocean. It is unclear how strong it will be, but its persistence this fall could have significant impact on Minnesota's winter outlook, as El Nino episodes generally bring mild winters to our area. I am sure El Nino will be discussed in the next winter outlook from the National Weather Service. This is to be released next Thursday (Sept 21st).

Topic: Worms Fight Climate Change

The current issue of Weatherwise magazine describes the use of earthworms at the Mount Nelson Hotel in Cape Town, South Africa. The hotel uses a worm farm to dispose of and process some of its organic waste (food). The earthworms eat the waste and reduce it to stabilized organic matter, reducing the amounts that convert into methane, carbon dioxide and other greenhouse gases. Researchers suggest that the worms can reduce the amounts of organic waste by up to 70 percent and also neutralize many of the harmful bacteria. One day the hotel hopes to process 100 percent of its organic waste in this manner.

Topic: Fall Colors Moving Along

A combination of weather stress during the summer (heat and drought) combined with recent cold nights is accelerating the fall color change in many trees, especially in northeastern Minnesota counties. Many observers have already reported overnight lows in the 20s F. However it appears that further trends toward cold temperatures will be impeded by dominant cloudiness and rain over the next week or so. This will perhaps slow the pace of change.

Topic: Tropical Storm Ernesto Delivers a Rare Site to Bird Watchers

Among the effects of last week's Tropical Storm Ernesto along the Atlantic Coast was the rare inland displacement of the Manx Shearwater, a North Atlantic sea bird that rarely ventures far inland. The strong winds of this storm apparently carried many of these birds hundreds of miles inland across communities in the Lake Ontario region of Canada. Many

bird watchers in the area had never seen this bird and were taken aback to realize it was so far removed from its native habitat in the northeastern islands of Canada. Presumably in better weather conditions it will find its way home.

MPR listener question: We camped in the Boundary Waters Canoe Area (BWCA) last weekend on Jack Lake. We didn't need to worry about mosquitos, West Nile Virus, or Heat Stroke! Both Saturday (Sept 9) and Sunday (Sept 10) mornings there was ice in the cooking pots, stiff frozen wet socks, and frozen moisture on our tent....we did not expect this on September 9 and 10. Nearby Ely reported a record low of 28 degrees F on September 9th. Was this cold snap truly that unusual?

Answer: Indeed, we have had "frost on the pumpkin" conditions around the state since the morning of September 8th. Minnesota reported the nation's coldest temperatures on September 8 (28 F at Hibbing), September 9 (19 F at Embarrass), September 10 (24 F at Embarrass), and September 13 (26 F at Embarrass). Only one of these values established a new statewide record low the the date, that of 19 degrees F at Embarrass on the 9th broke the old record of 22 degrees F at Argyle back in 1917. Many other years have seen temperatures this cold in the second week of September including 1885, 1901, 1903, 1917, 1973, 1974, 1976, 1985, 1995, and 1997. Nevertheless many locations since September 8th have reported frosts, with some new record or record tying values. Below is a list of reports by location and date, with (\*) indicating a new record low for that location, and (#) indicating a record tying low temperature.....

Date	Location	County	Low Temperature
Sep 8	International Falls	Koochiching	31 F
Sep 8	Hibbing	St Louis	28 F*
Sep 9	Itasca St Park	Clearwater	32 F
Sep 9	Baudette	Lake of the Woods	30 F
Sep 9	Orr	St Louis	26 F*
Sep 9	Bemidji	Beltrami	32 F*
Sep 9	Bigfork	Itasca	26 F*
Sep 9	Cook	St Louis	26 F*
Sep 9	Crane Lake	St Louis	28 F*
Sep 9	Eveleth	St Louis	32 F*
Sep 9	Roseau	Roseau	30 F
Sep 9	Hibbing	St Louis	23 F*
Sep 9	International Falls	Koochiching	25 F*
Sep 9	Babbitt	St Louis	26 F*
Sep 9	Grand Marais	Cook	32 F*
Sep 9	Waskish	Beltrami	28 F*
Sep 9	Embarrass	St Louis	19 F*
Sep 9	Ely	St Louis	28 F*
Sep 9	Tower	St Louis	28 F
Sep 9	Isle	Mille Lacs	31 F#
Sep 9	Floodwood	St Louis	29 F*
Sep 10	Itasca St Park	Clearwater	32 F
Sep 10	Grand Marais	Cook	30 F*
Sep 10	International Falls	Koochiching	29 F
Sep 10	Babbitt	St Louis	28 F*
Sep 10	Silver Bay	Lake	30 F*
Sep 10	Embarrass	St Louis	24 F*

Sep 10	Waskish	Beltrami	30 F*
Sep 10	Hibbing	St Louis	26 F#
Sep 10	Two Harbors	Lake	29 F*
Sep 10	Tower	St Louis	28 F
Sep 10	Eveleth	St Louis	32 F*
Sep 10	Ely	St Louis	30 F*
Sep 10	Bigfork	Itasca	28 F*
Sep 10	Cook	St Louis	28 F*
Sep 10	Crane Lake	St Louis	30 F*
Sep 11	International Falls	Koochiching	32 F
Sep 11	Babbitt	St Louis	31 F
Sep 11	Embarrass	St Louis	26 F#
Sep 11	Hibbing	St Louis	28 F#
Sep 11	Tower	St Louis	32 F
Sep 11	Crane Lake	St Louis	30 F*
Sep 11	Eveleth	St Louis	32 F*
Sep 11	Orr	St Louis	30 F
Sep 11	Cook	St Louis	28 F
Sep 11	Ely	St Louis	30 F*
Sep 11	Bigfork	Itasca	30 F
Sep 12	International Falls	Koochiching	30 F
Sep 12	Babbitt	St Louis	28 F*
Sep 12	Embarrass	St Louis	25 F*
Sep 12	Tower	St Louis	31 F
Sep 12	Orr	St Louis	30 F*
Sep 12	Cook	St Louis	30 F*
Sep 12	Bigfork	Itasca	30 F
Sep 12	Hibbing	St Louis	27 F*
Sep 12	Eveleth	St Louis	32 F*
Sep 13	Embarrass	St Louis	26 F
Sep 13	Eveleth	St Louis	32 F*
Sep 13	Floodwood	St Louis	30 F*
Sep 13	Tower	St Louis	32 F
Sep 13	Hinckley	Pine	32 F
Sep 13	Hibbing	St Louis	30 F
Sep 13	Silver Bay	Lake	30 F*
Sep 13	Grand Marais	Cook	30 F*
Sep 13	Cloquet	Carlton	32 F

Twin Cities Almanac for September 15th:

The average MSP high temperature for this date is 70 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 51 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for September 15th:

MSP weather records for this date include: highest daily maximum temperature of 98 degrees F in 1939; lowest daily maximum temperature of 46 degrees F in 1916; lowest daily minimum temperature of 36 F in 1964; highest daily minimum temperature of 72 F in 1897; record precipitation of 2.59 inches in 1992; and the record snowfall for this date, the only snowfall on this date is a trace reported in 1916.

Average dew point for September 15th is 48 degrees F, with a maximum of 72 degrees F in 1994 and a minimum of 29 degrees F in 1916.

All-time state records for September 15th:

The state record high temperature for this date is 100 degrees F at St Peter (Nicollet County) in 1939 and at Tracy (Lyon County) in 1955; the state record low temperature for this date is 17 degrees F at Big Fork (Itasca County) in 1964; state record rainfall for today's date is 4.98 inches at Winona in 2004; and the state record snowfall for this date is 0.2 inches at Warroad (Roseau County) in 1916, the start of a very long winter.

From "Minnesota Weather Almanac" (available in bookstores):

Just two years ago, September 14-15, 2004 one of the worst flash floods to ever hit southern Minnesota occurred. Six or more inches of rainfall fell over portions of Blue Earth, Dodge, Faribault, Fillmore, Freeborn, Houston, Jackson, Martin, Mower, Olmsted, Steele, Waseca, and Winona Counties, covering an area of over 4000 square miles. Up to 13 inches was reported in Alden Township of Freeborn County. Every watershed in the area flooded, including the Root, Cedar, Zumbro, and Upper Iowa Rivers of southern Minnesota. Over \$6 million in property damage was reported along with \$22 million in crop damage. Many roads were impassable, and hundreds of home basements flooded.

Word of the Week: Bucketing

Misting or drizzling is an extremely light precipitation, while raining is descriptive of water droplets with enough velocity to splash on the ground. For torrential type rains forecasters may say a pouring or drenching storm. Such conditions in Scotland motivate forecasters to use the term bucketing, when rainfall is so intense it fills buckets in short order and greatly limits any visibility.

Outlook:

Looks like a cloudy and rainy weekend coming up, with chances for showers and thunderstorms most places. Starting out warm, temperatures will decline by late Sunday and Monday. Clouds and scattered showers should remain a possibility early next week with moderating temperatures that average cooler than normal.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, September 22, 2006

Six years ago today (Sep 22) Cathy and I chatted on Morning Edition for the first time.....whew, how time flies when you're having fun!

Friday night brings the autumnal equinox as the sun passes directly over the equator around 11:00 pm our time on its journey into the southern hemisphere.

#### HEADLINES:

- Second spell of cold weather this month
- New climate outlook for late fall and early winter
- Finger Pointing
- Somewhat rare, September tornadoes have sometimes been fatal....
- Question on September tornadoes
- Almanac for September 22nd
- An extremely wet September of 1900
- Outlook

Topic: Cold weather arrives again....

For the second time this month a Canadian high pressure system brought very cold temperatures to the state following a warm, windy and stormy weekend. By Monday, September 18 low temperatures fell into the 30s F in northern areas, including Tower, Hibbing, and Embarrass. By Tuesday, the cold air mass had found its way into southern Minnesota locations bringing 36 degrees F to Redwood Falls and 38 degrees F to Rochester. Finally, on Wednesday, the first frosts of the season were reported across central and southern counties with.....28 F at Pipestone, 30 F at Lamberton and Rochester, 31 F at Preston and Worthington, and 32 F at Litchfield and St James. A reading of just 26 F from Embarrass on September 20th was the lowest in the 48 contiguous states.

Topic: New Winter Climate Outlook

The NOAA Climate Prediction Center released the new seasonal outlook on Thursday of this week. It calls for above normal temperatures during the October through December period across our region. This is based on a developing El Nino episode in the equatorial Pacific Ocean. Actually the climate outlooks through the whole winter (until March of 2007) favor above normal temperature conditions for our region, primarily based on El Nino and recent trend analysis. The outlook does not favor either drier or wetter than normal conditions during the same period, except for a small area of southeastern Minnesota which is expected to be drier than normal. Obviously, over most the the state, the snow season could go either way, producing either above or below normal amounts.

Topic: Finger Pointing When Deadly Natural Disasters Occur

The following is written not with the intent of proposing excuses for the



tragedy at Rogers this weekend, but in the context of criticism leveled at the National Weather Service Forecast Office in Chanhassen regarding the lack of a tornado warning in the Rogers area on Saturday night....I have a few thoughts regarding a wider community discussion about severe weather.....

Human reaction to natural disasters (earthquakes, volcanic eruptions, tsunamis, and severe storms among others) has varied over time. For centuries these events were described in various fashion as "acts of God", but in the modern era we have used our knowledge to take actions that warn us of their threat, and even help mitigate and in some cases prevent some of the dire consequences, especially in the arena of severe weather. Protection of life and property is the common mission of many of our government organizations. For the National Weather Service the bar of of public expectation has been set very high.

There are at least two false assumptions by the public concerning the National Weather Service: (1) they can provide a scientific explanation for the cause of every weather event or episode and (2) with new technology and computer models they can forecast and warn us about every severe weather event.

The National Weather Service (NWS) mission is to provide forecasts of the weather on a 24 hour by 7 day basis. Imbedded in that mission is the task of communicating watches and warnings of severe weather threats. Recent years have brought great strides in knowledge about the atmospheric sciences and the technologies to measure, forecast, and communicate weather threats. There have indeed been improvements in the forecasting and detection of severe weather, along with increased lead times in the issuance of warnings to the public. The NWS Central Regional Office reports that a high percentage of all tornadoes in the region are detected with sufficient time to issue a warning. In addition, minute by minute coverage of severe weather events in the media has become common place, showing video images and dramatic visualizations of radar and satellite displays.

It is no wonder that citizens expect the NWS to warn them when severe weather is about to strike. My experience tells me they do an admirable job. The employees I have known for nearly 30 years are dedicated to their mission. I know many who have worked continuous 12 to 24 hour shifts when the severe weather threat is persistent. In addition, in the middle of some of the most traumatic and dangerous severe weather events, many staff do not even leave their assigned station for a minute (not even to go to the bathroom!). They follow forecasting and communication protocols and coordinate with other NWS offices and other public agencies to get the best information possible, then issue warnings in a timely manner. This process and procedure is practiced the first Wednesday of every month during the severe thunderstorm and tornado season as we all hear the sirens sound at 1:00 pm on those test days.

So, why do influential critics still feel the need to point fingers and find blame when unforeseen or undetected storms strike with deadly consequences? Perhaps two underlying and critical issues for future consideration: (1) we should accept and respect our vulnerability to severe weather events, that's part of our history and part of our future; and (2) we should exercise common sense in taking personal responsibility when a severe weather situation presents itself. Do we think we should be immune, and not vulnerable because the technology and people who use it will protect us? Shouldn't we know the precise criteria and procedures used to trigger storm warnings in our own area? It is assumed we will hear the sirens,

see the warning scroll on television, hear the bulletin on the radio, or have the alarm on our NOAA Weather Radio go off. These are great systems to protect us, but they are not infallible. As earlier generations of Minnesotans did we should use our own experience and common sense in planning and taking action to protect our property and lives.

Though disasters often lead to a great deal of finger pointing, they also offer us lessons and motivate us to rally as a community, just like Rogers, MN has done in their recovery efforts.. Where knowledge is sound and certain about how to improve the detection technology or communications systems we use for public safety, investment of substantial resources would be a solid choice. Further widespread community discussion at these times helps inform citizens of the procedures that are in place to protect them, getting everybody on the same page. In light of the tragedy that befell Rogers, MN this week, NOW WOULD BE A GOOD TIME TO GO BEYOND FINGER POINTING AND BRING CITIZENS TO THE TABLE TO DISCUSS WAYS TO BETTER PREPARE OURSELVES FOR SEVERE WEATHER THREATS AND HELP MITIGATE OUR VULNERABILITY. PERHAPS COMMUNITY FORUMS ON THIS TOPIC WOULD BE A WORTHY INVESTMENT OF TIME THIS WINTER.

MPR listener question: The tornado that hit Rogers, MN on Saturday night (September 16) after dark was very destructive. Isn't this unusual for the month of September in Minnesota? How many September tornadoes have we had?

Answer: Historically only about 5 percent of all Minnesota tornadoes have occurred during the month of September. What is also unusual about the Rogers tornado is that it struck after sunset and was difficult to see. The relatively low frequency of September tornadoes that strike at night does not equate to lack of damages or deaths. As recently as last year, there were six tornadoes in the month of September, one on the 21st, struck between 7:00 and 7:30 pm and inflicted damages in the cities of Blaine and Andover. An unusual F-1 tornado struck Albertville inflicting damages at the stroke of midnight on September 10, 2002.

Other destructive or lethal September tornadoes include....

September 21, 1894 brought eight tornadoes to northeastern Iowa and southeastern Minnesota, killing 30 people and damaging scores of buildings, especially in Spring Valley. These too struck after dark, 8:00 to 9:00 pm. The railroad depot near Eyota (Olmsted County) was destroyed.

Eight deaths were reported from an F-2 tornado that struck Morristown on September 24, 1900, as a brick building being used for shelter collapsed, bringing the crushing weight of the roof down onto the people inside.

On September 4, 1941 an F-2 (winds 113-157 mph) crossed Hennepin and Ramsey Counties, leaving four people dead and fifty injured.

On September 16, 1962 an extremely short-lived F-4 (207-260 mph) tornado struck a neighborhood in southeast Rochester, destroying 11 homes and injuring 34 people. Few if any were warned or prepared for this storm as it struck between 4:00 and 4:15 am when all were asleep.

On September 3, 1980 two tornadoes struck in Stearns County between 6:00 and 7:00 pm. The stronger of these storms (an F-3) was especially devastating

to the Waite Park neighborhood of St Cloud, producing over \$9 million in property damage, and causing one death and 15 injuries.

Twin Cities Almanac for September 22nd:

The average MSP high temperature for this date is 68 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 48 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for September 22nd:

MSP weather records for this date include: highest daily maximum temperature of 95 degrees F in 1936; lowest daily maximum temperature of 49 degrees F in 1913 and 1983; lowest daily minimum temperature of 26 F in 1974; highest daily minimum temperature of 71 F in 1937; and record precipitation of 2.80 inches in 1895. The Heat Index on this date in 1936 was 98 degrees F.

Average dew point for September 22nd is 45 degrees F, with a maximum of 70 degrees F in 1903 and a minimum of 20 degrees F in 1974.

All-time state records for September 22nd:

The state record high temperature for this date is 101 degrees F at Ada, Beardsley, Moorhead, and Wheaton in 1936; the state record low temperature for this date is 10 degrees F at Thorhult (Beltrami County) in 1974; state record rainfall for today's date is 4.84 inches at Cambridge (Isanti County) in 1968; and the state record snowfall for this date is 2.0 inches at Baudette (Lake of the Woods County) in 1995.

From "Minnesota Weather Almanac" (available in bookstores):

The community of Hallock in Kittson County holds the record for the wettest ever September in northern Minnesota. In September of 1900 the observer there recorded a total of 15.30 inches of rainfall, most of which came during seven different thunderstorms. Flooding occurred along the Two Rivers that runs into the Red River of the North west of town, but there were few farms dotting the Minnesota landscape back then.

Word of the Week: Wailer

This is a term used to describe a fallen tree that lies in the fork of another standing tree. Strong winds will produce movements in both trees and a friction when they rub together results in a sound effect that is not unlike a dull moaning or a shrill wailing. I suspect such sounds have caused a few people to think of the forest as being haunted.

Outlook:

Showers around the state early in the weekend, but diminishing later on Saturday. Temperatures will remain near or below seasonal averages for this time of year. There will be frosts in the north, but mostly 40s and 50s F in the south overnight. Another chance for showers is seen by Wednesday and

Thursday of next week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, September 29, 2006

HEADLINES:

- Preliminary September Climate Summary
- NOAA Hazard Radios for Schools
- Loss of light in the month of October
- Almanac for September 29th
- In Praise of October
- What's a Polynya?
- Outlook

Topic: 14th Annual Kuehnast Lecture Set for October 4th

The University of Minnesota Kuehnast Endowment supports this annual public lecture in climate and atmospheric science. This year, Dr. Julie Winkler of Michigan State University will speak. She holds her Ph.D. from the University of Minnesota. Her topic is:

The Pileus Project: Climate Science in Support of Decision Making for an Intensively-Managed Agricultural Crop

The lecture will take place from 3:30 to 5:00 pm on Wednesday, October 4th in Rm 335 Borlaug Hall.....all are invited to attend.

Topic: Preliminary Climate Summary for September, 2006

Temperatures were generally cooler than normal in most areas of the state during the month of September, except northern counties. Average temperature for the month ranged from 1 to 3 degrees cooler than normal most places, but up to 1 degree F warmer than normal in the north. Extreme values ranged from 89 degrees F at Moorhead on the 14th to just 19 degrees F at Embarrass on the 9th. Minnesota reported the nation's lowest temperature (excluding Alaska) on four dates during the month. There were multiple frosts in the north and single frosts in some central and southern counties during the month, but nearly all crops reached maturity without frost damage.

September precipitation was generally short of normal in many counties of the state, though some of the areas hurt by summer long drought received above normal rainfall for the month. Some of the beneficiaries of abundant rainfall included: Wheaton with 7.74", Canby with 6.91", Browns Valley with 6.24", Fergus Falls with 5.68", and Itasca State Park with 4.54"

Severe weather visited the state on September 16th, bringing a tornado to parts of Hennepin and Anoka Counties, where the community of Rogers was damaged significantly. It was the 22nd tornado of the season reported in Minnesota this year, down from the 68 that occurred last year.

## Topic: Hazard Warning Radios For Schools

The Department of Homeland Security in cooperation with NOAA National Weather Service announced this week that they will provide NOAA Weather Radios (now called Hazard Warning Radios) to all 97,000 public schools in America. This multi-million dollar program will provide school officials an alarm system for keeping track of watches and warnings in their area, and taking steps to protect school children when severe weather or other hazards pose a threat. The NOAA radio broadcasts now include warnings about terrorism threats, or chemical spills. Six states including WA, TN, NC, MD, FL, and MS already mandate use of the radios in their schools. I will certainly be glad to see our Minnesota schools equipped with these radios. This is a great idea for business locations as well, as they may have hundreds or thousands of employees to alert in case of a hazard threat.

For years we have been teaching severe weather awareness, education, and action plans to schools, government offices, and business operations in Minnesota. It is good practice to make use of the NOAA hazard radios because they now have alarm systems that can be tuned for local areas. Everyone can benefit from using this simple technology.

MPR listener question: October is our last month on Daylight Savings Time. How many minutes of daylength do we lose during the month?

Answer: In the Twin Cities area we lose about 70 minutes of daylength during the month of October. This compounds the effect of going off Daylight Savings Time at the end of the month when we set our clocks back one hour and it suddenly gets dark at 5:00 pm. Next year, Daylight Savings Time will be expanded in length, running from the second weekend in March to the first weekend in November.

Twin Cities Almanac for September 29th:

The average MSP high temperature for this date is 65 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 45 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for September 29th:

MSP weather records for this date include: highest daily maximum temperature of 89 degrees F in 1897; lowest daily maximum temperature of 44 degrees F in 1985; lowest daily minimum temperature of 27 F in 1945; highest daily minimum temperature of 63 F in 1922, 1982, and 1995; and record precipitation of 0.92 inches in 1971. There was a trace of snowfall on this date in 1908 and 1972.

Average dew point for September 29th is 45 degrees F, with a maximum of 68 degrees F in 1983 and a minimum of 23 degrees F in 1993.

All-time state records for September 29th:

The state record high temperature for this date is 96 degrees F at Moorhead (Clay County) in 1897; the state record low temperature for this date is 13 degrees F at Hallock (Kittson County) in 1899 and

at Mora (Kanabec County) in 1984; state record rainfall for today's date is 3.45 inches at New Ulm (Brown County) in 1925; and the state record snowfall for this date is 2.1 inches at Pokegama Dam (Itasca County) in 1899.

From "Minnesota Weather Almanac" (available in bookstores):

October can be a dry month in Minnesota. It is also the last month of the year that gives us a several clear sky days, about 1 out of 3. In the Twin Cities climate record, October of 1842 and 1957 were completely dry, not a measurable drop of precipitation occurred. In the modern era, National Weather Service records show the driest October in the Twin Cities was 1952 when only .01 inches of rainfall was measured.

For many Minnesotans, October is a favorite month. This is what the Minneapolis Journal said about October in 1895.....

"October is generally a kingly month in Minnesota. It opens with the usual affluence of sunshine and quickening, bracing air which stimulates .....summer's silent fingering will be overwoven with pageantry of color which no human art can call into being. The recession of the year is grander than the processional."

Word of the Week: Polynya

This is a Russian word that literally means ice hole. It is used to describe open waters that appear in the Arctic Ocean during the summer months. Some form near the same location every year, such as around Baffin Island in polar Canada. They vary in size from less than a half mile in diameter to thousands of square miles. As the Arctic sea has warmed in recent decades, the size and number of polynyas have grown. This week it was reported that one had grown to the size of the state of Indiana in the Beaufort Sea north of Alaska, an area that does not see many polynyas form historically.

Outlook:

Chance of scattered light showers in the east early on Saturday, otherwise a nice weekend coming up. Warming trend will take hold for Saturday through Monday. Increasing cloudiness on Monday with a chance for showers in southern sections. This will carryover into Tuesday with cooler temperatures.

TC Marathon runners may be greeted by temperatures in the mid to high 40s F Sunday morning, climbing into the 60s F by the end of the race midday. Their should be little wind and low dewpoints during the race.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, October 6, 2006

#### HEADLINES:

- Cold at Embarrass
- Climate Change in the News
- The Last Kite Observations
- Readings for Environmental Ethics
- Below Zero in October!
- Almanac for October 6th
- Early signs of winter
- GRACE
- Outlook

Embarrass reported a morning low of just 20 degrees F on Thursday, October 5th, the coldest temperature in the nation that day. Despite this, the temperatures during the first week of the month were generally warmer than normal around the state.

Topic: Climate Change Themes in the News.....

Spain is in the midst of its second consecutive year of serious drought. They faced a serious deficiency in moisture starting the year 2006 and it has only worsened. In terms of longevity and intensity officials are calling the drought one of the worst in the past century. Water rationing, water bans, limited irrigation and cutbacks in hydroelectric power have been consequences of this drought.

The National Snow and Ice Center reports that Arctic sea ice continues to shrink at a rate of about 8.6 percent per decade. The second lowest amount of September ice cover historically was reported for the Arctic region last month. One symptom of this trend is the higher frequency of larger polynya (ice holes) which we spoke about last week.

The National Interagency Fire Center has reported the most destructive fire season in the United States in nearly half a century. Total cost for fighting wildfires so far this year exceeds \$1.5 billion, the 4th time in the past seven years when fire fighting costs have exceeded one billion dollars. Western states again have lost the largest acreages to fires.

As climate has warmed in higher latitudes over the past 24 years, there have been associated genetic shifts (variations) in the makeup of species of fruit flies, that parallel the temperature change. This suggests rapid adaptation of some species to climate change. (Science, Sept 22, 2006).

Topic: The Last Kite Observations

In the early days of the National Weather Service, instrumented balloons were not routinely used for upper air observations, but instead instrumented kites were flown. In 1898 the Weather Service operated sixteen upper air stations around the country using instrumented kites. An additional five stations were



added during WWI as military and airmail flights became more common and there was a greater need to measure winds aloft. The last of the kite stations was located at Ellendale, ND, just north of the SD border about half way between Fargo and Bismarck. This station closed in July of 1933.

Obviously these kite stations were located in windy places where you could count on successful launches and measurements up to several thousand feet. In fact at one time in history, the National Weather Service held the record for the highest altitude attained by a tethered kite, 23,000 feet! That's a lot of string.

MPR listener question: I have heard you speak about climate change in Minnesota, showing some examples of what is happening with temperature in the winter (warmer) and dewpoints in the summer (higher). You advocate for more community discussion on this, but emphasize the need to discuss environmental ethics, stewardship, and conservation as well. Can you recommend any books to read along these lines?

Answer: At least three come to mind. the paperback edition of Sir John Houghton's book, "Global Warming: The Complete Briefing" published about two years ago is very comprehensive and thought-provoking. Recent books include Edward O. Wilson's "The Creation: An Appeal to Save Life on Earth." This book seeks the common ground for environmental stewardship between religion and science. Similarly the book "The Language of God" by Francis S. Collins discusses evolution and genetics, but in the context of religious beliefs. There are probably scores of others as well, but I am not a prolific reader!

MPR listener question: Has Minnesota ever seen below zero temperature readings in the month of October?

Answer: Indeed, we have, on several occasions. In October of 1887, 1913, 1916, 1917, 1919, 1925, 1936, and 1976 below zero temperatures were recorded, mostly in northern counties. The earliest ever below zero F reading was at Argyle (Marshall County) on October 20, 1916.

Twin Cities Almanac for October 6th:

The average MSP high temperature for this date is 63 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 43 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for October 6th:

MSP weather records for this date include: highest daily maximum temperature of 85 degrees F in 1961; lowest daily maximum temperature of 40 degrees F in 1952; lowest daily minimum temperature of 26 F in 1976; highest daily minimum temperature of 60 F in 1949; and record precipitation of 1.69 inches in 1941. There was a trace of snowfall on this date in 1976.

Average dew point for October 6 is 41 degrees F, with a maximum of 63 degrees F in 1913 and a minimum of 17 degrees F in 1935.

All-time state records for October 6th:

The state record high temperature for this date is 94 degrees F at Madison (Lac Qui Parle County) in 1993; the state record low temperature for this date is 8 degrees F at Alborn (St Louis County) in 1935; state record rainfall for today's date is 3.98 inches at Wolf Ridge Environmental Learning Center near Finland (Lake County) in 1998. The state record snowfall for this date is 3.0 inches at Caribou (Kittson County) in 1974.

From "Minnesota Weather Almanac" (available in bookstores):

Sometimes there are early signs of what type of winter we are going to have. Certainly such was the case with the long winter of 1880-1881 which began with a terrible blizzard on October 16, 1880. Likewise the harsh winter of 1916-1917 began with heavy snows in October of 1916. One of the snowiest months of October occurred in 1951, when two major winter storms crossed the state. Virginia, Minnesota reported nearly 19 inches of snow from those two storms. It was a precursor to a long and snowy winter which produced vast amounts of spring snowmelt flooding in the spring of 1952.

Words of the Week: GRACE

Another research acronym standing for Gravity Recovery and Climate Experiment satellite mission, this represents a joint international effort sponsored by a number of agencies, including NASA. The pair of satellites used were launched from Russian in 2002. Their mission is to measure and map variations in Earth's gravity field, much of which is induced by shifting water masses. A recent paper in Science magazine quantifies an enormous loss of ice from the Greenland ice sheet in recent years, amounting to over 50 cubic miles of ice per year. This rate of loss is higher than that measured from earlier experiments.

Outlook:

Warm weekend ahead with temperatures several degrees above average. Generally windy statewide, with a chance for showers in northern sections later on Saturday. A general cool down next week, perhaps abruptly on Wednesday and Thursday with a storm system moving through, and much colder air behind it.....rain and snow showers may occur before next weekend.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, October 13, 2006

#### HEADLINES:

- Cold arrives
- Snowfalls this week
- Historical early snowfalls in the Twin Cities area
- Too early for anhydrous applications
- Almanac for October 13th
- Record October snowfall of 1820
- Hand twist model
- Outlook

PLEASE NOTE: I will now be away until Friday, November 3rd. So there will be no weekly Minnesota WeatherTalk over the next two weeks.

#### Topic: COLD

This was a good week for playing Jimmy Buffett's new CD "Take the Weather With You." Brrr, the cold and snow were a slap in the face so early in the season. Many Minnesotans still have docks and boats to take in, leaves to rake, storm windows to put on, firewood to chop, and cars to winterize.

Rochester, MN reported both a record low temperature (23 F) and a record cold high temperature (36 F) on October 12th.

East Grand Forks, MN reported a record low of 20 degrees F on October 11th, while International Falls reported a record low of just 19 degrees F for the date.

Embarrass reported record lows of 12 degrees F on the 10th and 15 degrees F on the 12th. The reading on the 12th was also coldest in the nation on that date.

#### Topic: So Who Reported Snowfall This Week?

Snowfall was reported around the state from October 10-13 this week. Many locations, including the Twin Cities reported at least a trace of snow.

Some reported measurable amounts, including

Itasca State Park 0.8" Moorhead 3.4" Red Lake Falls 3.0"

Leech Lake Dam 0.1" Littlefork 0.4" Cook 0.5"

Embarrass 0.5" Tower 0.4" Duluth 2.7" Tofte 5.0"

Fargo 1.6" Grand Forks 0.1" Sioux Falls 0.2"

Breckenridge 1.0" Morris 1.0" Pelican Rapids 0.5"

Rothsay 0.9" Wheaton 0.1" Willmar 0.2" Warroad 2.0"

Mora 1.1" Forest Lake 0.1" Lakefield 0.5"

Waseca 0.5" Grand Meadow 0.3" Spring Valley 0.3"

For some communities these snowfall amounts were records for the dates.

MPR listener question: How often has the Twin Cities seen snow on or

before October 13th?

Answer: The 19th Century historical records are sketchy on snowfall and therefore somewhat unreliable. But at least a trace of snow was noted on or before October 13th in 1863, 1883, 1889, 1907, 1908, 1915, 1916, 1927, 1935, 1951, 1952, 1955, 1972, 1991, 1995, and 2005 (16 years). Measurable snowfalls of 0.1 inches or greater were measured on or before October 13th in 1820 (see below), 1840, 1917, 1925, 1942, 1945, 1959, 1961, 1969, 1977, and most recently in 1985 (11 years). Thus from a total record period of roughly 187 years, snow was observed on or before October 13th at least 27 times, about 14 percent of the time.

MPR listener question: Because soil temperatures need to be below 50 degrees F, I usually wait until late October to apply fall anhydrous ammonia to my soil. But with the recent cool down do you think it would be OK to apply it now?

Answer: Though soil temperatures have dramatically dropped this week, they are still marginal for anhydrous ammonia applications in some southern counties. I would wait until next week to see where they are. We are expected to warm up a bit this weekend, then average cooler than normal temperatures over the next two weeks. As a consequence, I expect soil temperatures will rebound a bit, but then gradually cool down and remain below 50 degrees F. Like my University of Minnesota Extension colleagues, I am conservative on this issue and don't like to jump the gun. This often leads to denitrification and leeching loss of the nitrogen you are trying to put in storage for next spring's crops.

Twin Cities Almanac for October 13th:

The average MSP high temperature for this date is 61 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 41 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for October 13th:

MSP weather records for this date include: highest daily maximum temperature of 84 degrees F in 1956; lowest daily maximum temperature of 37 degrees F in 1937; lowest daily minimum temperature of 22 F in 1917; highest daily minimum temperature of 62 F in 1968 and 2000; and record precipitation of 1.12 inches in 1956. Record snowfall was 0.4 inches in 1969. The windchill on this date in 1909 was near zero degrees F.

Average dew point for October 13 is 41 degrees F, with a maximum of 67 degrees F in 1962 and a minimum of 14 degrees F in 1937.

All-time state records for October 13th:

The state record high temperature for this date is 89 degrees F at Canby (Yellow Medicine County) in 1958, and at Fairmont (Martin County) and Luverne (Rock County) in 1975; the state record low temperature for this date is 2 degrees F at Sawbill Camp (Cook County) in 1936; state record rainfall for today's date is 4.71 inches at Fosston (Polk County)

in 1984; and state record snowfall for this date is 5.5 inches at Young America (Carver County) in 1959.

From "Minnesota Weather Almanac" (available in bookstores):

One of the earliest heavy snow storms of record occurred at Camp Coldwater (later Ft Snelling) from October 12-14, 1820. The soldiers there measured eleven inches of snowfall from this storm, which introduced a second consecutive cold and snowy winter. The total of 11 inches of snow remains the record amount for the month of October in the Twin Cities area (the Halloween Blizzard of 1991 brought 8.2 inches, the second greatest October total snowfall, while October of 1835 brought 6.0 inches, 3rd most) even after 186 years! Both November and December of 1820 brought abundant snowfall as well, as Minnesota was beginning to establish its 19th Century reputation as the American Siberia.

Words of the Week: Hand Twist Model

This is a simple model of atmospheric motion taught in meteorology classes. Since we are in the midst of the fall season when high and low pressure systems can bring very different air masses, it might be useful to review this model.

In the northern hemisphere, the atmospheric motions associated with high pressure systems can be expressed by placing your hand on a table top with fingers and thumb all touching each other, so that your palm is elevated above the table. Now twist your hand in a clockwise direction, and as you do so, spread your fingers and thumb outward until your palm rests flat on the table. You have just duplicated the motion of air in a high pressure system (cold air advection like we had this week): downward moving air (getting drier as it descends from aloft); clockwise turning air (wind that turns to the right around the high pressure); and surface divergence (air that spreads outward from the center of high pressure). **DOWNWARD, OUTWARD, AND CLOCKWISE** are the three motions.

To duplicate the motions of a low pressure system in the northern hemisphere start with your hand flat on the table, fingers and thumb spread outward. As you slowly twist your hand in a counterclockwise motion (to the left), raise the palm of your hand above the table and draw your fingers and thumb together until they touch each other. This mimics the motions of low pressure: upward moving air (rising air that often reaches saturation and forms clouds); counterclockwise turn air (wind that turns to the left around the low pressure); and surface convergence (air that travels inward toward the center of low pressure). **UPWARD, INWARD, AND COUNTERCLOCKWISE** are the three motions.

Outlook:

Warmer over the weekend, with temperatures moderating into the 40s and 50s F. Generally a dry weekend most areas. Increasing cloudiness late Sunday with a chance for showers possibly mixed with snow in the north. This will carry over into Monday and Tuesday as well. Generally cooler than normal temperatures next week with chances for showers in northern and eastern sections.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, November 3, 2006

#### HEADLINES:

- Climate Summary for October
- Weather Elsewhere
- Variance in Winter Season Outlook
- Historical Snow Season Deficiencies
- Almanac for November 3rd
- Historical Early November Cold
- What's a Yuki Tsuru?
- Outlook

Topic: Climate Summary for October 2006

Generally cool and dry are descriptive of the month just past. Around the state, average October temperatures were 2 to 5 degrees cooler than normal. This was the third month this year with below normal temperatures, both February and September having been cooler than average as well. Temperature extremes for the month included 90 degrees F at Worthington on October 3rd, and just 8 degrees F at Embarrass on October 25th. Minnesota reported the coldest temperature in the 48 contiguous states on five dates during the month. Soils were beginning to freeze up near the end of the month, with frost depths of 2-4 inches reported on bare ground.

Most communities reported less than average precipitation for October, many receiving less than one inch. Most places also reported at least a trace of snowfall. Some northern locations received several inches, including Warroad with 7.2", Cook with 8.5", and Babbitt with 11.1".

Topic: Recent Weather Elsewhere.....

The British Meteorological Office reports that October 2006 was the third warmest since 1914. With few frosts and ample rainfall, gardens were in bloom to the end of the month, including flowering roses, clematis, daisies, forsythia, rhododendrons, and mums. Having just visited in October, I can say firsthand that gardens were in fine form, as were fall pasture crops. The British use a network of phenological observations in gardens to track climate change. In fact these sites are referred to as "Climate Change Gardens." They have all been showing a trend toward much longer growing seasons in recent decades.

In the middle of the North Atlantic, Iceland reported a very stormy month of October, with heavy snows and ice. Many roads were closed during the month and structural damages were reported from storm winds as high as 111 mph.

The Australian Bureau of Meteorology reported that October was the driest on record in the states of Victoria and New South Wales, exacerbating a drought that extends back to last March. As a result, there has been

an increase in "water thefts." Thieves have used crowbars to pry open water storage tanks and steal the water, while others have been caught pumping water from storage reservoirs without permission.

Topic: Variance in the Winter Seasonal Forecasts

The NOAA Climate Prediction Center has been standing by its winter outlook for the western Great Lakes Region despite a rather weak El Nino episode. They expect the November through January period will be warmer than normal with equal chances for above or below normal snowfall.

Conversely, Larry Cosgrove who writes the WeatherAmerica newsletter sees a pattern across North America that will more likely lead to a cold and snowy winter season for the Midwest. Perhaps in the next month we'll see more definition to the weather patterns that will dominate this winter.

MPR listener question: My wife and I cross-country ski. We have lived in the Twin Cities since 1975 and been able to do some skiing for at least a few days every winter. Has there ever been a winter when one of the primary snow season months (Nov-Mar) did not bring any measurable snowfall?

Answer: Yes. December of 1913 brought only a trace of snowfall to the Twin Cities, as did December of December of 1943. Neither of those winters, are remembered fondly by snow-lovers. Only 22.5" fell in 1913-1914, while only 26.9" fell in 1943-1944.

Twin Cities Almanac for November 3rd:

The average MSP high temperature for this date is 49 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 32 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for November 3rd:

MSP weather records for this date include: highest daily maximum temperature of 74 degrees F in 1978; lowest daily maximum temperature of 18 degrees F in 1991; lowest daily minimum temperature of 8 F in 1991; highest daily minimum temperature of 55 F in 1956; and record precipitation of 0.53 inches in 1970. Record snowfall was 4.2 inches in 1951.

Average dew point for November 3rd is 30 degrees F, with a maximum of 60 degrees F in 1987 and a minimum of 2 degrees F in 1991.

All-time state records for November 3rd:

The state record high temperature for this date is 82 degrees F at Montevideo (Chippewa County) in 1909; the state record low temperature for this date is -8 degrees F at Beardsley (Big Stone County) and Park Rapids (Hubbard County) in 1951; state record rainfall for this date is 2.62 inches at International Falls (Koochiching County) in 1919; and state record snowfall for this date is 26.0 inches at Onamia Ranger Station (Mille Lacs County) in 1991.

From "Minnesota Weather Almanac" (available in bookstores):

Though November has started out much colder than normal, the extent of cold is far from that experienced in both 1991 and 1853. In 1991, following the Halloween Blizzard that ended on November 3rd, daytime temperatures fell into the teens and twenties, with nighttime lows in the single digits and below zero F, lasting until a warmup came on the 9th of November. Similarly, in 1853 the first days of November brought overnight low temperatures in the single digits, while even the daytime temperatures remained below freezing from the 2nd through the 9th. Without snow cover the ground began to freeze deeply that winter.

Words of the Week: Yuki (u-kee) Tsurii (Zur-ree)

These are Japanese words used to describe a "snow teepee", a wooden, conical structure that is built around small trees, shrubs, and bushes to protect them from the weight of snow. These pointed structures are made by lashing the tops of wooden poles together. In snowbelts of the main island (Honshu) and the northern island (Hokkaido), such structures are put up each November to help protect the vegetation from the damaging effects of heavy accumulations of snow. Snowfall accumulations can be several feet in these areas and in the winter of 2005-2006 snow depths up to 13 feet thick occurred in some areas. In the current issue of "Weatherwise" magazine, there is an interesting article about snow defenses used for homes, roads, and gardens in Japan.

Outlook:

The colder than normal temperatures will disappear over the weekend and give way to a warming trend that may bring daytime temperatures into the 40s, 50s and 60s F next week. Clouds will still dominate much of the time, with occasional chances for light precipitation. Generally, though, a dry pattern is seen, with a more significant chance for rain by Wednesday or Thursday. Election day next Tuesday looks to be dry and mild, presenting no obstacle to an excellent voter turnout in the 2006 election cycle.



To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, November 10, 2006

#### HEADLINES:

- Warm Election Day
- The Storms of November-a TOP TEN list
- question on snow cover duration or lack thereof..
- Almanac for November 10th
- a few uncomplimentary words about November
- Clapotic or Clapping Waves
- Outlook

#### Topic: Warm Election Day

Tuesday, November 7th marked one of the warmest Election Days in recent memory. Temperatures in many places soared to over 20 degrees F above average, under generally cloudy skies and southeast winds. Temperatures reached 70 degrees F at Canby, Montevideo, Madison, and Benson in western Minnesota. Many other southern Minnesota locations reached the 60s F. Even warmer temperatures prevailed on Wednesday, November 8th, as numerous communities reported record high temperatures in the 70s F, while Mankato and Redwood falls broke the all-time state record for the date with 82 degrees F (previous record had been 81 F at Benson in 1999). An abrupt change in air mass began to occur on Thursday and Friday, bringing in much colder air and some snow to southern counties. Snowfall accumulations by early Friday morning ranged from 3 to 7 inches across southern Minnesota, with more expected through the morning hours. Such abrupt weather changes and storms are not uncommon in November.....

#### Topic: The Storms of November

I will be speaking this weekend at the Annual Split Rock Lighthouse Beacon Lighting commemorating the sinking of the Edmund Fitzgerald on November 10, 1975. My topic is November storms and I have compiled a TOP TEN list of sorts.

November 27, 1896....worst ever Thanksgiving snow storm, blizzard conditions in the north...no travel...winds 45-50 mph....Canadian Steamer Acadia sunk in Lake Superior

November 28, 1905....the long-lived Mataafa Storm, lasted the better part of 3 days, wrecking the Mataafa and many other ships on Lake Superior. The storm brought winds to 68 mph and 20-30 ft waves.

November 10, 1913....a stalled frontal system intensified across the Great Lakes, producing winds to 74 mph and dangerous conditions on Lake Superior. Both the Leafield and the Henry B. Smith, among other ships were sunk.

November 11, 1940...the famous Armistice Day Blizzard. Struck suddenly and with ferocity, poorly forecast, and producing zero visibility, with dangerous wind chills. Winds reached 65 mph. Over 50 people, many duck hunters lost their lives.

November 18, 1958....strong winter storm brought record setting 2-3 inch rains to southern Minnesota and a blizzard in the north. Winds reached 67 mph. The ship Carl D. Bradley sunk on Lake Michigan.

November 29, 1960....a very large storm system brought winds of 70-73 mph that produced 20-40 ft waves on Lake Superior....tremendous coastal erosion occurred and downtown Grand Marais flooded.

November 10, 1975...the Edmund Fitzgerald Storm....winds reached 70-90 mph...a true hurricane force...waves may have exceeded 30-40 ft. The Fitzgerald sank suddenly with all hands.

November 2, 1991...the tail end of the Halloween Blizzard, topped off 36.9 inches of snowfall at Duluth, with winds reaching 55-60 mph.

November 10, 1998.....most intense low pressure ever measured in Minnesota..28.43 inches at Albert Lea...winds of 55-64 mph lasted for a long time causing some structural damage to buildings. Not much precipitation though.

November 27, 2001....fresh water fury struck the Duluth Harbor and Lakewalk area with 10-15 ft waves causing over \$1.5 million in damage. Winds reached 50-55 mph.

The frequency and intensity of these November storms is somewhat unique. Such storms are difficult to find in other months of the year.

MPR listener question: It seems that the old fashioned winters when permanent snow cover blanketed the landscape from late November through March have all but disappeared. When was the last time we had snow cover persist for several months in the Twin Cities area?

Answer: The last winter showing constant snow cover for any length of time was 1996-1997 when the Twin Cities reported snow cover of 1 inch or greater for 122 days, from November 20 to March 21st. The following historical winters showed constant snow cover of 1 inch or greater for 130 or more consecutive days: 1896-1897, 1898-1899, 1935-1936, 1940-1941, 1950-1951 (142 days), 1951-1952, and 1978-1979. Indeed, nearly all recent winters in the Twin Cities have show relatively brief periods of snow cover, as a result of frequent thaws. Recall that last January we had 34 freeze-thaw cycles in the Metro area.

Twin Cities Almanac for November 10th:

The average MSP high temperature for this date is 44 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 28 degrees F (plus or minus 9 degrees F standard deviation).

MSP Local Records for November 10th:

MSP weather records for this date include: highest daily maximum temperature of 67 degrees F in 1930; lowest daily maximum temperature of 19 degrees F in 1986; lowest daily minimum temperature of 3 F in 1986; highest daily minimum temperature of 52 F in 1909; and record precipitation of 1.36 inches in 1915. Record snowfall was 5.0 inches in 1896.

Average dew point for November 10th is 26 degrees F, with a maximum of 55 degrees F in 1909 and a minimum of -3 degrees F in 1986.

All-time state records for November 10th:

The state record high temperature for this date is 78 degrees F at Winona Dam (Winona County) in 1999; the state record low temperature for this date is -15 degrees F at Big Falls (Koochiching County) in 1933; state record rainfall for this date is 2.80 inches at Minnesota City (Winona County) in 1975; and state record snowfall for this date is 12.4 inches at Moorhead (Clay County) in 1919.

From "Minnesota Weather Almanac" (available in bookstores):

"Affection for October may be inspired by its proximity to what is arguably one of the worst months of the year. November certainly has its share of negative connotations: freezing rain, frozen ground, and icing lakes; howling winds and the first wind chills; low, gray decks of clouds; pile after pile of leaves to rake; short days getting shorter; the transition to layered clothing; the onset of flu season and Seasonal Affective Disorder (SAD); haze and morning fog; all-day rains; the first winter storm watches and warnings. Despite these and other depressing qualities, November is redeemed somewhat by the bountiful holiday of Thanksgiving (and some interesting elections, too!)."

Words of the Week: Clapotie or Clapping Waves

These waves are generated by the superposition of two identical waves propagating in opposite directions. One may be a reflection wave off a steep coastline that meets with an oncoming wind-driven wave from offshore. In such cases these waves can amplify each other and produce a double wave height. One theory associated with the sinking of the Edmund Fitzgerald on November 10, 1975 is that an enormous clapotic wave (perhaps 35-45 ft) submerged the bow of the ship so deeply it could not recover.

Outlook:

Cooler and cloudy this weekend, with a chance for light rain or snowfall by Sunday. Continued cool next week, with chances for rain or snow Tuesday through Thursday. Some significant snowfall accumulations may result by the end of next week, as a more winter-like pattern prevails.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, November 17, 2006

HEADLINES:

- Climate Calendars Available
- New Climate Outlook
- Climatology of Bigger Snowfalls
- Character of the worst Thanksgiving in Minnesota
- Almanac for November 17th
- Hardening and Dehardening
- Outlook

Topic: New Online Climate Calendars Available

Jim Zandlo, our Minnesota State Climatologist has just released a new climate calendar product on our web site. Weather and weather history buffs will find it quite interesting. Users can pick from among 128 locations around Minnesota and derive a daily climate calendar that shows such things as average daily high and low temperature, average daily precipitation and snowfall, sunrise and sunset times, lunar phases, daily temperature and precipitation records, and even holidays. If you wish to try this out go to the following web site and follow the directions..

<http://www.134.84.160.120/calendar/>

Use MS Explorer to navigate through the instructions and follow directions carefully. Be sure to download the three files that are described and highlighted in blue font and to set your MS Word Security Level to medium. This allows you to use the "macro" instructions imbedded in the files which calculate the numbers that are placed in the calendar you create. You can customize the calendar information content, as well as size and images. Perhaps you would want to consider producing the calendar as a Holiday gift for someone living in one of the communities listed. There is the potential to display a wealth of interesting data in a highly readable and interesting calendar format.

Topic: New Climate Outlook.....

The NOAA Climate Prediction Center (CPC) released their outlook for December through February this week. They continue to see warmer than normal temperatures prevail in our region during this time and equal chances for precipitation to lead to wetter or drier than normal conditions.

The North American winter outlook produced by the Hadley Centre in Europe suggests warmer and wetter conditions will prevail in Minnesota over the next three months. Most of the Minnesota landscape would benefit from abundant moisture this winter as soils remain extremely dry in many areas due to lack of summer and fall rainfalls. As a result many Minnesotans are hoping for a wet winter.

Topic: Regional Summary of Significant Snowfall Statistics

Despite a recent trend toward mild winters in many parts of the state, the incidence of heavy snowfalls seems to be generally increasing. Recent publications by climatologists have revealed some interesting statistics on snowfalls in our region. With respect to significant snowfalls of 6 inches or greater occurring over 1-2 day periods, there is an upward trend in frequency for our region. Some eastern and northern counties have recorded as many as six snow storms of 6" or greater in one winter, though the long-term average is only 1 or 2 per year. Over most of the state the largest share of storms producing 6" of snow or more have occurred in either January or March, though historical data show that such storms have occurred as early as October and as late as May in parts of the north.

Recurrence statistics used to calculate the return periods for heavy snowfalls (6" or more) over 1-2 days show some differences between Rochester and the Twin Cities...

Every Five Years: Rochester records at least one 10 inch snow storm (as it did recently on November 10th), while the Twin Cities records at least one 14 inch snow storm.

Every Ten Years: Rochester records at least one 12 inch snow storm, while the Twin Cities records at least one 17 inch snow storm.

MPR listener question: I heard your presentation at the Split Rock Lighthouse Beacon Lighting and Ceremony for the Edmund Fitzgerald last weekend when you spoke about the worst ever November storms. You said that November 26-27, 1896 was arguably the worst ever Thanksgiving in Minnesota history. What were some characteristics of that storm in Minnesota?

Answer: This storm cut a wide swath through the area. It produced severe thunderstorms, hail, strong winds and heavy rain in southern counties. Worthington received 4.80 inches of rain on Thanksgiving Day and Montevideo received over 3 inches. Blizzard conditions with winds of 45-50 mph prevailed in northern counties, leaving 12 ft high drifts of snow. Roseau reported nearly a foot of snow with zero visibility. The fresh swath of snow and following arctic air mass brought the Thanksgiving weekend temperatures to new record lows including -45 F at Pokegama Dam, -39 F at Tower, -37 F at Bemidji, -36 F at Roseau, and -32 F at Park Rapids. Even the Minneapolis Weather Service Office reported a low of just -15 F. Brrrr, no wonder there was little travel reported that Thanksgiving.

Twin Cities Almanac for November 17th:

The average MSP high temperature for this date is 42 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 26 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for November 17th:

MSP weather records for this date include: highest daily maximum temperature of 71 degrees F in 1953; lowest daily maximum

temperature of 15 degrees F in 1927; lowest daily minimum temperature of -5 F in 1880; highest daily minimum temperature of 49 F in 1952; and record precipitation of 0.73 inches in 1978. Record snowfall was 8.3 inches also in 1978.

Average dew point for November 17th is 26 degrees F, with a maximum of 58 degrees F in 1958 and a minimum of -14 degrees F in 1959.

All-time state records for November 17th:

The state record high temperature for this date is 76 degrees F at Canby (Yellow Medicine County) and Springfield (Brown County) in 2001; the state record low temperature for this date is -19 degrees F at Hallock (Kittson County) in 1914; state record rainfall for this date is 3.21 inches at Tower (St Louis County) in 1996; and state record snowfall for this date is 15.0 inches at Roseau in 1996.

From "Minnesota Weather Almanac" (available in bookstores):

At about 9:35 pm (well after dark) on November 16, 1931, an F-2 tornado (winds 113-157 mph) touched down near Maple Plain in Hennepin County. On the ground for 5 miles, this tornado destroyed all the outbuildings on a nearby farm, resulting in an estimated \$12,000 worth of damages. Warm, southerly winds that day brought a record high temperature of 68 degrees F, with dewpoints in the 50s F, as numerous communities reported thunderstorms. Most significant, this tornado remains the latest fall occurrence of such a storm in state history.

Words of the Week: Hardening and Dehardening.....

These are words used in gardening and landscaping circles. Perennial plants and vegetation undergo physiological changes in the fall season to become hardened against the stresses of winter climate, including desiccation (dryness) and low temperatures. Onset of this transition is triggered by the shortening daylength, drier soils, and lower air and soil temperatures. Once hardened, many plants are better able to withstand the extreme low temperatures that occur in the winter months.

Dehardening is a process that occurs after the chilling requirement (hardening) has occurred, when plant stems, shoots, and roots lose their hardiness and get ready for new growth. Triggers for this process include longer days, thawing soils, and warmer temperatures. On rare occasions plants can be fooled by Mother Nature as was the case in 1877 and 1998, when fall conditions allowed hardening to occur, but extremely warm temperatures, thawed soils, and rain showers prevailed in December, promoting many plants to dehardening and initiate new growth prematurely. This can cause more harm than good, especially if the weather turns markedly colder and freezes any new plant growth.

Outlook:

Mostly a benign, quiet period of weather coming up, with warmer than normal temperatures and lack of precipitation. Some early morning

drizzle or freezing drizzle might be found in the southeast on Saturday.  
No storms are seen through Thanksgiving Day, though chances for snow and rain in our region may improve by next weekend.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, November 24, 2006

#### HEADLINES:

- Fall Dryness
- Warm Thanksgiving Week Brings Records
- Volcanoes and Drought
- Books for the Holiday Shopper
- Question about golf over Thanksgiving
- Almanac for November 24th
- What's a Warm Braw?
- Outlooks

Topic: Fall Dryness.....

For many parts of the state, especially northern and eastern counties, fall precipitation deficits have been substantial, amplifying the effects of summer drought in many cases. As the harvest season finished at Crookston in Polk County, the University of Minnesota Research Center there reported less than 3 inches of stored soil moisture in the top five feet of soil, while similar measurements from Lambertton in Redwood County reported less than 4 inches of moisture storage. These are very low values resulting from the absence of any meaningful precipitation. In fact, since October 1st many observers around the state have reported less than one inch of precipitation, and some have received less than a half inch. It would be most beneficial to these areas if precipitation occurred before the soil completely freezes up for the winter.

Topic: Warm Thanksgiving Week Brings Records.....

While parts of Florida and South Carolina were experiencing cold, rain, and even snow this week, both Tuesday and Wednesday brought record setting warmth to Minnesota and the region. On Tuesday, November 21st record high temperatures included....

Grand Forks 60 F    Fargo 58 F    Crookston 55 F (tied 1990)  
Crane Lake 54 F    Fosston 61 F    Roseau 54 F

Then on Wednesday, November 22nd, more record warmth was recorded as over a dozen communities reached 60 F or higher. The the following places reported new record highs....

International Falls 55 F    Baudette 59 F    Roseau 57 F  
Hallock 61 F    Bemidji 59 F    Wheaton 64 F

The warm temperatures continued on Thanksgiving Day (Thursday, Nov 24) as the following communities reported new record highs for the date...

Rochester 57 F (tied 1931)    St Cloud 53 F    Faribault 59 F  
Albert Lea 57 F    St James 57 F    Cambridge 57 F



The mild temperatures were expected to tail off during the Thanksgiving weekend and become colder than average by next week.

Topic: Linking Volcanoes to Drought

A recent paper explains how the drought that plagued Egypt in 1783-1784 was the result of a volcanic eruption that occurred in Iceland. Mt Laki in southern Iceland began a series of eruptions in June of 1783, resulting in an estimated 9,000 deaths. The eruptions produced over 100 million tons of sulfur dioxide and toxic gases. This pollution diminished the amount of the sun's energy reaching the Earth's surface across the northern hemisphere and changed weather patterns sufficiently to bring the coldest summer in 500 years to some locations. Normal rainfall patterns in the Mediterranean region and the Monsoon region of Asia were disturbed resulting in prolonged droughts, the worst of which was along the agricultural region of the Nile River in Egypt. This paper appears in the current Geophysical Research Letters.

Topic: Books for the Holiday Shopper

The Thanksgiving weekend usually jump starts the holiday shopping season. With that in mind a number of WeatherTalk readers and people who have already bought my book (Minnesota Weather Almanac) have been asking me about other book gifts for the for those who are infatuated with weather. Here is a list of suggestions, some old and some new.....

"The Weather Book" (USA Today) by Jack Williams (Vintage Press)... great overview and visuals, best in the 1997 edition.

"The Divine Wind" by Kerry Emanuel (Oxford Press, 2005)...very good mixture of stories and science regarding hurricanes.

"Extreme Weather: A Guide and Record Book" by Christopher C. Burt (W.W. Norton Co., 2004)..nearly unbelievable events and episodes.

"Global Warming: The Complete Briefing" by John Houghton (Cambridge University Press, 2004)....a comprehensive scientific review....

"The Weather Wizard's Cloud Book" by Louis Rubin and Jim Duncan (Algonquin Books, 1989)...great pictures and forecasting guide.

I am sure there are several others out there that I am not aware of.. good luck shopping.

MPR listener question: We moved to the Twin Cities from ND in 1998 and I was able to play golf over the Thanksgiving holiday (something I never did in North Dakota!). I did it again in 2001, and with temperatures flirting around the 60 F mark I will probably do it again this week. How frequent are temperatures of 60 F or higher during the second half of November? And are we experiencing a trend so we might one day see golf tournaments held over the Thanksgiving Holiday?

Answer: Obviously these mild temperatures have you day-dreaming about a longer golf season. But for the Thanksgiving period these are truly anomalous conditions for the Twin Cities. From a historical perspective a temperature of 60 F or higher occurs about one year in four during the second half of November in the Twin Cities area. 1998 brought 2 such days, while 2001 brought 4 days. I might suggest if you lower your temperature threshold for playing golf to 55 degrees F, you'll find such temperatures occur about one year in two. I fail to find a warming trend in the month of November, so I cannot speculate that we'll one day be hosting golf tournaments during the month. Besides the short day length and horrible sun angle (blinding) would not be compatible for such activity.

Twin Cities Almanac for November 24th:

The average MSP high temperature for this date is 35 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 20 degrees F (plus or minus 11 degrees F standard deviation).

MSP Local Records for November 24th:

MSP weather records for this date include: highest daily maximum temperature of 59 degrees F in 1990; lowest daily maximum temperature of 10 degrees F in 1893 and 1985; lowest daily minimum temperature of -10 F in 1893; highest daily minimum temperature of 43 F in 2001; and record precipitation in the modern era of 1.06 inches in 2001, record precipitation in the pioneer era of 2.30 inches in 1878. Record snowfall was 1.7 inches in 1977.

Average dew point for November 24th is 18 degrees F, with a maximum of 40 degrees F in 1908 and a minimum of -12 degrees F in 1950.

All-time state records for November 24th:

The state record high temperature for this date is 68 degrees F at Wheaton (Traverse County) in 1984; the state record low temperature for this date is -31 degrees F at Pokegama Dam (Itasca County) in 1898; state record rainfall for this date is 2.38 inches at Vesta (Redwood County) in 2001; and state record snowfall for this date is 16.0 inches at Tower (St Louis County) in 1983.

From "Minnesota Weather Almanac" (available in bookstores):

Prairie and forest fires were common occurrences during the 19th Century in Minnesota. Soldiers at old Ft Snelling routinely noted them in daily weather observations. What is interesting is that for most of the century, November was a significant month for fires. In fact only April and October show higher frequencies of fires than November. Some historians have suggested that native American hunters used to start fires in November to flush game out into the open.

## Words of the Week: Warm Braw.....

This is the term used to refer to a warm downslope wind, notably in New Guinea off the north coast of Australia. Braw is a Scottish term that means pleasant, fine, splendid or appealing. Downslope winds bring drier, compressed, and warmer air, and during the winter season a respite from cold and damp conditions. A "warm braw" is occasionally used to describe pleasant, downslope winds in other places, but we do not have the types of landscapes in Minnesota where it applies.

## Outlook:

Partly cloudy over the weekend and generally dry with above average temperatures. Chance for snow in the northern sections, and rain or drizzle in the south later on Sunday. Cooler next week, with a better chance for mixed precipitation and stronger winds by Tuesday and Wednesday as a series of weather disturbances will affect the state.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, December 1, 2006

#### HEADLINES:

- November rains welcome, preliminary summary
- Super Typhoon Durian in the Western Pacific
- Remembering the warmest December 1st (1998)
- Coldest temperature without snow?
- Minimum temperatures changing more than maximums
- Almanac for December 1st
- December 1950-SNOW
- Crepuscular rays
- Outlook

Topic: Some end of the month November rain is welcome.....

Tuesday, November 28 brought significant rainfall to most parts of the state, even lightning and thunder to many. Many observers recorded over a half inch of rainfall, while some others received new record amounts for the date including Rochester with 1.17", Dodge Center with 1.00", Minnesota City with 0.90", and Austin with 1.13" (tying the record for the date). Soils that were unfrozen and only slightly frozen took in most of the rainfall, the first significant recharge in some time.

The month of November generally was warmer than normal with most observers reporting a mean monthly temperature that was 2 to 5 degrees above the historic average. Temperature extremes ranged from 83 degrees F at Mankato on the 8th (a new state record high for the date) to -6 degrees F at Hallock (Kittson County) on the 29th. Only twice during the month did Minnesota report the lowest temperature in the 48 conterminous states.

Despite recent rain and snow, most locations in the state reported less than average precipitation for November. The only areas to receive above average amounts were in the southeastern counties. A heavy snow storm occurred over the southeastern counties on November 10th bringing up to 10 to 13 inches to some places, including a record 10.5" at Rochester. In addition some significant snows occurred in northeastern counties, where up to 6 inches occurred at Cook. Most of the state saw an absence of snow throughout the month and by 30th many soils were frozen to a depth of 4-6 inches.

Topic: Super Typhoon Durian in the Western Pacific

Super Typhoon Durian struck the Phillipines this week where schools were cancelled and business offices were closed in preparation for the damaging effects of sustained winds of 150 mph and gusts to 185 mph, and significant wave heights of 41 feet. As of Friday, at least 388 people had died in the storm, the 4th strong typhoon to hit these islands in past four months. Sea surface temperatures are currently warmer than normal around the Phillipines, helping to fuel and sustain such storm, but cold air drainage from higher latitudes over Asia will help alleviate these conditions in

coming weeks. Now that's a good use for polar air.

Topic: Remembering the warmest December 1st....

By far the warmest December 1st occurred in 1998, with an absence of snow around much of the state. The following were afternoon high temperatures that day...

Twin Cities 68 F   Chaska 70 F   Montevideo 63 F   Marshall 64 F  
St Cloud 61 F   Fairmont 65 F   New Ulm 67 F   Austin 65 F

It was a Tuesday and many citizens played hooky in order to get out on the golf course. Those at work for the day took a lunch hour walk in shirt sleeves. I remember seeing young boys after school flying kites in Como Park.

MPR listener question: What has been the coldest temperature measured in the Twin Cities in the absence of snow cover?

Answer: As I have stated before, nearly all of the low temperature records during the winter season are associated with the presence of snow cover. The coldest readings I can find without any snow cover occurred on January 29, 1934 and January 12, 1954 when the overnight low reached -18 degrees F.

MPR listener question: I have heard you mention that climate change is evident in the Minnesota temperature record, but that minimum temperatures are warming more than maximum temperatures. What type of evidence exists for this?

Answer: Two data sources help substantiate this: Trends in monthly temperatures over the past 50 years and the number of record setting daily temperature values that have occurred over the past decade. Taking the December records from International Falls for example shows that the average monthly minimum temperature has warmed by 1.5 degrees F, while the average monthly maximum has warmed by 0.5 degrees F since 1961. This uneven warming pattern is true for most other months of the year and for many other Minnesota locations.

Secondly, a recent analysis by Greg Spoden of the State Climatology Office shows that since 1997 the Twin Cities have recorded 36 new record maximum daily temperature values and 50 new record warm daily minimum temperature values. This is evidence for more extreme values of temperature during the overnight or early morning hours.

Twin Cities Almanac for December 1st:

The average MSP high temperature for this date is 31 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 17 degrees F (plus or minus 11 degrees F standard deviation).

MSP Local Records for December 1st:

MSP weather records for this date include: highest daily maximum temperature of 68 degrees F in 1998; lowest daily maximum

temperature of 1 degree F in 1919; lowest daily minimum temperature of -15 F in 1893; highest daily minimum temperature of 43 F in 1962; and record precipitation in the modern era of 0.83 inches in 1985, and in the Pioneer Era 1.65 inches in 1837. Record snowfall for the date is 8.4 inches in 1985.

Average dew point for December 1st is 18 degrees F, with a maximum of 49 degrees F in 1982 and a minimum of -17 degrees F in 1930.

All-time state records for December 1st:

The state record high temperature for this date is 70 degrees F at Chaska (Carver County) in 1998; the state record low temperature for this date is -51 degrees F at Pokegama Dam (Itasca County) in 1896; state record precipitation for this date is 2.12 inches at Two Harbors (Lake County) in 1985; and state record snowfall for this date is 16.0 inches at Winona (Winona County) in 1985.

From "Minnesota Weather Almanac" (available in bookstores):

One of the snowiest months in Minnesota history was December of 1950. Several snow storms crossed the state and brought record setting monthly totals to many communities. Duluth recorded an incredible 44.3 inches of snowfall, while nearby Cloquet had 37 inches and Two Harbors reported 25 inches. Several other communities received over two feet of snow that month: Twin Cities 25", Stillwater 30", Winona 27", and New Ulm 37". This heavy snow set up a long winter that lingered deep into spring and produced snow melt flooding on most Minnesota watersheds.

Words of the Week: Crepuscular Rays

Though the sun was absent over much of the past week, there were some beautiful crepuscular rays in evidence on Wednesday across Minnesota. These alternating lighter and darker bands of light appear to diverge like flower pedals or fan blades away from the sun, most commonly at twilight. This flower-like appearance can also happen with lower sun angles during the daytime as sunlight passes between vertical cloud elements, composed of different size ice crystals that refract the light in different ways. Such was the case on Wednesday afternoon this week.

Outlook:

Generally a cold period coming up with chances for light snow over the weekend, especially in northern areas. Continued cold next week with below normal temperatures and not much precipitation.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, December 8, 2006

#### HEADLINES:

- Remembering 1927
- Soils freeze
- Ice fishing reminders..
- Almanac for December 8th
- Minnesota the "American Siberia" lives on...
- Flash Drought
- Outlook

Topic: 1927 Blizzard.....frozen milk!

If you think that it was cold early this week, you're right, as daily temperatures averaged 7-11 degrees F colder than normal. But this was minor compared to the early December of 1927, when daily temperatures averaged 20 degrees F colder than normal over the first ten days of the month. During that period windchill values ranged from -40 to -50 degrees F around the state. Snow fell on 9 of the first 10 days, with a blizzard over the 7th and 8th, that produced 13 inches of snow at Redwood Falls, 8.1 inches at Minneapolis, 9 inches at Willmar and nearly 20 inches at Maple Plain. Winds were fierce, blowing over 40 mph so visibility was near zero in many areas and huge drifts of snow blocked roads. Fortunately weather service warnings were heeded and most schools and businesses were closed. Milk deliveries were suspended and much of the milk froze in cans, producing a milk shortage that lasted for a few days until roads were cleared.

December of 1927 was the coldest of record statewide until 1983, which surpassed it for both lowest mean temperature as well as windchill values (-60 to -70 F range).

Topic: Soils freeze.....

The absence of snow cover and spell of cold weather to start the month of December has brought frost depths ranging from 8-14 inches across Minnesota. Even though a trend toward warm temperatures in the coming week will slow the progression of frost penetration, the continued absence of snow cover presents a higher risk of deep frost occurring this winter unless we establish some significant snow cover by January.

MPR listener question: I know that the MN-DNR recommends ice thickness of 4 inches or greater for ice fishing and I heard several reports of ice forming on central and northern area lakes. However, I am concerned about the forecasted warming trend. Do you think ice fishing will be safe by Christmas Day?

Answer: Though the first five days of the month were great in

terms of producing ice cover, that process will be halted or significantly slowed by the weather over the next two weeks as we are expected to have a prolonged spell of above normal temperatures.

At mean daily temperatures of 20 degrees F or less (common around the state the first 7 days of this month) ice formation begins in previously shallow, open water in a matter of 2 to 3 days. Successively lower daily mean temperatures will accelerate the process, along with the decreasing daylength this time of year. For example, 9-11 inches of lake ice will develop on previously shallow open water in approximately 6 days at a daily mean of 10 degrees F, but will take over 11 days at a daily mean temperature of 20 degrees F. Mean daily temperatures even colder than 10 degrees F further accelerate the ice forming process but at a reduced rate, for example a daily mean temperature of 0 degrees F, produces 9-11 inches of ice over 4-5 days in shallow waters.

Bear in mind that there is no reliable method to estimate the rate of ice formation on individual lakes. Several factors such as lake depth, vegetation, water currents, exposure to wind and snow cover all influence the rate of ice formation. Ice chisels or augers should be used to check thickness of lake ice. Remember a minimum thickness of 4 inches is recommended for ice fishing, but a thickness of 12 inches or greater is needed to support vehicles according to DNR guidelines.

Twin Cities Almanac for December 8th:

The average MSP high temperature for this date is 27 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 14 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for December 8th:

MSP weather records for this date include: highest daily maximum temperature of 50 degrees F in 1939 and 1990; lowest daily maximum temperature of -6 degree F in 1927; lowest daily minimum temperature of -15 F in 1927; highest daily minimum temperature of 40 F in 1907; and record precipitation in the modern era of 0.44 inches in 1963, 1987, and 1995 and in the Pioneer Era 0.85 inches in 1837. Record snowfall for the date is 7.1 inches in 1995.

Average dew point for December 8th is 13 degrees F, with a maximum of 46 degrees F in 1946 and a minimum of -20 degrees F in 1977.

All-time state records for December 8th:

The state record high temperature for this date is 67 degrees F at Grand Marais (Cook County) in 1913; the state record low temperature for this date is -38 degrees F at Big Falls (Koochiching County) in 1932; state record precipitation for this date is 2.02 inches at Babbitt (St Louis County) in 1924; and state record snowfall for this date is 14.0 inches at Isabella (Lake County) in 1969.



From "Minnesota Weather Almanac" (available in bookstores):

Our historical reputation as the "American Siberia" started with the old 19th Century reports from Ft Snelling, where temperatures as cold as -40 degrees F were recorded. This reputation was reinforced by 20th Century reports from such renowned "icebox" locations as International Falls, Tower, and Embarrass, many of which report the nation's lowest temperature on various days throughout the year. More recently, new weather stations at Orr (St Louis County) and Flag Island (Northwest Angle in Lake of the Woods) have added to this reputation by reporting the nation's lowest temperature on several dates.

Incidentally, Orr reported a low of -13 degrees F this week, Flag Island -9 degrees F, and Roseau -17 degrees F, with windchill values ranging from -25 to -31 degrees F. Alexandria, MN was perfectly symmetric around the 0 F mark on Thursday, December 7th, with a high of 8 degrees F and a low of -8 degrees F.....an unusual occurrence historically.

Words of the Week: Flash Drought

A term coined by Jim Zandlo and Greg Spoden this past summer, flash drought refers to a relatively sudden drought onset brought on by the prolonged absence of significant precipitation during the middle of a hot growing season. Such was the case this past summer when much of Minnesota was in a surplus moisture situation going into the month of May, but by the end of July many northern and eastern Minnesota counties declined to the Severe and Extreme Drought categories as a result of prolonged absence of rainfall combined with very high summer temperatures. This rapid onset of drought over a 2-3 month period is a rare occurrence in Minnesota history, having only occurred previously in 1896 and 1933 at a comparable rate. Other severe droughts have taken much longer to establish.

Outlook:

A generally warm and dry period coming up, with temperature averaging several degrees warmer than normal. Fog may be a common occurrence, and there will be some chance for light drizzle or freezing rain in the northeastern counties, but precipitation chances will be very slight elsewhere. Another chance for snow comes by Wednesday of next week.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, December 15, 2006

#### HEADLINES:

- Most winter storms occur at night
- Changes in the character of precipitation
- December daily temperature ranges
- Almanac for December 15th
- December 1855, what a cold Christmas Eve!
- What's a woolly whipper?
- Outlooks

Topic: Nocturnal Character of Winter Storms.....

Frequencies of hourly precipitation from the Twin Cities climate records show some interesting daily patterns with respect to the onset of winter storms. Patterns in the hourly frequencies of precipitation do vary by month. In the winter months, December through February, the afternoon hours from noon to 4 pm show the lowest relative frequency of measured precipitation. Overnight frequencies of hourly precipitation are relatively higher, especially from 1 am to 6 am. This could be due to the relationship between temperature and the saturation of the air. Low temperatures usually occur during these hours and probably remain closer to the dew point temperature, preserving the structure and continuity of precipitation, whether droplets, sleet or snow crystals. The other feature of winter storm systems to remember is that they are usually large and take some time to move across the area. Precipitation may last for several hours and since most of our 24 hour calendar day is in darkness during the winter, we associate the storminess with the night.

Topic: Changes in the Character of Precipitation

Many well known researchers (Trenberth, Karl, Changnon) have written about changing patterns in precipitation over recent years. The amount of precipitation received from thunderstorm rainfall, and especially intense storms appears to be increasing for many places in our region. Recall that I have mentioned the increased frequency of 2 inch rainfalls in some of our Minnesota landscapes. But there is also evidence that this trend is going on elsewhere. A recent paper in Science magazine by Goswami et al shows an increasing frequency for extreme rainfall events over India, with a decreasing frequency for moderate events. This presents an increased risk of coping with flooding during the monsoon season. It remains to be seen whether or not the continued industrial development in India, including increased emissions has anything to do with the changing character of precipitation there.

MPR listener question: Seems to me from years of walking the dog

(in Chaska) that the range of temperatures on any given day in December requires anything from shorts to fleece-lined jeans. So just how variable on any given day are temperatures in this region?

Answer: The daily range in typical highs and lows is rather extreme, ranging up to 70 degrees F or more in the months of November and March for example. During December the range in daily high temperatures is typically 55 to 65 degrees F, but can be a bit higher. For example the range in maximum daily temperature for December 14th in the Twin Cities is a high of 55 degrees F in 1998 and only -14 F in 1901. Because of the low sun angle and short days, the period of day when the maximum temperature is reached is from 1:00 to 3:00 pm and may be very short-lived, minutes up to an hour. The range in daily minimum temperatures during December in the Twin Cities is typically 50 to 60 degrees F, but can be higher as well. For example on December 19th the lowest minimum temperature is -29 degrees F in 1983, while the highest is 38 degrees F in 1923. The somewhat narrower average range in minimum temperature is probably a function of the longer nights of December.

The daily temperature ranges in winter are amplified by presence or absence of snow cover, while those of summer are moderated by actively growing vegetation and a higher water vapor content of the atmosphere. You can examine the range of extreme temperatures for most climate stations in Minnesota by going to our web site:

[http://www.134.84.160.120/doc/online\\_resources.htm](http://www.134.84.160.120/doc/online_resources.htm)

Use the Climate Calendar section.

Twin Cities Almanac for December 15th:

The average MSP high temperature for this date is 26 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 12 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for December 15th:

MSP weather records for this date include: highest daily maximum temperature of 49 degrees F in 1923; lowest daily maximum temperature of -5 degree F in 1932; lowest daily minimum temperature of -21 F in 1901; highest daily minimum temperature of 39 F in 1928; and record precipitation in the modern era of 0.71 inches in 1902; and record snowfall of 7 inches from the same storm in 1902.

Average dew point for December 15th is 10 degrees F, with a maximum of 39 degrees F in 1928 and a minimum of -22 degrees F in 1963.

All-time state records for December 15th:

The state record high temperature for this date is 63 degrees F at Kinbrae (Nobles County) in 1891; the state record low temperature for this date is -47 degrees F at Pokegam Dam (Itasca County) in

1901; state record precipitation for this date is 2.25 inches at Grand Rapids (Itasca County) in 1893; and state record snowfall for this date is 14.6 inches at Rockford (Wright County) in 1996.`

From "Minnesota Weather Almanac" (available in bookstores):

In the years prior to statehood (1858) weather records across Minnesota are rather sparse. But we do know from the Ft Snelling readings that December of 1855 was no picnic. Well, actually maybe you could have had a picnic during the first days of the month as temperatures reached the mid 40s F. But following that mild spell a series of arctic fronts descended across the region bringing measurable snowfalls on nine days and an especially heavy snow at mid month. Friday and Saturday, December 15th and 16th brought snow "with flakes as big as a featherbed" totaling 8 to 12 inches around the St Paul area. Sleighing was said to be excellent as total snowfall amounted to 22 inches for the month. The fresh snow cover and arctic air produced one of the coldest Christmas Eves in Minnesota history with a reading of -33 degrees F at Ft Snelling, -36 degrees F at St Paul, and -38 degrees F elsewhere in southern portions of the state. So after a teasing, mild start what a bitter month it turned out to be.

Words of the Week: Woolly Whipper

Among all the names given to regional winds around the world this one is a favority of mine. The Canadians use this term to describe a very cold northerly wind that even a woolly (scarf) cannot fend off. In fact the suggested image is that your woolly blows all around you and is difficult to keep tucked around your neck. We certainly had some of this kind of weather during the first week of December with wind chills of -25 to -35 degrees F around the state. But it has been unusually mild since December 9th, averaging 15 to 20 degrees F above normal in most places around the state.

Certainly a woolly whipper type of wind was present across SW Minnesota on Thursday afternoon this week as northwesterly winds were gusting to 40-45 mph at Pipestone, Marshall, and Worthington.

Outlook:

Continued mild temperatures into the weekend with a chance for freezing rain or snow in the northeastern counties. Next chance for rain or snow on a broader scale comes Tuesday and Wednesday next week, though it looks like the system will track south of Minnesota, inflicting perhaps a glancing blow.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, December 22, 2006

#### HEADLINES:

- Record warmth on the 19th
- New seasonal climate outlook
- Climate effects of trees vary
- Skunks know how to stay warm
- Potential snowfall in January
- Almanac for December 22nd
- Notes on Christmas past
- Crawlies?
- Outlook

Topic: Record warmth on December 19th.....

Continuing the run of warmer than normal temperatures this month (13 consecutive days since the 8th) Tuesday the 19th brought some record high temperature values to the region. The following locations reported record highs.....

International Falls 38 F   Hibbing 42 F   Grand Forks 43 F  
Willmar 44 F (tied record)   Grand Rapids 44 F (tied record)

By Thursday, December 19th a winter storm was bringing a mixture of precipitation (freezing rain, drizzle, sleet, and snow) to the state, along with colder temperatures.

Topic: New Seasonal Climate Outlook

The NOAA Climate Prediction Center released the new seasonal climate outlook on Thursday this week. They considered the continuation of the current El Nino episode into early next spring and as a consequence forecasted above normal temperature conditions for Minnesota over the January through March period. The outlook for precipitation during the period suggests drier than normal condition in SE Minnesota, and equal chances for wetter or drier than normal conditions for the remainder of the state.

Topic: Trees have differing effects on climate

A new study from the Lawrence-Livermore Lab and Carnegie Institution finds that reforestation of tropical lands may help mitigate global climate change because the trees take up carbon, increase cloudiness, and help cool the planet. But, conversely, trees planted in mid to high latitude positions may decrease the albedo of the landscape significantly and actually amplify the warming that is occurring in those regions, offsetting their effects on carbon storage and water vapor release. "The darkening of the surface by new forest canopies in the high latitude Boreal regions allows absorption of more sunlight that helps to warm the surface....and could be counterproductive

from a climate perspective" says the article. These studies were based on current climate models tweaked by changing the landscape composition to differing amounts of forests within various latitude bands. (see Science Daily....www.sciencedaily.com or check on reports from the recent AGU meetings in San Francisco earlier this month)

Topic: Skunks prefer to brave winter together....

A recent study in Physical and Biochemical Zoology reveals that striped skunks of the northern climates get through winter in better shape when they huddle together. Biologists found that skunks living in communal dens huddle together to conserve body heat, often in groups composed of several females around one male. Skunks huddled in groups were found to minimize heat loss and conserve against loss of water and body fat, emerging in the spring in much better physical condition. The study termed this behavior as "social thermoregulation."

MPR listener question: My wife and I moved to the Twin Cities from Idaho eight years ago and we had anticipated being able to cross country ski each winter. Instead, we have had to travel north most winters to find enough snow base for skiing. What is the potential to get a large dose of snow next month, at least within driving distance of the Twin Cities?

Answer: For now, there is little meaningful guidance from the National Weather Service concerning snowfall for January. The deficit could continue, or we could turnout and see a very wet month. Please bear in mind that the historical potential for January snowfall is great. Some of the numbers may startle you....so don't lose hope...

Twin Cities 46.4" in 1982, Duluth 58.5" in 1969, Mora 32.1" in 1975  
Grand Rapids 40.0" in 1975, St Cloud 32.6" in 1965, Brainerd 33" in 1950

Twin Cities Almanac for December 22nd:

The average MSP high temperature for this date is 27 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 13 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for December 22nd:

MSP weather records for this date include: highest daily maximum temperature of 48 degrees F in 1931, in the Pioneer Era it is 54 F in 1890; lowest daily maximum temperature of -12 degree F in 1983; lowest daily minimum temperature of -20 F in 1983, in the Pioneer Era -23 F in 1865; highest daily minimum temperature of 34 F in 1931; record precipitation in the modern era of 0.52 inches in 1968; and record snowfall of 7.6 inches from the same storm in 1968.

Average dew point for December 22nd is 13 degrees F, with a maximum of 44 degrees F in 1941 and a minimum of -32 degrees F in 1983.

All-time state records for December 22nd:

The state record high temperature for this date is 62 degrees F at Two Harbors (Lake County) in 1899; the state record low temperature for this date is -44 degrees F at Baudette (Lake of the Woods County) in 1963; state record precipitation for this date is 1.30 inches at Glencoe (McLeod County) in 1920; and state record snowfall for this date is 16.0 inches at Artichoke Lake (Big Stone County) in 1968.`

From "Minnesota Weather Almanac" (available in bookstores):

Notes on past Christmas weather: Very cold Christmas periods occurred in 1822, 1831, 1872, 1879, 1884, 1903, 1914, 1933-1936 (four consecutive years), 1983, 1989, 1990, and 1996. Pioneer records from Ft Snelling and St Paul indicate minimum temperature readings of -30 degrees F or colder in 1822, 1855, 1872, and 1879, with a -39 F reading on Christmas morning in 1879 marking the all-time coldest Christmas in the Twin Cities area. Very cold wind chill conditions with readings from -40 to -60 degrees F occurred in 1903, 1933, 1934, and 1983.

State record cold for Christmas Eve dates to 1884 when St Vincent (Kittson County) reported -43 F. State record cold for Christmas Day dates to 1933 when Big Falls in Koochiching County reported -50 F. Conversely, Christmas in 1877, 1888, 1899, 1922, 1923, 1936 and 1994 several communities reported temperatures in the 50s F for the holiday. State record high for Christmas Eve is 57 F at Northfield in 1888, while the state record high for Christmas Day is 62 F at Faribault in 1923.

Snowiest Christmas Day? Albert Lea received 14 inches in 1945.

Words of the Week: Crawlies

Now that we are getting some snow, perhaps it is time to use some snow jargon. This term is used to describe blowing snow at ground level that snakes along in rope-like appendages across open fields. Snow of light density (powdery) may do this for days before it crusts over.

Outlook:

Partly to mostly cloudy over the weekend with a small chance for scattered snow showers and flurries Christmas Eve (Sun) and early Christmas Day. Temperatures will continue warmer than normal most places reaching the upper 20s to low 30s F during the day. Continued warmer than normal for much of the week between Christmas and New Years.

To: MPR's Morning Edition  
From: Mark Seeley, Univ. of Minnesota, Dept of Soil, Water, and Climate  
Subject: Minnesota WeatherTalk for Friday, December 29, 2006

#### HEADLINES:

- Preliminary Climate Summary for December
- Weather Headlines from 2006
- Be patient for snow
- Almanac for December 29th
- Historical snowy Decembers long ago....
- "shooting the balloon"
- Outlook

#### Topic: Preliminary Climate Summary for December 2006

December of 2006 continues a recent trend of winter warmth. Eight of the past eleven Decembers have been warmer than normal, one near normal, and only two colder than normal. Thus this month has helped show one of the strongest warming trends in Minnesota. Many locations reported average temperatures for December that ranged from 8 to 11 degrees F above average. Statewide it appears that this December will rank 6th warmest in the modern record (since 1895). Extreme values for the month ranged from 67 degrees F at Browns Valley (Traverse County) on the 9th to -18 degrees F at Fosston on the 7th, when wind chill values across western Minnesota ranged from -25 to -35 degrees F. Minnesota reported the lowest temperature in the nation (excluding Alaska) only twice during the month, unusual given the state's reputation.

The month was drier than normal for most locations, wrapping up a dry year for many Minnesota counties. Snowfall was scarce, with less than 2 inches reported in many southern locations. A few north central and northeastern locations like International Falls, Cook, and Littlefork reported 10 or more inches for the month, but they were clearly the exception. More snow was expected for New Years Eve, so perhaps these numbers will be increased.

Frost depths ranged from 8 to 12 inches in most soils. There was a general absence of strong winds during the month. Only the 14th brought winds of 40 mph or greater to some areas.

#### Topic: Weather Headlines from 2006

#### Local and Regional:

For the Twin Cities area January of 2006 was the warmest since 1846, and 2nd warmest all-time. Freeze-thaw cycles numbered 30 or more in many places and caused significant potholes and pavement damage for Mn/DOT to repair.

It was a snowy March for most of the state. For many it was the snowiest month of the year, including the Twin Cities which reported 20.4 inches, much of which came during the mid month high school basketball tournament sessions.



The warmest July statewide since 1936, amplified a rapid onset of drought in central and northern Minnesota counties. Many locations recorded their first 100 degree F maximum temperatures in over 10 years, but it was abnormally warm nights that made the month so hot. Many nighttime lows never fell below 75 F. In the end July 2006 was the 4th warmest all-time in the Twin Cities area, and 5th warmest statewide.

A severe hail storm brought widespread damage across southern Minnesota counties on August 24th. Both New Prague and Northfield reported baseball size hail and severe damage to motor vehicles, many of them on car sales lots.

A tornado that formed very rapidly struck Rogers (north Hennepin County) on the evening of September 16th. Many homes were damaged and a child was killed. A total of only 21 tornadoes were reported in the state this year.

Drought left its mark on Minnesota during 2006 and much of the state remains in its grasp, as central and northern counties are still marked as Severe to Extreme Drought by the USDA and National Weather Service. Lake levels are very low, including Lake Superior, river flows are low, and stored soil moisture in many areas is the lowest since the drought of 1988 in some areas.

National and International:

January 2006 brought very heavy snowfalls to Japan, setting records and preventing travel in many areas. Extreme cold killed scores of homeless people in Russian and eastern Europe.

A remarkable February snow storm hit the northeastern U.S. crippling parts of New York and Connecticut. New York City's Central Park reported a record setting 26.9 inches of new snow, while Harford, CT reported 21.9 inches.

A dry March helped foster an outbreak of wildfires in the Panhandle of Texas and across Oklahoma where 11 people died and over 10,000 head of cattle perished. March 12th brought severe weather to the central states with 140 tornado reports from Oklahoma to Illinois.

Spring snowmelt floods caused significant damages in parts of Germany, Hungary, Bulgaria, Serbia, and Romania during April. The Danube River reached its highest flood stage in 111 years.

Tropical Storm Alberto crossed the Florida Panhandle in mid June and brought flooding rains there as well as parts of Georgia, North Carolina, and South Carolina, but the rest of the Atlantic Hurricane Season was relatively quiet. June was near record setting cold for Australia, where Queensland, New South Wales, and Victoria were plagued by drought all year, some of the worst in over a century.

While Minnesota baked in July, so did California, where a heat wave caused 140 deaths. Similarly July heat waves occurred in England, Spain, France, Italy, and the Netherlands.

August brought short-lived heat waves to New York City and parts of Japan, along with monsoon flooding to India and Pakistan.

November brought widespread flooding to the state of Washington, especially for areas around the Olympic National Park which received over 25 inches of rainfall in just four days. A rare deadly tornado struck Hokkaido, Japan. Typhoon Durian devastated parts of the Phillippines, killing hundreds of people with winds of 145 mph, massive flooding and mudslides. It was the 4th of five typhoons to hit the Phillippines in 2006.

On December 7th a rare tornado struck London, England, damaging some homes and injuring six people (the U.K. has about 33 tornadoes each year). Then on December 20th and 29th much of Colorado was paralyzed by two separate blizzards and heavy snow storms with several feet of snow falling in the mountains, much to the delight of ski resort operators.

MPR listener question: Do you think we are going to see any decent snowfalls this winter? We can't wait to use our cross country skis, but don't have time to travel north for weekend skiing.

Answer: The NWS models are beginning to show signs that we may have more frequent chances for snowfalls during the second half of January as the projected storm track may favor exposure to eastern Minnesota. Please be patient.

Twin Cities Almanac for December 29th:

The average MSP high temperature for this date is 24 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 9 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for December 29th:

MSP weather records for this date include: highest daily maximum temperature of 53 degrees F in 1999; lowest daily maximum temperature of -4 degree F in 1909; lowest daily minimum temperature of -24 F in 1917; highest daily minimum temperature of 33 F in 1965; record precipitation of 0.80 inches in 1972; and record snowfall of 3.7 inches from the same storm in 1972. Snow depth was 20 inches on this date back in 1968.

Average dew point for December 29th is 7 degrees F, with a maximum of 40 degrees F in 1936 and a minimum of -24 degrees F in 1976.

All-time state records for December 29th:

The state record high temperature for this date is 61 degrees F at Montevideo (Chippewa County) in 1999; the state record low temperature for this date is -47 degrees F at Itasca State Park (Hubbard County) in 1917; state record precipitation for this date is 1.55 inches at Farmington (Dakota County) in 1982; and state record snowfall for this date is 16.0 inches also at Farmington (Dakota County) in 1982.

From "Minnesota Weather Almanac" (available in bookstores):

Decembers of 1830, 1849, and 1856 are noted for snow in the Pioneer records from Ft Snelling and St Paul. Though precise snow depth measurements are missing from 1830, snowfall was recorded on 15 days during December of that year, leading to snow depths that undoubtedly made any travel quite difficult. Heavy December snowfalls occurred in both 1849 and 1856, producing monthly totals of 30 inches and good sleighing conditions. These remained the snowiest Decembers in the Twin Cities climate records until December of 1969 which brought 33.2 inches of snowfall.

Phrases of the Week: "shoot the balloon" or "take a run"

These are old National Weather Service phrases used to describe the taking of a balloon observation or launching a radiosonde. Twice daily instrumented balloons are launched from selected National Weather Service Offices. Observers used to be given orders to "shoot the balloon" or "take a run", a task that is still given high priority and done according to very strict standards. Such data are essential for running the forecast models used by the NWS.

Outlook:

A mostly cloudy, unsettled weekend coming up with chances for mixed precipitation, including freezing rain. Temperatures will continue on the mild side, but travel in places may be impaired by the nature of the precipitation. Snowfall is more likely late on New Years Even and during New Years Day. The balance of next week looks to be mostly dry.