

Minnesota WeatherTalk for Friday, January 2, 2009

HAPPY NEW YEAR

To: MPR's Morning Edition

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

Subject: Minnesota WeatherTalk for Friday, January 2, 2009

Headlines:

- Jet Streaming podcast this week
- December climate summary
- Special Edition...the weather of 2008 national and international review...
- Almanac for January 2nd
- Past weather features
- Outlook

Topic: Jet Streaming Podcast this week.....

In a special year-ending segment this week Mark and Paul Huttner discuss the weather headlines of 2008, continued evidence for our societal vulnerability to weather extremes, and signs of climate change. Perhaps you have some weather memories from 2008 you would like to share. If so, email us.....

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Climate Summary for December of 2008

It was the 14th coldest December statewide since 1895. Most observers reported mean monthly temperatures that were 5 to 10 degrees F colder than normal, the coldest since December of 2000. Extremes were 48 degrees F at Redwood Falls on the 3rd and Winona on the 28th, and -35 degrees F at Babbitt and Brimson on the 17th. Minnesota reported the coldest temperature in the 48 contiguous states 12 times during the month.

It was a wet December as well, the 8th wettest historically on a statewide basis. Most observers reported above normal precipitation, including Marshall and Aitkin where observers reported over 3 inches. It was very snowy as well. At International Falls snow was observed on 28 of 31 days. Many observers reported over 30 inches for the month. A sample of December snowfall totals includes....

Two Harbors 51.4" a new record
Red Lake Falls 31.8" a new record
Crookston 30.0" a new record
Breckenridge 33.7" a new record
Ottertail 33.0" a new record
Long Prairie 31.1" a new record
Aitkin 30.0" a new record
Fairmont 31.1" a new record
Grand Meadow 34.6" a new record
Preston 32.7" a new record
La Crosse, WI 32.7" a new record
International Falls 35.9" 2nd all-time
Rochester 28.6" 3rd all time
Fargo, ND 33.5" a new record
Bismarck, ND 33.3" a new record
Williston, ND 32.0" a new record
Grand Forks, ND 30.1" a new record

In the Red River Valley region which recorded one of the wettest falls in memory, the abundant December snowfall raises a red flag about the possibility of spring snowmelt flooding in 2009.

New Year's Day started snowy for some as International Falls reported 4 inches of new snow, Grand Marais 7 inches, Isabella 4.5 inches, and Kabetogama 4 inches.

Topic: Significant Weather Events and Episodes of 2008- National and International

Last week I reviewed the weather headlines of 2008 for Minnesota....this week I consider the broader national and international context....

January 7, 2008 brought an unusual winter outbreak of tornadoes, 75 in all. These occurred across Arkansas, Missouri, Illinois, and Wisconsin. The tornadoes in Wisconsin were the first in the month of January since 1967. January 11, 2008 brought the first ever measured snowfall to Bagdad, Iraq.

February 5, 2008 saw the media attention directed at Super Tuesday for all the political primaries underway that day. But a massive frontal system brought 131 tornado reports across the states of Arkansas, Alabama, Kentucky, Tennessee, and Mississippi. These tornadoes caused 57 deaths, the highest single day death toll in years attributed to tornadoes. On February 17th Cyclone Ivan struck Madagascar with winds of 132 mph and intense rainfall. It was the largest cyclone to ever hit that nation.

March 1-17, 2008 brought a persistent and intense heat wave to South Australia. Adelaide reported 15 consecutive days of 95 degrees F or higher, the longest streak of heat ever recorded there. In the USA, March 17-19 brought heavy rains to Texas, Missouri, and Arkansas where many rivers surpassed flood stage. For some of the rivers in Arkansas flood crests were the highest measured in 90 years.

Speaking of flooding, April brought spring snowmelt flooding to Ontario and Quebec in Canada. It was some of the worst in years. In addition the St Johns River in Maine reached the highest flood stage ever reported at Fort Kent. Just under an inch of snow in April pushed the seasonal snowfall total at Madison, WI to a record 101 inches.

May 2, 2008 produced the deadliest weather related disaster of the year. Cyclone Nargis, which developed in the Bay of Bengal and intensified in just a few days traveled along the Burmese coast and made landfall in Myanmar with 132 mph winds and a 12 foot storm surge. It killed an estimated 78,000 people and completely altered the coastal landscape. Clearly it was the worst cyclone to ever strike that country.

June of 2008 brought more than 800 severe wildfires to California. These fires burned over 272,000 acres, along with a number of homes. In the Midwest, June 1-15 was one of the wettest periods ever. In Iowa, 83 of 99 counties were declared flood disasters. Nine rivers in that state set new flood crest records, including the Cedar River that runs through Cedar Falls. Losses were in the billions of dollars. Elsewhere, thanks to Typhoon Fengshen, Hong Kong reported its wettest June in history with 53 inches of rain.

July, 2008 was not kind to the nation of Taiwan. On the 17th Typhoon Kalmaegi struck with winds of 104 mph and up to 43 inches of rainfall. Over \$16 million in estimated damages occurred. Then on the 28th, Typhoon Fung-Wong struck with another 33 inches of rainfall and damages to the electric utility grid and widespread agricultural losses.

From August 18-23 Tropical Storm Fay hit the Florida coast 4 different times, the first storm to ever do so. It caused over \$12 million in damages across the state. On a positive note, it brought some much needed rainfall to the drought-stricken SE states.

Later that month over the 26th to the 30th Hurricane Gustav wreaked damage across Haiti, Dominican Republic, Jamaica, and Cuba with heavy rains that triggered flooding and landslides. By the time it hit Cuba, wind gust were over 200 mph. It was said to be the worst hurricane to hit Cuba in 50 years.

September, 2008 was the driest on record for Melbourne, Australia, where just 0.47 inches of rainfall was reported. After devastating Cuba, Hurricane Gustav made landfall in Louisiana on September 1st with winds up to 115 mph. Nearly 2 million residents had been evacuated from the coastal region there. Over 50 tornadoes were attributed to Gustav. Hurricane Ike struck Cuba on September 7th, causing 7 fatalities and adding to the billions of dollars in damages inflicted earlier by Gustav. Later on the 13th Ike made landfall in the USA at Galveston, TX with winds up to 109 mph. The storm system known as Ike hung together and brought flooding rains, tornadoes and wind damage to several states including Arkansas, Missouri, Illinois, and Indiana. In all, 40 fatalities were blamed on this storm and over \$20 billion in losses. Remnants of Ike even brought high winds and storm surge to Iceland later in the month.

October brought unusually heavy rains to Vietnam, some in the form of tropical storms. Nearly 600,000 acres of crops were destroyed and 54 people died as a result of storms and associated flash flooding. Daily rainfall approached 18 inches with some of these storms and Hanoi reported the wettest month since 1984.

Heavy rains continued in Vietnam during November, 2008. There was more flooding which submerged over 100,000 homes and killed 80 people. Heavy rain on November 22-24 brought flooding to southern Brazil, closing roads and submerging homes. The floods and lethal mudslides caused over 100 deaths and ruptured a natural gas pipeline. Many people were without power and fresh water for a period of time. Hurricane Paloma, the 2nd strongest November hurricane, struck Cuba on the 8th.

With 50 tornado reports in December, the NOAA Storm Prediction Center totals for 2008 show over 1600 tornadoes across the USA, the 2nd highest annual total in history (trailing the 1817 in 2004). In early December, 2008 parts of Russia reported record setting heat. Moscow reported a high temperature of 49 degrees F on the 6th the highest reading ever on that date. Strong tidal surge combined with heavy rainfall brought flooding to Venice, Italy twice during December.

Almanac for January 2nd:

The average MSP high temperature for this date is 22 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 5 degrees F (plus or minus 12 degrees F standard deviation).

MSP local Records for January 2nd:

MSP weather records for this date include: highest daily maximum temperature of 45 degrees F in 1897 and 1998; lowest daily maximum temperature of -7 degrees F in 1912; lowest daily minimum temperature of -36 degrees F in 1885; highest daily minimum temperature of 32 F in 2006. Record precipitation for this date is 0.46 inches in 1999. Record snowfall is 6.1 inches in 1999, and a record snow depth of 19 inches in 1969 and 1970.

Average dew point for January 2nd is 8 degrees F, with a maximum of 38 degrees F in 1998 and a minimum of -31 degrees F in 1979.

All-time state records for January 2nd:

The all-time state record high temperature for this date is 53 degrees F at Austin (Mower County) in 1944. The all-time state record low temperature for this date is -50 degrees F at St Cloud (Sherburne County) in 1885 and at Pokegama Dam (Itasca County) in 1904. The all-time state record precipitation for this date is 4.64 inches at Pigeon River (Cook County) in 1941. State record snowfall for this date is 17.0 inches also at Pigeon River (Cook County) in 1941.

Past Weather Features:

Probably the coldest January 2nd in Minnesota history occurred in 1885. St Vincent in Kittson County reported -46 degrees F, while Tower reported -48 degrees F, Northfield -41 degrees F, Fort Snelling -43 degrees F, St Paul -36 degrees F, Minneapolis -38 degrees F, and St Cloud -50 degrees F. Most locations reported between 1 and 2 feet of snow on the ground as well. Interestingly enough, by the 5th many observers were reporting daytime highs in the 40s F.

New Year's Day of 1912 brought a morning low of -13 degrees F to the Twin Cities. The temperature did not rise above 0 degrees F until 1:00 pm on January 8th, the longest consecutive string of below 0 temperature readings in the Twin Cities area. During that stretch the temperature was colder than -20 degrees F for 43 hours. After rising above 0 F for a brief time on January 8th, the temperature fell below zero for four more days, not making 0 F again until 9:00 am on the 13th. It marked a brutal winter in Minnesota.

Outlook:

Snow across the central and northern counties on Saturday and into early Sunday morning, chance of mixed precipitation in the south. Winds will continue to blow

snow around on Sunday. Then much colder. Increasing clouds on Tuesday with a chance for snow later in the day and on Wednesday.

Minnesota WeatherTalk Newsletter for Friday, January 9, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, January 9, 2009

Headlines:

- Jet Streaming Podcast
- Record setting pace of snow at International Falls, MN
- Seasonal snowfall totals mounting up as January starts
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for January 9th
- Past weather features
- Words of the week
- Outlook

Topic: Jet Streaming Podcast this week.....

This week we talk again with Doug Biesecker from the NOAA Space Weather Center in Colorado. Doug talks about why 2008 was such an inactive year for sunspots and what might be the implications for this. He also shares his thoughts about the international cooperation to study space weather. We also talk to David Waskow from Oxfam American. He attended the recent United Nations conference on climate change at Poznan, Poland. David shares his thoughts on what planning and actions we might expect from the Obama Administration on this issue. Paul, Craig and Mark also share another web site of the week.

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Topic: International Falls on record setting snow season pace...

Not unexpectedly the new year has started out rather snowy for many, continuing the trend of December. An Alberta Clipper low pressure system brought some significant

snowfall across northern Minnesota over the first weekend of the year (Jan 3-4). Finland, MN reported 11 inches of new snow, Little Marais 10 inches, Littlefork and Isabella 9 inches, and Two Harbors 7.7 inches. On January 4th International Falls reported a record 8.4 inches of new snow and also a new daily precipitation record of 0.45 inches. Warroad, Wolf Ridge, and International Falls all picked up 15 inches or more of new snow during the first full week of the year. Speaking of International Falls, they are one of several locations in the state that are on a pace to set a record for most days of observed snowfall, as well as most snowfall for a season. The table below compares the number of days by month when at least a trace of snow was reported at International Falls, comparing this season to their all-time snowiest season of 1995-1996 when they totaled 116 inches. The table below just shows the statistics for September 1 through January 7th over the two seasons.

Current snow season (2008-2009)			Snow season (1995-1996)		
Month	Days with snow	Total (in.)	Month	Days with snow	Total (in.)
Sep	0	0	Sep	2	Trace
Oct	3	0.3	Oct	8	4.7
Nov	21	10.9	Nov	25	16.5
Dec	29	35.9	Dec	28	21.4
Jan 1-7	7	15.8	Jan 1-7	4	0.9
SUM	60 days	62.9 in.		67 days	43.5 in.

We'll see if this record-setting pace is sustained throughout the rest of January, February and March. Additional snow fell overnight on January 8-9, but mostly across southern Minnesota counties where some observers reported up to 4 inches.

Topic: Significant snowfalls reported elsewhere....

The first full week of January added to significant seasonal snowfall totals being reported from weather observers around the state. The seasonal total snowfall now stands at 50.8 inches at Babbitt, 64.3 inches at Two Harbors, 58.1 inches at Wolf Ridge Environmental Learning City (near Finland), 47.4 inches at Duluth, 43.2 inches at Breckenridge, 41 inches at Preston. Over at Marquette, MI where lake effect snows have been frequent this winter, they stand at 126.1 inches of snowfall so far. Further the outlook for mid January continues to favor significant snowfall, especially lake effect snows along the Superior shoreline over the 12th and 13th.

The first nine days of January also saw Minnesota report the nation's coldest temperature on 5 different days (excluding Alaska where it was colder than -50 F). Embarrass reported the season's lowest statewide temperature on January 5th with a reading of -36 degrees F, and Orr reported a reading of -30 degrees F on the 9th.

Topic: Weekly Weather/Climate Related Potpourri:

A 64-year old northern Minnesota woman has survived nearly freezing to death. It was reported this week that Janice Goodger suffered a fall near her car on December 27th and could not help herself to shelter. So she lay in the cold for hours before her daughter discovered her and got medical treatment. In the meantime her heart stopped beating and her body temperature fell to just 60 degrees F. Duluth paramedics and fire department crews got her to St Luke's Hospital emergency room in Duluth where they were able to successfully warm her up and restart her heart. She went home days later and is doing fine.

Heavy December rains that saturated area soils combined with melting snow earlier this month to bring flooding to portions of Oregon and Washington. Some mountain roads were closed due to avalanches, while the main highway between Seattle and Portland was closed for a time due to flooding. The flood waters in western Washington state caused the evacuation of tens of thousands of residents from their homes. Thankfully the weekend was supposed to bring drier conditions.

Southern Australia remained in the grip of a summer heat wave this week. In some areas daytime temperatures have been at 104 degrees F or higher for 11 consecutive days. Some readings as high as 108 degrees F were reported. Numerous weather related wildfires have been reported as well.

MPR listener question: Can you settle an argument between my wife and I? For years I have thought the coldest week of the year on average is the 4th week of January. But she insists it is earlier than that. Is there a definitive answer?

Answer: It depends both on where you look in the state, as well as what time period you evaluate. For some locations the week of the 7th through the 13th of January is the coldest. For others it is as late as the week of the 25th to the 31st. It also depends on what time period you examine. In the modern context since 1972, most observers report that the coldest week of the year falls between the 7th and the 13th. This year, it looks like the coldest week may be next week, the 11th to the 17th.

Almanac for January 9th:

The average MSP high temperature for this date is 22 degrees F (plus or minus 14 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 9th:

MSP weather records for this date include: highest daily maximum temperature of 49 degrees F in 2002; lowest daily maximum temperature of -14 degrees F in 1886;

lowest daily minimum temperature of -32 degrees F in 1977: highest daily minimum temperature of 34 F in 2002. Record precipitation for this date is 0.31 inches in 1924. Record snowfall is 3.8 inches also in 1924 and a record snow depth of 19 inches in 1969.

Average dew point for January 9th is 3 degrees F, with a maximum of 42 degrees F in 1939 and a minimum of -40 degrees F in 1977.

All-time state records for January 9th:

The all-time state record high temperature for this date is 60 degrees F at Amboy (Blue Earth County) in 2002. The all-time state record low temperature for this date is -49 degrees F at Warroad (Roseau County) in 1930. The all-time state record precipitation for this date is 1.70 inches at Beaver Bay (Lake County) in 1873. State record snowfall for this date is 17.0 inches also at Beaver Bay (Lake County) in 1873.

Past Weather Features:

Saturday and Sunday, January 9-10, 1982 brought perhaps the coldest windchill readings ever reported in Minnesota. Many western locations reported temperatures of -25 to -30 degrees F with winds of 40 mph or greater. This indicates a WC of -70 F or colder, conditions that will freeze exposed skin in less than 5 minutes. In both Norman County and Mower County stranded motorists who could not get help froze to death overnight.

January 8-9 of 2002 and 2003 were astonishingly warm, with temperatures that were 30 to 35 degrees F warmer than normal. In 2002 over two dozen communities reported daytime highs that were over 50 degrees F, while the next year on January 9, 2003 over 60 communities reported daytime highs above 50 degrees F. Locations as far north as Blackduck were over 50 degrees F, and it was reported by the media that some golf courses opened so people could claim they were playing golf in Minnesota during January!

Words of the Week: Katabatic and Anabatic Winds

Katabatic winds (taken from the Greek word katabatikos, meaning to go down) are sometimes called gravity winds, drainage winds, mountain winds, or glacier winds. They result when air flows downward from higher positions in the landscape. The air may be channeled through canyons as it flows to lower elevations. This will tend to accelerate the air flow and produce strong winds. Some regional winds such as the foehn (German and Austrian Alps), Chinook (Rocky Mountains) and Santa Ana (Southern California) are dry, warm katabatic winds. On the other hand, glacier winds

which flow downslope as well, are very cold winds, some of which produce the world's worst windchill conditions. An example would be the Cape Denison-Commonwealth Bay region of Antarctica, where winds flowing downward from the interior of the continent to the coast may reach 100 to 200 mph, producing windchill conditions well below -100 degrees F.

Anabatic winds (taken from the Greek word anabatikos, meaning to mount) are ascending or upslope winds, often the result of heating along valley slopes. These winds are prevalent in many landscapes with pronounced topography, especially during the daylight hours. Balloonists and pilots of gliders and sailplanes often use these winds to maintain or gain altitude. There is even a type of sailplane called an Anabat.

Outlook:

Near seasonal average temperatures this weekend with a chance for light snow in the north later on Saturday and across the state on Sunday into Monday. Windier on Monday with increasing chances for snow going into Tuesday, then temperatures will drop and remain very cold much of next week with daytime highs remaining below zero F by mid-week.

Minnesota WeatherTalk Newsletter for Friday, January 16, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, January 16, 2009

Headlines:

- Jet Streaming Podcast
- January coldest since 1996
- Seasonal outlooks released
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for January 16th
- Past weather features
- Three-dog night
- Outlook

Topic: Jet Streaming Podcast this week.....

This week we talk to a special guest, 64-year old Janice Goodger from Duluth, MN. She had an accident on December 27th that endangered her life. She slipped in the snow and could not get back up. So she covered up as best she could and remained prone in the snow for several hours with windchill conditions in the teens and twenties F. She was found by her daughter about 9:00 pm and taken to St Luke's Hospital in Duluth with a body temperature of just 60 degrees F. Physicians warmed her up and shocked her heart back to life. She has been fine since then, having literally survived a freezing experience. We also speak with Dr. Aaron Burnett from Regions Hospital in St Paul about the health dangers posed by winter weather and some precautions we can all take. Paul, Craig and Mark also share another web site of the week concerned with winter health (www.healthtalk.umn.edu/topics/frostbite/home.html)

To listen to the entire Jet Streaming podcast online, please go to...

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Topic: Cold, snowy January

Minnesota continues colder than normal this month, following the trend established in December. Most observers are reporting temperatures for the month that are averaging 5 to 10 degrees F colder than normal, making this the coldest January since 1996. Minnesota has reported the coldest temperature in the 48 contiguous states 9 times so far this month, with many days of -40 F or colder.

Some low temperature records were set this week at many places. New record lows for January 13th were: -44 degrees F at Embarrass; -42 F at International Falls, Bigfork, and Babbitt; -39 degrees F at Floodwood; -38 degrees F at Grand Forks, ND, and Cook, MN, Littlefork, MN, and Warroad, MN; -36 degrees F at Waskish, and Crane Lake; -33 degrees F at Aitkin; -31 degrees F at Alexandria; and -30 degrees F at Brainerd. Yet more records were set on January 14th with a reading of -48 degrees F at Babbitt, -47 degrees F at Embarrass, -42 degrees F at International Falls (tied record), -36 degrees F at Flag Island, and -32 degrees F at Long Prairie. Winds produced dangerous windchill conditions ranging between -30 and -50 degrees F.

On Thursday morning, January 15th Bismarck, ND set a new record low with -44 degrees F, Aberdeen, SD set a record low of -42 degrees F, and Spencer, IA tied their low temperature record with -27 degrees F. Babbitt narrowly missed a record low with a reading of -40 degrees F. Elsewhere across Minnesota near record setting minimum temperatures were recorded at many locations, with values commonly from -20 to -38 degrees F. Windchill conditions ranged from -40 to -55 degrees F and many school districts started school late.

Friday morning brought the 4th consecutive day of -40 F readings to parts of northern Minnesota. Cotton reported a new record low of -41 degrees F, while Bigfork also reported a record low of -40 degrees F. International Falls reported a low of -40 degrees F as well, and St Cloud reported a new record low for January 16th with a reading of -34 degrees F. Spencer, IA set a new record low of -28 degrees F. Thankfully Friday was to bring the last day of arctic temperatures as a warming trend is expected over the weekend and into next week.

Snow continues to accumulate for the season. Many observers have already reported over 10 inches of new snowfall this month, including Fairmont with 10 inches Redwood Falls with 11.5 inches, Milan and Willmar with 12 inches, Kabetogam with 13.1 inches, Littlefork with 13.5 inches, Warroad with 13.6 inches, and International Falls with 16.4 inches. International Falls has now reported a total of nearly 65 inches of snow for the season, with an observation of snowfall on 64 of the last 70 days.

Topic: New climate outlooks

This week, both the NOAA Climate Prediction Center and the International Research Institute for Climate and Society released seasonal outlooks for February through April. For Minnesota average seasonal temperatures have a equal chance of being below or above normal for the balance of winter. Similarly expected precipitation shows equal chances of being above or below normal values.

Topic: Weekly Weather/Climate Related Potpourri:

The National Weather Service Forecast Office in the Baltimore/Washington D.C. area has put together an excellent retrospective on Presidential Inaugural Weather, including photos of historic events. To view this go to their web site....

http://www.erh.noaa.gov/lwx/Historic_Events/Inauguration/Inauguration.html

The Weather Channel announced last week a partnership with Monsanto to deliver better agricultural weather information to American farmers via their web site. The web address is www.weather.com/farming

This site will include forecast information on rainfall, soil moisture, wind, temperature and UV index, along with severe weather alerts. It will be updated several times each day and compete with the University of Kentucky Agricultural Weather web site for USA customers (<http://www.agwx.ca.uky.edu/ukawc.shtml>).

Minister of the Environment in Canada, Jim Prentice is hosting a Polar Bear Roundtable meeting in Winnipeg this week to discuss the health and sustainability of polar bear populations in the context of changing climate and landscape in northern Canada. This is similar in concept to the Minnesota-DNR conference held last month in Duluth to discuss the health and future of moose herds in the state.

Queensland Australia was struck this week by the remnants of Tropical Storm Charlotte. The high winds, heavy rains and tidal surge caused some flooding and wind damages there. Some areas received rainfall of 12 to 16 inches from the storm system, and overall damage estimates exceed \$25 million.

MPR listener question: On Tuesday, January 13, in the morning some of us were lucky enough to be have a good view of the sunrise from the 15th floor of Moos Tower on the University of Minnesota Twin Cities campus. There appeared to be "two suns" rising in the east. What is this called?

Answer: A variety of optical features in winter occur because of the presence of ice crystal in the air and their ability to refract the sunlight. Many of these are called parhelia, sun dogs, mock suns, or halos. These false images of the sun are projected by the ice crystals, often at a 22 degree angle left and right of the sun, but sometimes

they appear in other ways, such as in arcs, or directly above the sun, and in different colors. The Cloud Appreciation Society web site has some interesting pictures of parhelia. I have listed a few below.

<http://cloudappreciationsociety.org/gallery/index.php?showimage=3659>

<http://cloudappreciationsociety.org/gallery/index.php?showimage=2557>

<http://cloudappreciationsociety.org/gallery/index.php?showimage=3751>

<http://cloudappreciationsociety.org/gallery/index.php?showimage=3487>

<http://cloudappreciationsociety.org/gallery/index.php?showimage=1911>

Almanac for January 16th:

The average MSP high temperature for this date is 21 degrees F (plus or minus 14 degrees F standard deviation), while the average low is 4 degrees F (plus or minus 15 degrees F standard deviation).

MSP local Records for January 16th:

MSP weather records for this date include: highest daily maximum temperature of 46 degrees F in 1961; lowest daily maximum temperature of -16 degrees F in 1982; lowest daily minimum temperature of -29 degrees F in 1888; highest daily minimum temperature of 34 F in 1894. Record precipitation for this date is 1.05 inches in 1887. Record snowfall is 8.4 inches in 1994 and a record snow depth of 18 inches in 1984.

Average dew point for January 16th is 2 degrees F, with a maximum of 37 degrees F in 1913 and a minimum of -38 degrees F in 1977.

All-time state records for January 16th:

The all-time state record high temperature for this date is 54 degrees F at New Ulm (Brown County) in 1974 and at Worthington (Nobles County) in 1990. The all-time state record low temperature for this date is -47 degrees F at Thorhult (Beltrami County) in 1977. The all-time state record precipitation for this date is 1.65 inches at Beaver Bay (Lake County) in 1870. State record snowfall for this date is 16.0 inches also at Beaver Bay (Lake County) in 1870.

Past Weather Features:

As cold as this month has been so far (averaging just 7 or 8 degrees F in the Twin Cities area through the first 16 days of the month), there have been four historical months of January when the mean monthly temperature was below zero: 1857, 1875, 1888, and 1912. In 1857 and 1875 all but three nights in January fell below zero

degrees F. In 1888 all but five nights fell below zero, while in 1912, all but 9 nights fell below zero F. So far January of 2009 has brought seven nights below zero degrees F through the first 16 days.

January 16-17, 1870 brought a blizzard to eastern sections of the state. Beaver Bay was socked with 16 inches of snowfall and huge waves on Lake Superior's shoreline. West of Minneapolis in McLeod County 12 inches of snow was reported, while east of St Paul in Afton 10.5 inches of snow fell. Strong winds piled the snow into huge drifts and travel was not possible for a number of days.

Words of the Week: Three-Dog Night

Pete Boulay of the Minnesota State Climatology Office provided this information, and I thought it appropriate for this time of year.

Most of the current generation would associate this name with the popular rock band, originally composed of lead singers Danny Hutton, Chuck Negron, and Cory Wells. They were extremely popular in the 1970s and still play concerts even today. But the root of their name is a weather association used in both Native Australian culture and Eskimo culture. When the nights are extremely cold and you need the company of your dogs to sleep warm enough, it is said to be a three-dog night. We have certainly been having a number of three-dog nights this winter in Minnesota.

Outlook:

Warming trend begins on Saturday with daytime temperatures climbing into the 20s F. There may be some snow in northern counties as well. Generally dry and warming through Wednesday of next week, then a downturn in temperature.

Minnesota WeatherTalk Newsletter for Friday, January 23, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, January 23, 2009

Headlines:

- Jet Streaming Podcast
- January cold continues, some thaws
- Snow shoveling
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for January 23rd
- Past weather features
- Barber
- Outlook

Topic: Jet Streaming Podcast this week.....

This week we talk with the EPA's new Chief Scientist, Dr. Pai-Yei Whung from Washington, D.C. She shares some thoughts on the science agenda for the new Obama Administration and talks about some collaborations on air and water quality work with Canada. Our second guest is Fred Haberman, chief organizer of the U.S. Pond Hockey Championships being played outdoors in Minneapolis this coming weekend. Fred says there will be over 1500 hockey players and thousands of spectators watching the outdoor games on Lake Nokomis. No ice condition worries this year as January has been frigid. Paul Huttner and I also share some listener feedback and an Environment Canada web site.

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Topic: Despite a short break, January cold continues....

Many Minnesota observers are reporting the coldest January since 1994. At least 8 Minnesota communities have seen temperatures of -40 degrees F or colder this month. Several western and southern Minnesota observers finally saw their first January thaw this week. Milan, Lakefield, Marshall, Redwood Falls, Worthington, New Ulm, St James, and Winnebago reported highs of 34 degrees F, while Mankato reached a high of 36 degrees F. However, a number of observers have not yet seen a January thaw, something that is rather rare across the state as even International Falls sees a January thaw about every other year. Based on two or more days with daytime highs greater than 32 degrees F the historical frequency of January thaws for various locations in Minnesota shows great reliability in most of southern Minnesota, and even parts of central Minnesota, but more like a 50/50 probability in the northern sections of the state.

Historical frequency of January thaws at various locations since 1948
(here defined as two or more days with daytime temperatures greater than 32 F)

Twin Cities 92 percent Rochester 95 percent Pipestone 92 percent
Fairmont 93 percent St Cloud 87 percent Morris 80 percent
Crookston 62 percent Duluth 60 percent International Falls 50 percent

It is interesting to note that the three consecutive years of 1977, 1978, and 1979 brought no January thaw to most of Minnesota. All three were dominated by abundant January snow cover and are ranked among the top 15 coldest in state history. The last year without a January thaw in most places was 1994.

Topic: A Brief History of Snow Shoveling

Bernard Mergen in his, "Snow in America" recounts the history of the snow shovel. As early as 1870, a patent was granted to William Wentworth of Seneca Falls, NY for a snow shovel with a riveted metal tip for scrapping. In 1889 a Lydia Fairweather (there's a good name) applied for a patent on a snow shovel that had both attachable scrapper and scooper. The snow scooper, sometimes called a yooper scooper, is a large bucket shaped shovel with sides. It is a common snow removal device in the Upper Peninsula of Michigan and in Maine, where 100 to 200 inches of snow occurs most winters.

The first plastic snow shovel patent was granted to a Robert Smith of New Jersey in 1939. These are by far the most popular sold today, many with metal tips for scrapping. Often times, shorter handle versions are carried in the trunks of cars for emergency use. In the past several decades, snow blowers and snow throwers have replaced the use of snow shovels for many areas of the country. As a result perhaps

the number of heart attacks has been reduced, but on the other hand there are still the occasional serious accidents with these snow removal machines.

Topic: Weekly Weather/Climate Related Potpourri:

A study conducted by researchers at UC-Berkeley and Harvard University and published in the magazine Nature this week shows that as global temperatures have risen over the past 100 years there has been a phase change in the occurrence of annual maximum temperatures over land. On average these maximum temperatures are occurring two days earlier. In addition the researchers report that in the non-tropical latitudes the difference between the annual minimum and maximum temperatures has been decreasing, primarily as a result of warmer winter temperatures. This note phase change in maximum temperature to earlier in the year conforms with much of the phenology observations of earlier flowering dates of plants and other observations of the natural world.

The January 19 edition of Eos, Transactions of the American Geophysical Union, reports results from a survey of earth scientists conducted by researchers from the University of Illinois-Chicago. Of 3,146 earth scientists who responded to the survey approximately 90 percent agreed that global mean temperatures have risen from the pre-1800s levels; secondly, 82 percent agreed that human activity has been a significant factor in the changing mean global temperature. Somewhat surprisingly only 64 percent of meteorologists agreed that human activity is a significant factor in this. Of course this group has a great appreciation for the day to day variations in weather and how difficult they are to predict.

On Wednesday of this week Cyclone Fanele hit the west coast of Madagascar with heavy rain and winds up to 130 mph, while earlier in the week Cyclone Eric skirted the east coast of the country with heavy rains and seas. The storms displaced a number of people and disrupted power. Many could not remember their country being affected by two cyclones simultaneously. It was a week of widespread storm activity in the Indian Ocean Basin.

Many parts of northern Florida recorded low temperatures in the twenties F this week. Vegetable and fruit growers were taking measures to protect against frost damage. Even as far south as Naples, FL reported a low of just 38 degrees F, West Palm Beach fell to 36 degrees F and Daytona Beach reported 29 degrees F on Wednesday morning. For some south Florida locations these were the coldest temperatures measured since the winter of 2003, and put many crops at risk from freezing injury.

MPR listener question: What's causing the fog we have seen more often this week? Is it the warm, moist air from the south?

Answer: Indeed, as the warm, moist air from the south passes over the colder air near the surface saturation occurs and a fog layer is formed. In addition, some melting of the snow cover has occurred this week (see note on January thaw above) and evaporation from the surface has contributed additional water vapor to the air. The end result is widespread fog formed from the airborne water vapor both carried on the winds and produced by surface evaporation.

Almanac for January 23rd:

The average MSP high temperature for this date is 22 degrees F (plus or minus 14 degrees F standard deviation), while the average low is 4 degrees F (plus or minus 14 degrees F standard deviation).

MSP local Records for January 16th:

MSP weather records for this date include: highest daily maximum temperature of 54 degrees F in 1942; lowest daily maximum temperature of -16 degrees F in 1936; lowest daily minimum temperature of -34 degrees F in 1886; highest daily minimum temperature of 35 F in 1909. Record precipitation for this date is 0.85 inches in 1871. Record snowfall is 5.7 inches in 1949 and a record snow depth of 38 inches in 1982.

Average dew point for January 23rd is 6 degrees F, with a maximum of 40 degrees F in 1909 and a minimum of -42 degrees F in 1963.

All-time state records for January 23rd:

The all-time state record high temperature for this date is 62 degrees F at Itasca State Park (Clearwater County) in 1942. The all-time state record low temperature for this date is -55 degrees F at Warroad (Roseau County) in 1936. The all-time state record precipitation for this date is 1.43 inches at Stillwater (Washington County) in 1982. State record snowfall for this date is 17.0 inches also at Stillwater (Washington County) in 1982.

Past Weather Features:

January 21-22, 1917 is remembered for a terrible blizzard across southern Minnesota counties that closed schools, roads, and railroads for days. The storm brought 16 to 24 inches of snowfall but was also accompanied by winds up to 40 mph that produced drifts up to 10 feet and zero visibility. Windchill values ranged between -25 to -35 degrees F. This storm came in the midst of one of the state's snowiest winters.

The week of January 19-25, 1982 was one of the snowiest in Minnesota history. The state was hit with back to back winter storms, the first coming over January 20-21, the second over the 22nd and 23rd. Many areas set daily snowfall records and accumulated 30 to 40 inches of snowfall that week. The Twin Cities measured 39.7 inches. For a time Interstates 90 and 35 had to be closed as strong winds produced blizzard conditions. The accumulated snow collapsed the roofs of several buildings; as one result, a tool for removing snow loads-the roof rake-gained in popularity.

Word of the Week: Barber

This term originates from weather forecasting on the Great Lakes and is still used by mariners at times today. Most of the time it refers to a severe storm on the Great Lakes or in the Gulf of St Lawrence which produces a lot of frozen spray or ice that sticks to the ships riggings. In its worst form it can be a blizzard in which the wind-borne ice particles almost cut the hair and the skin from a mariner's face. Nasty business.

Outlook:

Getting much colder over the weekend, with daytime highs only in the single digits many places, and overnight lows falling below zero F. Windchill conditions early in the weekend may range into the -20s F. Generally a dry week coming up. Temperatures will average colder than normal with another chance for snow by late Wednesday and Thursday, especially in northern counties.

Minnesota WeatherTalk Newsletter for Friday, January 30, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, January 30, 2009

Headlines:

- Jet Streaming Podcast
- Program in Agriculture and the Environment
- Preliminary climate summary for January
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for January 30th
- Past weather features
- Ice shove
- Outlook

Topic: Jet Streaming Podcast this week.....

This week we talk again with Dr. Susan Solomon of NOAA's Earth System Research Laboratory about a paper she co-authored and recently presented to the National Academy of Sciences. This paper is thought provoking in that it provides evidence for how much climate change we may already be committed to over the next 1000 years. Further, there is little we can do about it but adapt. An abstract of her paper can be found at....<http://www.pnas.org/content/early/2009/01/28/0812721106.abstract>

Paul Huttner and I also talk with Dr. Gannet Hallar from the Desert Research Institute's Storm Peak Observatory near Steamboat Springs, Colorado. She shares what it's like to live at 10,500 feet elevation and describes some of the atmospheric research conducted at the laboratory. You can find out more about this facility by going to http://stormpeak.dri.edu/SPL_home_page.html

Paul and I also share some listener feedback and describe what an ice shove is (see below)

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Program on "Agriculture and the Environment" starts in February....

Mark Seeley, a University of Minnesota Extension climatologist, will speak Monday, February 2, in Northfield in the opening event of a lecture series devoted to agriculture and the environment. He will speak on "The Case for Global Climate Change and Its Impact on Minnesota." The lecture series, the Agriculture and Environment Town Hall Forum, is sponsored by the University of Minnesota Extension, the Cannon River Watershed Partnership and the Rice County Soil and Water Conservation District. Several local farm organizations are also contributing financial support for the series.

Each event in the five-session forum will be a public lecture with questions and discussion to follow. Speakers will be encouraged to present scientific information about an issue, but not to advocate for a position or course of action.

All the lectures are free and open to the public, and all will begin at 7 p.m. in basement of the Community Resources Bank on Highway 3 on the south side of Northfield. Future topics to be discussed during the series are:

Impacts of agricultural drainage -- Feb. 16.

Hypoxia and fertilizer use -- March 2.

Pesticides and water quality -- March 16.

The food vs. fuel debate -- March 30.

Topic: Preliminary Climate Summary for January 2009

Following the trend set in December, January was significantly colder than normal as well. Most observers are reporting mean monthly temperatures that are from 4 to 8 degrees F colder than normal, making this the coldest January statewide since 1994. Extreme values were 41 degrees F at Redwood Falls on the 3rd and -48 degrees F at Babbitt on the 14th.

Precipitation was less than normal for the month at many locations around the state, especially across western and southern counties. However, some observers reported significant snowfall. These included nearly 21" at International Falls (where snow was reported on 23 days); near 23" at Wolf Ridge Environmental Learning Center near Finland along Lake Superior; over 17" at Babbitt and Cook; over 16" at Warroad, Littlefork, and Two Harbors; and 15" at Fairmont.

Many observers also reported wind gusts of 40 mph or greater, and 3 or more days with windchill readings of -25 degrees F or colder.

Minnesota reported the coldest temperature in the 48 contiguous states on 13 days in January, a very high frequency even for us. The state low was -48 degrees F at Babbitt on the 14th, but many locations reported minimum temperature values of -40 degrees F or colder during the month. By the end of the month, ice thickness on many lakes was a foot and a half or greater.

For many observers around the state, January brought no thawing temperatures, a fairly rare occurrence for most areas.

Topic: Weekly Weather/Climate Related Potpourri:

The AP reported this week that in addition to Doppler radars, some airports may start deploying bird detecting radars. These radars would assist air traffic controllers in preventing dangerous encounters with birds as aircraft are taking off or making a landing. Some of the busiest east coast airports will soon be experimenting with these radar systems.

A huge winter storm brought a swath of damaging winds, freezing rain, ice, sleet, and snow from Oklahoma, across the midwest, and into the northeastern states this week. Accumulations of ice and sleet caused power outages, many accidents, and structural damage to some buildings across Missouri, Illinois and Kentucky, among other states. It was one of the largest and most damaging winter storms since the early December 2006 ice storm that affected the Midwest. FEMA responded to a federal disaster declaration for the states of Arkansas and Kentucky this week due to the ice storm.

The roof on Rod Laver Arena was closed this week to prevent the players and spectators from suffering too much heat stress. Temperatures in Melbourne soared well above 100 degrees F. On Thursday (Jan 29) the high reached 111 degrees F, the highest temperature in Melbourne since 1939.

A paper in the current edition of the Journal Climate Change documents shifts in the climates of European countries since 1901. It especially notes the shifts that have occurred over the past two decades with an expansion of the climate types known as subtropical (both wet and dry summer types). You can find this paper at <http://www.springerlink.com/content/u5166x3010550378/fulltext.pdf>

MPR listener question: With news of the devastating winter storm affecting a region from Oklahoma-Missouri to the New England States sleet, freezing rain, and ice this week, I wondered when is the peak freezing rain/ice storm season for Minnesota?

Answer: Minnesota is the only state that has three distinct peak seasons for freezing rain or ice storms. In the northeast, along Lake Superior's shoreline, the peak occurrence historically is in the month of March. In the southeast counties along the Mississippi River Valley the peak ice storm season is January (compatible with most of the eastern USA). For the remainder of the state, the peak season for ice storms is the month of December. (according to a publication done for NOAA by Stan Changnon).

Almanac for January 30th:

The average MSP high temperature for this date is 21 degrees F (plus or minus 14 degrees F standard deviation), while the average low is 2 degrees F (plus or minus 14 degrees F standard deviation).

MSP local Records for January 30th:

MSP weather records for this date include: highest daily maximum temperature of 49 degrees F in 1879 and 1989; lowest daily maximum temperature of -19 degrees F in 1887; lowest daily minimum temperature of -30 degrees F in 1887; highest daily minimum temperature of 35 F in 1931. Record precipitation for this date is 0.49 inches in 1878. Record snowfall is 3.6 inches in 1947 and a record snow depth of 24 inches in 1969.

Average dew point for January 30th is 2 degrees F, with a maximum of 34 degrees F in 1923 and a minimum of -34 degrees F in 1951.

All-time state records for January 30th:

The all-time state record high temperature for this date is 56 degrees F at St Peter (Nicollet County) in 1989. The all-time state record low temperature for this date is -52 degrees F at Duluth, Leech Lake, and Pokegama Dam in 1899. The all-time state record precipitation for this date is 2.00 inches at Crane Lake (St Louis County) in 1927. State record snowfall for this date is 16.0 inches at Worthington (Nobles County) in 1947.

Past Weather Features:

One of the coldest weeks in Twin Cities history occurred from January 29, 1887 to February 4, 1887. About 20 inches of snow depth combined with an arctic high pressure system to bring persistent overnight temperatures of -20 degrees F or colder. The average minimum temperature for the week was -29 degrees F. Four nights brought -30 degrees F or colder. Surprisingly daytime temperatures rose above zero F

on three days that week, so that the average maximum temperature was -1 degrees F. When the temperatures were above zero F 1.4 inches of snowfall occurred. Residents of St Paul were not put off by temperatures that were 25 degrees F colder than normal as they began work on the 1887 Winter Carnival Ice Palace. In fact the weather was perfect for building ice block structures. Elsewhere, Rochester and Fort Snelling recorded temperatures of -42 degrees F while Moorhead reported -48 degrees F. January of 1887 ranks as the 6th coldest in Twin Cities climate history.

January 28-30, 1947 brought a heavy snow which at times turned into a blizzard across southern Minnesota, especially southwestern counties. Worthington reported a total of 24 inches of snow, while Fairmont recorded over 21 inches. The winds blew the snow into drifts as high as telephone poles and in Martin County a locomotive with a snowplow and flatcar attached were snowbound for a week.

Word of the Week: Ice Shove

The word shove taken from the old Middle English word "shouven" is most often used as a verb, meaning to push away or force away. In this context however it is a noun, referring to the slabs of ice pushed upon a shoreline as a result of thermal expansion of lake, sea, or river ice cover, or as a result of strong winds. These sometimes large flat slabs of ice, called pans, may pile up along the shore into odd shaped mounds and towers.

Ice shoves become more evident along the shorelines of larger lakes in Minnesota during late winter and early spring as the temperatures warm up and winds tend to increase in strength. Some good pictures of ice shoves are online at the U.S. Army Corps of Engineers web site:

<http://www.mvp-wc.usace.army.mil/ice/photos/index.html>

Outlook:

Moderating temperatures over the weekend with a chance for snow in the north, and perhaps some freeing rain. Chance of snow continues on Monday, then cooler and drier by the middle of next week. Warming temperatures and a chance for snow by the end of the week.

Minnesota WeatherTalk Newsletter for Friday, February 6, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, February 6, 2009

Headlines:

- Jet Streaming Podcast
- Cold start to February
- Snow continues at International Falls
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for February 6th
- Past weather features
- Two coats weather
- Outlook

Topic: Jet Streaming Podcast this week.....

Two guests this week: Volcanologist Richard Wunderman; and renowned climatologist David Phillips from Environment Canada.

Richard Wunderman from the Smithsonian shares his thoughts on recent volcanic activity, especially that of Volcano Redoubt in Alaska which affects air traffic patterns across the polar latitudes. He also highlights how volcanic eruptions can disrupt the amount of solar radiation reaching the Earth's surface. Climatologist David Phillips shares his thoughts on animal responses to climate and weather that are depicted in their behavioral changes. Many are valid. Craig Edwards and Paul Huttner also share another web site of the week (www.usgs.gov)

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Cold picking up where we left off....

Following the trend of both December and January, February has started out quite cold for most Minnesota weather observers. Temperatures for the first week of the month are averaging 3 to 7 degrees F colder than normal. Our state has reported the coldest temperatures in the 48 contiguous states for 3 of the first 6 days of the month: -27 F at Fosston on the 3rd, -36 F at Babbitt on the 4th, and -35 F at Embarrass on the 5th. Most observers have reported between 30 and 60 nights of below zero F temperature readings so far this winter.

Topic: Update on snow season at International Falls.....

Though most of the state has seen an absence of snow in recent weeks, it continues to appear along the Canadian border with a high frequency. At International Falls at least a trace of snow has been observed on 79 of the past 98 days (since November 1, 2008), totaling nearly 73 inches there. That number already exceeds average annual snowfall at International Falls and indicates they may approach their record seasonal snowfall total of 116 inches set in the winter of 1995-1996. Among other Minnesota observers this year, only Two Harbors and Wolf Ridge are reporting over 70 inches of snowfall so far.

Topic: Weekly Weather/Climate Related Potpourri:

Two snow storms disrupted travel and caused school closures in the United Kingdom this week. First on Sunday night and Monday morning 4 or more inches of snowfall in the London area shut down many transportation systems and closed airports. South London reported up to 11 inches of snow. Even the London Underground was closed for a period of time. Then on Thursday morning up to 8 inches of snowfall was reported from southwest England, southern Wales and the Midlands. London escaped this snow storm but did report moderate rainfall. Nevertheless the UK continues to experience its coldest winter since 1996-97

Tropical Cyclone Gael formed this week north of La Reunion Island in the Southern Indian Ocean. It has intensified and is moving toward Madagascar at 12 to 15 mph, producing wave heights of 20-25 feet. The Joint Typhoon Warning Center forecasts this storm to attain wind speeds greater than 150 mph before it reaches the island nation this weekend.

Parts of Siberia were recording their coldest week of the winter so far. Morning lows ranged from -58 to -67 degrees F and highs were in the negative teens F. Schools are slow to open or sometimes close when the temperature falls to -52 degrees F or colder. The cold temperatures from Siberia are a measure of the strength of the Siberian High Pressure system this time of year. It usually reaches its maximum pressure in February.

Speaking of cold, another hard freeze hit parts of Florida this week. Panhandle locations like Tallahassee reported minimum temperatures as cold as 14 degrees F, while Panama City right near the coast had 27 degrees F. Minimums in the mid 30s F were reported as far south as Naples. St Petersburg reported a record cold high temperature of just 50 degrees F on February 5th, while Jacksonville reported a record low of 23 degrees F on February 6th. Even in the Florida Keys daytime highs were only in the mid 50s F on Thursday this week.

MPR listener question: The way this month has started out, February could be our third consecutive colder than normal month. I have heard that it is very uncommon for Minnesota to record 3 consecutive winter months with colder than normal temperatures. Is this true?

Answer: Indeed it is unusual for this to happen. Over the past 120 winters in the Twin Cities area this has only happened 15 times, about 12 percent of the time. During the 1970s it happened in the consecutive winters of 1976-77, 1977-78, and 1978-79. The last winter that we experienced three consecutive months that were significantly colder than normal was 1982, when January, February and March averaged nearly 6 degrees F colder than normal. Interestingly enough the winters of 1903-04, 1916-17, 1919-20, 1961-62, and 1978-79 produced 4 consecutive months with significantly colder than normal temperatures. Those were obviously winters when our patience for spring was pushed to the limits!

Almanac for February 6th:

The average MSP high temperature for this date is 23 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 6 degrees F (plus or minus 14 degrees F standard deviation).

MSP local Records for February 6th:

MSP weather records for this date include: highest daily maximum temperature of 51 degrees F in 1925; lowest daily maximum temperature of -13 degrees F in 1936; lowest daily minimum temperature of -24 degrees F in 1875 and 1936; highest daily minimum temperature of 34 F in 1925. Record precipitation for this date is 0.62 inches in 1881. Record snowfall is 5.4 inches in 1946 and a record snow depth of 22 inches in 1967 and 1979.

Average dew point for February 6th is 5 degrees F, with a maximum of 38 degrees F in 1965 and a minimum of -32 degrees F in 1962.

All-time state records for February 6th:

The all-time state record high temperature for this date is 59 degrees F at Madison (Lac Qui Parle County) in 1963. The all-time state record low temperature for this date is -50 degrees F at Detroit Lakes (Becker County) in 1907. The all-time state record precipitation for this date is 1.78 inches at High Landing (Pennington County) in 1941. State record snowfall for this date is 16.0 inches at Beardsley (Big Stone County) in 1946.

Past Weather Features:

February 6-7, 1881 brought a heavy, wet snow and blizzard to parts of Minnesota. A foot or more of snow fell in many places, including the Twin Cities area. This was in the middle of the famous Laura Ingalls Wilder "Long Winter" which was every bit as she described it and one of the most severe of the 19th Century. St Paul reported snowfall on 8 consecutive days from January 28 to February 4, 1881, and the storm of February 6-7 added substantially to the already deep snow pack. Many observers reported 20-30 inches of snow that February, and by the end of the month snow depths were 2 to 3 feet.

February 6, 1936 is remembered for a terrible Cold Wave across the state. Over a dozen Minnesota communities reported air temperatures of -40 degrees F or colder. Roseau reported 5 consecutive mornings with -40 degrees F or colder. In the Twin Cities area windchill values of -40 degrees F and colder were reported. The cold would not go away as February of 1936 proved to be the coldest statewide in history.

Words of the Week: "Two Coats Weather"

This expression is used in the United Kingdom and can occasionally be heard in BBC broadcasts. It refers to the type of weather that is both cold and damp, so that you need both a raincoat and a warm coat to get by. Often times in February to April period around Minnesota we experience "two coats weather" as we need to stay warm and also shed the rainfall when we are outside.

Outlook:

Mixed cloudiness with warmer temperatures this weekend. A chance for snow in the north. By Sunday night some freezing rain and sleet may occur in southern and western counties. Temperatures will generally range through the 20s and 30s F with a good chance for mixed precipitation on Monday, including rain and freezing rain. Continuing chances for precipitation on Tuesday and Wednesday as well, with generally a wet week in the forecast as the weather pattern becomes more active during mid-month.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, February 13, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, February 13, 2009

Headlines:

- Jet Streaming Podcast
- A Big Melt
- Valentine's Day Weather
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for February 13th
- Past weather features
- Blowing a hoolie
- Outlook

Topic: Jet Streaming Podcast this week.....

Two guests this week: President and CEO of the National Audubon Society John Flicker joins us to talk about the Christmas bird count across North America and what it showed. He also shares some thoughts about climate change and effects on bird ranges, habitat, and migration patterns. These topics were the focus of a recent study by the Audubon Society scientists and more information can be found at:

<http://www.audubon.org/news/pressroom/bacc/index.html>

Our second guest this week is Mike Halpert, Deputy Director of the NOAA Climate Prediction Center (CPC). He describes the new El Nino Southern Oscillation (ENSO) long-lead watch and advisory service. Since so many unusual weather patterns are associated with this feature of the equatorial Pacific Ocean, this new service by the CPC will help officials from these vulnerable areas better prepare for the expected weather patterns. In addition, Craig Edwards, Paul Huttner and I discuss the recent weather headlines and share our thoughts on the Storm Prediction Center web site (www.spc.noaa.gov)

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: A Big Melt.....

From February 5th (last Thursday) to February 11 (this Wednesday) much of Minnesota saw 7 consecutive days of thawing, with daytime temperatures above 32 degrees F. In fact starting at 4:00 am on Monday morning (February 9th) and for 69 consecutive hours until 1:00 am on Thursday morning (February 12th) the MSP International Airport in the Twin Cities reported temperatures at or above 32 degrees F, the longest period of thawing temperatures since the first week of November last year.

Temperatures climbed into the 40s F at a number of locations around the state on both February 9 and 10. La Crosse, WI tied a record with 51 degrees F on the 10th, while Winona just missed tying a record that day with a high of 53 degrees F. Many other observers reported record warm minimum temperatures during the week as overnight lows remained above freezing (including Rochester, St Cloud, and the Twin Cities). Enhancing the rate of snow melt was a significant rainfall. On the 9th both Fargo (0.34 inches) and Grand Forks (0.43 inches) reported record rainfall amounts. Then on the 10th record rainfall occurred at Warroad (0.67 inches), International Falls (0.25 inches), and Duluth (0.71 inches).

The consequence of all the warmth was a significant loss of snow cover. Many areas of the state saw snow cover diminish by 6 to 8 inches. However with frozen ground, the melted snow tended to pool and formed ice which caused many accidents over the past week. Where the melt generated runoff, the ice on some watersheds started to break up and cause ice jams. Some were reported along the Red River, and some ice jams were causing flooding problems along the Zumbro River and Root Rivers in SE Minnesota.

Topic: Valentine's Day Weather

Certainly noted for being an indoor day for romantics, the weather on Valentine's Day is seldom suitable for outside activity, perhaps some skiing, skating, or ice fishing....none of which sounds too romantic. In the Twin Cities area it rains or snows on Valentine's Day about 28 percent of the time...snow has been recorded about once every four Valentine's Days. It's been in the 40s F fifteen times in the past 118 years on this date in the Twin Cities. On the other hand daytime high temperatures have been 15 degrees F or less 23 times in the past 118 years..brrr. Most recently 2007 brought a high of just 11 F and a low of -1 F. The coldest Valentine's Day in the Twin

Cities occurred in 1920, with a high of -5 F and a low of -16 F. Valentine's Day in 1950 brought 6.4 inches of snowfall, while in 1967 and 1979 snow depth was 20 inches or more. Obviously those years were good for horse drawn sled rides.

For those in the weather business, forecasting or observing, duty often prevents them from spending Valentine's Day with their loved one. Other vocations sometimes prevent this as well. For these people the day may be celebrated with a phone call, sending some flowers or gifts, or simply by recalling a fond memory. Regardless of your situation, Happy Valentine's Day to everyone.

Topic: Weekly Weather/Climate Related Potpourri:

Terrible fires in southern Australia dominated the headlines this week as it was reported over 1000 houses were destroyed and over 1100 square miles of landscape burned. A dangerous threat from wildfires had developed as a result of prolonged drought and a summer heat wave, when temperatures had soared to 110 to 117 degrees F. It was discouraging to hear that some of these fires may have been set by arsonists. Fortunately temperatures have cooled and next week is supposed to bring showers to the region, though in some areas fires continue to burn.

A rare tornado hit the island of Oahu in Hawaii on Wednesday of this week. Some minor damages to buildings was reported, but flooding from the associated thunderstorms was more of a threat. The average number of tornadoes per year in Hawaii is just one, the most abundant year coming in 1971 when five were reported.

Speaking of such storms, the first tornado deaths of the year were reported on Tuesday (February 10th) this week when 7 reported tornadoes occurred in the states of Texas, Oklahoma, and Missouri. Lone Grove, OK was the worst hit area with many destroyed mobile homes and damaged buildings. There were nine deaths reported from this storm.

A study released this week by the University of Minnesota St Anthony Falls Laboratory shows that salt used to combat snow and ice on Minnesota roads is ending up in the state's lakes, rivers, and wells. Dr. Heinz Stefan one of the authors of the study says he wanted to find out the fate of the salt that is used on Minnesota's roads. Tests conducted on 39 lakes and three major rivers showed that chloride concentrations, or salinity, has increased in these Twin Cities area waters over a 22 year period.

MPR listener question: I have been in the state about 5 years, and love the waterfalls of the North Shore. When, roughly in the spring thaw season would the volume of water going over these falls be the highest?

Answer: Never had this question before. This certainly ties in with the variability in spring snow melt across the northeastern counties of Minnesota. But if I check the historical flow volume on selected watersheds near and along the North Shore of Lake Superior I can at least approximate a range of dates for you. These data come from the USGS, the NOAA NC River Forecast Office and Minnesota DNR-Division of waters. For the rivers below, I have noted the week of historical peak spring volume, so you can use this as a guide for your travels us there:

St Louis River near Scanlon April 21-27
Knife River near Two Harbors April 20-26
Baptism River near Beaver Bay April 24-30
Pigeon River near Grand Portage April 24-30

Almanac for February 13th:

The average MSP high temperature for this date is 27 degrees F (plus or minus 12 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 13th:

MSP weather records for this date include: highest daily maximum temperature of 51 degrees F in 1890; lowest daily maximum temperature of 0 degrees F in 1905 and 1909; lowest daily minimum temperature of -23 degrees F in 1905; highest daily minimum temperature of 34 F in 1911. Record precipitation for this date is 0.60 inches in 1915. Record snowfall is 5.5 inches in 1909 and a record snow depth of 22 inches in 1979.

Average dew point for February 13th is 12 degrees F, with a maximum of 36 degrees F in 1915 and a minimum of -23 degrees F in 1971.

All-time state records for February 13th:

The all-time state record high temperature for this date is 63 degrees F at Mankato (Blue Earth County) in 1990. The all-time state record low temperature for this date is -46 degrees F at Detroit Lakes (Becker County) in 1916. The all-time state record precipitation for this date is 1.87 inches at Pipestone in 1915. State record snowfall for this date is 20.0 inches at Pigeon River Dam (Cook County) in 1936.

Past Weather Features:

The first recorded observation of "thunder snow" occurred on February 15, 1820 at cantonment New Hope, the precursor to Fort Snelling. Rain, sleet and snow were reported from that storm.

A fierce blizzard struck Minnesota over February 13-15, 1866. Violent winds and heavy snow produced drifts up to 20 feet. Fortunately the storm started at night when most people were inside and there was relatively little loss of life. Temperatures dropped 40 to 50 degrees F during the storm.

On February 13, 1916 the state was in the grip of an arctic high pressure system. The pressure reading at Colledgeville peaked at 30.90 inches. Many observers reported 2 feet of snow on the ground and the overnight low temperatures were record-setting. Nearly two dozen observers reported lows of -30 degrees F or colder, and 5 communities reached -40 degrees F or colder. Four days later on February 17, 1916 daytime temperatures were in the 40s and 50s F.

February 12, 1990 brought a taste of spring to southern Minnesota. Without snow cover the bright, sunny day beat down on the landscape long enough to raise the temperature into the 60s F. Over a dozen weather observers reported afternoon high temperatures of 60 degrees F or greater. In some places golf course opened. It was short-lived however as a winter storm brought several inches of snow over the 15th and 16th of the month and another dose of winter prevailed.

Words of the Week: Blowing a hoolie

This term is used in England and South Africa among other countries. It refers to a strong wind that blows wild (gusty) and noisy. According to Penny Tranter of the BBC Weather Centre hoolie may be a shorter form of hooligan to refer to the noise and commotion produced by a gang of such. More often than not winds must exceed 35 mph for this condition. Conversationally this term might be used to say "it's not wise to take your boat out when it is blowing a hoolie", or "when you're golfing on the links you have to keep the ball low when it's blowing a hoolie."

Outlook:

Generally cloudy and somewhat colder over the weekend with temperatures a few degrees either side of normal. There will be increasing chances for snow by late Monday and lasting into Wednesday, with another chance for snow by Friday of next week.

Minnesota WeatherTalk Newsletter for Friday, February 20, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, February 20, 2009

Headlines:

- Jet Streaming Podcast
- Update on the snow season
- Update on frost depths
- Coldest in the nation this week
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for February 20th
- Past weather features
- Sierra cement
- Outlook

Topic: Jet Streaming Podcast this week.....

Two guests this week: Elissa Lynn, senior meteorologist with the California Department of Water Resources joins us to talk about the recent storms there and to what degree they have alleviated the water supply concerns. She also share her thoughts on how California is preparing to deal with water supply shortages this year if they materialize; Our second guest is Steve Buan with NOAA's National Operational Hydrological Remote Sensing Center in Chanhassen, MN. He shares his thoughts about the potential for spring snow melt floods in the Red River Valley this year. He reminds us that there is still a number of weeks to go before the snow melt season starts.

In addition, Craig Edwards, Paul Huttner and I discuss the recent weather headlines and Craig shares his views of drought and the web site of the week.....

www.drought.unl.edu

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Update on snow season at International Falls, MN

During the past weeks I have spoken of the extraordinary snow season being recorded at International Falls. Despite the relative lack of snow across the state in recent weeks, International Falls continues to get its share. They are on track to set new records for the number of days snowfall was observed, as well as the total snowfall for the season.

Since November 1, 2008, a period of 111 days (through February 19, 2009), at least a trace of snowfall has been recorded at International Falls on 89 days, 80 percent of the time. The February total of 20.3 inches so far this month ranks 6th among snowiest months of February there and the seasonal total is approaching 90 inches. There record snow season is 116 inches in 1995-96. With many weeks of winter still left, this season may produce a double record at International Falls, most days with snowfall and most total seasonal snowfall.

Only a few other locations are reporting above normal seasonal snowfall accumulations. These include Babbitt with 66.1 inches, Kabetogama with 64.2 inches, Waskish with 62.2 inches, Two Harbors with 75 inches, and Wolf Ridge ELC near Finland with nearly 79 inches.

Topic: Update on Frost Depths

Declining snow depth and warmer than normal temperatures over the past week did not prevent frost from going deeper into the soil. Frost depths from various locations as of February 18th include:

21 inches at the University of Minnesota St Paul Campus, 24 inches at Waseca, 34 inches at Morris, 40 inches at Crookston, and 12 inches at Lamberton. Maximum frost depth is usually reached in late February, before the soil starts to thaw from both the top and the bottom.

Topic: Coldest in the Nation Twice this Week....

Minnesota reported the coldest temperature in the nation twice this week. On February 15th, the low of -21 degrees F at Embarrass was the coldest. On February 19th the low of -28 degrees F at International Falls was the lowest.

Topic: Weekly Weather/Climate Related Potpourri:

As our podcast guest this week announced, California received perhaps its most substantial rainfall of the season from last weekend's storm. Many observers reported several inches of rainfall and the Sierra-Nevada range received well over a foot of new snow in many places. Following a relatively dry December and January, this was welcome news to a state that has been suffering from drought and quite concerned about their water supply.

After some discussion by the NOAA State Climate Extremes Committee a new record low temperature has been declared for the state of Maine. On January 16, 2009 near the Big Black River a weather station recorded a morning minimum temperature of -50 degrees F. This was measured with a thermistor and certified by the Weather Service. It is a new record low for Maine and ties the all-time coldest temperature measured in New England in the state of Vermont.

The NOAA ship John N. Cobb built in 1950 to conduct fisheries research will be named to the National Register of Historic Places this year. This honor is in recognition of the value placed on this ship and crew for nearly 60 years of fisheries research. The 93 foot, wooden-hulled vessel was used to take fish inventories along the California coast and into the Gulf of Alaska. It helped researchers to track the populations of killer whales and seals among other species. The John N. Cobb is harbored in Seattle, Washington.

Scientists with the United Kingdom Meteorological Office have revealed the importance of tropical rain forests in mitigating the effects of rising carbon dioxide in the Earth's atmosphere. In recent modeling studies they have found that the carbon dioxide fixed (consumed) by the tropical rain forests has slowed the rate of increase in the Earth's atmosphere by as much as 10 percent. They emphasize that further deforestation or disturbance of the tropical rain forests will likely accelerate the increase of carbon dioxide significantly.

MPR listener question: I have heard you say that February is the driest month of the year for many Minnesota communities, including the Twin Cities. That is to say, the average monthly precipitation for this month (0.79 inches at MSP) is less than any other month of the year. If this is true for the average how often is February actually the month with the least precipitation?

Answer: Examining the climate records of the Twin Cities for the past 118 years (1891-2008), February has been the driest month of the year 36 times, the highest frequency of any month. January has been the driest month 32 times while December has been the driest month 27 times. In the broader context it is interesting to note that April, May, and September have never had the distinction of being the driest month of the year in the Twin Cities record. Further, July has only been the driest month of the

year twice, in the consecutive years of 1936 (0.11") and 1937 (0.48"). Next month, March, has been the driest month of the year in the Twin Cities climate records only 4 times (1902, 1909, 1910, and 1994).

Almanac for February 20th:

The average MSP high temperature for this date is 28 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 11 degrees F (plus or minus 13 degrees F standard deviation).

MSP local Records for February 20th:

MSP weather records for this date include: highest daily maximum temperature of 57 degrees F in 1981; lowest daily maximum temperature of -4 degrees F in 1918; lowest daily minimum temperature of -20 degrees F in 1889 and 1941; highest daily minimum temperature of 35 F in 1899. Record precipitation for this date is 0.60 inches in 1882. Record snowfall is 4.2 inches in 1979 and a record snow depth of 29 inches in 1967.

Average dew point for February 20th is 12 degrees F, with a maximum of 43 degrees F in 1930 and a minimum of -26 degrees F in 1966.-

All-time state records for February 20th:

The all-time state record high temperature for this date is 65 degrees F at Canby, Luverne, and Tracy (SW MN) in 1981. The all-time state record low temperature for this date is -50 degrees F at Baudette (Lake of the Woods County) in 1966. The all-time state record precipitation for this date is 1.60 inches at Caledonia (Houston County) in 1898. State record snowfall for this date is 16.0 inches at Marshall (Lyon County) in 1952.

Past Weather Features:

One of the strongest winter storms of the 20th Century struck Minnesota on February 21-22, 1922. A deep low pressure system moved up from the southwest and brought thunder, lightning, rain, sleet, freezing rain, and snow to many parts of Minnesota. Winds gusted to 5 mph. Heavy ice coated sidewalks, telephone polls and trees in SE Minnesota. Wires in the Winona area were reported to have two inches of ice on them, while over in Wisconsin, ice coatings up to 4 inches thick were reported. Blizzard conditions prevailed further west and north. Morris reported 15 inches of snow, Montevideo 19 inches, Milaca 22 inches, and Detroit Lakes 25 inches from this storm.

The warmest February 20th statewide occurred in 1981. Over a dozen southern Minnesota communities reported a daytime high of 60 degrees F or greater that afternoon. An absence of snow cover also prompted some local golf courses to open for a round of afternoon golf. That week the temperatures were so mild in some southwestern Minnesota counties that a few farmers planted small grains just to see what would happen!

Words of the Week: Sierra cement

This term is used by meteorologists and hydrologists in the western states to refer to extremely dense snowpack that is left on mountain slopes and valleys after the winter snows have aged and been rained on. This leaves an extremely dense snow layer that may contain as much as an inch of water for every two inches of snow. The snowpack hardens so firmly that it feels like cement when skiers fall on it. This type of snowpack does however yield a great deal of water for California's reservoir system.

Outlook:

Some scattered snow flurries still possible in eastern sections of the state early Saturday, then a dry weekend with cooler than normal temperatures. Mostly sunny on Sunday and Monday with increasing clouds by Tuesday and a chance for snow. Warmer temperature during mid-week with chances for snow.

Minnesota WeatherTalk Newsletter for Friday, February 27, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, February 27, 2009

Headlines:

- Jet Streaming Podcast
- Preliminary February Climate Summary
- Update on the storm of the 26th
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for February 27th
- Past weather features
- Duff
- Outlook

Topic: Jet Streaming Podcast this week.....

The main topics this week for Paul Huttner and Craig Edwards are drought and air quality. Dr. Ken Dewey from the University of Nebraska joins them to talk about drought issues in the western states. He especially talks about how this has produced the potential for water restrictions in parts of Arizona and Nevada. Their second guest is pollution specialist Mark Sneller from Arizona. Mark talks about indoor air quality and what to be concerned about from a health standpoint.

In addition, Craig Edwards, Paul Huttner share some listener feedback and the web site of the week (drought related)..

<http://drought.gov>

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Preliminary Climate Summary for February 2009

After two consecutive months dominated by colder than normal weather, temperature behaved like a rollercoaster for most of the month of February. Some observers reported days when it was over 20 degrees F warmer than normal, followed by days when it was over 20 degrees F cooler than normal. For most observers the month of February was 1 to 3 degrees F warmer than normal. However, there were a few northern Minnesota locations that were slightly colder than normal, notably those with abundant snow cover that persisted throughout the month. Extremes for the month ranged from -36 degrees F at Babbitt on the 4th to 53 degrees F at Pipestone, Worthington, and Winona on various dates. Minnesota reported the lowest temperature in the 48 contiguous states at least 9 times during the month.

Up until the storm of February 26th (see below) precipitation had been relatively scarce and below normal in many areas. During a prolonged thaw period from the 9th to the 12th of the month some observers reported a healthy rainfall, ranging from 0.25 to 0.75 inches. These rainfall totals combined with the liquid water content of the snow storm of the 26th gave many observers a monthly total precipitation over 1 inch. Some of these locations included: Red Lake Falls 1.37 inches, Warroad 1.47 inches, Moorhead 1.23 inches, Itasca State Park 1.13 inches, International Falls 1.05 inches, Cass Lake 1.21 inches, Littlefork 1.06 inches, Brimson 1.19 inches, Grand Marais 1.30 inches, Kabetogama 1.13 inches, Wolf Ridge 1.60 inches, Grand Portage 1.41 inches, Two Harbors 1.27 inches, Browns Valley 1.28 inches, Artichoke Lake 1.08 inches, Wadena 1.33 inches, Long Prairie 1.35 inches, Jordan 1.37 inches, Moose Lake 1.40 inches, Redwood Falls 1.36 inches, Winnebaog 1.35 inches, Waseca 1.22 inches, and Mankato 1.12 inches. Most of the monthly snowfall came during the last half of the month. Several northern Minnesota observers reported monthly snowfall totals between 15 and 20 inches, while International Falls reported nearly 25 inches.

Topic: Heavy Snow Storm of February 26th

A significant winter storm brought a wide swath of heavy snow to Minnesota this week on the 26th. Many observers reported 4 to 9 inch amounts from this storm which at times was depositing 1-2 inches of snow per hour. Observers at Milan, New Market, Donnelly, and Glenwood reported over 8 inches of new snow, while further north Finland reported 8 inches and Silver Bay reported over 10 inches. The snow was rather high in water content, bringing over half an inch of liquid to many parts of the Minnesota landscape. The storm produced a long drive home from work for thousands of commuters, and it also caused a number of meeting cancellations, and scores of school closings. This storm was similar in areal extent and intensity to the heavy snow storms of 1971 and 2001 which brought several inches of snow to many parts of Minnesota and closed schools and highways, and caused many meeting cancellations as well. Similar to those storms, the frontal passage on Thursday night this week ushered in some very cold air, dropping many temperatures below 0 F.

Topic: Weekly Weather/Climate Related Potpourri:

The United Kingdom Meteorological Office reported this week that England, Scotland, and Wales will report the coldest winter since that of 1995-96. Temperatures in the single digits F are rare for England, but a number of observers have recorded them this winter. In addition many observers there have recorded the snowiest February in 18 years. High than normal heating bills have been compounding the economic problems in the UK.

Early this week a strong winter storm dumped up to 2 feet of snow across the state of Maine and left more than 70,000 homes and offices without power. Utility employees worked tirelessly for three days to restore power across Maine, while ski resorts were happy to see the snow.

Australia saw another round of intense bushfires this week. Victoria in southern Australia represented the area with the most fires, following another series of extremely hot and dry days. Hundreds of homes were being threatened by the fires.

An international team of scientists who studied the climate impacts of the 1816 eruption of Mt Tambora in Indonesia reported this week that there were significant impacts during the growing seasons of 1816 and 1817 in Spain and Portugal. In the summer of 1816 those countries did not see summer temperatures rise above 60 degrees F. Ejected material from the volcano circulated in the atmosphere for sometime and depressed solar radiation. Both Spain and Portugal saw severe winters during 1816-1817 as well. Previous studies of the Tambora eruption impacts had focused on North American and other parts of Europe, but this was the first study to reveal the impacts on the Iberian Peninsula.

MPR listener question: I heard you say on Gary Eichten's Midday show last week that the state temperature extremes for the month of March are 88 degrees F at Montevideo (1910) and -50 degrees at Pokegama Dam (1897), a range of 138 degrees F the highest of any month of the year. Why does March exhibit such temperature extremes?

Answer: The day length (increasing) and sun angle (increasing) are changing so dramatically during the month that a dry landscape can be heated into the 80s F, especially with prevailing warm winds from the southwest. Conversely, abundant snow cover can prevail in March (in some cases we can still have over 20 inches on the ground) and combined with the descent of an arctic air mass from the polar latitudes of Canada, this can produce some exceptionally cold nighttime air temperatures. Several Minnesota communities have reported -40 degrees F or colder in March, and some as late in the month as the 24th.

Almanac for February 27th:

The average MSP high temperature for this date is 30 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 14 degrees F (plus or minus 13 degrees F standard deviation).

MSP local Records for February 27th:

MSP weather records for this date include: highest daily maximum temperature of 54 degrees F in 1896; lowest daily maximum temperature of -1 degrees F in 1962; lowest daily minimum temperature of -22 degrees F in 1879; highest daily minimum temperature of 37 F in 1895 and 1983. Record precipitation for this date is 1.01 inches in 1981. Record snowfall is 5.5 inches in 1893 and a record snow depth of 24 inches in 1962 and 1967.

Average dew point for February 27th is 15 degrees F, with a maximum of 42 degrees F in 1958 and a minimum of -21 degrees F in 1962.

All-time state records for February 27th:

The all-time state record high temperature for this date is 66 degrees F at Pleasant Mound (Blue Earth County) in 1896. The all-time state record low temperature for this date is -40 degrees F at Warroad (Roseau County) in 1913. The all-time state record precipitation for this date is 2.35 inches at Comfrey (Brown County) in 1971. State record snowfall for this date is 18.0 inches at Blooming Prairie (Steele County) and Wabasha in 1893.

Past Weather Features:

February of 1843 was exceptionally cold and snowy at old Ft Snelling. More than 22 inches of snow fell that month on top of an already deep snow pack. A blizzard struck on February 25-26 with over 5 inches of snow and winds over 40 mph. The fort observer called it a "violent snowstorm" and it was followed by an arctic cold wave. The temperature readings at Fort Snelling remained below 0 degrees F all day on both the 27th and the 28th. This was a precursor to the coldest March in Minnesota history, that of 1843, when the monthly temperatures averaged 27-28 degrees F colder than normal.

The snowiest ever February 27th occurred in 1971, paralyzing much of northern Minnesota. Many roads and highways were closed as the heavy snow accumulated in mammoth drifts. For several communities the snowfall amount was not only a new record for the 27th, but a February 24-hr record as well. These communities included

Aitkin with 15", Brainerd with 10", Cook with 15", Grand Rapids with 13", Hibbing with 11", and Virginia with 8". The same storm set a record a day earlier at Redwood Falls with 11 inches.

Word of the Week: Duff

This is an old English term for plum pudding made from a stiff flour mixture. It is also a term often used to describe my golf shots. So how does it relate to meteorology you say? It is an important term in the fire weather program of the U S Forest Service, used to describe the partially decayed organic matter on the forest floor which can become highly combustible during drought periods and contribute to the longevity and spread of forest fires. In fact the Keetch-Byram Drought Index is sometimes referred to as the soil/duff drought index because it is a measure of how dry the soil and duff layers are.

Outlook:

Partly cloudy and colder than normal for the weekend. A chance for snow on Monday with warmer temperatures. A better chance for snow and/or rain Wednesday and Thursday next week. The first full week of March looks like it may be a wet one.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, March 13, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, March 13, 2009

Headlines:

- Jet Streaming Podcast
- Winter returns
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for March 13th
- Past weather features
- Chilblains
- Outlook

Topic: Jet Streaming Podcast this week.....

The main topics this week for Paul Huttner and Craig Edwards are blizzards and maple syrup. What a contrast!. Their first guest is Rich Naistat, retired National Weather Service forecaster who spent most of his career in Minnesota. He talks about blizzards in our area and reflects on his experience forecasting them. Their second guest is Jerry Jacobsen who is President of the Minnesota Maple Syrup Producers Association. He describes the weather conditions that produce a good sap run in Minnesota.

In addition, Craig Edwards and Paul Huttner share some listener feedback.

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Winter returns with a vengeance....

After six consecutive days of above normal temperature readings around the state (March 4-9), winter-like conditions once again prevailed over the 10th through the 12th, first with snow, then with arctic cold. Snowfall totals from the winter storm and

blizzard that struck late Monday into early Wednesday ranged from a few inches in southern Minnesota counties to well over a foot in many northern locations. Red Lake Falls reported 16.2 inches, Littlefork 15.7 inches, Waskish 13.5 inches, Kabetogama 16.2 inches, and International Falls 18.8 inches. International Falls snowfall total for 2008-2009 winter now stands at 111.5 inches, not far from their record seasonal total of 116 inches. On Tuesday, March 10th Fargo, ND reported a record 6.5 inches, Duluth reported a record 6.1 inches, Red Lake Falls a record 8.5 inches, and Halstad a record 8 inches.

Following the snowfall a strong arctic high pressure system descended on the state sending the barometer to 30.60 inches in some places. New record cold maximum temperatures were set on Wednesday afternoon, March 11th (St Cloud's maximum temperature topped out at only 4 degrees F), followed by record low temperatures on Thursday morning, March 12th. In fact both Babbitt and Embarrass reported a new state record low temperature for March 12th with -35 degrees F (surpassing the old state record of -34 F at Ada in 1896). Other records included -30 degrees F at Floodwood, -33 degrees F at Longville, -29 degrees F at Bigfork and Crane Lake, -28 degrees F at International Falls, -27 degrees F at Hibbing, and -15 degrees F at St Cloud. For most Minnesota locations these were the coldest readings for mid-March since 1997. Minnesota has reported the coldest temperature in the 48 contiguous states 4 times already this month.

Topic: Weekly Weather/Climate Related Potpourri:

This week National Weather Service forecasters issued a revised spring flood outlook for the Red River along the North Dakota-Minnesota border. The outlook favors major spring flooding along stretches of the Red River, including areas in and around Fargo and Grand Forks. The blizzard that struck this week over the 9th and 10th added to the snow depth on the landscape there. A considerably long dry spell with a gradual thaw over the second half of March might help alleviate this flood threat, but that weather scenario does not appear likely.

Researchers from the University of Paris and Duke University have collaborated to study the wind effects on the world's largest sand dunes. Their study show that in a warmer world, the boundary layer winds will generally increase and may produce even large dunes in some of the world's deserts. Their paper is published in the current issue of Nature.

Late last week the United Kingdom Meteorological Office along with the Carbon Trust announced the launch of a new web site to estimate site specific potential for wind generated power systems. The on-line service will estimate the potential for small scale wind power generation based on local climatic data, local land use, and

topography, along with modern technology in the deployment of small wind turbines. You can view more at the web site

<http://www.carbontrust.co.uk/default.ct>

A massive tornado swept through the southern Phillipines on Thursday this week tearing up acres of fruit trees and causing damage to some structures. Fortunately there were no deaths or injuries reported.

MPR listener question: I have heard you report that winter injury to pasture grasses, alfalfa, and garden perennials is more likely when soil temperatures fall into the single digits F. Has this happened this winter?

Answer: Not to my knowledge. We have come close in areas that have not had persistent snow cover. Some shallow soil temperature readings (2 inches) have fallen into the teens F and I have seen a couple of places report single night lows around 11 or 12 degrees F. For the most part snow cover has protected against these extreme conditions this winter.

Almanac for March 13th:

The average MSP high temperature for this date is 36 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 13th:

MSP weather records for this date include: highest daily maximum temperature of 66 degrees F in 2007; lowest daily maximum temperature of 12 degrees F in 1906; lowest daily minimum temperature of -9 degrees F in 1895; highest daily minimum temperature of 46 F in 1995. Record precipitation for this date is 0.78 inches in 2006. Record snowfall is 9.9 inches in 2006 and a record snow depth of 27 inches in 1962.

Average dew point for March 13th is 22 degrees F, with a maximum of 54 degrees F in 1995 and a minimum of -11 degrees F in 1960.

All-time state records for March 13th:

The all-time state record high temperature for this date is 80 degrees F at Waseca (Waseca County) in 1927. The all-time state record low temperature for this date is -36 degrees F at Campbell (Wilkin County) in 1896. The all-time state record precipitation for this date is 3.50 inches at Bemidji (Beltrami County) in 2002. State

record snowfall for this date is 18.0 inches at Duluth in 1917 and at Cloquet (Carlton County) in 1940

Past Weather Features:

March 10-12, 1859, the first spring following statehood, Minnesota was hit with a massive snow storm that dumped up to a foot of snow in many places, including St Paul. March of 1859 brought of 16 inches of snow in total, and combined with a wet April (more snow) produced some spring flooding on Minnesota's rivers.

A mixture of thunder, rain, sleet, and snow struck the state as part of a major winter storm over March 13-15, 2002. Many observers reported total snowfalls between 10 and 20 inches. Dawson in Lac Qui Parle County reported a storm total of 21 inches, the highest single storm total ever observed there.

Word of the Week: Chilblains

Taken from old Middle English and Anglo Saxon terms (chill for cold or shiver and blains for sore or swelling) this term refers to a distress of the skin as a result of exposure to cold temperatures. It primarily occurs on exposed hands, wrists, feet or ankles, but sometimes ears, nose or cheeks will show symptoms as well. Aside from some pain, the symptoms are swelling, itching, burning, or a redness or bluish mottled appearance. Sometimes the skin will crack. Not as severe as frostbite, this distress is primarily the result of the contraction in the blood vessels near the surface of the skin. The medical term used for this is acrocyanosis. Perhaps in reaction to the arctic air mass this week, some Minnesotans who failed to bundle up properly are suffering from chilblains.

Outlook:

A warming trend sets in this weekend and will bring temperatures into the 50s F in many areas. By the start of next week some locations may see temperatures climb into the 60s F, as much of the week remains dry and temperatures stay warmer than normal. As a consequence the state will lose much of its snow cover over the next week. It will be relatively warm for St Patrick's Day activities on Tuesday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, March 20, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, March 20, 2009

Headlines:

- Jet Streaming Podcast
- Warming up too fast
- New seasonal climate outlooks
- Vernal Equinox
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for March 20th
- Past weather features
- Ekman spiral
- Outlook

Topic: Jet Streaming Podcast this week.....

The main topics this week are spring snow melt flood forecasting, especially along the Red River between North Dakota and Minnesota, and options for carbon credits being considered by Minnesota landowners, a story by reporter Stephanie Hemphill. MPR's Steven John guides the conversation, along with Craig Edwards and myself. Our guest is Scott Dummer, Hydrologist in Charge at the NOAA North-Central River Forecast Center in Chanhassen, MN. He explains some of the data and procedures that go into flood forecasting and assesses the outlook for the Red River. Stephanie Hemphill interviews some Minnesota landowners who currently grow trees for biomass and pulpwood markets, and may obtain credits for carbon sequestration in the future, as cap and trade policy discussion become more widespread as a mitigation response to climate change.

In addition, we share another web site of the week focused on improvements in NOAA weather radar (www.nssl.noaa.gov), provide some new jargon terms, and respond to a listener question about frost depths.

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Warming up too fast...

The warming trend which began across the region last Saturday and has persisted most of this week has been of a larger magnitude than forecasted. Daytime temperatures rose into the 60s F at a number of locations on Monday (March 16) this week and have averaged 10 to 15 degrees F warmer than normal in many areas over subsequent days. As a result snow cover has diminished rapidly this week as the Fargo-Moorhead area has lost 11 inches of snow depth, while International Falls has lost 14 inches of snow cover. Many areas of central and southern Minnesota no longer have any snow cover. Because the ground is still frozen, much of the runoff is flowing through the ditches, streams, and rivers. The gage reading at Crookston for the Red Lake River shows an increase of 7.5 feet since Monday, while the gage flow on the Wild Rice River at Hendrum shows an increase of 7 feet. The Buffalo River at Sabin has come up 7 feet since Monday, while the Red River at Wapehton-Breckenridge has risen over 3 feet since Monday.

The National Weather Service and NOAA River Forecast Center are busy putting out flood forecasts and outlooks for the Red River and associated watersheds. It appears as though a flood crest may occur next week at some spots along the river, though a good deal of northern and western landscape areas still have snow cover to shed. It will undoubtedly be a busy weekend for some communities as they prepare for the floods and try to mitigate the risks of damage (an estimated 200,000 sandbags are needed in the Fargo area). Two storms are expected to cross the region over the next week and bring chances for precipitation. Depending on the amount that falls (a few tenths to over 1 inch), they could significantly inflate the flood crests on these rivers.

Topic: New Seasonal Climate Outlooks

The NOAA CPC released new seasonal climate outlooks for April through June. They call for equal chances of warmer or colder than normal temperatures and above or below normal precipitation values.

Topic: Vernal Equinox

At 6:44 am CDT on Friday, March 20, the overhead (vertical) sun passes over the equator (0 degrees latitude) on its seasonal migration into the northern hemisphere. Length of daylight is roughly 12 hours everywhere, though there are variations on the order of minutes due to time zone geography, slight variations in the angle of the

setting and rising sun relative to the curvature of the Earth, and other features. Over the rest of March we will gain an additional 34 to 36 minutes in day length, and daylight hours will continue to lengthen all the way to the summer solstice on June 21st.

Topic: Weekly Weather/Climate Related Potpourri:

The Minneapolis City Council Committee on Health, Energy, and Environment passed a resolution to observe "Earth Hour" from 8:30 to 9:30 pm on Saturday, March 28th. At that time the city will turn off all uses of electricity in municipal buildings that are not required for life, safety, or operations. The city will thus be much darker than normal. This effort is a way to acknowledge that electricity usage accounts for up to 35 percent of greenhouse gas emissions, so why not conserve. It is expected that as many as 1000 cities in 100 countries will participate in the Earth Hour Program.

NASA reported earlier this week that a relatively large mass of surface ice still exists on Lake Superior as of mid-March. This is rare in recent years as the ice on Lake Superior has tended to disappear earlier. Over on Lake Huron where winter released its grip earlier, mountains of ice driven by the wind had piled up along the shores of Saginaw Bay in Michigan. In Linwood, MI it was reported that 36 homes had to be evacuated as the ice was pushed up into the houses.

NASA-JPL scientists along with researchers from the National Taiwan University reported recently that an assessment of the devastating cyclone Nargis that struck Myanmar last May showed that sea surface temperatures across the Bay of Bengal were unusually high, and the mixing depth of the warm water was unusually deep when the cyclone intensified from a category 1 to a category 4 storm over a 24 hour period. At the time, May 1-2, 2008 upper ocean warm temperatures (79 F and higher) extended to a depth beyond 300 feet. The added warmth and water vapor allowed Nargis to strengthen very rapidly just before landfall.

Rice University released a report this week showing that residents did not respond any better to evacuation orders associated with Hurricane Ike last year than they did to Hurricane Rita in 2005. Improvements still need to be made to get evacuation orders followed in an orderly manner. NOAA officials have pledged to work on this with local emergency managers.

The United Kingdom Meteorological Office reported this week that the harsh winter across England has produced up to three times the normal number of potholes on roads and highways, mostly in areas that normally do not experience a high frequency of freeze-thaw cycles. In Devon, for example, they recorded an unusually high

number of freeze-thaw cycles this winter and more than 7500 potholes have already been repaired there.

MPR listener question: Along the north shore of Lake Superior it is common for the weather forecast to mention "cooler by the lake" in the summer season, and "warmer by the lake" for the winter season. What is the most common time in the spring for the shift from winter's "warmer by the lake" to summer's "cooler by the lake."?

Answer: Looking at the daily temperature profiles of shoreline stations like Two Harbors and Grand Marais and comparing them to inland and upland locations like Duluth Airport, Finland, and Isabella it appears that the transition from "warmer by the lake" to "cooler by the lake" often occurs during the last week of March or first week of April. Naturally there is variation induced by the persistence of snow cover across inland and upland areas, and in some years the persistence of ice cover across Lake Superior.

Almanac for March 20th:

The average MSP high temperature for this date is 41 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 23 degrees F (plus or minus 10 degrees F standard deviation).

MSP local Records for March 20th:

MSP weather records for this date include: highest daily maximum temperature of 66 degrees F in 1938; lowest daily maximum temperature of 12 degrees F in 1951; lowest daily minimum temperature of -9 degrees F in 1965; highest daily minimum temperature of 41 F in 1938. Record precipitation for this date is 0.86 inches in 1921. Record snowfall is 3.8 inches in 1901 and a record snow depth of 25 inches in 1951.

Average dew point for March 20th is 22 degrees F, with a maximum of 51 degrees F in 1948 and a minimum of -12 degrees F in 1965.

All-time state records for March 20th:

The all-time state record high temperature for this date is 75 degrees F at Winnebago (Faribault County) in 1934. The all-time state record low temperature for this date is -37 degrees F at Ft Ripley (Crow Wing County) in 1872 and at Bigfork (Itasca County) in 1965. The all-time state record precipitation for this date is 2.12 inches at Brwons Valley (Traverse County) in 1982. State record snowfall for this date is 15.0 inches also at Bronws Valley in 1982.

CORRECTION: Last week's newsletter for March 13th incorrectly reported that the state record precipitation for that date was 3.50 inches at Bemidji in 2002. That turned out to be a faulty report. The correct state precipitation record for March 13th is 2.70 inches at Montevideo in 1977.

Past Weather Features:

March 19-20, 1826 brought one of the worst severe winter storms of the 19th Century to Minnesota. Some areas of the state received up to 18 inches of snow, blown by mighty winds into drifts that were 10 to 15 feet high. This storm contributed to one of the harshest winters as well. There was great loss of life among the Sisseton and Dakota tribes. Further there was a great flood on the Red River, perhaps the worst of the 19th Century. German pioneer families who had settled there decided to move elsewhere, so they moved to the Minnesota River Valley.

On March 21, 1953 about 4:45 pm in the afternoon a tornado carved an 11 mile path across parts of Stearns and Benton Counties northwest of St Cloud. This tornado, 100 yards wide at times, destroyed a church, warehouse, and laundromat, injuring three people. In addition a boy was killed inside the laundromat. It was one of the state's earliest spring tornadoes.

March 19-20, 1982 brought a major winter storm to west-central Minnesota. Browns Valley recorded 15 inches of snowfall, while Morris and Alexandria reported 10 inches. Numerous traffic accidents were reported, along with two fatalities. The March snowfall boosted the seasonal total at Browns Valley to 64.5 inches, Alexandria 67 inches, and Morris 57.5 inches, making 1981-82 one of the snowiest seasons of the past three decades for those observers.

About 4:20 pm on March 20, 1991 a tornado touched down near Bricelyn in Faribault County. Several farm buildings were destroyed, along with three tractors and two combines. This tornado also damaged homes, took down power lines and uprooted trees in Wells. It was one of the state's earliest spring tornadoes. This storm was followed by another major winter storm on March 22-23 that brought ice, sleet, and snow. A 6-inch coating of ice was observed around the Duluth area and the 850 foot WIDO-TV tower there was toppled by the weight of the ice.

Words of the Week: Ekman spiral

Named for Swedish physicist Walfrid Ekman (1874-1954) the Ekman spiral is an idealized mathematical representation of how the wind driven surface currents of the ocean behave with depth; and it is also a representation of how wind speed and direction vary with height above the ground. In the atmosphere, the Ekman spiral

refers to how winds spiral to the right with height above the ground, as a result of the balance between the Coriolis Force (rotation of the Earth), atmospheric pressure gradient, and friction forces. This motion traces an imaginary clockwise ascending spiral. Thus a wind from the south (180 degrees) at the ground level may become a stronger wind from the southwest (225 degrees) at a height of 1000 meters. The clockwise drift of winds and ocean currents in the northern hemisphere, becomes a counterclockwise drift in the southern hemisphere as a result of the Coriolis force.

Outlook:

Continued warmer than normal temperatures into the weekend, with increasing clouds on Sunday and a chance for rain showers later in the day. Winds will become stronger on Sunday and Monday as temperatures warm, and by Monday there may be some thunderstorms as well as rain showers across the region. Chance of showers lingers into early Wednesday, before a cooler and drier air mass takes over later next week.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, March 27, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, March 27, 2009

Headlines:

- Jet Streaming Podcast
- Unchartered waters
- Record Precipitation Amounts
- More Snow
- A success story in flood mitigation
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for March 27th
- Past weather features (yet to be done)
- Hydrograph
- Outlook

Topic: Jet Streaming Podcast this week.....

The main topics this week are spring snow melt flood forecasting along the Red River between North Dakota and Minnesota, and a discussion about the first ever "State of the Birds" report for the USA delivered by Interior Secretary Ken Salazar last week. Mark Ewens from the National Weather Service in Grand Forks, ND is our first guest and shares the flood forecast for the Red River Valley, along with perceptions about community response. Carroll Henderson, non-game wildlife specialist with the DNR and author of several books about birds shares his views on the state of birds in Minnesota and what's being done to preserve and restore bird habitat.

In addition, we share another web site of the week (www.crh.noaa.gov/crh/), and a new jargon term used in flood forecasting.

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Unchartered waters in 3-dimensions....

When extreme weather and climate conditions occur that are beyond the limits of historical measurements or outside the range of public experience, then forecasters (and journalists) often refer to being in "unchartered waters" Certainly this jargon has been used recently in describing the Red River flooding along the North Dakota and Minnesota border, especially in headlines. There are at least three attributes to this year's spring snow melt flood on the Red River and its tributaries that might fall in the category of "unchartered."

Firstly, the flood crests at most points along these watersheds have arrived extraordinarily early on the calendar. At some points along the Red River they have not seen any significant flood crests this early in the spring. Over the last half century, the only experience and measurements this early on the calendar come from the flood crests of March 1966 when selected points along the Buffalo River and Red River recorded significant flood crests.

Secondly, as a result of this earliness on the calendar combined with a return to winter-like conditions (snow and frozen water on the ground), and a forecast that favors a somewhat wetter than normal start to April, it is highly likely that the flood levels, whether moderate or major, at points along these watersheds will remain for a prolonged period of time. It will be a long flood fight.

Lastly, the quantity of snow melt run off combined with recent precipitation events this week have combined to produce flood flows on selected watersheds that surpass the all-time highest measured values. These include: a stage of 27.77 ft on the North Dakota Wild Rice River at Abercrombie, ND which has already occurred; a forecasted stage of 41 ft on the Red River at Fargo, ND (already at an all-time record crest of 40.48 ft); a forecasted stage of 22.4 ft on the Sheyenne River at Kindred, ND; a forecasted stage of 892.3 ft on the Sheyenne River at Harwood, ND; a forecasted stage of 34.1 ft on the Minnesota Wild Rice River at Hendrum, MN; and a forecasted stage of 38.5 ft on the Red River at Oslo, MN. Many of the other forecasted flood crests along the main stem of the Red and some of its tributaries place the volume of water in the top 5 historical measurements.

Because of these three attributes (earliness, longevity, and magnitude) the 2009 flood fight on the Red River will surely be a case study for hydrology researchers as well as a life-long memory for those fighting and enduring it.

Topic: Record precipitation amounts in winter storm of March 23-24, 2009, Ice Storm in the NE

The storm earlier this week was relatively slow moving and brought record-setting amounts of precipitation to many areas, as dewpoints spiked into the 40s and low 50s F ahead of the storm. Among those reporting record amounts on March 23rd were Grand Forks, ND with 0.46 inches on the 23rd (4-day total of 1.93 inches Mar 22-25); Fargo reported 0.90 inches (4-day total of 2.76 inches Mar 22-25); Warroad with 0.91 inches; Itasca State Park with 1.42 inches; Morris with 1.62 inches; Bemidji with 1.30 inches; Willmar with 2.00 inches; Staples with 2.04 inches; Grand Rapids with 2.26 inches; and Milan with 2.32 inches. The amounts at Willmar, Staples, Grand Rapids, and Milan were not only daily records but some of the highest 24-hour amounts ever observed in the month of March. Both Melrose and Pine River reported between 3 and 4 inches of precipitation over the 4 days from March 22-25. As a result many watersheds rose above flood stage for a time.

The same low pressure system that brought heavy precipitation on Monday and Tuesday to much of central and northern Minnesota also brought an intense ice storm to the northeastern counties of St Louis, Lake, and Cook along the north shore of Lake Superior. For some the freezing rain just kept coming for a period of 16 to 18 hours. Climatologically the north shore has the highest frequency of freezing rain events in March, but this one was especially long and heavy. Many observers reported ice coatings from a quarter of an inch to nearly an inch in thickness. The weight of ice split trees, brought down power lines, damaged buildings, and made roads and highways very slick. Three state parks (Tettegouche, Temperance River, and Crosby-Manitou) had so much damage they had to close. Beaver Bay reported a record precipitation for March 24th of 1.58 inches, while Grand Portage reported a record 0.83 inches, mostly in the form of ice. This will undoubtedly go down as one of the areas worst ice storms.

Topic: More Snow

Wednesday (March 25th) of this week brought a return to winter, as temperatures fell below freezing and many observers reported more snow. Areas in the north reported 3 to 5 inches of snowfall, while others in central Minnesota saw just a dusting. International Falls reported over 2 inches of snow bringing their seasonal total to over 115.4 inches, less than 0.6 inches from their all time seasonal record of 116 inches. Since November 1, 2008 International Falls has reported snow on 106 days, a remarkable frequency. In fact it has been an exceptionally snowy winter across the Minnesota-Canada border.

Topic: An example success story in flood risk mitigation

Since the great 1997 flood along the Red River of the North a good deal of flood risk mitigation work has been done. Cities, counties, the MN DNR, the Corps of

Engineers, and the Association of Floodplain Managers among other organizations have played major roles in these efforts. Dikes have been built, pumping stations installed, storage basins have been constructed and ditches cleaned out around the Wapehton-Breckenridge area. Among these all these efforts a diversion channel was cut across the landscape (from 2003-2005) to direct the Otter Tail River around the northeast side of Breckenridge before eventually linking with the Bois de Sioux River and the Red River. During the flooding at Wapehton-Breckenridge earlier this week, this diversion channel carried over 5,000 cubic feet per second (cfs) of flow around the city. This substantially reduced the volume of water that would have otherwise reached Breckenridge. The Bois de Sioux flow was at 10,300 cfs earlier this week so the combined flow in the two watersheds (Otter Tail plus Boix de Sioux) surpassed 15,000 cfs, dwarfing the flow of the 1997 flood which was 12,600 cfs and produced an all-time crest reading of 19.42 ft at the Wapehton-Breckenridge gage on the Red River. The high crest this week was only 17.5 ft and thus a good deal of damage to structures, roads and homes was averted thanks to this earlier flood mitigation work.

Stories like this abound across the Red River watershed as hundreds of structures have been removed from the floodplain and similar flood mitigation work has taken place in other cities. Tragic as the 2009 flood has been and will continue to be, it could have been much worse if investments and efforts had not taken place to mitigate risk along all of these watersheds. I tip my cap to all who have been involved. (Thanks to Greg Spoden and Terry Lejcher of the MN DNR for helping to document this story).

Topic: Weekly Weather/Climate Related Potpourri:

The Redoubt volcano in the Cook inlet of Alaska has erupted at least five times since Sunday and released plumes of gas and ash to heights of over 60,000 ft. This was detectable on satellite imagery shown on the following web site

http://www.sciencenews.org/view/access/id/42085/title/REDOUBT_FROM_ORBIT

The plume from the eruption caused some rerouting of air traffic over Alaska, but it remains to be seen if the airborne debris will have any climatic effects. Perhaps further eruptions will occur as well.

A line of severe thunderstorms moving across Mississippi on Wednesday afternoon and evening this week produced nine tornado reports. At least 80 homes were damaged by these storms and 24 people were injured. NOAA's Storm Prediction Center reports a relatively quiet year so far with respect to tornadoes, as only 98 have been reported so far in 2009.

A winter storm brought blizzard like conditions and heavy snows to parts of Colorado on Thursday of this week. Many flights out of Denver were postponed or cancelled as snowfall accumulations ranged from 8 to 10 inches by midday. With winds gusting to over 40 mph there were also some road closings that stranded travelers as well.

NOAA released its new Climate Literacy Brochure and educational resources on line. This material is intended to enhance school earth science curricula and provide resources for teaching climate science. Materials can be ordered from the NOAA Outreach Office (PH: 301-713-1208) or downloaded on line from

http://www.noaanews.noaa.gov/stories2009/20090318_climateliteracy.html

MPR listener question: We keep hearing about a flood crest forecast at Fargo, ND of 41 feet. Is that the depth of the river channel? If not what does that refer to?

Answer: River staging and river gaging is based somewhat on local arbitrary standards that were set ages ago by those who first monitored the flows on rivers. As a result some stage values refer to a river height above the bottom of the channel or above a bridge footing or some other reference point. Some stage values refer to a river height expressed above mean sea level (MSL), a reference elevation used by NOAA. The gages and staging points along the Red River between North Dakota and Minnesota use different references. Some are expressed as height above some local reference point and are therefore tens of feet, ranging from 0 to 55 feet for example. Others use MSL so that they express river height as 806 feet for example. The height of a river's flow can also be translated into a volume flow. For example a river elevation reading of 27 feet from a gage may also indicate a volume flow of 14,000 cubic feet per second. Though this disparity in expressing elevation exists, most local residents know what numbers correspond to minor, moderate, or major flood stages.

Almanac for March 27th:

The average MSP high temperature for this date is 44 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 26 degrees F (plus or minus 10 degrees F standard deviation).

MSP local Records for March 27th:

MSP weather records for this date include: highest daily maximum temperature of 75 degrees F in 1946; lowest daily maximum temperature of 24 degrees F in 1899 and 1965; lowest daily minimum temperature of 5 degrees F in 1921; highest daily minimum temperature of 57 F in 1910. Record precipitation for this date is 1.52

inches in 1998. Record snowfall is 5.6 inches in 1965 and a record snow depth of 17 inches also in 1965.

Average dew point for March 27th is 27 degrees F, with a maximum of 58 degrees F in 1989 and a minimum of -1 degrees F in 1934.

All-time state records for March 27th:

The all-time state record high temperature for this date is 80 degrees F at Argyle, Madison, Beardsley, and Moorhead in 1946. The all-time state record low temperature for this date is -29 degrees F at Red Lake Falls (Red Lake County) in 1955. The all-time state record precipitation for this date is 2.70 inches at Two Harbors (Lake County) in 1975. State record snowfall for this date is 15.0 inches also at Virginia (St Louis County) in 1975.

Past Weather Features:

This week in 1910 Minnesota farmers had already planted a large share of the small grain crop (wheat, barley, oats). Daytime temperatures had been averaging in the 70s and 80s F for most of the week and soils were thawed out from winter. It was one of the earliest planting seasons in state history. Unfortunately the 1910 growing season played out to be one of the driest in Minnesota history and much of the crop died or yielded very little.

March 23-24 in 1975 brought a major winter storm to Minnesota. A nasty ice storm deposited 1-3 inches of ice across communities in southwestern Minnesota, splitting trees, and bringing down power lines. Northern communities reported from 6 to 17 inches of snowfall and many roads were closed. High winds generated 20 foot waves on Lake Superior which caused a good deal of shoreline property damage in both Duluth and Two Harbors.

Words of the Week: Hydrograph

This is a graphical depiction of the stage (elevation) or discharge (flow volume) at a point along a stream as a function of time. Hydrograph data are extremely important in assessing the response of a watershed to precipitation and in determining a crest level in flood forecasting. Hydrographs depict both the elevation of a stream and the flow volume. Examples of hydrographs for the Red River Valley and its watersheds can be found at...

<http://www.crh.noaa.gov/ahps2/index.php?wfo=fgf>

Outlook:

Partly cloudy skies with colder than normal temperatures for most of the weekend. Increasing cloudiness later on Sunday, especially in the south. Chance of precipitation by Monday and Tuesday with temperatures remaining colder than normal.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, April 3, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, April 3, 2009

Headlines:

- Jet Streaming Podcast
- The Weather Vein Project
- March Climate Summary
- Record snows over March 31-April 1st
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for April 3rd
- Past weather features
- Sinuosity
- Outlook

Topic: Jet Streaming Podcast this week.....

This week, Mark Ewens of the National Weather Service Office in Grand Forks, ND is back with us to share thoughts and experiences associated with the flooding along the Red River Valley, which thankfully shows signs of easing up. In addition we talk with Don Burgess from the NOAA National Severe Storms Lab in Oklahoma about the deployment of new dual polarization radar for detecting hail. Don also talks about Vortex-2 and the mobile team that will study severe weather outbreaks this spring and summer.

In addition, we share another web site of the week (www.nwc.ou.edu), and jargon terms used by hydrologists.

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Project Weather Vein and the Annicha Arts

Annicha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at...

<http://wecanchangetheweather.org/about.html>

Topic: March Climate Summary

March was a wet month with a mixture of warm spells and cold spells. Mean monthly temperatures in southern and central locations were near normal, while most observers in the north reported temperatures that were 1 to 4 degrees colder than average. Temperature extremes ranged from 69 degrees F at Marshall on the 16th to -36 degrees F at Embarrass on the 12th. Minnesota reported the lowest temperature in the 48 contiguous states 7 days during the month.

Nearly all weather observers except those in east-central and southeastern Minnesota reported above normal precipitation for the month. Some reported record-setting amounts. Fargo, ND reported a record 4.62 inches of precipitation along with 28.1 inches of snow. St Cloud reported a record wet March with 4.66 inches. Moorhead reported a record 4.36 inches of precipitation; Otter Tail reported a record 3.77 inches; Aitkin reported a record 5.27 inches; Grand Rapids a record 4.18 inches; and Ortonville a record 3.12 inches. Most of this precipitation came in the intense rains of the 23rd, 24th, and 25th that contributed to the flooding along the upper reaches of the Red River.

Besides the monthly snowfall record at Fargo, ND, some locations in Minnesota also reported near record, or certainly above normal March total snowfall. International Falls reported 30.1 inches, while Duluth reported 15.5 inches. Other abundant snowfall reports included Kabetogama with 20.3 inches, Red Lake Falls with 21.8 inches, Breckenridge with 23.5 inches, Otter Tail with 33.5 inches, and Rothsay with 18.8 inches.

Topic: Storm and blizzard this week was no April Fools

March 31 and April 1 this week brought heavy snow and blizzard conditions to much of western, central and northeastern Minnesota. Snowfall totals ranged from 9 to 18 inches in some areas. St Cloud reported a new record 6.3 inches of snow on March 31st, followed by a record 2.9 inches of snow on April 1st. Elsewhere snowfall totals

were even more impressive. Breckenridge, just recovering from a flood crest on the Red River reported a snowfall total of 18 inches, Grand Portage reported 16 inches, Campbell reported an incredible 27 inches of snow, Frazee 18 inches, Wadena 14 inches, Pelican Rapids 16 inches, while Beaver Bay reported 14 inches. Many also reported a liquid water equivalence in the snow of 1 to 2 inches. Fortunately much of this remained frozen on the ground with cold air temperatures and did not rush to already swollen rivers and streams. International Falls reported over 8.5 inches of snow pushing them over 124 inches for the season, a new seasonal record at that location. Other locations in NE Minnesota have reported over 100 inches of snow this season as well.

Topic: Weekly Weather/Climate Related Potpourri:

The National Academy of Science hosted a conference in Washington D.C. this week called America's Climate Choices. Many distinguished scientists spoke there, including Dr. Susan Solomon and Dr. Stephen Schneider. The session notes and presentations can be viewed at the conference web site....

http://www.americasclimatechoices.org/summit_webcast.shtml

An AGU paper published in Geophysical Research Letters this week (Wang et al) suggests that the loss of Arctic Sea ice is so accelerated over previous model estimates that a nearly-ice free Arctic Ocean in summer may be seen in about 30 years. Six different climate models have predicted this scenario, most likely to occur in late August or early September during the northern hemisphere summer. See

<http://www.sciencedaily.com/releases/2009/04/090402143752.htm>

The flood fight along the Red River between North Dakota and Minnesota continued this past week. Flood crests began to fall significantly on the upper end of the basin where record crests were observed last week. The cold weather helped slow the runoff from the landscape despite a significant winter storm across the area. The gage reading at Fargo-Moorhead fell below 36 ft for the first time since March 25th. This is still above major flood stage (30 ft) where the flow has been since March 23rd (11 days). At many points along the Red the volume of flow continues above major flood stage and is expected to do so for many days yet as a good deal of frozen surface moisture thaws and flows towards the channels.

Les Everett of the University of Minnesota provided the following information relative to the Red River flood fight this year. In some areas around the Fargo-Moorhead area LIDAR based digital elevation data were used for the placement of sandbags in order to more precisely protect areas from specified flood crests. This was

a side benefit from funds expended in Clean Water Legacy Fund to provide high resolution digital elevation data for Minnesota watersheds. Certainly flood mitigation work made excellent use of these data.

A tornado in the east Indian state of Orissa killed 12 people earlier this week and injured over 200 people. It was a long lived tornado and did quite a bit of damage according to news sources. Over 300 homes were damaged and power lines and communication lines were taken down.

MPR listener question: In my opinion from daily walks with the dog, this winter has been unusually windy in the Twin Cities area. Do the statistics on wind measurements bear me out on this?

Answer: The measurements from the MSP airport for this past winter (November through March) show that the average daily wind speed was less than normal in all months but February, which exhibited stronger average winds. This runs counter to your perception, but perhaps you are remember especially windy days. The data show that on 45 days the wind gusts exceeded 30 mph this winter. Since most of these high wind gusts were during daylight hours, you may have been walking your dog then.

Almanac for April 3rd:

The average MSP high temperature for this date is 48 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 30 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for April 3rd:

MSP weather records for this date include: highest daily maximum temperature of 80 degrees F in 1921; lowest daily maximum temperature of 24 degrees F in 1874; lowest daily minimum temperature of 9 degrees F in 1954; highest daily minimum temperature of 52 F in 1921. Record precipitation for this date is 0.84 inches in 1974. Record snowfall is 5.9 inches in 1974 and a record snow depth of 9 inches in 1975.

Average dew point for April 3rd is 26 degrees F, with a maximum of 58 degrees F in 1956 and a minimum of -6 degrees F in 1995.

All-time state records for April 3rd:

The all-time state record high temperature for this date is 86 degrees F at Beardsley (Big Stone County) in 1929. The all-time state record low temperature for this date is -19 degrees F at Big Falls (Koochiching County) in 1954 and at Thorhult (Beltrami

County) in 1975. The all-time state record precipitation for this date is 3.04 inches at Farmington (Dakota County) in 1934. State record snowfall for this date is 14.0 inches at Kettle Falls (St Louis County) in 1982.

Past Weather Features:

It is interesting to note that on April 2, 1934 in the middle of severe drought, Farmington, MN recorded one of their worst thunderstorms of the Dust Bowl Era. They received 3.04 inches of rainfall, the wettest day of the year in 1934 and their greatest 24-hour rainfall amount ever for the month of April. That single day storm represented nearly 15 percent of their precipitation for the entire year of 1934.

On April 2-3, 1982 southwestern Minnesota was under a severe thunderstorm watch with very warm, humid air dominating the landscape. Temperatures were in the 70s F with dewpoints in the 50s F. Lambertson reported an afternoon high of 78 degrees F, fully 27 degrees F warmer than normal. Severe thunderstorms did materialize and produced 3/4 inch hail in Redwood County, along with wind gusts over 60 mph. A strong cold front passed overnight and arctic high pressure descended on the state dropping the morning low temperatures on April 3rd to just 7 degrees F at Lambertson. Thus in a period of less than 18 hours residents experienced t-shirt like summer weather followed by parka-like January weather with a drop in temperature of 71 degrees F.

Word of the Week: Sinuosity

This is not a term used by meteorologists, but certainly hydrologists use it. It is a numerical expression for how a stream or river meanders through the landscape. Technically sinuosity is a ratio of the threaded channel distance between two points versus the straight linear distance between two points. A stream bed is said to meander if its sinuosity is greater than 1.5. The Red River of the North between North Dakota and Minnesota has a sinuosity between 1.75 and 2.0, depending on what segment you look at. Overall its threaded distance is about 545 miles, while its linear distance is 280 miles, so it really meanders its way along the landscape. With such a shallow slope gradient, only 4 to 8 inch drop in elevation per mile, it is no wonder that the river is prone to ice dams in the spring.

Outlook:

Continued cooler than normal temperatures with a chance for mixed precipitation over the weekend, mostly across southern Minnesota. Some substantial snow may accumulate in southern counties by Sunday. Lingering precipitation Monday in

eastern sections of the state, then drier. Warmer temperatures, at least closer to seasonal normals, may prevail by next Thursday and Friday.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, April 10, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, April 10, 2009

Headlines:

- Jet Streaming Podcast
- The Weather Vein Project
- The Larson/Allmaras Lecture
- Dry start to April helping the flood fight
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for April 10th
- Past weather features
- Lamb weather
- Outlook

Topic: Jet Streaming Podcast this week.....

This week, Mark Ewens of the National Weather Service Office in Grand Forks, ND is back one more time to explain flood forecasting and the distinction between deterministic and probability models used by hydrologists. Fortunately, the area around the Red River has not seen measurable precipitation since April 1st. However, the flood threat remains, as a second crest is anticipated later this month. There have been only five cases of second flood crests during the spring snow melt period over the past 50 years on the Red. Our second guest is Dave Horsman, the Minnesota Twins Director of Operations. He will talk about the new baseball stadium, scheduled to open in April of 2010. Particularly he explains how weather threats and potential postponements will be handled by the Twins and the umpiring crew now that Major League Baseball is moving back outdoors in Minnesota.

In addition, we share another web site of the week (www.noaa.gov), and a jargon term used in baseball since 1892.

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Project Weather Vein and the Annicha Arts

Aniccha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at...

<http://wecanchangetheweather.org/about.html>

Topic: 7th Annual Larson/Allmaras Endowed Lecture

Those who have an interest in agriculture may wish to attend the 7th Annual Larson/Allmaras Lecture hosted by the University of Minnesota Department of Soil, Water, and Climate on April 15th next week. Dr. G. Philip Robertson of Michigan State University will discuss "The Role of Ecology in Modern Agriculture," and we will also hear from Tony Thompson of Willow Lake Farm in southwestern Minnesota who will share his thoughts on land stewardship. The program starts at 2:00 pm in room 335 Borlaug Hall on the St Paul Campus.

Topic: Dry start to April 2009 a benefit to the flood fight

Thankfully the Red River Valley has not seen measurable precipitation since the first day of the month, 9 days ago. Even then the precipitation to start the month was only a few hundredths. The forecast calls for little or no precipitation across the area until Monday, April 13th. This pattern of April dryness is relatively unusual for the area. If we examine the Wahpeton and Grand Forks climate records since 1893, a period of 115 years there are only 22 years that produced a two week April dry spell at Wahpeton (19 percent frequency), and there are 32 years that produced a two week April dry spell at Grand Forks (a 28 percent frequency). With this year's dry interval there has also been a slow thaw, with frequency freeze-thaw overnight cycles. This has allowed the landscape to discharge snow melt run off at a slower pace. Hopefully this unusual weather pattern will persist deeper into April and diminish the amplitude of a second flood crest for most places along the Red River. With the thaw taking place some river gage readings were starting to rise slightly again on Thursday, April

9th. They may continue to rise as the landscape thaws, even in the absence of additional precipitation.

A second dimension to the dry spell since April 1st is that the fire danger has risen for some areas of the state. Currently the Minnesota DNR-Forestry web site shows 10 counties centered around the Twin Cities Metro Area are in a high fire danger category and expected to remain so during the weekend. For the latest go to

http://www.dnr.state.mn.us/forestry/fire/firerating_restrictions.html

Topic: Weekly Weather/Climate Related Potpourri:

A severe weather outbreak plagued the southern states Thursday night (April 9) this week. There were 24 tornado reports filed across the states of OK, TX, AR, MO, and LA. These tornadoes killed 3 people in Arkansas, caused numerous injuries, and destroyed up to 100 homes. It was one of the biggest outbreaks of tornadoes in 2009 so far.

Additionally wildfires in TX and OK caused the closure of Interstate 35 for a period of time and a number of people had to evacuate their homes. There were two deaths in Texas blamed on the fires.

South Dakota State Climatologist Dennis Todey reported this week that at least three locations in that state have set new seasonal snowfall records this winter. Camp Crook has reported 118 inches of snow so far, while Fort Meade reports 95.4 inches, and Bison reports 71.4 inches. Camp Crook received 51 inches of snowfall in March alone.

Heavy rains were causing widespread flooding across many African nations this week. Rivers from Mozambique west across Zambia to Namibia were swollen with runoff from persistent heavy rains over the past week. In some areas it is the worst flooding in 50 years. Fortunately rain bearing Cyclone Jade currently off the east coast of Madagascar is expected to track SE and not affect Mozambique as it dissipates in the southern Indian Ocean.

Scientists with the European Space Agency revealed this week that the Wilkin Ice Shelf in Antarctica has broken away from the islands it was attached to. Signs of this breakage have been observed via satellite since the 1990s. Continued break up of the ice shelf is expected in the open ocean waters and a prolific number of icebergs may be produced.

Parts of Canada are still quite cold this week. Reports from northern Manitoba and Nunavut around Hudson Bay showed many temperatures in the -10 to -20 degrees F

range. Winter's grip remains strong there with plenty of snow cover on the landscape and ample ice cover across Hudson Bay.

NASA announced this month a month-long airborne survey effort to assess the Greenland ice sheet. Measurement of the ice sheet will be made by radars and lasers. Previous studies have suggested the ice sheet is thinning around the coastal edges, but thickening in the interior. Combined with satellite monitoring the researchers hope to differentiate areas that are showing faster melt rates.

MPR listener question: Most everyone I have talked to says this has been a long winter in the Twin Cities. But have we really had an unusual number of colder than normal days?

Answer: Indeed we have. Since November 1st, a period of 160 days (through April 9) we have recorded 90 days with below normal temperatures. So 56 percent of the time we have been colder than average. We have reported daily mean temperature values within 1 degree F of normal only 16 days, only a 10 percent frequency. That leaves only 34 percent of the days with above normal temperatures.

Almanac for April 10th:

The average MSP high temperature for this date is 53 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 33 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for April 10th:

MSP weather records for this date include: highest daily maximum temperature of 88 degrees F in 1977; lowest daily maximum temperature of 33 degrees F in 1997; lowest daily minimum temperature of 15 degrees F in 1997; highest daily minimum temperature of 57 F in 2005. Record precipitation for this date is 1.33 inches in 1883. Record snowfall is 6.0 inches in 1891 and a record snow depth of 6 inches in 1980.

Average dew point for April 10th is 29 degrees F, with a maximum of 58 degrees F in 1945 and a minimum of 3 degrees F in 1959.

All-time state records for April 10th:

The all-time state record high temperature for this date is 92 degrees F at Browns Valley (Traverse County) and Madison (Lac Qui Parle County) in 1977. The all-time state record low temperature for this date is -8 degrees F at Brimson (St Louis County) and Gunflint Lake (Cook County) in 1989. The all-time state record

precipitation for this date is 2.40 inches at Bricelyn (Faribault County) in 1947. State record snowfall for this date is 14.0 inches at Lynd (Lyon County) in 1913.

Past Weather Features:

April of 1929 brought two dramatic storms to Minnesota. April 5th brought a warm, humid afternoon with temperatures ranging from 75 to 80 degrees F across Minnesota. Between 4:15 and 5:30 pm a tornado formed near Lake Minnetonka and raced NE across Columbia Heights-Fridley area, passing north of Forest Lake, and crossing the St Croix River into Wisconsin before dissipating. It was an F-4 intensity (winds 207-260 mph), about 300 yards in diameter, and on the ground for approximately 80 miles (one of the longest tornado tracks in Minnesota history). Six deaths and 40 injuries were attributed to the storm, with over \$1 million in damages to property.

Less than a week later, on April 10 and 11, a strong winter storm struck the southern portion of the state, bringing high winds and heavy snow. This storm delivered 18 inches of snow to Lynd (Lyon County), 19 inches of snow at Tracy, and 16 inches of snow at Pipestone. Further to the east, Waseca reported 11 inches of snow and Albert Lea reported 10 inches. Most travel of any kind was suspended during the storm.

Words of the Week: lamb storm, lamb-showers, or lamb-blasts

Our April showers, often snow showers in northern Minnesota counties, do not have a colloquial name associated with them. But, they certainly do in England and Scotland. The term lamb-showers is used to refer to nuisance storms which produce a light falling of snow in the spring when new lambs are born, most often during late March or early April. More severe snow storms or squalls (called lamb storms or lamb-blasts) during this time can be lethal to the newborn lambs, so the U.K. Meteorological Office provides special forecasts to sheep producers during the spring season to help them avoid or at least anticipate any weather-related difficulties.

Outlook:

Generally a pleasant spring weekend, with increasing cloudiness later on Easter Sunday. Chance of rain on Monday and Tuesday in some southern and western sections of the state. Most daytime highs will be in the 50s F with overnight lows in the 30s F for much of next week. Increasing chance for some precipitation by Thursday and Friday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, April 17, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, April 17, 2009

Headlines:

- Jet Streaming Podcast
- The Weather Vein Project
- Time to plant
- Dryness, fire danger, and ice-out
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for April 17th
- Past weather features
- Red Flag Warning
- Outlook

Topic: Jet Streaming Podcast this week.....

This week, our weather gaze turns to the topics of agriculture and fire weather. Brad Carlson Extension Educator in Rice County shares his thoughts on spring planting and trends in Minnesota agricultural practices. In addition, Jean Bergerson with the Interagency Fire Center in Grand Rapids, MN talks about what's behind the increased fire risk this spring, especially in east-central and southern sections of Minnesota.

In addition, we share another web site of the week (<http://www.dnr.state.mn.us/forestry/fire/index.html>), and a jargon term used by the Weather Service in issuing fire weather forecasts.

To listen to the entire Jet Streaming podcast online, please go to...

http://minnesota.publicradio.org/radio/programs/morning_edition/
or
http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Project Weather Vein and the Annicha Arts

Annicha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at...

<http://wecanchangetheweather.org/about.html>

Topic: Time to Plant

Minnesota farmers got busy this week with planting of small grains (wheat, barley, oats) and corn. Soils in the southern two thirds of the state are frost free, and daytime soil temperatures have climbed into the 50s F. These temperatures are suitable for crop germination. Some areas need rain where top soils have dried out considerably over the last two weeks. Many area farmers are putting in long days to get seed in the ground before expected weekend rains. Even northern Minnesota counties reported their first 60 F temperatures since the early days of November last year.

Topic: Dryness has increased fire danger, ice cover disappearing from area lakes

The Minnesota DNR has imposed burning restrictions this week for a number of counties, including Anoka, Chisago, Isanti, Washington, Wright, and Sherburne. In fact much of central and southeastern Minnesota is in a High to Very High fire danger rating, see

http://www.dnr.state.mn.us/forestry/fire/firerating_restrictions.html

Precipitation totals since April 2nd have been very low with a number of observers reporting just a quarter inch or less. In addition, sunny days have prevailed, and low relative humidity has amplified the drying out of the landscape. As a result, secondary flood crests along the Red River were lower than estimated last week.

According to solar radiation measurements made on the University of Minnesota St Paul Campus, the period from April 6-15 was the sunniest such period in measurement history (back to 1963). This pattern in solar radiation data is evident in the percent possible sunshine measurements made by the National Weather Service in Chanhassen. Over the same period of time their measurement shows that over 82 percent of possible sunshine has occurred.

Portions of eastern and southeastern Minnesota are reported to be in either moderate drought (D1 category) or severe drought (D2 category) this week according to the US Drought Monitor. A grass fire broke out along Highway 169 near Shakopee on Wednesday afternoon, and over 30 other fires of various sizes have been reported during this week as well.

Most lakes in the southern half of Minnesota have lost their ice cover. Ice went out on Lake Minnetonka on April 13th which corresponds to the historical average date, while ice remains on Mille Lacs in the central part of the state. Some far northern Minnesota lakes will not be ice-free until May. You can track Minnesota ice out dates by going to the web at...

http://www.climate.umn.edu/doc/ice_out/ice_out_status_09.htm

Topic: Weekly Weather/Climate Related Potpourri:

The NOAA Storm Prediction Center in Oklahoma showed that 43 tornado reports were filed on April 9th across the southeastern states, while on April 10th another 65 tornado reports were filed. These were by far the highest frequency of daily reports for the year so far. Especially hard hit were the states of Tennessee and Arkansas. After a relatively quiet start to the year (54 tornado reports in January and February combined) SPC shows 123 tornado reports in March and 152 so far in April nationwide.

The United Kingdom Meteorological Office announced this week a new Education Section on their web site that is designed to teach children and teens about weather and climate change. There are also resources for classroom teachers to use. For younger children they can meet the "Weather Explorer" or play games and do simple experiments; teens can delve into case studies of severe weather impacts; and teachers can make use of worksheets and presentations. You can find more at....

<http://www.metoffice.gov.uk/education/>

Tropical Cyclone Bijli formed this week in the Bay of Bengal of the Indian Ocean. Modest in strength it is expected to travel NE and make landfall along the Bangladesh-Myanmar border before dissipating on Sunday. Maximum winds are forecast to be 70-80 mph and sea wave heights may range from 15 to 20 ft. Heaviest rain bands may pass over Chittagong, Bangladesh.

MPR listener question: I heard Craig Edwards say it was desert-like air over the state on Tuesday, April 14th with afternoon relative humidity ranging from 10-15 percent in parts of Minnesota. How often is the air that dry?

Answer: Not very often, perhaps once per year. It is rare for relative humidity to fall below 20 percent in Minnesota. The months when this occurs most frequently are April, early May, or October, especially when vegetation is not fully growing and respiring water vapor into the air. Some of the afternoon readings in Minnesota for this past Tuesday, April 14th show that we were drier than Tucson, Arizona.....

3:00 pm to 4:00 pm readings for Tuesday, April 14, 2009

Montevideo, MN temperature 64 F, dewpoint 7 F, Relative Humidity 10%

Faribault, MN temperature 64 F, dewpoint 1 F, Relative Humidity 8%

Rochester, MN temperature 63 F, dewpoint 11 F, Relative Humidity 13%

Twin Cities, MN temperature 64 F, dewpoint 10 F, Relative Humidity 12%

Tucson, AZ temperature 81 F, dewpoint 27 F, Relative Humidity 14%

Similar conditions prevailed at all of the above locations on Wednesday, April 15th as well. The Twin Cities reported an afternoon relative humidity of 12%, Faribault reported 9%, Rochester reported 13%, and Montevideo reported just 5%. Tucson, AZ reported 15% RH values on Wednesday.

April 14th was also the first day this month that the Chanhassen National Weather Service Office reported 100 percent of possible sunshine. Wednesday's report included 95 percent possible sunshine.

Almanac for April 17th:

The average MSP high temperature for this date is 58 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 38 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for April 17th:

MSP weather records for this date include: highest daily maximum temperature of 85 degrees F in 1985; lowest daily maximum temperature of 33 degrees F in 1953; lowest daily minimum temperature of 10 degrees F in 1875; highest daily minimum temperature of 61 F in 1976. Record precipitation for this date is 1.44 inches in 1975. Record snowfall is 2.7 inches in 1939 and a record snow depth of 5 inches in 1961 and 1983.

Average dew point for April 17th is 32 degrees F, with a maximum of 62 degrees F in 1915 and a minimum of 4 degrees F in 1953.

All-time state records for April 17th:

The all-time state record high temperature for this date is 91 degrees F at Tracy (Lyon County) in 1914. The all-time state record low temperature for this date is -5 degrees F at Gunflint Lake (Cook County) in 1983. The all-time state record precipitation for this date is 4.00 inches at Belle Plaine (Scott County) in 1894. State record snowfall for this date is 13.0 inches at Detroit Lakes (Becker County) in 1945.

Past Weather Features:

On April 17, 1894 starting about 10 am it started to rain in Belle Plaine, MN. By 8 pm it had rained 4 inches in that Scott County town. A second storm the next day, April 15th brought another 3.50 inches for a two day total of 7.50 inches. Over the same period Dawson, MN received 4.70 inches of rainfall. Heavy rains in April of 1894 were common throughout the state and that ended up being the 4th wettest April in Minnesota history. Belle Plaine received a monthly total of 11.20 inches, while Dawson received 11.09 inches. These totals represent the largest total quantity of April precipitation ever measured in the state.

April 16-17, 1945 brought a strong winter storm to western and northwestern sections of Minnesota. It started on the evening of the 16th with winds gusting from 30 to 40 mph and heavy snow accumulation. Pelcan Rapids in Otter Tail County picked up 18 inches of snow, while Detroit Lakes in Becker County received 15 inches. Wadena and Elbow Lake where the storm brought mixed precipitation, both rain and snow, reported a snowfall of 8 inches. Fortunately warm, spring-like temperatures followed the storm and most of the snow was melted by the 19th.

Words of the Week: Red Flag Warning

This is a term used by fire-weather forecasters to call public attention to weather situations that may result in extreme burning conditions. It is issued when it is an on-going event or the fire weather forecaster has a high confidence that Red Flag criteria will occur within 24 hours. Red Flag criteria occurs whenever an area has been in a dry spell for several days or longer, especially if before spring green-up or after fall color, and the National Fire Danger Rating System (NFDRS) is high to extreme, and the following forecast weather parameters are forecasted to be met:

- 1) a sustained wind average 15 mph or greater
- 2) relative humidity less than or equal to 25 percent and
- 3) a temperature of greater than 75 degrees F.

In some states, dry lightning and unstable air are criteria. A Fire Weather Watch may be issued prior to the Red Flag Warning.

Outlook:

Mostly cloudy and cooler over the weekend with a chance of showers, especially in southern and eastern sections of the state. Chance of showers continues into Monday. Cooler weather will prevail until Wednesday when a warming trend starts and there will be increasing chances for precipitation by the end of next week.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, April 24, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, April 24, 2009

Headlines:

- Jet Streaming Podcast
- The Weather Vein Project
- Happy Arbor Day
- History Lessons
- Late season snow storm for NE MN
- A jump to summer
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for April 24th
- Past weather features
- Rain foot
- Outlook

Topic: Jet Streaming Podcast this week.....

This week is Severe Weather Awareness Week in Minnesota and Wisconsin, so appropriately enough we speak with Kris Chapin from the Minnesota Department of Public Safety. She explains the purpose of Severe Weather Awareness Week and highlights some of the critical information we should all pay attention to. Our second guest is Steve Buan, NOAA hydrologist with the National Weather Service in Chanhassen, MN. He brings us up to date on the spring snow melt floods along the Red River Valley and some of the unique characteristics associated with the weather and the floods this year.

In addition, we share another web site of the week related to severe weather (<http://www.severeweather.state.mn.us/index.asp>), and a jargon term used by the Weather Service in issuing severe weather warnings.

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or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

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<http://wecanchangetheweather.org/about.html>

Topic: Happy Arbor Day

Arbor Day is traditionally celebrated on the last Friday of April, today on the 2009 calendar. April is a great month to select a favorite tree to plant in your yard. There are many benefits of trees in the landscape: shade, wildlife habitat, reducing noise, screening air pollution, saving energy, enhancing the beauty of a garden, reducing soil erosion, conserving soil moisture, and a number of others. For more information on trees you can go to several web sites, including

<http://www.forestry.umn.edu/extension/index.html>

www.mntrees.org

Topic: History Lessons

For those interested in Minnesota weather history I will be presenting stories from our history at an author's event hosted by the Saint Paul Central Library (40 W. 4th St, St Paul, MN 55102) at 2:00 pm this Sunday (Apr 26). More information can be found at

<http://www.eventkeeper.com/code/events.cfm?curOrg=SPPL>

Topic: Late season snow storm in Northeastern Minnesota this week

Portions of St Louis, Lake, and Cook Counties received a dose of winter earlier this week on April 20th and 21st as a snow storm crossed the region. Many of the upland areas along the north shore of Lake Superior reported 3 to 10 inches of snowfall. Rockwood Lodge northwest of Grand Marais reported 10 inches of new snow, while

Devil Track Lake reported 6 inches, and Silver Bay nearl 4 inches. Grand Portage reported 5 inches of snow and Gunflint Lake 4 inches, while Wolf Ridge Environmental Learning Center near Finland reported 3.3 inches. The snowfall at Wolf Ridge pushed their seasonal total to 115 inches for 2008-2009.

Last April (2008) also brought some significant late season snows. Over April 26-27 many northern observers reported over a foot of new snow adding to a record-setting snowy April. More on historical snowy Aprils can be found in the Past Weather section of this edition of Minnesota WeatherTalk.

Topic: To Heck with Spring, Let's Jump to Summer!

Thursday of this week was record-setting for many communities in Minnesota, as bright sun and strong southerly winds brought a remarkable rise in temperature to mid-July values. It was by far the warmest April 23rd since 1990. With 30-40 mph winds mixing the air, relative humidity fell to just 10 to 20 percent in many southern and western counties. Afternoon temperatures of at least 90 degrees F were reported from Marshall, Appleton, Morris, Wheaton, Willmar, Benson, Madison, Ortonville, Montevideo, Olivia, Redwood Falls, Canby, Luverne, Fergus Falls, Milan, Artichoke Lake, and Granite Falls. A reading of 94 degrees F at Canby (Yellow Medicine County) set a new all-time state record for the date (old record was 93 F at Winona on April 23, 1980). Communities as far north as Fergus Falls saw temperatures climb into the 90s F.

Among the new record high temperatures for April 23rd were:

Montevideo with 91 F, Redwood Falls 92 F, Morris 91 F, Wheaton 90 F, Willmar 91 F, Madison 91 F, Canby 94 F, Olivia 90 F, Marshall 90 F, Luverne 90 F, Granite Falls 93 F, Fergus Falls 90 F, Fairmont 88 F, Faribault 88 F,

With the number of records set it was arguably the warmest April 23rd in state history, as over 20 communities hit 90 degrees F or greater. In 1990 seven communities hit 90 F or greater on April 23rd, while in 1980 two communities did so, and in 1960 three communities warmed that much. It was also a record-setting day of high temperatures on the South Dakota side of the border, as many observers there saw afternoon highs in the 90s F as well.

Topic: Weekly Weather/Climate Related Potpourri:

Earlier in the week, California suffered under a three day heat wave with dry Santa Ana winds blowing. Los Angeles set a new high temperature record with a reading of

100 degrees F on Monday, while San Francisco set a new record with 93 degrees F. By mid-week westerly winds brought in milder air from the Pacific Ocean.

Wildfires plagued the southeastern states this week. The National Weather Service had Red Flag Warnings up in many states. On Wednesday, Florida's Alligator Alley highway was closed due to dense smoke from brush fires. On Thursday, fires at Myrtle Beach, SC burned dozens of homes and forced the evacuation of many residents and vacationers.

NOAA announced that three new permanent instrumented buoys will be deployed north of the Hawaiian Islands to assist meteorologists with wave, surf, and wind forecasts. The Coast Guard is assisting in the deployment of the new buoys.

The Sri Lanka Coconut Research Institute reported last week that climate change may have adverse effects on coconut production in that region of the world. Increasing temperature and greater moisture stress will affect fruit formation in the trees, as well as nut size. This crop is an important one in the agricultural economy of the tropics. Its fruit meets some of the nutritional requirements; its oil is used for cooking; and tree fibres are used for mattresses, ropes, brooms, and baskets.

MPR listener question: Though you talked with Cathy a lot about the long cold winter and some of the coldest temperature readings in the nation were from Minnesota this year, you have not spoken of any cold temperatures this month. Is Minnesota's national reputation for cold at stake? Have we simply not had enough cold air this month to lead the nation?

Answer: Indeed, after starting the month with colder than normal temperatures over the first ten days, we have seen warmth dominate during the past two weeks. Nevertheless, our climate observers in northern portions of the state have reported the coldest overnight lows in the 48 contiguous states on four days this month: April 9th it was just 16 degrees F at Embarrass, April 10th was just 12 degrees there as well. April 11th was just 9 degrees F at Grand Marais, and earlier this week, April 22nd it was just 23 degrees F at Park Rapids. I think four times in a month is enough to sustain our national reputation.

Almanac for April 24th:

The average MSP high temperature for this date is 60 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 41 degrees F (plus or minus 9 degrees F standard deviation).

MSP local Records for April 24th:

MSP weather records for this date include: highest daily maximum temperature of 84 degrees F in 1962; lowest daily maximum temperature of 36 degrees F in 1887; lowest daily minimum temperature of 24 degrees F in 1875; highest daily minimum temperature of 62 F in 1915. Record precipitation for this date is 1.43 inches in 1908. Record snowfall is 0.3 inches in 1902.

Average dew point for April 24th is 35 degrees F, with a maximum of 66 degrees F in 1948 and a minimum of 8 degrees F in 1918.

All-time state records for April 24th:

The all-time state record high temperature for this date is 92 degrees F at Madison (Lac Qui Parle County) and Milan (Chippewa County) in 1962. The all-time state record low temperature for this date is 3 degrees F at Sawbill Camp (Cook County) in 1936. The all-time state record precipitation for this date is 5.44 inches at Winona Dam (Winona County) in 1990. State record snowfall for this date is 15.0 inches at Fosston (Polk County) in 1937.

Past Weather Features:

A big snow storm hit Park Rapids on April 24, 1893 depositing 8.9 inches of new snow. This storm was one of several heavy snows that came in the month of April 1893. The two biggest occurred over April 19 to 21 and April 24 to 26. The Park Rapids and Ft Ripley observers reported snowfall on 9 days during the month, with snowfall totals of 34.3 inches, and 31 inches, respectively. These are some of the highest April snowfall totals ever observed in those locations. Others who received extra large doses of April snowfall included Cambridge with 28 inches, New London with 30 inches, Lynd with 31 inches, Leech Lake with 23.6 inches, and Fairmont with 20 inches. Needless to say with all of the snowfall April of 1893 was one of the coldest in state history.

April of 1937 was cold and snowy in northwest Minnesota. The observer at Fosston reported 19 inches of snowfall. On the last day of the month the snow depth was still 11 inches as the May planting season started. One of the heaviest snowfalls of the month occurred over April 23-25, dropping 6 inches at Roseau and Mahnommen, and 5 inches at Crookston.

More recently on April 25, 1996 a winter storm crossed the northern counties of Minnesota bringing heavy snowfalls to many communities. Approximately 10 inches of snow fell between Baudette and International Falls. Winds up to 25 mph caused whiteout conditions and some roads were closed. The airport at International Falls

was closed for only the second time in history. Elsewhere observers at Little Fork and Babbitt reported 6 inches of new snow, while Embarrass reported 5 inches.

Words of the Week: Rain foot

This is a term associated with severe weather, namely convective thunderstorms. It refers to the shape of the rain shaft or condensation cloud that descends from a thunderstorm base and shows a horizontal bulging near the surface that mimics the impression of a foot. It is a visual indication of a wet microburst or heavy rain that is accelerated towards the ground by downburst winds coming from the thunderstorm. In the midst of such a storm it is almost impossible to see, but if you observe this feature from a distance it does appear as a foot descending towards the ground.

Outlook:

Much cooler over the weekend with chances for rain showers in the south on Saturday, and across much more of the state on Sunday. Some thunderstorms may occur as well. Lingering chance for showers in the north and east on Monday. Cooler temperatures will continue into next week with many daytime readings in the 40s and 50s F. Warmer and a chance for showers by Thursday of next week.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, May 1, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, May 1, 2009

Headlines:

- Farewell to Jet Streaming
- Jet Streaming Podcast
- The Weather Vein Project
- April Climate Summary
- UVI Reminder
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for May 1st
- Past weather features
- Cut-ins and Cut-outs
- Outlook

Topic: Jet Streaming coming to an end.....

Due to the economic downturn and staff reductions at Minnesota Public Radio, the "Jet Streaming" podcast will likely make its final run next week on May 6th with the broadcast of segments from the UBS Forum on Severe Weather Awareness and Education held that evening. (space for that public event at the MPR UBS studio in downtown Saint Paul is still available... if you are interested in attending, go to <http://events.publicbroadcasting.net/mpr/events.eventsmain?action=showEvent&eventID=876765>). I have participated in this effort for over two years and enjoyed the discussions with our guests (scientists, authors, observers, educators, agency heads, and others). We have tried to provide educational content and deal with significant topics in atmospheric, hydrologic, and climate sciences. If you have questions or concerns about this podcast or have other related comments you can reach us via the web at...

http://www.publicradio.org/applications/formbuilder/user/form_display.php?form_code=6194777ecc87

or simply email me: mseeley@umn.edu

After next week, the Minnesota WeatherTalk newsletter will no longer make reference to this podcast.....

Topic: Jet Streaming Podcast this week.....

This week we discuss climate change with well known author Elizabeth Kolbert of the New Yorker magazine. Her best seller "Notes from a Catastrophe: Man, Nature, and Climate Change" serves as a basis for our conversation, but we also discuss the current posture of the Obama Administration on this issue. In addition, we visit with Euan Kerr of Minnesota Public Radio. Euan reports on the arts for public radio, and particularly on the movies through his blog "Movie Natters." In this context he shares his thoughts on how weather is depicted in movies and to what degree it is realistic.

In addition, we share another web site of the week, one from the National Science Foundation (<http://www.exploratorium.edu/climate/index.html>), and a jargon term used by the EPA when it comes to air quality standards.

To listen to the entire Jet Streaming podcast online, please go to....

http://minnesota.publicradio.org/radio/programs/morning_edition/

or

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Project Weather Vein and the Annicha Arts

Annicha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at....

<http://wecanchangetheweather.org/about.html>

Topic: April Climate Summary

Despite some large swings in temperature during the month, average April temperatures reported by most Minnesota observers were within a degree or two of normal. Some northern counties where more snowfall occurred reported average monthly temperatures that ranged from 2 to 3 degrees F colder than normal. Minnesota reported the coldest temperature in the 48 contiguous states on four dates

during the month. Temperature extremes were 94 degrees F at Myers Field Airport in Canby on the 23rd, and just 9 degrees F at Cook County Airport outside Grand Marais on the 11th. The temperature of 94 degrees F at Canby on April 23rd was a new state record for the date (old record was 93 degrees F at Winona in 1980). The next day the temperature fell 54 degrees F at Canby dropping to 40 F. In addition on April 24th Rochester reported a high of 92 degrees F which tied the state record for the date (at Milan and Madison in 1962).

Precipitation was generally less than normal in April for most observers. A few northern locations like Littlefork, Babbitt, and Beaver Bay reported above normal precipitation. In fact the month started with a strong winter storm up north. April 1st brought record setting precipitation and snowfall to some locations. Littlefork reported a record 1.43 inches of precipitation and 6 inches of snow. Beaver Bay reported a record 2.52 inches of precipitation, and Grand Portage reported a record 2.23 inches of precipitation and 16 inches of snowfall. From southern Minnesota Austin reported a record 1.43 inches of precipitation on April 27th. Indeed across the southern half of the state most of the precipitation fell during the second half of the month.

Several observers reported significant April snowfall. Grand Portage had a record 23.7 inches. Pelican Rapids reported a foot of snowfall, while Otter Tail reported 16.5 inches. Breckenridge on the headwaters of the Red River reported 13 inches.

Speaking of the Red River, during the first 25 days of April it was continuously in major flood stage at a number of points along the watershed, including Fargo-Moorhead where major flood stage lasted a period of 33 days. Only during the last week of the month did many gage readings drop to moderate or minor flood stage. The drier than normal April was a blessing there.

April lived up to its reputation as a windy month delivering winds in excess of 30 mph on several days and a couple of days produced winds greater than 40 mph.

Topic: Now that it's May, pay attention to the UVI

May typically brings enough sunny and pleasant weather to induce sunbathers to spend sometime outside. But, don't underestimate the effects of the spring sun. The National Weather Service Forecast Office issues a forecast of the next day Ultra Violet Index (UVI) each afternoon. This product is intended to help people anticipate the level of exposure to the sun and whether or not to protect themselves. The UVI is estimated based on expected intensities at solar noon and ranges from 0-15. The exposure categories used are:

minimal (0-2), low (3-4), moderate (5-6), high (7-9) and very high (10 and above).

This is a cooperative effort between the National Weather Service, the Environmental Protection Agency, and Center for Disease Control. Their slogan is to be "sun wise." For categories of 6 or higher it is best to wear sunglasses and put on some blocking lotion if you intend to be outside for hours. UVI categories of 6 or greater begin to appear typically during the month of May in Minnesota. Graphs of the UVI for various cities can be found at...

http://www.cpc.ncep.noaa.gov/products/stratosphere/uv_index/uv_annual.shtml

Topic: Weekly Weather/Climate Related Potpourri:

Recent beneficial rains have removed southeastern Minnesota counties from a severe drought category (D2) according to the US Drought Monitor. Some remain in moderate drought (D1), but the area designated as such is shrinking. Portions of west-central Wisconsin remain in severe drought however and residents are hoping that the first half of May is wetter than normal.

Jan Null, Certified Consulting Meteorologist from Golden Gate Weather Services in California has published an evaluation of the Old Farmers Almanac regional forecasts for this past winter's heating season (Nov, 2008 to Mar, 2009). The skill scores are not very high. For the High Plains Region, which includes Minnesota, the average grade on getting the monthly temperature and precipitation values placed in the correct categories was C+. But this represents a mean value of extreme scores. They did well in forecasting precipitation (scores of A to A-), but failed on many of the monthly scores for temperature (too many Fs). You can read more on this evaluation of the Old Farmer's Almanac at...

<http://ggweather.com/farmers/2009/index.htm>

NOAA scientists released a report last week on the 2008 global inventory of greenhouse gases. Despite a downturn in global economies, the trends were still upward in carbon dioxide and methane gases. It was especially disconcerting to see methane, a more powerful greenhouse gas, increase for the second consecutive year. More information on this can be found at...

http://www.noaanews.noaa.gov/stories2009/20090421_carbon.html

With a recent rapid melt of snow cover ice dams were producing some spring flooding along the Tanana River of interior Alaska this week. Parts of the Old Richardson Highway were under 3 feet of water. Some rural residents along this watershed were literally surrounded by water during mid-week.

The American Lung Association released its Annual State of the Air report on national air quality this week. This document includes a report card (grades A-F) on air quality for hundreds of cities and counties across the USA. The grades are based on three types of pollution: ozone, annual particle pollution, and 24-hour particulate pollution. The report finds that 60 percent of American citizens live in communities where air pollution reaches unhealthy levels at various times. A description of the report can be found at...

<http://www.sciencedaily.com/releases/2009/04/090429131158.htm>

Access to the full report, including specifics for Minnesota counties can be found at..

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

MPR listener question: When was the last time we had measurable snowfall during the month of May in the Twin Cities? And how often does it snow in the month of May around here?

Answer: The first two days of May in 2005 brought a trace of snowfall to the Twin Cities. The last measurable May snowfall was on May 5, 1991 when 0.3 inches was measured. Approximately one in every three Mays brings at least a trace of snowfall to the Twin Cities area. Of the past 125 years only 21 have brought measurable snowfalls in the month of May.

Almanac for May 1st:

The average MSP high temperature for this date is 63 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 43 degrees F (plus or minus 9 degrees F standard deviation).

MSP local Records for May 1st:

MSP weather records for this date include: highest daily maximum temperature of 91 degrees F in 1959; lowest daily maximum temperature of 33 degrees F in 1909; lowest daily minimum temperature of 24 degrees F in 1909; highest daily minimum temperature of 64 F in 1934. Record precipitation for this date is 1.26 inches in 1983. Record snowfall is 3.0 inches in 1935.

Average dew point for May 1st is 36 degrees F, with a maximum of 66 degrees F in 2001 and a minimum of 8 degrees F in 1958.

All-time state records for May 1st:

The all-time state record high temperature for this date is 100 degrees F at Beardsley (Big Stone County) in 1959. The all-time state record low temperature for this date is 4 degrees F at Pine River Dam (Crow Wing County) in 1909. The all-time state record precipitation for this date is 3.86 inches at Winona (Winona County) in 1936. State record snowfall for this date is 8.0 inches at Hinckley (Pine County) in 1909.

Past Weather Features:

At just passed 5:00 pm on the afternoon of May 1, 1887 a tornado touched down SW of Fergus Falls. It remained on the ground for 8 miles and inflicted damage to some homes and barns, but caused no injuries or fatalities. At first the funnel was thought to be smoke from a prairie fire, something that had been common in the area that spring.

May 1, 1909 brought a winter storm to the state, as daytime temperatures ranged mostly in the 30s F with accumulating snow in many places during midday. Several observers reported over 2 inches. In the southeast Caledonia and Grand Meadow received 3 inches of snowfall from the storm. Further to the north, Taylors Falls reported 3.5 inches, Sandy Lake 4 inches and Hinckley 8 inches. Many observers also reported record setting cold temperatures as polar air moved in behind the front.

For the past nine consecutive years Minnesota has reported tornado activity in the month of May. On May 1, 2001 between 5:00 pm and 8:00 pm seven tornadoes were reported in southeastern counties. Most were small in size and of short duration. One tornado was on the ground between Glenville and Myrtle in Freeborn County for a distance of 7 miles, and rated an F-2 (wind speed 113-157 mph). In Glenville 25 homes sustained major damage and 70 minor damage. Numerous other counties reported large hail and damaging winds from these storms.

Words of the Week: Cut-in and Cut-out speeds

These terms are not used so much in atmospheric science or climatology, but they are certainly used in the wind turbine/wind energy industry. They refer to the wind speed limits for the capacity of wind generating power systems (typically wind turbines).

The Cut-in Speed is the wind speed required to turn the turbine blades on a wind generator at a speed that will produce electricity. Often times this is around 10 mph.

The Cut-out Speed is the wind speed when the wind turbine stops the blades from turning and rotates out of the wind to avoid damage to the turbine itself. This can happen at wind speed of 55 mph or greater.

Outlook:

Slight chance of some showers in the north on Saturday and partly cloudy elsewhere. A bit warmer on Sunday with a continuation of near normal temperatures next week. A chance of showers returns by Wednesday, as temperatures moderate around normal for this time of year.

Further Information:

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<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, May 8, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, May 8, 2009

Headlines:

- Jet Streaming Podcast
- The Weather Vein Project
- Hail visits the state
- Fishing Opener
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for May 8th
- Past weather features
- Aerolite
- Outlook

Topic: Jet Streaming Podcast this week.....

The podcast this week is about severe weather awareness and education. It is comprised of a discussion held at the MPR UBS Forum on Wednesday, May 6th, 2009 the 44th anniversary of the famous Twin Cities tornado outbreak of 1965. Hosted by Cathy Wurzer, the forum provides a wide ranging discussion of severe weather elements in Minnesota and the technologies and procedures used to detect them and to warn the public. Some of the more interesting segments include stories of first hand experiences with severe weather in Minnesota. We also salute our long time producer Patti Rai Rudolph of MPR who did a terrific job assimilating all of this material each week and delivering a quality podcast.

The web site we share is associated with severe weather education and can be found at...

(<http://www.severeweather.state.mn.us/index.asp>),

To listen to the highlights of this UBS Forum discussion, please go to....

<http://minnesota.publicradio.org/display/web/2009/05/07/midday1/>

or for other older Jet Streaming podcasts go to...

http://minnesota.publicradio.org/radio/podcasts/jet_streaming/

Topic: Project Weather Vein and the Annicha Arts

Annicha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at....

<http://wecanchangetheweather.org/about.html>

Topic: Hail visits Minnesota this week

As we migrate into the spring the probabilities for severe weather elements increase. On May 5 and 6 this week a number of observers reported quarter to three-quarter inch hail, including Nobles, St Louis, Carlton, Olmsted, Houston, McLeod, Benton, Aitkin, Lake, Clearwater, Beltrami, Pine, and Washington counties. In Nobles County near Worthington hail piled up an inch deep on the ground, while in Pine and Carlton Counties hail from 1 to 1.5 inches in diameter was reported. Fortunately little damage was noted. At Flying Cloud Airport in Eden Prairie a 61 mph wind gust was reported associated with a passing thunderstorm. With the flux of moisture from the south dewpoints approached the 60 degrees F mark on May 5 and 6 this week, making it feel much more like spring.

Considering the severe weather elements of tornadoes, hail, and straight line winds, the peak frequency in Minnesota is centered on June 10th, but ranges more broadly from March through October. Over the past three decades nearly 75 percent of all Minnesota tornadoes have occurred in the months of May, June, or July. Over the same period of years nearly 60 percent of all tornadoes in Minnesota have occurred between the hours of 5:00 and 7:00 pm.

Topic: Fishing Opener Weekend Weather

It appears as though nearly all of our Minnesota lakes will be hospitable for fishing this weekend. There may still be some ice on Lake of the Woods in the far north central part of the state, while a number of lakes in Cook County (northeastern most Minnesota) are still showing some ice cover.....these include Devil Track, Gunflint, and Greenwood among others. MODIS satellite images depict this ice cover in scenes take earlier this week. You can view these at....

http://ge.ssec.wisc.edu/modis-today/index.php?viewcal=true&satellite=t1&product=true_color

Topic: Weekly Weather/Climate Related Potpourri:

After the long, traumatic spring snow melt flood fight along the Red River Basin between North Dakota and Minnesota last month, government officials from both states met with the Army Corps of Engineers this week to discuss measures to better cope with long term flood threats on that watershed. Government and community leaders are hoping to build a consensus view on mitigation and adaptation projects that would better protect communities from future flooding of the Red River. Final costs of these projects may range from \$800 to \$2 billion.

The current issue of Weatherwise magazine has an article about weather testing of products written by Nick D'Alto. Most weather testing is associated with the effects of sun, heat, freeze-thaw cycles, and moisture. In the case of sun effects testing facilities sometimes concentrate the energy from the sun to magnify the impact on materials such as metals, plastics, paints, or textiles. Minnesota is known to have a suitable climate for cold weather testing, or testing related to freeze-thaw cycles.

The BBC reported this week that persistent heavy rains in northeastern Brazil have caused nearly 200,000 residents to abandon their flooded homes. Roads have been closed and relief workers were being transported to some areas by boat. Thunderstorms were expected to continue through the weekend in many areas there.

<http://news.bbc.co.uk/2/hi/americas/8035116.stm>

The Joint Typhoon Warning Center was busy this week issuing warnings associated with Typhoon Chan-Hhom in the western Pacific Ocean. It struck the northern Philippines early Friday with heavy rains, high seas, and strong winds. Wind gusts were reported between 90 and 110 mph. Floods, landslides, and destructive winds were blamed for at least 18 deaths there. The weakened typhoon was heading northeast across the western Pacific Ocean and was expected to fully dissipate by Sunday.

This week researchers from Purdue University and the USDA-ARS reported on a new sensor technology that can help maximize the efficiency of wind turbines while protecting the machinery from undue stress in high wind situations. Sensors imbedded in the blades of the turbine can keep track of loads, or forces exerted on the turbine blades and then predicting fatigue. If the blades are fitted with control surfaces, like flaps on an airplane wing, they can be adjusted to maximize efficiency. This report on "smart turbine blades" can be found at.....

<http://www.sciencedaily.com/releases/2009/05/090501154141.htm>

MPR listener question: Having heard you and Cathy talk about May snowfalls last week I looked in your book to see if there was ever a blizzard recorded during this month. I could not find one. Is that correct, or have we ever had blizzard conditions in May?

Answer: Blizzard conditions have come as early as October and as late as April. I don't believe that the National Weather Service has ever reported a May blizzard in Minnesota. The closest we've come was probably May 3, 1954. During the early morning hours that day temperatures were in the 30s F with 30 to 40 mph wind gusts and snow was falling. Visibility was reduced for a time to just half a mile (but quarter mile or less visibility is a criteria for a blizzard). Nevertheless travel was not advised and many areas received substantial amounts of snow from this winter storm over the first few days of May. In the Twin Cities 3.4 inches fell, but elsewhere the numbers were much higher, including 8 inches at Itasca State Park, 10 inches at Park Rapids, 13 inches at International Falls, a foot of snow at Babbitt, 15 inches at Tower, and almost 16 inches at Virginia. A similar storm that may have been blizzard like for a brief time occurred in early May of 1890 when Mankato received 5 inches of snow, Le Sueur reported 4 inches, Red Wing 3.5 inches, and Northfield 3 inches, with strong winds. For this storm the data are too sketchy to precisely characterize the visibility and wind speeds during the event.

Almanac for May 8th:

The average MSP high temperature for this date is 65 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 8th:

MSP weather records for this date include: highest daily maximum temperature of 90 degrees F in 1874; lowest daily maximum temperature of 41 degrees F in 1924 and 1945; lowest daily minimum temperature of 28 degrees F in 1960; highest daily minimum temperature of 67 F in 1896. Record precipitation for this date is 1.73 inches in 1872. Record snowfall is 0.5 inches in 1923.

Average dew point for May 8th is 38 degrees F, with a maximum of 67 degrees F in 1965 and a minimum of 6 degrees F in 1947.

All-time state records for May 8th:

The all-time state record high temperature for this date is 102 degrees F at Beardsley (Big Stone County) in 1934. The all-time state record low temperature for this date is 10 degrees F at Pine River Dam (Crow Wing County) in 1907. The all-time state record precipitation for this date is 4.80 inches at Montevideo (Chippewa County) in 1993. State record snowfall for this date is 12.0 inches at Windom (Cottonwood County) in 1938.

Past Weather Features:

At 3:00 pm in the afternoon on May 8, 1882 an F-2 tornado (winds 113-157 mph) touched down near Lakefield in Jackson County. It was on the ground for 5 miles and destroyed a school house. Fortunately only 11 of the 32 students were present as most of the children were helping with the planting season on the local farms. Some of the students were carried 50 yards by the tornado and dropped into a ravine, but there were no fatalities reported.

On May 10, 1934 a classic Dust Bowl wind storm visited the state. The dust storm caused widespread damage over the region. Extensive damage with near daytime blackout was observed in the Twin Cities and West Central Minnesota. Dust drifts piled high and automobiles were driven with their headlights on due to the poor visibility. The damage done to personal property was due to fine dust sifting inside homes and businesses. Drift piles of dust and soil 6 inches deep were on the roads around Fairmont, MN.

The early evening of May 8, 2005 between 6:00 and 7:00 pm three tornadoes visited Minnesota communities. Two occurred in Lac Qui Parle County and were videotaped by storm spotters. They touched down only briefly and caused no damage. A third tornado struck near Shieldsville in Rice County and crossed Mazaska Lake before dissipating. It knocked down a number of trees, but did little other damage.

Word of the Week: Aerolite

This is the name given to a stony meteorite that is mostly composed of silicate minerals. Between 5:00 and 6:00 pm on May 2, 1890 an enormous aerolite brightened the sky across northwestern IA, southeastern SD, and southwestern Minnesota before exploding into hundreds of fragments. The largest fragment, weighing nearly 70 tons was found in Winnebago County, Iowa.

Outlook:

Cooler than normal for the Fishing Opener on Saturday, then warmer for Mother's Day on Sunday, with some afternoon highs in the 60s F. Generally dry through

Monday, then a chance for showers Tuesday through Thursday next week as temperatures warm.

Further Information:

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<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, May 15, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, May 15, 2009

Headlines:

- The Weather Vein Project
- Slow planting progress in NW Minnesota
- Big wind and high dewpoints
- Weekly weather/climate potpourri
- MPR listener question
- Almanac for May 15th
- Past weather features
- Tatsumaki
- Outlook

Topic: Project Weather Vein and the Annicha Arts

Annicha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at....

<http://wecanchangetheweather.org/about.html>

Topic: Slow progress in planting of the Red River Valley

Following the spring snow melt flooding some areas of the Red River Valley have remained too wet to plant. Some small grains like spring wheat, as well as some sugarbeets may not get planted until the second half of May. Elsewhere corn and soybean planting have made good progress, with over 80 percent of the corn planted and about a third of the soybeans in the ground. Minnesota is in relatively good shape with respect to planting compared to even wetter states like Illinois and Indiana, where barely 10 percent of the corn has been planted due to wet soils and flooding. It's

looking like wetter than normal conditions may dominate our weather pattern for the rest of May.

Cooler temperatures in the north have delayed green-up in some areas. Some snow was reported at Gunflint Lake last weekend, and Embarrass has reported the coldest temperature in the 48 contiguous states on both May 5th (22 degrees F) and May 15th (25 degrees F).

Topic: A big wind and spike in dewpoints this week

A deep low pressure system moving across Canada provoked strong winds this week across the state. Almost all observers reported wind speeds of 30 mph or greater for portions of the day on Wednesday and Thursday. Many reported wind gusts of 40 mph or greater, including New Ulm (44), Faribault (45), Pipestone (44), Baudette (46), Morris (44), Wheaton (43), Marshall (48), Crookston (46), Jackson (48), International Falls (46), Duluth (41), Fairmont (45), and Fergus Falls (43). These strong winds blew some soil around, as dust clouds were reported by a number of observers.

In addition, the first multiple reports of dewpoints in the 60s F occurred on Wednesday of this week (May 13th). The combination of southerly winds bringing warm, moist air from the south and the greening of the landscape seems to have provided enough water vapor to raise the dewpoints to such levels. Thunderstorms cropped up in places as well on Wednesday. Late in the day Wabasha reported a strong thunderstorm with hail.

Topic: Weekly Weather/Climate Related Potpourri:

Recent NASA MODIS satellite imagery captured two significant events in the past week. The first was the Jesusita fires along the California coast near Santa Barbara. By May 9th over 75 homes had been lost or damaged by these fires. The MODIS image can be seen

at <http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=38446>

In addition the strong dust storm in Syria and Iraq last week was captured in MODIS imagery and can be viewed at

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=38443>

The dust veil splits into north and south branches over Iraq.

The NOAA National Weather Service federal budget request for fiscal 2010 was just under \$964 million, an increase of \$5 million over 2008. I still consider this a bargain considering the environmental monitoring, forecasting, warning, and advisory

services we all benefit from. In fact based on the USA population (about 304 million) the cost is \$3.17 per person for the year.

This week in Congress the House subcommittee on Energy and the Environment passed a plan that would initiate a National Climate Service under NOAA. This plan would amplify the federal coordination of local National Weather Service Offices with Regional Climate Centers and State Climatology Offices.

A paper published recently in the Journal of Environmental Science and Technology highlights the difference in greenhouse gas emissions between using traditional timber railroad ties and reinforced concrete ties. With so many aged railroad tracks being replaced, Robert Crawford of the University of Melbourne in Australia evaluated the estimates of greenhouse gas emission from the manufacture and deployment of timber and reinforced concrete railway ties using a 100 year life cycle. He found that the use of concrete ties emits 2 to 6 times less greenhouse gases than those of timber. This type of environmental thinking may be relevant to U.S. railroads as they replace old or damaged lengths of track.

MPR listener question: We spent a few years working in Germany before moving to Minnesota. During that time we had experience with severe thunderstorms and winter storms, but never tornadoes. Can you tell us how many tornadoes occur in Minnesota each year and whether or not there are tornado statistics for Germany?

Answer: There have been over 600 tornado reports in the USA so far in 2009. Across the country about 1300-1400 tornadoes are reported each year. Typically 35 to 40 of these occur in Minnesota, but of those over 75 percent are weak tornadoes, EF-0 or EF-1 category (winds less than 110 mph). In Europe, approximately 300 tornadoes occur each year, with an average of 10 in Germany. There too, the vast majority are weak ones.

Almanac for May 15th:

The average MSP high temperature for this date is 68 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 47 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for May 15th:

MSP weather records for this date include: highest daily maximum temperature of 93 degrees F in 1987; lowest daily maximum temperature of 39 degrees F in 1907; lowest daily minimum temperature of 31 degrees F in 1907 and 1980; highest daily

minimum temperature of 70 F in 2001. Record precipitation for this date is 1.95 inches in 1911. Record snowfall is 0.8 inches in 1907.

Average dew point for May 15th is 42 degrees F, with a maximum of 70 degrees F in 1998 and a minimum of 21 degrees F in 1956.

All-time state records for May 15th:

The all-time state record high temperature for this date is 99 degrees F at Hutchinson (McLeod County) and Olivia (Renville County) in 2001. The all-time state record low temperature for this date is 16 degrees F at Saint Vincent (Kittson County) in 1888. The all-time state record precipitation for this date is 4.20 inches at New London (Kandiyohi County) in 1911. State record snowfall for this date is 8.0 inches at Mount Iron (St Louis County) in 1907.

Past Weather Features:

On May 15, 1862 President Lincoln signed into law a bill which established the USDA. In the early days of statehood agriculture struggled in Minnesota. Those living on the Dakota Mission or farming nearby in Renville County saw only one rain during the month of May, 1862. 1.80 inches fell on May 15 that year, enough to start a crop, but not enough to sustain it. "King wheat" was the major crop in Minnesota back then.

May of 1907 was by far the coldest May in state history, averaging over 10 degrees F colder than normal. Numerous frosts were recorded, some as late as the 27th. A late season winter storm visited the state over May 13-15 and brought thunderstorms, rain, sleet, and snow. Many places in northern counties reported 4 to 9 inches of snow by May 15th. The cold and late start to the growing season was hard on Minnesota agriculture as most farmers reported poor yields.

May 15, 2001 was clearly the warmest in history. Over 70 Minnesota communities reported an afternoon high of 90 degrees F or greater. Dewpoints climbed into the 65-70 degrees F range pushing the Heat Index values from 98 to 104 degrees F. With winds of 25 to 35 mph some clouds of blowing soil were observed in western counties.

Word of the Week: Tatsumaki

This is the Japanese word for tornado. Many tornadoes in Japan are associated with the landfall of typhoons and as a result there is a mixture of waterspout and funnel sightings during most of these storms. When tornadoes occur with typhoons the intense rain bands of the storm sometimes obscure tornadoes, which can be detected

by Dopplar radar imbedded in the typhoon. Japan reports about 20 tatsumaki per year, plus an additional 5-6 waterspouts.

Outlook:

A cool and breezy weekend, especially in the north on Saturday. Cold start to Sunday with a chance for frost in the north, but more sun and a bit warmer temperatures in the afternoon. Gradual warm up next week with a chance for showers and thunderstorms by late Tuesday.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, May 22, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, May 22, 2009

Headlines:

- The Weather Vein Project
- A dose of winter last weekend
- Heat and Wind
- A challenge
- Weekly Weather Potpourri
- MPR listener question
- Almanac for May 22nd
- Past weather features
- Belfries, Steeples, Cupolas, etc
- Outlook

Topic: Project Weather Vein and the Annicha Arts

Annicha Arts of the Twin Cities (<http://aniccha.org>) has initiated The Weather Vein project with a grant from the Jerome Foundation. This is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project includes a blog (<http://wecanchangetheweather.org/blog/>), various education workshops, a performance at the Pillsbury Playhouse (June 5-7, 2009), and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at...

<http://wecanchangetheweather.org/about.html>

Topic: A dose of winter over last weekend

Embarrass reported the lowest temperature in the 48 contiguous states on both Friday, May 15 and Sunday, May 17 with 25 degrees F and 20 degrees F, respectively. In addition a number of northern Minnesota weather observers reported 0.1 to 0.3 inches of snowfall on Saturday, May 16th, perhaps a last gasp of winter. Embarrass has reported overnight lows in the 20s F in every month of the year historically.

Topic: Heat and Wind

Despite cool temperatures and some snow in northern Minnesota last weekend (International Falls has now seen 125.7 inches for the '08-'09 season), the two primary characteristics of weather this week have been heat and wind. Monday brought an abrupt shift in temperature as afternoon highs in western and southern parts of the state climbed into the mid to upper 80s F. Though not a record Montevideo in Chippewa County reported a high of 90 degrees F on Monday afternoon after a high of only 57 degrees F on Saturday. Winds grew stronger on Tuesday and brought some record-setting heat to portions of the state. Minneapolis-St Paul Airport reported a record 97 degrees F, as did both Marshall and Mankato. In western Minnesota Madison and Montevideo reported record-setting afternoon highs of 99 degrees F, while Browns Valley had a record setting 95 degrees F. At the top of the heap was Granite Falls with a record 100 degrees F. Winds gusted between 35 and 40 mph in the afternoon and early evening.

The winds were even stronger on Wednesday, May 20, with several observers reporting wind gusts over 50 mph, including 55 mph at Redwood Falls and Slayton, 54 mph at St James and Fairmont, 53 mph at Waseca and St Cloud, 52 mph at Rochester, 51 mph at Tracy and Owatonna, and 50 mph at MSP Airport. Many farmers reported that soil erosion was dominant for a time in the afternoon with clouds of soil blowing across the landscape. The wind combined with the warm temperatures and low humidity produced record-setting evaporation on Wednesday. The University of Minnesota Climate Observatory reported 0.63 inches of evaporation, the third highest daily value in history. A few more record high temperatures were reached on May 20th as well, with St Cloud reporting 92 degrees F and the Twin Cities 94 degrees F. Duluth reported a record 88 degrees F. Gunflint Lake started the day at 41 degrees F but soared to a near record 86 degrees F on Wednesday. Similarly at Devil Track Lake outside of Grand Marais Wednesday started off with freezing rain, a temperature of 33 degrees F and ended up with an afternoon high of 85 degrees F, a 52 degree F temperature rise.

Topic: A Challenge to MPR listeners

To the best of my knowledge, the temperature spread across the state of Minnesota at 4:00 pm on Tuesday afternoon this week was record setting. Granite Falls was reporting 100 degrees F, while Grand Marais coastal station, modified by the Lake Superior water temperature of 37 degrees F was reporting an air temperature of just 34 degrees F. This snapshot in time shows a 66 degrees F temperature difference, the largest known in our state for any moment in time. If someone can find a case in Minnesota's weather history with a larger temperature spread I will send them a gift

pack of Minnesota cheeses from the University of Minnesota Dairy Store. How's that for a challenge?

Topic: Weekly Weather/Climate Related Potpourri:

The NOAA Climate Prediction Center released a new seasonal climate outlook this week. For Minnesota the outlook favors below normal temperatures for the period from June through August, suggesting more frequent incursions of Canadian air masses and a higher degree of cloudiness this summer. The outlook for June through August precipitation showed equal chances for above or below normal values.

The National Weather Service reported that on May 20th the Red River at Fargo-Moorhead finally dropped below flood state (18 ft gage reading) after 61 consecutive days above it. Two spring snow melt flood crests went down the Red, one at a record-setting 40.82 feet and the other at 34 feet. It was the longest duration flood of all-time at that point along the Red River watershed.

Florida observers are reporting one of the wettest months of May in history. On May 20th Ormond Beach on the Atlantic coast reported nearly 10 inches of rainfall. At Daytona Beach May rainfall has totaled 19.23 inches so far, a new monthly record (old record was 12.33 inches in 1976), and the 2nd highest value for any month of the year. At Jacksonville 12.49 inches has fallen so far in May, marking it the 3rd wettest all time (for the moment). Yet more rain was forecasted through the weekend there.

Northern Ireland has been plagued by persistent and heavy May rainfall as well. Little of the potato crop has been planted and pastures are too wet and mucky for livestock, so they are being kept in winter quarters. Silage crops are not being harvested as producers wet for drier conditions to prevail. More rain is expected there on Friday and Saturday.

The NOAA Central Pacific Hurricane Center predicted this week that the 2009 hurricane season in the Central Pacific Ocean Basin will be near or below normal. An average season produces 4-5 tropical systems that may evolve into hurricanes. The NOAA Climate Prediction Center also issued its first seasonal outlook this week for tropical storms in the North Atlantic Basin. This initial outlook for the 2009 Atlantic hurricane season, which runs from June through November, calls for a 50 percent probability of a near-normal season, a 25 percent probability of an above-normal season and a 25 percent probability of a below-normal season. Global weather patterns are imposing a greater uncertainty in the 2009 hurricane season outlook than in recent years. Forecasters say there is a 70 percent chance of having nine to 14 named storms, of which four to seven could become hurricanes, including one to three

major hurricanes (Category 3, 4 or 5). The first tropical storm in the 2009 Atlantic Hurricane Season will be named Ana.

MPR listener question: I have heard you say that for Minnesota, May is the month when the average difference between the daily minimum and maximum temperature is greatest. Why? Has there ever been a day in May when the daily temperature range was only 1 or 2 degrees F?

Answer: The relatively larger difference between the minimum and maximum temperature during May is due to a combination of factors: One is the increasing day length and sun angle, allowing for longer and more intense heating of the landscape, particularly under relatively sunny skies; secondly, there are still large temperature differences between air masses that cross over the state, and therefore large temperature changes can accompany frontal passages and wind shifts. In addition sometimes the water temperatures of Lake Superior and the larger inland lakes remain very cold (Lake Superior was just 37 to 39 degrees F this week along Grand Marais for example), and this modifies the near shore temperature conditions, even though the surrounding landscape may heat up. There are probably other reasons as well, but I think these are the major ones.

The answer to your second question is no, there has never been a date in May when the temperature varied only 1 or 2 degrees F in the Twin Cities area. Such conditions are far more prevalent during the season of long nights and small sun angles. For example, the only four occasions in the MSP record when the difference between the daily maximum and minimum was just 1 degree F have all occurred in December. Indeed, the majority of dates when the daily temperature change has only been a few degrees F have occurred in the months of November and December, a period that is dominated by long nights and very cloudy skies, with low ceilings.

Almanac for May 22nd:

The average MSP high temperature for this date is 72 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 51 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for May 22nd:

MSP weather records for this date include: highest daily maximum temperature of 99 degrees F in 1925; lowest daily maximum temperature of 42 degrees F in 1882; lowest daily minimum temperature of 32 degrees F in 1917 and 1980; highest daily

minimum temperature of 74 F in 1921. Record precipitation for this date is 1.20 inches in 1936. No snowfall on this date historically.

Average dew point for May 22nd is 46 degrees F, with a maximum of 73 degrees F in 1991 and a minimum of 19 degrees F in 1924.

All-time state records for May 22nd:

The all-time state record high temperature for this date is 100 degrees F at Fairmont, New Ulm, and Tracy in 1925. The all-time state record low temperature for this date is 20 degrees F at Sawbill Camp (Cook County) in 1935. The all-time state record precipitation for this date is 5.84 inches at Collegeville (Stearns County) in 1962. State record snowfall for this date is 2.5 inches at Big Falls (Koochiching County) in 2001.

Past Weather Features:

Between 1:00 pm and 3:00 pm on May 22, 1920 tornadoes roared across Rice, Steele, Dakota, and Goodhue Counties in Minnesota. At least three tornadoes were documented to have caused F-3 (winds 158-206 mph) and F-4 (winds 207-260 mph) damages. Several homes were destroyed, as well as a school and a church. There were numerous injuries reported and a child was killed near Red Wing.

By far the hottest May 22nd occurred in 1925. Over three dozen Minnesota cities watched the afternoon temperature soar past 90 degrees F. It was the middle of a three-day heat wave across southern Minnesota counties. But in the north heavy thunderstorms accompanied a cold front and the temperatures dropped by 30 to 40 degrees F on the 23rd. By the 24th of May some observers reported frost.

On this date (May 22) in 1936 the Twin Cities received 1.20 inches of rainfall, the second largest daily amount of the entire year. Most of the rainfall occurred in a thunderstorm that lasted from 8:00 pm to 11:00 pm. 1936 was one of the driest years in Twin Cities history bringing only about 18 inches of precipitation.

About 3:00 pm on May 22, 1979 an F-2 (winds 113-157 mph) tornado touched down near Bloomington in Hennepin County. It remained on the ground for only two miles, but damaged a number of homes, and took the roof off of a roofing company.

May 22, 2001 brought snow to northern Minnesota locations. Big Falls reported 2.5 inches. Roseau, Little Fork, Waskish, Grand Rapids, Babbitt, and Tower also reported snow. This was some of the latest spring snowfall in recent years for the state.

Words of the Week: Belfries, Steeples, Spires, Cupolas, and Barns

These are obviously not meteorological terms! So what do they have in common? In the history of weather recording, these are the most common structures for mounting wind vanes (sometimes called weather vanes). The weathercock, which turns to face the wind and is perhaps the oldest style of wind vane, was first used in bronze form during the 9th century on churches in parts of northern Italy. Subsequently, metallic roosters, doves, eagles, horses, and lambs were used for wind vanes on many church and public buildings throughout Europe. A weather vane has come to be known as a symbol for TPT's Almanac as it is shown during the introduction of the show each week. Across the USA perhaps the best variety of wind vanes can still be seen across the agricultural landscape mounted on the tops of barns. In the antique business, the collection of weather vanes has become fairly popular.

Outlook:

Near normal temperatures over the Memorial weekend, with a slight chance of showers across southern counties. Increasing cloudiness on Sunday, with a chance for showers and thunderstorms by evening. Chance of showers and thunderstorms continues into Monday and Tuesday, with moderating temperatures. Some showers and thunderstorms may bring heavy rains.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, June 5, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, June 5, 2009

Headlines:

- "Cloud Turn" Dance Performance from The Weather Vein Project
- A cold June 3rd
- Weekly Weather Potpourri
- MPR listener question
- Almanac for June 5th
- Past weather features
- Stacking
- Outlook

Topic: Project Weather Vein presents "Cloud Turn" this weekend

Annicha Arts of the Twin Cities (<http://aniccha.org>) will present a dance performance of "Cloud Turn" at the Pillsbury House Theater (3501 Chicago Avenue South) in Minneapolis on Friday, Saturday, and Sunday nights this weekend at 7:30 pm. Tickets can be purchased by calling the box office (612-825-0459 or going to the web site (<http://pillsburyhousetheatre.org>). This is part of the Weather Vein Project supported by a grant from the Jerome Foundation. The project is a study and artistic presentation of weather memories and images as we migrate to a warmer world. The project also includes a blog (<http://wecanchangetheweather.org/blog/>) and an installation at the Weisman Art Museum (July, 2009). You can find out more about it at....

<http://wecanchangetheweather.org/about.html>

Topic: Drought continues to plague some eastern counties in Minnesota

Many observers reported an unusually dry May, driest in the Twin Cities since 1934. Actually for the months of April and May combined it has been one of the ten driest for many Minnesota communities. According to the U.S. Drought Monitor, moderate drought (class D1) now extends from southern Pine County south to Winona County and west as far as Wright and Carver Counties. Imbedded within that area are some counties designated to be in severe drought (class D2). These include portions of Hennepin, Ramsey, Anoka, Dakota, Goodhue, Washington, and Chisago Counties.

Please find listed below locations that are reporting one of the ten driest April-May periods in their climate records:

Canby 1.86 inches (5th driest) St James 1.66 inches (2nd driest)
MSP 2.10 inches (8th driest) Montevideo 1.63 inches (2nd driest)
Morris 1.36 inches (4th driest) Moorhead 2.15 inches (7th driest)
Park Rapids 2.02 inches (8th driest) Milan 1.20 inches (3rd driest)
Long Prairie 1.90 inches (5th driest) New London 1.66 inches (6th driest)
Univ of Minn St Paul 1.99 inches (driest) Collegeville 2.01 inches (9th driest)

The DNR designates very high to extreme fire danger throughout the Twin Cities Metro Area, and high fire danger across much of central Minnesota. In addition the Minnesota Agricultural Statistics Service now reports that 50 percent of Minnesota topsoils are either short or very short on moisture supply. Fortunately crops are still in the early growth stages and seem to be surviving, but will need additional rainfall soon to achieve normal growth. Fortunately the recent 10-day outlook through June 12th favors above normal rainfall for much of the state.

Topic: A cold June 3rd

International Falls tied a record low last Sunday, May 31st with a reading of just 30 degrees F. But that was just a precursor to even more widespread cold this week.

For those doing some early summer camping in northern Minnesota, Wednesday morning (June 3rd) must have tested the insulation in their sleeping bags. For most of the north, from Itasca County east to Cook County, it was the coldest June 3rd morning since 1964. Dry, polar air dominated under clear skies and temperatures dropped off to the freezing mark and lower. Embarrass reported the coldest temperature in the 48 contiguous states with a record-setting 23 degrees F. Many other Minnesota locations either set record lows, tied record lows, or just missed record low temperatures for June 3rd. Some of the reports from Wednesday morning (June 3rd) include..(those marked with * are record-setting lows for the date)

Crane Lake 30 F Seagull* 28 F Floodwood* 27 F Embarrass* 23 F
Aitkin* 30 F Bigfork 28 F Cook 28 F Cloquet 30 F
Grand Rapids 32 F Bemidji 31 F International Falls* 29 F
Hibbing* 29 F Two Harbors* 30 F Silver Bay* 28 F Ely* 28 F
Orr 28 F Kabetogama* 29 F Cotton 28 F Wadena* 30 F

With sunny skies, dry air, and westerly winds most locations had warmed by 40 degrees F into the upper 60s F (Bigfork reported 68 F) by mid afternoon on Wednesday.

Though fewer in number, several locations also reported abnormally cold temperatures for Thursday, June 4th. Embarrass was the coldest in the 48 contiguous states again with 25 degrees F, tying their record for the date. Orr reported a record 27 degrees F, while Kabetogama also reported a record with 29 degrees F.

Topic: Weekly Weather/Climate Related Potpourri:

Gavin Pretor-Pinney, British founder of the Cloud Appreciation Society has proposed a new cloud name "asperatus." This name is derived from the Latin verb "aspero" which means to agitate. He uses the word to describe a very turbulent looking cloud form that appeared recently over New Zealand. You can read more about it at...

http://news.bbc.co.uk/2/hi/uk_news/england/somerset/8077787.stm

Marysville, California reported an explosion in the local toad population recently. This was attributed to drought which dried up a drainage basin and wiped out the fish population. The fish used to control the toads by feeding on their eggs. Now the town is inundated with small brown and green toads. Residents are hoping that local cats and birds will eat them to trim back the population of toads this summer.

Today, June 5th is World Environment Day (WED) a program initiated by the UN General Assembly in 1972. The purpose is to raise awareness of environmental issues and the political actions needed to address them. The theme this year is "Your Planet Needs You: United to Combat Climate Change." You can read more about this at...

<http://www.unep.org/wed/2009/english/content/about.asp>

Strong summer thunderstorms passed over central China this week bringing winds over 60 mph and very heavy rainfall. Twenty deaths were blamed on the storm, while thousands of homes were damaged by the strong winds. It was estimated that power and water supplies to over 3 million residents were disrupted.

MPR listener question: We hear that about 900 million ash trees in Minnesota are likely to be killed by emerald ash borer over the next few decades. Each adult ash tree can transfer 18 gallons of water from the soil to the air each day in the growing season. Would the loss of Minnesota's ash trees cause a significant change in the amount of atmospheric moisture over our state? What might be possible weather consequences?

Answer: The Minnesota landscape contains about 23 million acres of cropland, about 16.5 million acres of forests, and well over 11,000 lakes. All of this surface area contributes to the water vapor content of the atmosphere around us, much more so in

the summer months when the days are long and warm and the growth cycle of the vegetation is peaked. There are well over 50 species of trees in Minnesota, among them the Black Ash, Green Ash, White Ash, American Northern Ash, and Northern Mountain Ash which according to DNR estimates account for about 937 million trees. Most of these ash trees are concentrated in north-central and northeastern counties. But they represent only a fraction of the state's 16.5 million acres of forest. The loss of these ash trees due to the emerald ash borer may not play out for decades depending on how fast the species spreads and whether or not we find successful ways to mitigate it. Even if we were to lose these millions of ash trees in short order, they would be replaced in the landscape by other species that would likely extract and transpire about as much water from the soil. In this context, I doubt that there would be a quantifiable effect on water vapor flux into the atmosphere.

A more direct consequence from the loss of ash trees might be realized in the urban landscape where they are used for shade and to protect the soil. I lost a mature ash tree from my own front yard years ago. It provided protection from soil erosion due to intense rainfall, but more importantly it provided ample shade on the southwest-facing side of the house. Without its shade weathering on the outside of the house has increased and I am sure we have felt the increased heat from the long summer afternoon and early evening sun.

Almanac for June 5th:

The average MSP high temperature for this date is 77 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 55 degrees F (plus or minus 7 degrees F standard deviation).

MSP local Records for June 5th:

MSP weather records for this date include: highest daily maximum temperature of 92 degrees F in 1911 and 1925; lowest daily maximum temperature of 50 degrees F in 1935; lowest daily minimum temperature of 40 degrees F in 2000; highest daily minimum temperature of 75 F in 1925. Record precipitation for this date is 2.59 inches in 1944. No snowfall on this date historically.

Average dew point for June 5th is 52 degrees F, with a maximum of 77 degrees F in 1925 and a minimum of 30 degrees F in 1945.

All-time state records for June 5th:

The all-time state record high temperature for this date is 99 degrees F at Pipestone in 1933 and at Fairmont (Martin County) in 1934. The all-time state record low

temperature for this date is 18 degrees F at Remer (Cass County) in 1985. The all-time state record precipitation for this date is 5.47 inches at Rosemount (Dakota County) in 1994. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

About 8:00 pm on the evening of June 5, 1880 an F-2 tornado (winds 113-157 mph) touched down in Blue Earth County and traveled 10 miles between Lake Crystal and Garden City. Many barns were destroyed and some homes were damaged in this sparsely populated area.

Exactly 100 years later (1980), at a few minutes before 9:00 pm another F-2 tornado touched down near Lewiston in Winona County. Three different funnels were sighted by observers as they watched barns and outbuildings being destroyed by the winds. The tornado traveled approximately 5 miles before lifting back into the cloud base.

June 4, 1859 brought frost to many areas of southern Minnesota. Even St Paul reported a morning low of 32 degrees F. This was the latest frost in the area reported in the 19th Century. June of 1859 was the third coldest June in the Twin Cities historical records.

On June 4, 1935 the observer at Mizpah, MN (Koochiching County) reported a killing frost and 1.5 inches of new snow. This is the latest date for measurable snowfall in the state. The weather remained cold for five consecutive days and another killing frost with an overnight low of just 30 degrees F was reported on June 8th that year.

Starting about 9:00 pm on the evening of June 4, 1994 thunderstorms brought heavy rain to areas of Dakota County, southeast of the Twin Cities area. These rains persisted for 12 hours until 9:00 am the morning of June 5th and by then Rosemount had recorded nearly 5.5 inches of rainfall, flooding out intersections and county roads. It was only the 2nd time in history Rosemount has seen rainfall exceed five inches in less than 24 hours.

Word of the Week: Stacking

This does not refer to the CDs in the MPR music library! In meteorology this term refers to a condition of continuity in the vertical of a low pressure or high pressure system. That is, the geographic center of low pressure at the surface, tends to be the same for low pressure aloft as well. So there is little tilt or horizontal distortion in the pressure field. This may happen with large scale, slow moving low pressure systems and show up in satellite water vapor imagery as a large rotating white blob.

Outlook:

Cooler than normal temperatures over the weekend and early next week. Increasing cloudiness on Saturday with a chance for showers and thunderstorms during the day and more widespread by evening. Continuing chance for showers and thunderstorms Sunday and Monday with some heavier rains in southern counties. Drier weather by Wednesday and warmer by Thursday of next week.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, June 12, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, June 12, 2009

Headlines:

- Cold June so far.....
- Southeastern Minnesota catching up on rainfall
- Weekly Weather Potpourri
- MPR listener question
- Almanac for June 12th
- Past weather features
- Blirty
- Outlook

Topic: Cold June so far....

This past Saturday, Sunday, and Monday was one of the coldest three-day periods in climate history for the month of June. The Minnesota State Climatology Office noted that based on daytime maximum temperatures it was the coldest three day period in June for the Twin Cities since 1951. Elsewhere around the state many record lows, as well as record cold maximum temperature records were broken on those three dates. Remarkably on Sunday, June 7th Browns Valley in the normally warm western thumb of the state reported a record setting cold daytime high of just 48 degrees F! Many other locations saw highs in the upper 40s F as well. Duluth reported a high of only 47 degrees F on June 8th (tying a record) with 0.80 inches of rain under persistent cloud cover. Across the state many climate observers reported temperatures for June 1-9 that averaged 6 to 10 degrees F colder than normal. Bear in mind these are significant negative departures in temperature as the state's coldest June, that of 1969 average 6.5 degrees F colder than normal.

Topic: Southeastern Minnesota catching up on rainfall

The weather in June has brought some relief to southeastern Minnesota counties which were quite dry coming into the month. Some observers have already reported over 3 inches of rainfall so far this month. These include: Albert Leas with 3.05

inches, Austin with 3.54 inches, Grand Meadow with 3.79 inches, Lanesboro with 3.42 inches, and Spring Valley with 3.12 inches. Much of this rainfall has helped to recharge soil moisture values there, now estimated at 8 to 9 inches of available moisture in the top 5 feet of soil.

Topic: Weekly Weather/Climate Related Potpourri:

Leavenheath in Suffolk of the United Kingdom reported a severe thunderstorm and tornado on Sunday, June 7th. The BBC carried photos of this somewhat rare storm for eastern sections of the country. There was reported damage inflicted due to lightning strikes, but the tornado was short-lived. Read more at...http://news.bbc.co.uk/2/hi/uk_news/england/8089268.stm

Last weekend brought a winter weather advisory to parts of Montana and North Dakota. From 1 to 6 inches of snowfall was reported, mostly from locations with some elevation. The snowfall was short-lived as temperatures rose into the 50s and 60s F after being in the 30s and 40s F to start the weekend.

MPR listener question: I read in your book (Minnesota Weather Almanac) that 1894 was the driest summer (June-August) in Twin Cities history with just 1.73 inches of rainfall for the three months. My question, how many actual days did it rain that summer?

Answer: Ignoring traces as non significant amounts, rainfall occurred during the summer of 1894 on only 8 days in June, totaling 1.15 inches, on only 5 days in July, totaling 0.20 inches, and on only 4 days in August totaling 0.38 inches. This meager amount of rainfall preceded the horrific fall wildfire season of 1894 in eastern Minnesota.

Almanac for June 12th:

The average MSP high temperature for this date is 78 degrees F (plus or minus 7 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 12th:

MSP weather records for this date include: highest daily maximum temperature of 95 degrees F in 1956; lowest daily maximum temperature of 51 degrees F in 1929; lowest daily minimum temperature of 39 degrees F in 1877; highest daily minimum temperature of 72 F in 1920. Record precipitation for this date is 2.35 inches in 1899. No snowfall on this date historically.

Average dew point for June 12th is 55 degrees F, with a maximum of 74 degrees F in 1961 and a minimum of 30 degrees F in 1969.

All-time state records for June 12th:

The all-time state record high temperature for this date is 102 degrees F at Crookston (Polk County) in 1893 and at Redwood Falls (Redwood County) in 1956. The all-time state record low temperature for this date is 23 degrees F at Remer (Cass County) in 1985. The all-time state record precipitation for this date is 8.00 inches at Minnesota City (Winona County) in 1899. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

About 5:00 pm in the afternoon on June 12, 1899 a funnel cloud touched down north of Stillwater, MN and destroyed one home. However, 40 minutes later a more massive F-5 tornado (winds >261 mph) passed through New Richmond, WI resulting in 117 deaths and destroying most of the town. The unfortunate circumstances were that many people had come to town that day to go to the circus, which had just ended about an hour before the tornado struck. Over 200 people were injured and nearly every building in town was damaged or destroyed. The same storm system brought 8 to 10 inches of rainfall to southeastern Minnesota sending flash floods down the Zumbro and Cannon Rivers and flooding out many crops. A number of livestock were lost in the floods as well.

June 9-10, 2002 brought severe weather and flash floods to far northern Minnesota around Lake of the Woods. Observers in Lake of the Woods, Koochiching, and Roseau Counties reported from 10 to 14 inches of rainfall, with a maximum of 14.55 inches reported near Roosevelt, MN. This level of rainfall was unprecedented for these counties and caused widespread flash flooding. The flooding resulted in significant damage to the city of Roseau, where the Roseau River peaked at an all-time high flood crest of 23.40 ft (major flood stage is at 19 ft). You can read more about this storm at.....

http://www.climate.umn.edu/doc/journal/flash_floods/ff020609-10.htm

June 12th of last year (2008) brought tornadoes to Hubbard, Clearwater, and Becker Counties, but all were short-lived.

Word of the Week: Blirty

This is not unlike the word "blurt" which refers to a sudden, impulsive, and often unexpected verbal response from a person. This term is used primarily in Scotland to refer to sudden spells of wind gusts and rain which occur during unsettled highly overcast conditions. Blirty weather certainly fits for much of our weather this past week in Minnesota, some of which brought spells of rain and cool wind gusts from the north and east. I recall seeing many jackets and sweatshirts this week. We have also seen plenty of cloud, fog, drizzle, rain and wind, along with some record cold low and high temperatures already this month.

Outlook: Warmer over the weekend with a chance for showers and thunderstorms by Monday. Warmest week of June so far next week with another chance for showers and thunderstorms by Wednesday. Temperatures will be near or slightly above normal values.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, June 19, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, June 19, 2009

Headlines:

- Tornado season begins (late)
- Wet Week Welcome
- Weekly Weather Potpourri
- MPR listener question
- Almanac for June 19th
- Past weather features
- Plum Rains and Mold Rains
- Outlook

Topic: Tornado Season Begins Late in Minnesota This Week....

Wednesday, June 17 brought the first reports of tornadoes in Minnesota this year. This is the latest date for first tornado activity in the state since 1952, when the first one occurred on June 23rd. More precisely the first Minnesota tornado in 2009 was reported between 4:30 and 5:00 pm near Doran, MN in Wilkin County on Wednesday (June 17). It only briefly touched down. A second tornado was observed briefly along the Wilkin and Traverse County line near Nashua shortly after 5:00 pm. Later in the evening other tornadoes were reported near Waseca, Blooming Prairie, and Austin in southern Minnesota. In total there were 23 tornado reports across the nation on Wednesday bumping the total reports for June to over 160. Many southern Minnesota observers reported dewpoints in the low to mid 70s F on Thursday, June 18th, as the National Weather Service placed much of the state in a Tornado Watch Status well into the night. Fortunately, no more tornadoes were reported. Nevertheless the weather pattern across our region has changed and may offer more severe weather threats to deal with over the next two weeks.

Topic: Wet Week Welcome.....

A wet weather pattern settled in across the state on Tuesday this week bringing some much needed rainfall to many areas. Over the 16th and 17th widespread amounts of 0.50 to 1.50 inches of rainfall were reported. In some parts of western Minnesota

recording setting rainfall totals were reported for June 16th, including 2.85 inches at Breckenridge and 2.86 inches at Rothsay. These amounts came from the same storm system that brought a record 2.60 inches to Bismarck, ND. A volunteer observer near Lawndale in Wilkin County reported a total of 6.88 inches of rainfall over the 16th and 17th. Many roads, including parts of Highway 75 were closed for a time due to flooding. Across Lincoln and Murray Counties there were reports of 1 to 1.75 inch diameter hail. Some additional significant rainfall amounts occurred on Thursday, June 18th and some observers reported 1.5 to 3 inches of rainfall for the week, a boost for the corn and soybean crops in those area, as well as for home gardens and landscape plants.

Weekly Weather Potpourri:

Researchers from the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison reported recently on new high speed techniques to measure and analysis changes in cloud top temperatures detected by satellites. These procedures may help forecasters with the prediction of severe thunderstorms, perhaps improving lead times by as much as 45 minutes over the detection of severe storms by Doppler Radar alone. The technique makes use of cloud top satellite scans done every 5 minutes over the North American Continent. You can read more about this at

<http://www.sciencedaily.com/releases/2009/06/090617123702.htm>

A MODIS image obtained from NASA's Aqua satellite in late May shows a swirl of colored waters in the western North Pacific associated with algae blooms and sediments that are brought together by the warm northward flowing Kuroshio Current and the cold southward flowing Oyashio Current. This image depicts the massive scale of current movements in the western Pacific Ocean and can be viewed at <http://earthobservatory.nasa.gov/IOTD/view.php?id=38917>

A study released this week by scientists at the Lamont-Doherty Earth Observatory (Columbia University in New York) suggests that carbon dioxide levels in the atmosphere today are higher than anytime in the past 2.1 million years. The study is based on analyzing the shells of single-celled plankton buried under the Atlantic Ocean. You can read more about this research at Science Daily

<http://www.sciencedaily.com/releases/2009/06/090618143950.htm>

MPR Listener Question: As cool as this growing season has been, my neighbor in Farmington was telling me that it has even frosted on the Summer Solstice. Is this true? I have lived here for over ten years and never thought it could frost that late.

Answer: Indeed, the one and only time widespread frost was reported on the Summer Solstice was June 21, 1992. It had been a rather cool Father's Day that year, with high temperatures only reaching the 60s F in most places. A dry, cool, Canadian air mass descended on the state and temperatures plummeted into the 30s overnight into Monday, the 21st. Widespread frost was reported, with temperatures as low as 25 degrees F up north, and many readings of low 30s F across the south. Places like Zumbrota and Preston in SE Minnesota reported 33 degrees F, technically not a frost. But many crop producers reported frosted corn and soybeans. Most of the frosted crop recovered, but yields were low that year.

Almanac for June 19th:

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 58 degrees F (plus or minus 7 degrees F standard deviation).

MSP local Records for June 19th:

MSP weather records for this date include: highest daily maximum temperature of 100 degrees F in 1933; lowest daily maximum temperature of 56 degrees F in 1946; lowest daily minimum temperature of 41 degrees F in 1950; highest daily minimum temperature of 75 F in 1933. Record precipitation for this date is 2.44 inches in 1954. No snowfall on this date historically.

Average dew point for June 19th is 55 degrees F, with a maximum of 76 degrees F in 1953 and a minimum of 31 degrees F in 1992.

All-time state records for June 19th:

The all-time state record high temperature for this date is 108 degrees F at Beardsley (Big Stone County) in 1933. The all-time state record low temperature for this date is 26 degrees F at Tower (St Louis County) in 1980 and at Kelliher (Beltrami County) in 2001. The all-time state record precipitation for this date is 5.13 inches at Moorhead (Clay County) in 2000. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

Between 4:30 pm and 6:00 pm on June 19, 1951 two tornadoes caused damages across central Minnesota. One struck Hutchinson and damaged over 50 homes, while causing serious injury to four people. The other tornado struck Brooklyn Center and Fridley in the Twin Cities area. Scores of homes were damaged and one woman was killed as this tornado stayed on the ground for 20 miles. The resulting flash flood

washed out roads, flooded basements, and drowned crops. A landscape area of over 1300 square miles recorded over 4 inches of rainfall from these storms.

Intense thunderstorms moved across portions of Kandiyohi, Meeker, Sherburne, Stearns, and Wright Counties on June 21, 1983. The heavy rain came in two pulses, one coming between 2:00 and 6:00 am followed by another between 11:00 am and 2:00 pm. Total rainfall ranged between 4 and 8 inches, but an observer near Watkins in Meeker County reported 9.68 inches.

On June 16, 1992 at least 23 tornadoes were reported in Minnesota, the most in any single day. It was a busy day for the National Weather Service as the first tornado was reported about 4:00 pm in the afternoon and the last tornado occurred about 11:00 pm at night. The last F-5 tornado (winds greater than 261 mph) ever reported in the state struck Chandler, MN (Murray County) just after 4:00 pm and stayed on the ground for 16 miles. It damaged or destroyed scores of homes and caused tens of millions of dollars in losses. A check from a Chandler resident was found in Willmar, about 95 miles away.

On June 19-20, 2000 strong thunderstorms brought torrential rains exceeding 6 inches to the Fargo-Moorhead area. A great deal of urban flooding (streets and basements) occurred, some stream flooding occurred along the Red River Watershed and a good deal of agricultural land was under water for a time. The Red River at Fargo rose by over 2.5 feet and the observer at Moorhead, MN reported 7.31 inches of rainfall during the evening of the 19th and early morning of the 20th. It was one of the heaviest 24-hour rainfalls to hit that area of the Red River Valley.

Word of the Week: Plum Rains or Mold Rains

In parts of Japan and China the frequency and intensity of rains increases in in June and early July. This is also usually the season for apricots and plums to ripen. Thus the name "plum rains." It is also a season when the frequent rains, heat and humidity cause fresh foods to mold and rot if not refrigerated, hence the name mold rains. These are colorful, if not appetizing names for the rainy season in those countries.

Outlook:

Summer like conditions over the weekend. Light winds with temperatures in the upper 50s F to mid 60s F for the running of Grandma's Marathon on Saturday morning along the North Shore. Generally increasing clouds later on Sunday and a chance for showers and thunderstorms in the late afternoon or evening on Father's Day. A warm and humid week coming up with chances for showers on Monday and Tuesday,

perhaps some 90 F daytime highs. A bit cooler towards the end of next week with a chance for showers Thursday and Friday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, June 26, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, June 26, 2009

Headlines:

- Surplus June rainfall is rare this year
- Beach weather
- Weekly Weather Potpourri
- MPR listener question
- Almanac for June 26th
- Past weather features
- Fulgerite
- Outlook

Topic: Moisture situation around the state

Though recent rains have helped alleviate the persistent dry pattern that carried over from spring, much of central Minnesota remains drier than normal, and counties in the east-central part of the state are still designated to be in moderate to severe drought by the USA Drought Monitor. As we approach the end of June, observers reporting above normal rainfall for the month are few in number. Some of the wetter spots in the state include: Wadena with 4.43 inches; Albert Lea with 6.04 inches; Owatonna with 5.04 inches; Austin with 5.49 inches, Grand Meadow with 6.53 inches; and Wabasha with 5.60 inches.

The onset of warmer than normal temperatures will accelerate crop growth which has been lagging due to either late planting or fewer than normal growing degree days. However, the increased temperature will mean greater water needs for the crops, so their root systems will be extracting more from the soil. Fortunately both measurements and estimates of deeper soil moisture around the state (to a depth of 5 feet) suggest that 5 to 9 inches of stored soil moisture remains for crops to utilize. This level of moisture should carry the crop into July, but more rainfall would certainly be a welcome sign to our agricultural sector.

Topic: Going to the beach this summer?

If you are planning a vacation to coastal beaches this year, the National Oceanic and Atmospheric Administration has a web site for you. Average monthly water temperatures, along with measurements of current conditions, updated each 24 hrs are available for many common beach destinations. You can probably find conditions at your favorite beach at this URL:

<http://www.nodc.noaa.gov/dsdt/wtg12.html>

Weekly Weather Potpourri:

Many areas of Texas, Louisiana, and Missouri suffered through a spell of high heat and humidity this week. Heat Index values ranged from 100 to 110 degrees F across parts of those states with Houston hitting a record high of 104 degrees F on Wednesday (June 24th). Compounding the problem was poor air quality. In many areas air quality alerts were in place during mid-week.

The United Kingdom Meteorological Office forecasted the warmest week of the summer to come during the Wimbledon Tennis Tournament over the weekend and into next week. Temperatures will reach the upper 70s to mid 80s F with a chance for afternoon showers. The heat and sun have already caused officials there to utilize the new retractable roof on Center Court to provide shade for the spectators (including the Royal Family). The warm weather has been good for attendance, as near record capacity has been achieved on some days so far.

The Monsoon Season and its associated cloud cover has been inconsistent and patchy across India so far this summer. As a result, more sunshine and hot temperatures have prevailed. Many areas of east India have reported daytime temperatures of 104 degrees F or higher. Some officials estimate that up to 200 people have died so far from heat related symptoms. Indian agriculture is heavily dependent on an adequate monsoon season, so many are conducting prayers for the monsoon rains to start soon and bring some cooler temperatures there as well.

Tropical Storm Nangka in the South China Sea has produced winds of 50-60 mph and sea wave heights of 10-15 feet this week. The storm system brought heavy rains to parts of the Philippines where some landslides were reported. Nangka was expected to weaken somewhat before making landfall in China, east of the Hong Kong area. The major threat for residents there will also come from heavy rainfall amounts.

MPR Listener Question: After averaging nearly 6 degrees F colder than normal for the first two weeks of June, with three consecutive days never getting out of the 50s F (remember that lovely first weekend), Paul Huttner, your MPR chief meteorologist tells us all that it looks like we'll have a warmer than normal June after all with this

run of warm weather to finish the month. After having moved to the Twin Cities from South Carolina only two years ago, I am motivated to ask if this type of flip-flop in June temperature is normal for Minnesota?

Answer: Welcome to Minnesota where dramatic flip-flops in temperature are quite common, though more often in the fall and spring seasons. Our Twin Cities climate history shows that when we have a very cool early June, the second half of the month makes up for it by being warmer than normal in about two-thirds of all years. This year is an extreme example as we averaged less than 61 degrees F through the first two weeks of the month (about 6 degrees F below normal), and it appears we will average close to 77 degrees F for the final 16 days of the month (about 9-10 degrees F above normal). This level of June contrast in daily mean temperature between the first half and second half (a temperature difference of 10 degrees F or greater) has only happened three other times in history: 1907, 1st half 60 degrees F, 2nd half 70 degrees F; 1966, 1st half 64 degrees F, 2nd half 74 degrees F; and 1998, 1st half 58 degrees F, 2nd half 72 degrees F. So we are experiencing a more intense flip-flop in June temperatures this month.

Almanac for June 26th:

The average MSP high temperature for this date is 81 degrees F (plus or minus 8 degrees F standard deviation), while the average low is 61 degrees F (plus or minus 7 degrees F standard deviation).

MSP local Records for June 26th:

MSP weather records for this date include: highest daily maximum temperature of 99 degrees F in 1931; lowest daily maximum temperature of 55 degrees F in 1968; lowest daily minimum temperature of 46 degrees F in 1926; highest daily minimum temperature of 78 F in 1931. Record precipitation for this date is 2.54 inches in 1998.

Average dew point for June 26th is 58 degrees F, with a maximum of 78 degrees F in 1943 and a minimum of 37 degrees F in 1926.

All-time state records for June 26th:

The all-time state record high temperature for this date is 106 degrees F at Milan (Chippewa County) in 1933, and at Faribault (Rice County) in 1934. The all-time state record low temperature for this date is 30 degrees F at many northern locations in northern Minnesota, most recently at Tower (St Louis County) in 1982. The all-time state record precipitation for this date is 5.20 inches at Morris (Stevens County) in 1914. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

June 27, 1894 brought one of the worst historical tornado outbreaks in Minnesota. Temperatures approached 90 degrees F that day with high dew points. Starting about 5:00 pm the first tornado, an F-3 (winds 158-206 mph), was sighted in Pipestone County and viewed by many citizens there. It was on the ground for 20 miles and destroyed at least half a dozen farms. Over the next four hours a dozen tornadoes were reported in Yellow Medicine, Renville, Kandiyohi, Murray, Cottonwood, Meeker, Stearns, Brown, Sibley, McLeod, Hennepin, and Wright Counties. Seven of these were F-3 intensity inflicting damage to Glencoe, Forest City, Collegeville, Gibbon, and Montrose. Several buildings at St Johns University in Collegeville were damaged. One of the funnels passed over Lake Harriet in the Twin Cities, briefly turning into a waterspout. In total these storms killed six people and injured another 86. It was the worst June outbreak of tornadoes in Minnesota until June 22, 1992.

Minnesota's 2nd largest flash flood in total land area occurred over June 28-29, 1975. The total area receiving 4 or more inches of rainfall was over 6000 square miles, encompassing parts of Becker, Clay, Mahnomon, Norman, Otter Tail, and Wilkin Counties. An observer in northern Clay County near Ulen reported 13 inches of rainfall. Drainage ditches were filled up and Highway 32 was closed for a time. There was widespread crop damage as well from this flash flood.

1982 brought one of the coldest late June spells of weather in Minnesota history. Many locations across the north reported frost on several mornings. Minimum temperatures of 27 degrees F occurred at Tower and Wannaska, Warroad reported 31 degrees F, and Roseau reported 33 degrees F. It turned out to be the 5th coldest June in state history.

Word of the Week: Fulgurite

This word is used by both geologists and meteorologists. Derived from the Latin root word "fulgur", meaning lightning, this is a term used for the glassy, rootlike tube that is formed when lightning strikes a sandy soil. The intense heat causes soil moisture to vaporize, and the remaining molten material fuses into a tube like structure which may be an inch or two in diameter and inches to several feet in length. The wall-like material holding them together is very thin and fragile, so they typically crumble and fall apart when dug up. In 1998 University of Florida lightning researchers reported finding a fulgurite with three branches, one of which extended 16 ft into the soil. This was noted as a world record size for fulgurite.

Outlook:

Cooler temperatures with showers and thunderstorms statewide early in the weekend. A continued chance for showers on Sunday in northeastern sections. Several degrees F cooler on Sunday and Monday, before warmth returns on Tuesday of next week. Another chance for showers late Wednesday and on Thursday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, July 3, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, July 3, 2009

Headlines:

- June Climate Summary
- July 4th Weather Trivia
- Weekly Weather Potpourri
- MPR listener question
- Almanac for July 3rd
- Past weather features
- Birainy
- Outlook

Topic: June Climate Summary

For most observers in Minnesota the average June temperature was 1 to 3 degrees F colder than normal. But it was a real roller coaster ride with respect to temperature and the second half of the month was distinctly warmer than the first half. In fact for the Twin Cities, the 2nd half of June was 13 degrees F warmer than the first half of the month. Statewide extremes for the month ranged from 96 degrees F at Fairmont and St James on the 23rd to 23 degrees F at Embarrass on the 3rd. In fact Embarrass, MN reported the nation's lowest temperature on the 3rd and 4th of the month. Eau Claire, WI set a record cold high temperature reading on the 30th with just 59 degrees F.

Similar to May, June was generally drier than normal in most places. Only a handful of observers reported above normal rainfall for the month. Some of these locations included: Red Lake Falls with 4.30 inches; Crookston with 4.17 inches; Ottertail with 4.74 inches; Wadena with 4.97 inches; Albert Lea with 6.04 inches; Austin with 5.76 inches; Wabasha with 5.70 inches; and Grand Meadow with 6.55 inches. Most observers reported monthly rainfall that was 1-2 inches less than normal.

After a late start to the severe weather season, the first tornadoes of the year were reported in Wilkin, Steele, Waseca, and Mower Counties on June 17th. Some damage was reported near Austin. Then on June 21st tornadoes were reported in Faribault and Freeborn Counties with some reports of damage. High winds prevailed over the 27th through the 29th with many gusts over 40 mph.

Topic: July 4th Weather Trivia

How often does it rain in the Twin Cities on July 4th?

Answer: about 44 percent of the time since 1891

What was the warmest 4th of July in the Twin Cities?

Answer: Afternoon high of 100 degrees F in 1949

Warmest statewide was in 1936 with 107 degrees F at Pipestone.

What was the coldest 4th of July in the Twin Cities?

Answer: Afternoon high of only 58 degrees F in 1967

1972 was the coldest statewide with lows in the upper 20s to low 30s F up north. In 1876 the morning of July 4th was so cold in Duluth, they harvested ice from the harbor to make ice cream.

What is the biggest rain on the 4th of July?

Answer: 9.78 inches at Milan in 1995

Biggest July 4th rain in the Twin Cities was 2.27 inches in 1900

Weekly Weather Potpourri:

The Farm Service Agency reported that last week's heat wave in Nebraska, provoked by very high dew points, caused up the death of over 2000 cattle. One feedlot lost 250 animals. Some animal scientists noted that the cool spring in Nebraska did not allow cattle to acclimate normally so they could withstand a sudden onset of high temperatures.

Two new laws in Colorado will allow property owners to freely collect and store rainwater that falls on their land. Older state and territorial laws had prohibited owners in some areas from collecting rainwater from roofs and other runoff areas. All of the water that fell from the sky was assumed to belong to the state. For years many of these older laws had been ignored, but now at least you can collect rainwater from your own roof and not break the law.

The Clean Beaches Council is promoting "Clean Beaches Week" during July 1-7, 2009. Their messages include safety, healthy eating, no-littering, and traveling to enjoy your favorite beach environment. You can read more at...

<http://www.cleanbeaches.com/events.html>

The National Weather Service Office in Los Angeles, CA announced this week that the city has seen an unprecedented stretch of cooler than normal days since May 22nd, 40 consecutive days have been at or below normal in terms of mean temperature. Only two days reached 80 degrees F during the month of June. Elsewhere, NOAA reports that both Houston and Galveston, TX recorded their driest May-June period ever. At Houston, only 0.65 inches of rainfall was reported.

A new study from the Niels Bohr Institute in Copenhagen has reconstructed the arctic sea ice patterns between Greenland and Svalbard (the Norwegian Arctic Archipelago) over the past 800 years. The study reveals that the extent of sea ice today is the lowest amount in the past 800 years. Scientists reconstructed the sea ice patterns from data obtained in ice cores and tree rings from Finland. The maximum extent of sea ice existed between 1700-1800 during the "Little Ice Age" and has declined significantly since then. They noted a rapid period of decline between 1910 and 1920. You can read more at...

<http://www.sciencedaily.com/releases/2009/07/090701102900.htm>

MPR Listener Question: Has July ever produced a day when the temperature never climbed out of the 40s F? It seems this might be possible along the Lake Superior north shore.

Answer: Indeed, July 2, 1992 was one of the coldest July days in history for northern Minnesota. International Falls recorded a daytime high of only 53 degrees F, the coldest July daytime maximum in their local history. Likewise in northwestern Minnesota it was the coldest July day ever as well with Thief River Falls reporting a high of only 54 degrees F. Along the north shore it was colder yet. Duluth Airport and Isabella reported daytime highs of just 49 degrees F, while Two Harbors reported a high of only 47 degrees F, a value that was 22 degrees colder than normal. Persistent cloud cover, rain, and a breeze off Lake Superior held the temperature down all day. July of 1992 ended up being the coldest in Minnesota history.

Almanac for July 3rd:

The average MSP high temperature for this date is 82 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 July 3rd:

MSP weather records for this date include: highest daily maximum temperature of 100 degrees F in 1949 and 1990; lowest daily maximum temperature of 62 degrees F in

1927; lowest daily minimum temperature of 47 degrees F in 1967; highest daily minimum temperature of 79 F in 1949. Record precipitation for this date is 3.70 inches in 1879.

Average dew point for July 3rd is 59 degrees F, with a maximum of 77 degrees F in 1975 and a minimum of 38 degrees F in 1941.

All-time state records for July 3rd:

The all-time state record high temperature for this date is 107 degrees F at Beardsley (Big Stone County) in 1949. The all-time state record low temperature for this date is 29 degrees F at Meadowlands (St Louis County) in 1927. The all-time state record precipitation for this date is 4.83 inches at Itasca State Park (Clearwater County) in 1983. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

About half past noon on July 3, 1935 an F-2 tornado (winds of 113-157 mph) tracked for 40 miles across eastern North Dakota and into Polk County Minnesota, near Crookston. This storm killed three people, injured 8 eight others and destroyed 33 buildings on 15 farms. It's 40 miles track was exceptionally long.

About 7:30 pm on July 3, 1947 a stronger tornado passed across Polk and Marshall Counties in northwestern Minnesota. This storm also stayed on the ground for 40 miles, but it was F-4 in strength (winds 207-260 mph) and killed two people near Oslo, MN. Up to 15 Minnesota farms were either destroyed or damaged by this tornado and ten people were injured.

About noon on July 3, 1983 another F-4 tornado raced just one mile across Anoka County, but struck a housing development in Andover and injured four people. This tornado damaged or destroyed 200 homes in the area, with estimates in losses totaling over \$11 million.

July 4, 1999 brought one of the worst derechos (straight-line wind storms) to every hit the state. It started early in the day with damaging winds in the Fargo-Moorhead area (up to 91 mph), and then raced across the Iron Range and Boundary Waters Canoe Area of Minnesota. Millions of trees were blown down and some campers and canoeists were injured. Heavy rains accompanied this storm and followed in the aftermath of the wind damage. Some observers reported over 4 inches of rainfall. Hibbing Airport received 7.81 inches, while Marcell Forestry Station received 6.30 inches, and an observer in west central St Louis County reported over 8.8 inches. Obviously many roads were washed out and closed for a period of time.

Word of the Week: Birainy

This is a term used in climate classification to refer to a place on Earth that has two distinct rainy seasons within a year. Most often these are locations near the equator which measure more abundant rainfall at or shortly after the equinoxes (March and September), a period of high sun. Some equatorial African countries and equatorial South American countries have such climates, including Zanzibar (east Africa) and Bogota (Columbia). Tropical rain forest vegetation thrives in this type of climate. In Kenya the two rainy seasons normally provide enough rainfall for the Masinga Hydroelectric plant on the Tana River to run all year long. However a recent dry spell associated with weaker rains during the spring equinox has caused the dam level to fall very low and authorities have shut down the plant for only the 2nd time in 28 years. You can read more about it

<http://news.bbc.co.uk/2/hi/africa/8128681.stm>

Outlook:

A bit cooler than normal over the weekend with a chance for showers in far southern counties on Saturday. Otherwise sunny and pleasant for the 4th of July weekend. Another chance for showers or thunderstorms by late Tuesday through Thursday of next week with warmer temperatures and higher humidity.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, July 10, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, July 10, 2009

Minnesota WeatherTalk Newsletter for Friday, July 10, 2009

Headlines:

- Cooler growing season continues
- Some severe weather this week in SW
- Weekly Weather Potpourri
- MPR listener question
- Almanac for July 10th
- Past weather features
- CAVU and CAVOK
- Outlook

Topic: Cool growing season continues.....

For the first ten days of July most Minnesota observers report temperature are averaging from 2 to 6 degrees cooler than normal. Many morning lows have been in the upper 30s and low 40s F in northern counties, with Embarrass, MN reporting just 37 degrees F and Orr reporting 38 degrees F on Thursday morning (July 9th). The NOAA Climate Prediction Center outlooks favor a cooler trend in temperature for Minnesota through the third week of July. Along Highway 61 in northeastern Minnesota the Lake Superior surface water temperature is reported to be in the low to mid 40s F. With easterly winds the cool water has been holding even the daytime temperatures along the north shore into the 50s and 60s F.

Topic: Severe weather this week in SW, continued dryness elsewhere..

A tornado was reported by law enforcement officials near Storden in Cottonwood County on Tuesday night this week (July 7) about 6:30 pm. It was short-lived fortunately. But the thunderstorms associated with this tornado brought abundant rainfall to some areas of western Minnesota. Marshall reported a record 1.87 inches of rainfall, while Pipestone had nearly an inch. Again on Thursday, July 9th during the

evening a band of severe thunderstorms moved across far southern Minnesota counties including Nobles, Jackson, Martin, Faribault, and Freeborn delivering 1 to 3 inch rainfall amounts along the Iowa border. Jackson reported a record 2.78 inches, Fairmont a record 2.57 inches, and Esterville, IA a record 2.65 inches of rainfall. Portions of Highway 60 near Worthington were closed because of flooding from these rains. The rains missed most of west central Minnesota which was placed in a moderate drought category (D1) by the USA Drought Monitor this week. This area of drought encompasses Yellow Medicine County north to Stevens and Pope Counties. The other area of serious drought in the state remains in the east-central counties, including the Twin Cities area which is 6 inches behind normal rainfall since April 1st.

Weekly Weather Potpourri:

Drought worsened in southern and central Texas this week. San Antonio reported its driest 22 month sequence (since Sept 2007) in history. Much of the southern part of Texas remains in Exceptional Drought (D-4 category). Officials estimate lost income to agriculture in that state may be in the billions of dollars.

Leaders of the G-8 nations (Britain, Canada, France, Germany, Italy, Japan, Russia, and USA) meeting in Italy this week pledged support for emission cuts to combat global climate change. Their target is a 50 percent reduction in emissions by 2050.

On Tuesday of this week (July 7th) torrential rains and hail struck London, England. The heavy rains caused flash flooding along rail lines and even closed several stations in the London Underground for a time. Many roads were also closed for a time as up to two feet of water collected in low spots.

Following a earthquake in China this week, it appears that a tropical storm is headed that way. The Joint Typhoon Warning Center is forecasting a tropical storm to move southeast of Hong Kong by the weekend bringing 10 to 15 foot seas, heavy rains and winds over 50 mph.

A series of sandstorms have dominated the weather in Iraq the past two weeks. These storms are more common in the spring (April) and are somewhat unusual for July. The storms have dramatically reduced visibility and grounded aircraft used by the U.S. military, cancelling a visit to northern Iraq by Vice President Joe Biden. Many citizens with respiratory problems were seeking medical assistance as well because of the high dust content in the atmosphere.

MPR Listener Question: Earlier this year you spoke about a trend towards higher minimum temperatures in Minnesota and the fact that recent summers have brought

very warm nights, in fact some that never dipped below 80 degrees F. How often does this happen in the so-called heat island of the Twin Cities?

Answer: The Twin Cities climate records show that there have been 25 nights when the minimum temperature has never fallen below 80s degrees F. There distribution by month is 16 times in July, 5 times in June, and 4 times in August. The most recent occurrence was twice in 2006 on July 29 and July 31. There were also two occasions in 2002, June 30 and July 1st. But in 1931 there were 5 such nights and in 1936 there were 7 nights, including July 13th when the overnight low was a Phoenix-like 86 degrees F. In the modern era such nights create enormous energy demand for air conditioning.

Almanac for July 10th:

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 6 degrees F standard deviation).

MSP local Records for July 10th:

MSP weather records for this date include: highest daily maximum temperature of 106 degrees F in 1936; lowest daily maximum temperature of 69 degrees F in 1945; lowest daily minimum temperature of 49 degrees F in 1945 and 1996; highest daily minimum temperature of 80 F in 1936. Record precipitation for this date is 1.93 inches in 2002.

Average dew point for July 10th is 59 degrees F, with a maximum of 79 degrees F in 1966 and a minimum of 37 degrees F in 1931.

All-time state records for July 10th:

The all-time state record high temperature for this date is 112 degrees F at Wadena (Wadena County) in 1936. The all-time state record low temperature for this date is 32 degrees F at Tower (St Louis County) in 1978. The all-time state record precipitation for this date is 7.02 inches at Leech Lake (Cass County) in 1954. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

About noon on July 10, 1935 a highly visible F-2 tornado (winds 73-112 mph winds) passed over Pelican Lake in Ottertail County, briefly becoming a waterspout. It

damaged four farms in the rural countryside there, but inflicted no injuries. Many observers reported over 2 inches of rainfall from the associated thunderstorm.

July 7-13, 1936, 73 years ago, produced the hottest week of weather in Minnesota history. The mean temperature measured at many locations, including the Twin Cities was over 90 degrees F, approximately 20 degrees above normal. The daily temperature records in the Twin Cities show the following readings for that week:

Date	High Temperature	Low Temperature	Mean Temperature
7/7	101 F	80 F	91 F
7/8	101 F	82 F	92 F
7/9	96 F	82 F	89 F
7/10	106 F	80 F	93 F
7/11	106 F	82 F	94 F
7/12	106 F	83 F	95 F
7/13	105 F	86 F	96 F

Many Minnesotans remember sleeping on the porch, or outside on the lawn during that time. There was no air conditioning, and few had fans to keep the air circulating at night. The July heat wave caused as many as 900 deaths in Minnesota in 1936.

On July 10, 1954 a stationary front was stuck west to east across central Minnesota. Along this boundary heavy nocturnal thunderstorms developed and brought 5 to 7 inches of rainfall across Hubbard, Cass, Wadena, and Crow Wing Counties in north central Minnesota. Many roads were washed out by this storm.

Between 4:00 and 5:00 pm on July 10, 1966 tornadoes moved over Wadena, Todd, and Morrison Counties. They destroyed farms and a couple of homes in Wadena. Hail up to 1.75 inches in diameter and wind gusts over 60 mph were also reported from these storms.

Community Salute: Wadena, MN

The county seat of Wadena County in central Minnesota, this community got its name from the Ojibway Indian word meaning "little round hill." It was originally a trading post along the Red River Ox Cart Trail. The city of Wadena is the only climate station with any longevity in the county. The first observer there was Mr. B.F. Buck, Jr who began taking daily observations of the weather for the Army Signal Corps in March of 1885. Numerous others have contributed to the daily climate record which is over 110 years old.

Wadena County produces corn, hay, and edible beans, some of which are grown on irrigated sandy soils. The average frost-free growing season is about 135 days long. Some historical climate extremes recorded there include: a maximum temperature of 112 degrees F on July 10, 1936; a minimum of -43 degrees F on February 5, 1907, February 8, 1933, and February 2, 1996; rainfall of 5.97 inches on August 7, 1995; and snowfall of 19.5 inches on March 15, 1957. It has snowed as early as September 25th there and as late as May 20th. In the winter of 1996-97 the snow depth was over 3 feet there. The driest year on record was just 13.42 inches of precipitation in 1976, and the wettest 1965 with 38 inches.

Word of the Week: CAVU and CAVOK

These are two aviation jargon terms. You might read these terms in pilot briefings and hear them in aviation broadcasts. CAVU is a welcome term to pilots of aircraft since it stands for "ceiling and visibility unlimited", basically reporting excellent conditions for take-off and landing, aerial photography, etc. CAVOK stands for "ceiling and visibility OK" but with limits, meaning visibility up to 6 miles, no cloud deck below 5000 feet, as well as no precipitation, shallow fog, or drifting snow. Minnesota weather conditions in the summer months are more often labeled CAVU or CAVOK, than IMC which stands for instrument meteorological conditions when pilots must rely on their instruments rather than their eyes for safe flying.

Outlook:

Generally cooler than normal weekend coming up with a slight chance for widespread showers or thunderstorms on Sunday. Increasing chances for showers and thunderstorms later on Monday and lasting through Wednesday. Temperatures will remain a few degrees F cooler than normal.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, July 17, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, July 17, 2009

Headlines:

- Cool Weather Persists
- More Severe Weather Visits
- New Climate Outlooks
- Cloquet Forestry Center Centennial
- Weekly Weather Potpourri
- MPR listener question
- Almanac for July 17th
- Past weather features
- Pirry, Parry, Perry
- Outlook

Topic: Cool weather persists....

As we enter the second full week of July cooler than normal weather continues to dominate much of Minnesota. Campers in northern Minnesota continue to huddle around the campfire this week as many nights fell into the 30s and 40s F. International Falls set two new record lows with 35 degrees F on both the 12th and 13th, while Brimson (St Louis County) reported a new record low of just 31 degrees F on the 13th. Many other Minnesota observers reported morning temperatures in the 30s F this week, including Embarrass (34 F), Floodwood (36 F), Hibbing (37 F), Kabetogama (38 F), and Cloquet (38 F). Minnesota has reported the nation's coldest temperature twice so far this month. Further, International Falls, MN reports the coldest first half of July in its history.

Topic: More severe weather visits the state

Tuesday, July 14th brought more severe weather to the state including reports of tornadoes, strong straight-line winds, hail, heavy rain, and flash flooding. Tornadoes were reported in Pope and Kandiyohi Counties with some damage to turkey barns and flipping of boats on Green Lake. Large hail was reported in Crow Wing, Cass, Nobles, and Pipestone Counties. Many areas across central and northern Minnesota

received rainfall of 1 inch or greater, with over 4 inches in Brainerd and Nisswa, and 6 inches near Deerwood and Pillager along Highway 210. Just ahead of the severe weather dew points spiked in the low to mid 70s F. You can read more about these storms at MPR's Updraft Blog written by Paul Huttner

<http://minnesota.publicradio.org/collections/special/columns/updraft/>

or at the Minnesota State Climatology Office web site:

<http://www.climate.umn.edu/>

Topic: New Climate Outlooks

The NOAA Climate Prediction Center released new seasonal outlooks on Thursday of this week. For the 90-day period of August through October, the models suggest cooler than normal temperatures for the western Great Lakes region, including Minnesota and Iowa. This may make it difficult for the maturation of crops like corn if Growing Degree Days fall short of the number needed for the crop to make the black layer kernel stage by late September.

The precipitation outlook for August through October calls for equal chances of above or below normal values, except for portions of southwestern Minnesota which are expected to see above normal rainfall prevail. In this context the drought is expected to continue in central and eastern Minnesota, along with northern Wisconsin, with some marginal improvement into the fall season. You can read more at...

http://www.cpc.noaa.gov/products/expert_assessment/seasonal_drought.html

Announcement: Centennial at the Cloquet Forestry Center

The University of Minnesota Cloquet Forestry Center will celebrate its Centennial next week, July 20-24 with a range of activities. This facility has long supported the forest and wood products industries in Minnesota with diverse research and training programs. For many University of Minnesota students their fondest memories are associated with their resident instruction or research conducted at the Cloquet Forestry Center. Activities during the week will include an Open House and public presentations on the logging industry, wildlife management, and even its weather history. If you wish to visit or join in you can find out more at their web site.....

<http://cfc.cfans.umn.edu/>

Weekly Weather Potpourri:

A recent study by scientists from Emory University highlights the burrowing behavior of some dinosaur species. Some species apparently raised their young in burrows, but also used such habitats to survive extremes of climate, especially when living in the mid latitude or polar regions. Remains of dinosaur burrows have been found in Montana and in Australia.

Researchers at Ryerson University report new findings on gaseous atmospheric mercury (GEM) which show higher concentrations than expected in some urban areas, especially during the summer months when low level inversions may dominate most nights. These results do not shed light on the sources of GEM but are likely to provide a motivation for further study. You can read more at...

<http://www.sciencedaily.com/releases/2009/07/090715160446.htm>

MPR Listener Question: I saw today (July 13th) the dew point in the Twin Cities was 37 which is as low as I have seen it in July. Do you know what the lowest dew point in July at the Twin Cities is? Also can you tell me during the heat waves of 1934 and 36 if it was humid or not? By the way I am very happy about the lack of humidity since I sweat a lot.

Answer: Dew points in the 30s F have been measured during the month of July many times in the Twin Cities history. The lowest was 33 degrees F on July 27, 1934. Numerous times in 1931, 1934, and 1936 the July dew points were in the 30s F. Relative humidity was as low as 21 percent in July of 1936, almost desert-like.

Almanac for July 17th:

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 6 degrees F standard deviation).

MSP local Records for July 17th:

MSP weather records for this date include: highest daily maximum temperature of 99 degrees F in 1936; lowest daily maximum temperature of 66 degrees F in 1939; lowest daily minimum temperature of 52 degrees F in 1976; highest daily minimum temperature of 79 F in 1942. Record precipitation for this date is 3.71 inches in 1997.

FOOTNOTE TO JULY 17, 1997 RAINFALL: Nearly all of the 3.71 inches of rainfall in the Twin Cities on July 17, 1997 came between the hours of 2:00 am and 4:00 am. This is a record rainfall intensity for those early hours of the morning. A good deal of

flash flooding resulted in a slow morning commute for many citizens later that morning.

Average dew point for July 17th is 59 degrees F, with a maximum of 76 degrees F in 1964 and a minimum of 38 degrees F in 1911.

All-time state records for July 17th:

The all-time state record high temperature for this date is 110 degrees F at Worthington (Nobles County) in 1936. The all-time state record low temperature for this date is 33 degrees F at Tower (St Louis County) in 1900, at Sawbill Camp (Cook County) in 1939, and at Bigfork (Itasca County) in 1971. The all-time state record precipitation for this date is 5.90 inches at Gull Lake (Cass County) in 1952. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

On July 16, 1926 about 4:00 pm an unusual outbreak of tornadoes occurred in northeastern Minnesota. F-2 tornadoes (winds 113-157 mph) were reported near Virginia, Hibbing, and Chisolm in the Iron Range. Three people were injured and a horse was killed. One of the funnels passed entirely across Lake Superior and reached the shores of northern Wisconsin.

On July 17, 1867 the greatest thunderstorm in Minnesota history commenced over west-central counties. Lasting for a period of 30-36 hours, when the storm finally ended on July 19, 30-36 inches of rainfall had occurred around Westport, Sauk Center, and Glenwood. The massive storm made the Pomme de Terre and Chippewa Rivers impassable for days. When the runoff hit the Mississippi River near St Cloud the river rose by 12 feet in 24 hours.

Word of the Week: Pirry, Parry, or Perry

These are not all MPR news anchors! They are terms used by the Scottish and English to describe a sudden squall, or heavy fall of rain. Technically, they sometimes refer to squalls that approximate a "half gale" on the Beaufort wind scale (20-22 mph). Actually some of the brief thunderstorms which have occurred this week might be described as a "perry."

Outlook:

A warming trend over the weekend will bring temperatures back up to normal values for July. There will be a chance for showers and thunderstorms by Monday and Tuesday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, July 24, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, July 24, 2009

Minnesota WeatherTalk Newsletter for Friday, July 24, 2009

Headlines:

- Welcome rains
- Professon Lewis F. Richardson, non-conformist
- Weekly Weather Potpourri
- MPR listener question
- Almanac for July 24th
- Past weather features
- Elfin forests
- Outlook

Topic: Welcome rains.....

Bands of thunderstorms crossed the state earlier this week bringing some welcome rains to many. Because of such cold air aloft, there were also over 40 reports filed for large hail during the week (Tue-Fri), ranging in size from 3/4 to 2.00 inches in diameter. Hail stones in Cloquet stripped some leaves off trees and piled up on the streets and parking lots to some depth on Wednesday evening. Some of those receiving significant rainfalls this week were in the heart of drought so far this summer, so the moisture was welcome relief. These places included Itasca State Park 1.13", Park Rapids 1.30", Duluth 1.49", Tower 1.53", Embarrass 1.86", Floodwood 1.55", Montevideo 1.33", Ortonville 1.30", Willmar 1.83", Buffalo 1.96", Bruno 2.57", Cloquet 2.71", Isle 2.73", Hinckley 1.75", Chanhassen 1.71", Moose Lake 1.80", Dodge Center 1.49", and Red Wing 1.40". For a brief time dew points climbed into the mid 60s F making it feel more like summer. But following the shower activity temperatures fell into the 50s F in many places. Tragically, lightning caused the death of a girl in Stillwater when the tree she was sheltered under was struck.

Topic: Professor Lewis F. Richardson, non-conformist

One of the pioneers in numerical weather prediction in the early 20th century (using the equations of fluid dynamics to solve for motions and turbulent flows in the atmosphere), Professor Richardson was one of the most esteemed members of the British Meteorological Office. Before computer technology was available, Professor Richardson proposed that numerical weather predictions could be made using dozens of desk top calculators to solve the basic equations of atmospheric motions.

A highly religious man, he was a conscientious objector during World War I and served in an ambulance unit in France from 1916-1919. Described as short-tempered outspoken, and without respect for authority, he was considered a maverick in the British scientific community.

In 1920, he resigned from the Meteorological Office when it became part of the Air Ministry and somewhat more dedicated to supporting military operations. Losing his research talents was a bitter blow to the Meteorological Office. Richardson spent the rest of his career primarily as a teacher and a researcher who attempted to model the statistics of war. In later life he wrote two books on war and peace. He died in 1953, but today there is a Richardson Institute for Conflict and Peace Research which helps carry on his work.

Weekly Weather Potpourri:

Earlier this week two wildfires in southern British Columbia, Canada caused the evacuation of over 17,000 residents. This area of Canada has seen drought persist this spring and summer, building up considerable rainfall deficits. In addition wildfires broke out this week in Spain, France, Greece, and the Italian Island of Sardinia. Soaring temperatures and summer dryness has parched much of the Mediterranean landscape and the fire danger remains very high. Many of these fires were started by lightning strikes.

NOAA scientists reported last week that mean global ocean temperatures for the month of June were the highest measured in the historical records dating back to 1880. The combined ocean and land surface temperatures for June were the second highest measured on a global basis. More from NOAA news can be found at

http://www.noaanews.noaa.gov/stories2009/20090717_juneglobalstats.html

Widespread flooding along the Amazon Basin in Brazil has been reported lately. A NASA image of the flooding around Manaus is posted at

<http://earthobservatory.nasa.gov/IOTD/view.php?id=39359>

Researchers at the University of Miami's Rosenstiel School of Marine and Atmospheric Science and Scripps Institution of Oceanography at the University of San Diego reported this week that warming ocean temperatures will likely lead to less lower level stratoform cloud formations, thus enhancing climate warming of the oceans as more direct sunlight passes through the atmosphere. Working with many of the major climate models they also point out that the only one which handles and ocean and cloud features of the Earth climate system in a manner than closely matches their measurements in the Hadley Centre Climate Model used by United Kingdom scientists. You can read more about this at...

<http://www.sciencedaily.com/releases/2009/07/090723141812.htm>

MPR Listener Question: Last week we were staying in a cabin on a lake near Finland, MN. As a thunderstorm passed by it seemed as though the echoes of thunder lingered on for the longest time. Is it possible the thunder echoes from the lakes?

Answer: The sound waves from thunder, especially that produced by cloud to cloud lightning aloft, can strike hills and valleys producing echoes that linger for long periods of time. I suspect this had more to do with the prolonged sound. The topography around Finland, MN offers a variety of sloped landscapes for the sound waves to reflect from so I can understand why the sound waves might linger. I would guess much of the sound might be absorbed by the area lakes rather than reflected.

Almanac for July 24th:

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 24th:

MSP weather records for this date include: highest daily maximum temperature of 104 degrees F in 1941; lowest daily maximum temperature of 65 degrees F in 1911 and 1915; lowest daily minimum temperature of 49 degrees F in 1891; highest daily minimum temperature of 78 F in 1934. Record precipitation for this date is 1.44 inches in 1985.

Average dew point for July 24th is 61 degrees F, with a maximum of 78 degrees F in 1941 and a minimum of 39 degrees F in 1946.

All-time state records for July 24th:

The all-time state record high temperature for this date is 110 degrees F at New London (Kandiyohi County) in 1901 and at Canby (Yellow Medicine County) in 1940. The all-time state record low temperature for this date is 29 degrees F at Kelliher (Beltrami County) in 2003. The all-time state record precipitation for this date is 5.80 inches at Rosemount (Dakota County) in 1987. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

The morning of July 24, 1987 was a mess in the Twin Cities Metro Area. Over a six hour period the previous evening 10 inches of rain had fallen at MSP International Airport, while St Paul had recorded 9 inches and over a foot of rain in Bloomington. Water over 13 feet deep was reported on I-494 near East Bush Lake Road, and I-494 was closed in Bloomington due to flooding for a period of 5 days. The Red Cross Blood Mobile was one of the victims of the flood, losing the day's collection of blood donations. Flood damages exceeded 20 million dollars to residential homes with water in the basements.

An outbreak of 14 tornadoes occurred across western Minnesota on July 25, 2000. The first tornado was reported in Becker County shortly before 1:00 pm. By 6:00 pm an F-4 tornado (winds 207-260 mph) was headed for Granite Falls in Yellow Medicine County. This tornado did extensive damage to the city and killed one person while injuring 15 others. The last tornado of the day occurred about 8:30 pm near the town of Adrian in Nobles County.

Words of the Week: Elfin Forests

This term is taken from the old Middle English word "elvene" meaning elf-like, small and sprightly. It is used to describe forests which grow in harsh environments, typically windblown, perhaps at high elevation, often dry and in very shallow or rocky soils. Many of the world's mountain ranges have elfin forests. Only dwarf trees can grow and they appear gnarled and misshapen, bearing little resemblance to members of the same species that grow in more favorable environments. The bristlecone pine that grows in Colorado is such a species. In parts of South America they call the elfin trees the Ceja de la Montana, meaning eyebrow of the forest.

Outlook:

Cooler than normal this weekend with widely scattered showers and thunderstorms. Temperatures will generally remain cooler than normal for this time of year well into next week with continuing chances for showers and thunderstorms, especially by Tuesday. Some locations may get above normal rainfall next week.

Further Information:

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For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, July 31, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, July 31, 2009

Minnesota WeatherTalk Newsletter for Friday, July 31, 2009

Headlines:

- July Climate Summary
- Record Cold July in International Falls
- Events on the calendar next week
- Weekly Weather Potpourri
- MPR listener questions
- Almanac for July 31st
- Past weather features
- Sabean odours
- Outlook

Topic: July Climate Summary

Cool and dry are the best descriptors of this month. Virtually all observers reported a cooler than normal month, ranging from 3 to 7 degrees colder than the historical normal. Extremes ranged from 31 degrees F at Brimson on July 13th to 89 degrees F at a number of locations. Most observers in the state reported a total absence of 90 degrees F, a very rare occurrence in the climate records. Twice during the month of July Minnesota reported the coldest temperature in the nation, but several observers reported many overnight lows in the 30s F. On a statewide basis it was the 3rd coldest July in history, surpassed only by July 1992 and 1915.

Rainfall for July was lacking in most areas. Some observers reported above normal rainfall for the month, including Cloquet, Bruno, Brainerd, Isle, Moose Lake, Lakefield, Worthington, Fairmont, and Crookston. Gull Lake received nearly 4.5 inches in one thunderstorm. Statewide this July's rainfall is in the lowest 20 percent historically. Designated drought areas in the state spread north and west during the month, mostly across central sections.

Severe weather visited the state during July, notably on the 14th which brought tornadoes to Swift and Kandiyohi Counties. Both Swift Falls and Spicer reported tornadoes that day with some damage to farm buildings, while another tornado was sighted near Elrosa in Stearns County but no damage was reported. The thunderstorms on the 14th also brought hail and high winds to some areas. A second episode of severe weather came over the 23-24 of July with widespread hail and high wind gusts. Golf ball size hail was reported in the Maplewood area of the Twin Cities, and hail stones stripped the leaves from many trees in the Cloquet area.

Topic: Record cold July at International Falls

The National Weather Service in Duluth reports that International Falls has recorded their coldest July in history, averaging just under 59 degrees F for the month. This breaks the record from the cold July of 1992. In fact they did not report a single day with a temperature of 80 degrees F or higher. The closest was 79 F on July 26th. Four mornings were in the 30s F and each daily average temperature was below the 30-year normal there. On July 16th the daytime high was just 53 degrees F, equivalent to a mid-April or mid-October reading. In addition International Falls reported 9 days with wind gusts over 30 mph, mostly from the northwest.

Topic: Annual PEBC Steak Fry and Farmfest next week.....

The Annual Prairie Ecology Bus Center Steak Fry will take place at the Heron Lake Community Center on Monday, August 3, 2009 with the social hour starting at 5:00 pm. I will be speaking on southwestern Minnesota's weather history and climate trends in the area. For ticket inquiries you can call 507-662-5064.

The Annual Farmfest will be held at the Gilfillan Farm near Redwood Falls next week, August 4-6, 2009. I will be there on Tuesday, August 4th at the University of Minnesota Booth to talk about drought in the state and the cool growing season that may challenge some of the corn crop to reach maturation before first frost. Senators Klobuchar and Franken, along with Congressmen Walz and Peterson will also speak that day, along with many others. You can learn more at....

<http://www.farmshows.com/ffst/index.po>

Weekly Weather Potpourri:

Hot temperatures have been dominating the western states this month. Phoenix, AZ has reported one of their hottest Julys in history with daily maximum temperature values of 110 degrees F or higher on at least 15 days, and at least 10 nights when the overnight low never fell below 90 F. Even more extreme heat has occurred in Death

Valley, CA where they have reported at least 8 days with daytime highs of 125 degrees F or higher, most recently 3 consecutive days with that value. On two nights the overnight low never fell below 94 degrees F there. Seattle-Tacoma area of Washington which normally is cloudy and relatively moderate in July set a new all-time temperature record with 103 degrees F on July 29th. In California, where drought has persisted for most of the year, water restrictions in the Los Angeles area are helping to reduce water usage. The Los Angeles Department of Water and Power reported the lowest water usage in 32 years during the month of June. However, many homeowners are complaining of their brown lawns with watering allowed only two days per week and only for periods of 15 minutes.

Tropical Storm Lana formed southeast of Hawaii this week, and it was expected to move near the islands this weekend. The storm track will take it south of the Hawaiian Islands this weekend, but some rain, wind, and high surf may be evident there. Peak winds speeds at sea may approach 70 mph with wave heights of 12-15 feet before it begins to dissipate in strength on Monday.

Recent research by NCAR scientists shows the effects of the solar cycle (11 years) on the Earth Climate system. One significant feature change is an increase in evaporation in the equatorial Pacific Ocean during the solar maximum and an associated increase in the intensity of tropical rainfall and the trade winds. This weather pattern systematically cools the eastern tropical Pacific Ocean much like a La Nina event does. More on this research can be found at...

<http://www.ucar.edu/news/releases/2009/solarcycle.jsp>

A recent paper by researchers at the Oviedo Higher Technical School of Mining Engineering (Spain) documents ways to utilize the geothermal energy stored in abandoned underground mine tunnels. Water forced into these tunnels and shafts would be warmed there and then could be used to transport heat to the surface for heating or other purposes. There are apparently many abandoned mining sites that could be used in this way. You can read more about this at...

<http://www.sciencedaily.com/releases/2009/07/090727081108.htm>

MPR Listener Question: How unusual is it to complete the month of July without a 90 degrees F temperature in the Twin Cities? I am not complaining as I have enjoyed the cool summer and the opportunities for outdoor activity have been great.

Answer: For the Twin Cities this is only the 8th time since 1891 that the thermometer did not reach 90 degrees F in July. The other years are: 1902, 1915, 1944, 1958 and 1992-94. Three of those years (1902, 1915 and 1993) did not have any 90 degrees F

for the year. So far in 2009 we have recorded 5 days with such a temperature. Two of those were in May and three were in June. On average, July alone has about 5 or 6 days that reach 90 degrees F or greater in the Twin Cities.

The cool July has not been local in nature. From North Dakota to South Carolina cool July weather has been dominant. Louisville, Kentucky has not seen 90 degrees F this July and is six degrees below normal for the month, their coldest July on record. Other cities that are likely to report the coldest July in their climate records include Chicago, Milwaukee, Toledo, Akron, and Columbus.

MPR Listener Question: Although we are nearly 8 inches behind normal precipitation for the year in the Twin Cities in 2009, how far above or below normal are we for the past several years? It seems that we have been hearing more about drought in recent years, and that it has become quite persistent.

Answer: Since January of 2006 the Twin Cities climate record shows 29 months with below normal precipitation, with every single May, June, and July showing a deficiency in rainfall. This trend has produced at least some manifestation of drought in each of the last four summers. The cumulative precipitation deficiency since January of 2006 is only about 12 inches, but the symptoms and consequences of this moisture deficiency have been most evident in the summer months, and this is true in 2009 as well.

Almanac for July 31st:

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

MSP local Records for July 31st:

MSP weather records for this date include: highest daily maximum temperature of 105 degrees F in 1988; lowest daily maximum temperature of 68 degrees F in 1898; lowest daily minimum temperature of 47 degrees F in 1924; highest daily minimum temperature of 80 F in 2006. Record precipitation for this date is 0.79 inches in 1911.

FOOTNOTE TO MSP RECORDS FOR JULY 31ST: THIS IS THE ONLY DATE ON THE SUMMER CALENDAR (JUNE-AUGUST) WHEN THE TWIN CITIES HAS NEVER RECORDED AT LEAST A 1 INCH DAILY RAINFALL AMOUNT.....VERY UNIQUE....

Average dew point for July 31st is 60 degrees F, with a maximum of 78 degrees F in 1987 and a minimum of 39 degrees F in 1936.

All-time state records for July 31st:

The all-time state record high temperature for this date is 110 degrees F at Madison (Lac Qui Parle County) and at Montevideo (Chippewa County) in 1988. The all-time state record low temperature for this date is 30 degrees F at Gunflint Lake (Cook County) in 1964. The all-time state record precipitation for this date is 6.70 inches at Albert Lea (Freeborn County) in 1961. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

July 28-29, 1917 was arguably the hottest two day period in Minnesota history. Many observers around the state reported afternoon highs that were well above 100 degrees F. Some of the reports included: 104 degrees F at Pine River, Park Rapids, and Fort Ripley; 105 degrees F at Itasca State Park and Fosston; 106 degrees F at Ada, Bagley, Detroit Lakes, and Campbell; 107 degrees F at Warren; 108 degrees F at Thief River Falls and Fergus Falls; 109 degrees F at Red Lake; 110 degrees F at Moorhead; and an incredible 114.5 degrees F at Beardsley.

July 31, 1943 brought tornadoes to western Minnesota. Just after 4:00 pm a tornado passed across Norman and Mahnomen Counties for 10 miles. It was visible as a double funnel cloud and destroyed some farm buildings and a church. Later in the evening about 8:00 pm another tornado passed across Douglas and Pope Counties for 15 miles. This tornado passed near Alexandria and Glenwood destroying a number of farm buildings. It killed one man and injured three others near Glenwood. Both tornadoes were rated F-2 (winds of 113-157 mph).

July 30, 1999 brought perhaps the highest Heat Index ever measured in Minnesota. With temperatures in the mid 90s F and dewpoints in the mid 80s F the Heat Index Values in southeast Minnesota spiked. Faribault reported an afternoon Heat Index of 122 degrees F, Winona reported 123 degrees F, and Red Wing reported a Heat Index of 125 degrees F. This was the last day of that year's Bike Ride Across Minnesota (TRAM) for the MS Society and most of the riders had a difficult time staying hydrated throughout the ride. Incidentally, congratulations to those bikers who are just completing the 2009 TRAM today. They had one of the coolest July weeks for biking in Minnesota history.

Words of the Week: Sabean Odours

From John Milton's "Paradise Lost"

'As when to them who sail
Beyond the Cape of Hope and now are past
Mozambic, off at sea north-east winds blow
Sabean odours from spicy shore
Of Araby the blest, with such delay
Well pleased they slack their course and many a league
Cheer'd with the grateful smell old ocean smiles'

Milton's Paradise Lost evokes an image of sailors pleased and comforted by the spicy smells of the southern Arabian shoreline waters. As to the source of the Sabean odours, it seems that despite the hot, dry climate of the interior of Oman on the Arabian peninsula, the coastline along the Arabian Sea is rather fertile and supports coconut, coffee, date palm, and frankincense. During the winter months when dry northerly winds move across the coastal lands they become scented with the odours of frankincense and other vegetation. These odors can be carried out to sea up to 20 miles or more. Indeed, aircraft pilots flying at low altitude over the Arabian Sea have reported such odors as well. It is not surprising that in the 16th century, sailors navigating across the Indian Ocean were comforted in knowing where they were when they encountered the fragrant Sabean odours.

Outlook:

Generally cooler than normal over the weekend with a chance for widely scattered showers and thunderstorms both Saturday and Sunday, mostly in the east and north. Also a chance for showers on Monday. Drier by Tuesday with a warming trend towards the end of the week.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

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For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, August 7, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, August 7, 2009

Minnesota WeatherTalk Newsletter for Friday, August 7, 2009

Headlines:

- Drought continues
- Cold first week of August
- Weekly Weather Potpourri
- MPR listener question
- Almanac for August 7th
- Past weather features
- Isoerodent
- Outlook

Topic: Drought continues in parts of the state....

For the 5th consecutive summer August begins with some areas of the state imbedded in drought. This year the drought area extends from Lac Qui Parle County east to Washington and Chisago Counties. The worst areas, designated by the USA Drought Monitor as Extreme Drought encompass parts of Washington, Chisago, Ramsey, and Anoka Counties and extends over into much of northwestern Wisconsin. Many of these areas are less than 50 percent of normal rainfall since April 1st leading to rainfall deficiencies of 7 to 9 inches, comparable in some cases to the moisture deficits of 1988. As a consequence lake levels have dropped and flows in the watersheds are very low. Fortunately the second week of August may bring significant rainfall to these areas as temperatures warm up and dewpoints climb.

Topic: Cool Start to August

The first week of August has been dominated by cooler than normal temperatures around Minnesota, averaging from 5 to 8 degrees F below normal at most locations. In the north Crane Lake, Brimson, Hibbing, and Embarrass have all reported overnight lows in the 30s F. In fact Embarrass reported the nation's low with 36 degrees F on

August 4th (Tue). The regional weather pattern will change this weekend and bring in a period of warmer than normal temperatures which may last through mid-August.

Weekly Weather Potpourri:

Tuesday, August 4 saw heavy thunderstorms over Kentucky bring 4 to 7 inches of rainfall to Louisville and the surrounding area. Most of this occurred in the morning hours, with some observers reporting over 3 inches in an hour. This storm produced widespread flash flooding, damaging many roads and homes in the area.

Hurricane Felicia was expected to be downgraded to a Tropical Depression before approaching the Hawaiian Islands early next week. Still some strong winds and heavy rains, along with high surf will likely affect the islands. Following Hurricane Felicia, Tropical Storm Enrique is forecasted to dissipate into a tropical depression north and east of the Hawaiian Islands even later next week. Meanwhile in the northwest Pacific Ocean Typhoon Morakot is expected to pass across Taiwan on Saturday bringing high seas (wave heights 25-30 feet), heavy rain, and strong winds (80-100 mph).

Thirty competitors in a sailing regatta off the west coast of Scotland had to be rescued this week when their boats overturned in a squall. Since summer squalls off the Scottish coast are somewhat common, race organizers had contingency plans in place and the rescue of those who went into the Loch Carron waters went off without a hitch. In all, 14 boats were overturned by the sudden squall, and the regatta was rescheduled for a later date.

Science Daily reported this week that bird researchers in Alaska discovered a bar-tailed godwit that had been banded 8000 miles away in Victoria, Australia. Some other birds that breed and summer in the interior wetlands of Alaska include the dunlin from Asia and the semipalmated sandpipers of South America.

MPR Listener Question: My friend and I in Roseville look after each others gardens when the other is on vacation. We keep watering and watering this summer just to help the plants survive. They say we are over 9 inches behind normal for the growing season (since April 1st). Do you think we will ever catch up? How often is August or September the wettest month of the year in the Twin Cities?

Answer: I wouldn't hold out hope that August and September will make up this moisture deficit. Checking Twin Cities areas records back to 1871 (138 year period), August has been the wettest month of the year only 29 times, but most recently in the back to back years of 2006 and 2007. Still that is only 21 percent of the time. September has been the wettest month of the year only 13 times, and not since 1994. So it is a rather low probability that either August or September will be the wettest

month of the year, or at least wet enough to catch up on the rainfall deficit. Nevertheless this did happen back in 2007, so we'll see.

Almanac for August 7th:

The average MSP high temperature for this date is 82 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 7th:

MSP weather records for this date include: highest daily maximum temperature of 98 degrees F in 2001; lowest daily maximum temperature of 61 degrees F in 1917; lowest daily minimum temperature of 45 degrees F in 1972; highest daily minimum temperature of 76 F in 2001. Record precipitation for this date is 2.29 inches in 1984.

Average dew point for August 7th is 60 degrees F, with a maximum of 77 degrees F in 2001 and a minimum of 42 degrees F in 1989.

All-time state records for August 7th:

The all-time state record high temperature for this date is 104 degrees F at Alexandria (Douglas County) in 1983. The all-time state record low temperature for this date is 29 degrees F at Brimson (St Louis County) in 1989. The all-time state record precipitation for this date is 8.62 inches at Saint Peter (Nicollet County) in 1968. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

On August 6-7, 1968 very heavy thunderstorms brought high winds, hail, and flash floods to southern Minnesota communities. Hail damage to crops occurred from Murray and Nobles Counties east to Freeborn and Sibley Counties. Wind speeds between 60 and 70 mph were associated with these thunderstorms, notably 66 mph at Rochester. St Peter (8"), North Mankato (7"), Albert Lea (6"), and Janesville (5") all reported flash floods, closed or washed out roads, and flooded basements.

Historically, one of the worst outbreaks of tornadoes in northern Minnesota occurred on August 6, 1969. As many as 12 different tornadoes were observed and reported between 1:15 and 7:00 pm across Cass, Crow Wing, Aitkin, St Louis, and Lake Counties. Many farms, homes and lake cabins were destroyed, while 15 people were killed and over 100 injured. The worst of these tornadoes, an F-4 (winds 207-261 mph), was on the ground for 33 miles, and at times was a 1/2 miles wide as it leveled

thousands of trees. You can read more about this tornado outbreak in 1969 at the National Weather Service Duluth Office web site:

<http://www.crh.noaa.gov/dlh/>

August 6-7, 1983 brought a heat wave to many areas of Minnesota. Many thermometers hit the century mark, including 104 F at Alexandria, Argyle, and Crookston, 103 F at Ada, 102 F at Browns Valley, Red Lake Falls, and Georgetown, 101 F at Cass Lake, Mahnommen, Orwell Dam, Baudette, Wheaton, and Campbell, and 100 F at Redwood Falls, Montevideo, Thief River Falls, Hawley, and Elbow Lake. These temperatures combined with dewpoints in the 70s F to produce Heat Index Values that ranged from 105 to 112 degrees F. The heat produced additional stress on Minnesota's corn crop which had been hit earlier in the growing season by one of the worst ever outbreaks of European Corn Borer.

Word of the Week: Isoerodent

This is not a type of rodent, nor is it a meteorological term. It is a term from soil science and means a line connecting points on a map which have an equal erosivity index. The average erosivity of soils (loss of soil in sediment runoff) is computed from the Universal Soil Loss Equation partially based on the long term historical rainfall and rainfall intensity. Many other soil characteristics are considered as well. The relative differences in the erosivity index across a landscape can be compared by mapping these values using isoerodents (lines of equal value). With such data state and federal agencies can better advocate for conservation practices that help minimize soil erosion where the risks are high.

Outlook:

Warmer and more humid over the weekend with some southern areas reaching 90 F. Chance for showers and thunderstorms, and in some areas severe weather may materialize. Some showers may linger into Monday. Drier by Tuesday next week, but with temperatures at or above normal most of the week, and summer-like humidity.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, August 14, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, August 14, 2009

Minnesota WeatherTalk Newsletter for Friday, August 14, 2009

Headlines:

- Big rains last weekend in some places
- PGA weather
- New Historical Climate Network Data Set Released
- Weekly Weather Potpourri
- MPR listener question
- Almanac for August 14th
- Past weather features
- ATSI
- Outlook

Topic: Big weekend rains bring relief to some drought plagued areas

August 7-8 brought some of the heaviest rains of the year to many central and southeastern Minnesota communities. Several observers reported rainfall amounts ranging from 3 to 6 inches. MSP International Airport reported the greatest daily rainfall of the year so far with 2.08 inches on the 7th. On August 8th a number of observers reported recording setting amounts, including: Chaska 6.20" (largest daily rainfall ever measured there); Lester Prairie 5.96" (largest daily rainfall ever measured there); Chanhassen 4.87"; Jordan 3.93"; St Cloud 2.14"; Willmar 2.63"; Hastings 2.98"; La Crescent 2.65"; and La Crosse, WI 2.55". Much of the area covered by the heavy rains had seen deficiencies in rainfall of several inches this year, and the soils generally soaked it up, though there were some areas reporting flash floods, along with large hail. The area of Minnesota designated by the Drought Monitor web site to be in either moderate or severe drought shrunk in size as a result of these storms. However portions of Chisago and Washington Counties remain in extreme drought.

An EF-1 tornado (winds 86-110 mph) was reported Saturday night (Aug 8) between Minnetrista and Plymouth, a 9 mile path length west of the Twin Cities. Some trees

were uprooted and some buildings damaged around Orono and Long Lake. In addition there were a number of reports of large hail from southwestern Minnesota.

Topic: PGA weather

Much of the media attention this weekend will be focused on the Hazeltine National Golf Club in Chaska where the annual PGA Championship is taking place. Weatherwise, spectators may have to endure higher dewpoints the first two days, especially in the afternoon and early evening hours. Much of this is the result of surface moisture brought by the heavy rains of last weekend. In addition spectators should be prepared for a good deal of sun exposure with a UV Index forecast of 7 to 8 (high to very high) on most days of the tournament, except for Sunday when it will be much lower. Umbrellas may be in order over the weekend with further chances for showers and thunderstorms late in the day on Saturday and Sunday that may disrupt play.

Topic: Version 2 of the United States Historical Climate Network is released by NOAA

This week NOAA climatologists announced the release of a new (version 2) US Historical Climate Network data set that includes daily and monthly records of common climate attributes (temperature, precipitation) for over 1200 locations. Most sites are at least 50 years in duration and many have records going back more than 100 years. The earlier version of this data set was used to detect and analyze regional climate change across the country and is well represented in the science literature of the past decade. Version 2 provides more comprehensive data and has been carefully analyzed for inhomogeneities such as station moves, changing landscape, or observation practices. Thus it will be interesting to observe if new studies reveal similar regional climate changes relative to those already published in earlier work.

Weekly Weather Potpourri:

The California State Energy Commission announced this week that through a multi-agency effort a document outlining the California Climate Adaptation Strategy has been produced for public comment. The report addresses adaptation strategies in Public Health, Biodiversity and Habitat, Ocean and Coastal Resources, Water Management, Agriculture, Forestry, Transportation, and Energy. It was produced by state agencies as a result of Governor Arnold Schwarzenegger's directive to the Natural Resources Agency in November 2008. This report may serve as a model for other states to consider. You can read more about it at...

<http://www.climatechange.ca.gov/adaptation/>

NOAA announced this week that portions of Texas are in the grip of the worst drought in history. Some areas are reporting less than 50 percent normal rainfall and a complete failure of the cotton crop. Nine counties have clearly seen their worst drought ever, dating back to 1895. Economists estimate that the drought may result in a \$4 billion loss to agriculture in that state. Many central and southern areas of Texas remain in exceptional drought with little relief in sight.

Typhoon Morakot in the western Pacific brought record-setting amounts of rainfall to Taiwan and parts of China. Some locations in Taiwan received up to 83 inches of rainfall that produced numerous mud slides, and left many people homeless. As many as 500 people may have perished in the storm. It was said to be the worst typhoon to hit the island nation in 50 years. Meanwhile Tropical Storm Guillermo in the eastern Pacific is headed for the Hawaiian Islands and may bring heavy rains and winds there by the middle of next week. Tropical Storm Fellicia brought rains to Hawaii this past week. In the far Atlantic Basin off the west African coast a tropical depression is forming that may evolve into a tropical storm over the next week.

The media in India reports this week that 161 of the 600 governmental districts in the country are suffering from drought this year as a result of a spotty monsoon season. Adequate rainfall has not been as widespread as normal resulting in diminished cropping prospects.

MPR Listener Question: I know we had a complete absence of 90 F days in July around the Twin Cities area. How many days typically reach 90 degrees F or higher in the month of August? Do you think we'll see more of such days in August to make up for the lack of heat in July?

Answer: For the Twin Cities the historical average (1891-2008) number of August days with a temperature of 90 degrees F or above is four. There have been 20 years when August saw no 90 F temperatures, most recently last year, and four of the last seven have seen no occurrence of 90 F. August of 1983 brought 11 days with 90 degrees F or higher, while 1988 brought 10. In 1947, the hottest August in Twin Cities history there were 15 days with temperatures of 90 degrees F or higher.

As for this August, the possibility of a 90 F reading exists for Friday, August 14th, but this may be the only chance this month. After this weekend, most of the outlook models from the National Weather Service suggest that the weather will be cooler than normal for the balance of August.

Almanac for August 14th:

The average MSP high temperature for this date is 82 degrees F (plus or minus 7 degrees F standard deviation), while the average low is 61 degrees F (plus or minus 6 degrees F standard deviation).

MSP local Records for August 14th:

MSP weather records for this date include: highest daily maximum temperature of 96 degrees F in 1978; lowest daily maximum temperature of 65 degrees F in 1887; lowest daily minimum temperature of 43 degrees F in 1964; highest daily minimum temperature of 72 F in 1938, 1970, and 1978. Record precipitation for this date is 1.00 inch in 1981.

Average dew point for August 14th is 59 degrees F, with a maximum of 76 degrees F in 1978 and a minimum of 32 degrees F in 1933.

All-time state records for August 14th:

The all-time state record high temperature for this date is 105 degrees F at Hawley (Clay County) in 1984. The all-time state record low temperature for this date is 25 degrees F at Tower (St Louis County) in 1977. The all-time state record precipitation for this date is 5.29 inches at Gaylord (Sibley County) in 1981. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

The historically wet summer of 1993 was capped off by a flash flood across southern Minnesota on August 14-15. From 4 to 10 inches of rainfall occurred across portions of Faribault, Fillmore, Freeborn, and Mower Counties. Around Austin up to 1000 homes suffered water damage, and the Cedar River reached its 2nd highest flood stage in history at 21.3 feet.

Four years later, August 14-15 of 1997 brought heavy rains and flash flooding again to portions of southern Minnesota, especially in Rice, Steele, and Waseca Counties. Many observers reported 3 inches or more of rainfall, while Medford in Steele County reported over 8 inches. This storm system ushered in a cold Canadian air mass that dropped temperatures to record low values by August 17, 1997 when many communities reported daytime highs that were only in the low 60s F.

Words of the Week: Acclimatization Thermal Strain Index (ATSI)

This index was developed to assess the health impact of recreational travel taken across a range of climate conditions. It is based on calculating the respiratory heat

losses from an individual in their home environment and comparing that to the same calculation for when they first arrive at their travel destination. More often than not summertime travel produces a significant change in respiratory heat loss that can affect the respiratory organs, particularly if there is significant change in temperature and dewpoint combined. Researchers have found these differences to be larger geographically during the summer season than the winter season in many countries. You can read more about the Thermal Strain Index at....

<http://springerlink.com/content/e9jx242304048g41/?p=7bf4760b6ea14244aff1e8aae2b6aef0&pi=0>

Outlook:

Chance of showers and thunderstorms throughout the weekend with slowly falling temperatures. By Monday there may be some lingering showers in eastern sections of the state, but daily temperatures will generally be cooler than normal and remain that way much of next week. There will be another chance for showers and thunderstorms by Wednesday and Thursday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, August 21, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, August 21, 2009

Minnesota WeatherTalk Newsletter for Friday, August 21, 2009

Headlines:

- Surprised by Severe Weather in the Twin Cities Metro on August 19th
- Wet August shrinking seasonal rainfall deficits in some places
- New seasonal climate outlooks
- State Fair Time
- Weekly Weather Potpourri
- MPR listener question
- Almanac for August 21st
- Past weather features
- SAFESEE
- Outlook

Topic: Surprised by high winds and tornadoes on August 19th

Wednesday, August 19th brought some severe weather to the Twin Cities Metro area and surrounding landscape, as well as west-central counties, northeastern Minnesota counties, and western Wisconsin. It was a surprise since early morning forecasts that day did not suggest any chances for severe weather development. Beginning shortly after 2:00 pm reports of strong winds and wind damage begin to filter in through the media and National Weather Service. As many as 6 tornadoes were reported across the region including one (an EF-0 with winds of 65-85 mph) in south Minneapolis, an EF-1 (winds 85-110 mph) near Cottage Grove (Washington County), an EF-0 near Hudson, WI (St Croix County), an EF-0 at North Branch, MN (Chisago County), one east of Springfield (Brown County), and one near Good Thunder (Blue Earth County). Other reports of wind damage, heavy rain, and flash flooding were numerous as well. Duluth reported winds over 40 mph and a record 2.89 inches of rainfall, while Cloquet reported a new record of 3.50 inches. Milan reported a record 2.09 inches of rainfall and Ortonville a record 1.95 inches. Elsewhere observers near Askov, Hinckley, Sandstone, and Finlayson reported over 5 inches of rainfall in total.

You can read more about these storms and the aftermath from a variety of web sites, including:

http://www.crh.noaa.gov/news/display_cmsstory.php?wfo=mpx&storyid=30471&source=0#SURVEY">http://www.crh.noaa.gov/news/display_cmsstory.php?wfo=mpx&storyid=30471&source=0#SURVEY

http://www.climate.umn.edu/doc/journal/heavy_rain090819_20.htm

http://www.crh.noaa.gov/news/display_cmsstory.php?wfo=mpx&storyid=30471&source=0

<http://minnesota.publicradio.org/display/web/2009/08/20/tornado-cleanup/>

and an excellent description of the peculiar aspects associated with these storms is provided by Paul Huttner at the MPR blog known as Updraft, see

<http://minnesota.publicradio.org/collections/special/columns/updraft/>

Topic: Seasonal rainfall deficiencies are shrinking in some areas....

At the beginning of this month, many observers were reporting sizable seasonal rainfall deficits ranging from 5 to 9 inches below normal since April 1st, especially across central counties. However since August 1st many areas of the state continue to receive large doses of rainfall. The heavy rains associated with the storms on August 19-20 followed episodes of thunderstorms and heavy rain that struck central Minnesota counties over the 15th and 16th, and earlier in the month on the 7th and 8th. These amounts are producing significant monthly totals already, with ten days to go in August. Chaska with nearly 9.5 inches for the month so far has already recorded their wettest August in history (surpassing the 9.10 inches in 1984), while Lester Prairie has reported nearly 9 inches this month as well. Willmar with nearly 8 inches is reporting their 6th wettest August of all time, and Hinckley with nearly 8 inches is reporting their 4th wettest August of all-time. For most Minnesota weather observers the first 3 weeks of August represents the wettest period of the year.

Fortunately much of this rainfall has occurred across drought-stricken areas of the state, notably west-central and east-central counties. In fact Pine County observers reported 5 to 6 inches of rainfall over the 19th and 20th alone, well above the average monthly total rainfall for August. For many Minnesota locations this is the 4th time in the past 5 years that August has provided surplus rainfall to catch up on earlier season deficits. These excessive values are helping to close the seasonal rainfall deficit this year in many places. For example at Milan in Chippewa County, the seasonal rainfall deficit since April 1st was approximately 8 inches behind normal to start August, and it has now shrunk to 5 inches behind normal. In addition the abundant rainfall is helping watershed flows return to near average conditions and raising lake levels.

Topic: New seasonal climate outlooks

The NOAA Climate Prediction Center Outlooks for September through November call for equal chances of above or below normal values for both temperature and precipitation across the western Great Lakes Region, including Minnesota. The Hadley Center seasonal outlook is the same for temperature, but their models see the western Great Lakes region being wetter than normal well into the fall season. In the shorter term for the balance of August, the outlook models favor a warm and dry pattern across Minnesota.

Topic: State Fair Time

Gary Eichten and I will broadcast the annual Minnesota Weather Quiz on Midday next week during the first day of the Minnesota State Fair from noon to 1:00 pm. If you are on the fairgrounds that day please stop by and see us. The Minnesota Public Radio broadcast facilities are located at the corner of Judson and Nelson. We'll even have some prizes for those who participate in the quiz.

Weekly Weather Potpourri:

An intense thunderstorm with frequent lightning rolled over Central Park in New York on Tuesday night bringing up to 80 mph winds. The winds uprooted a number of trees in the park, including many historical oaks and maples that had been enjoyed by generations of New Yorkers.

Hurricane Bill formed in the North Atlantic this week and attained Category 4 status (winds 135 mph) for a time. The hurricane caused Peter Bray from England to abandon his attempt to break the record for a solo crossing of the Atlantic by rowboat. He had been at it for 43 days since he left Newfoundland, Canada, but he was having trouble making any progress in the high winds and 20 foot seas produced by Hurricane Bill. As of Friday morning it was a Category 3 storm (winds 125 mph) producing 20 foot seas and taking a path between Bermuda and the east coast of the USA. By Sunday it may be off the coast of Nova Scotia, bringing high winds and heavy rain, but reduced to an extra tropical storm status.

Typhoon Vamco in the northwestern Pacific Ocean west of Wake Island was expected to reach peak intensity on Friday, August 21st with winds between 125 and 130 mph and sea waves of 35 to 40 feet. It was headed north and expected to dissipate by the middle of next week.

New research from scientists at the Lawrence Livermore National Laboratory published in the Proceedings of the U.S. National Academy of Sciences this month

reveals that all 22 climate models used in climate change research depict a human induced change in atmospheric water vapor content. As Earth as warmed the water holding capacity of the atmosphere has increased, and as the oceans have warmed they are emitting more water vapor into the atmosphere. You can read more about this work at...

https://publicaffairs.llnl.gov/news/news_releases/2009/NR-09-08-01.html

MPR Listener Question: What is the nature of the relationship between interstellar cosmic rays and cloud formation in the Earth's atmosphere? There are apparently some new theories on this.

Answer: Indeed, there is a working hypothesis that ties together the solar cycle, changes in the sun's magnetic field, the pattern and abundance of cosmic rays hitting the Earth's atmosphere, and the charges ascribed to water molecules that cling to each other in forming clouds. Recent research published in Geophysical Research Letters tests this hypothesis in the lab and shows that it has some validity. Apparently cosmic rays striking water vapor molecules strip away electrons leaving a charged ion. These ions begin attracting each other eventually forming the droplets that produce clouds. Because cosmic rays striking the Earth's atmosphere vary with the solar cycle (11 years) there is likely a cyclical relationship to examine. Of course all of this occurs in conjunction with the formation of other droplets around condensation nuclei derived from dust, salt, smoke and other materials. You can read more about this at...

<http://sciencenow.sciencemag.org/cgi/content/full/2009/805/1>

Almanac for August 21st:

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 61 degrees F (plus or minus 6 degrees F standard deviation).

MSP local Records for August 21st:

MSP weather records for this date include: highest daily maximum temperature of 98 degrees F in 1947; lowest daily maximum temperature of 59 degrees F in 1966; lowest daily minimum temperature of 44 degrees F in 2004; highest daily minimum temperature of 74 F in 1968. Record precipitation for this date is 3.64 inch in 1924.

Average dew point for August 21st is 58 degrees F, with a maximum of 78 degrees F in 1903 and a minimum of 34 degrees F in 1950.

All-time state records for August 21st:

The all-time state record high temperature for this date is 103 degrees F at Moorhead (Clay County) in 1947 and at Milan (Chippewa County) in 1976. The all-time state record low temperature for this date is 28 degrees F at Tower (St Louis County) in 1986. The all-time state record precipitation for this date is 6.30 inches at Montevideo (Chippewa County) in 2002. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

Throughout Minnesota weather history, perhaps the most written about and talked about August 21st event was the famous F-5 tornado (winds greater than 260 mph) that struck Rochester, MN in 1883. It happened around 5:30 pm in the late afternoon. At times the vortex was nearly one mile wide and on the ground for 25 miles. The deafening roar alerted many Rochester residents to take cover as the storm devastated the north side of town. In the end 37 people died and 200 were injured, including a number of passengers on a train that was derailed. Hundreds of homes were damaged or destroyed. The community responded with a massive recovery effort, tending to the wounded and rebuilding the town. The recovery and first aid efforts helped form the foundation for the establishment of the city's first hospital, St Marys, where the Mayo brothers began their medical practice which was eventually to lead to the Mayo Clinic. A tornado of similar intensity has yet to revisit the Rochester area.

Words of the Week: SAFESEE

This is the name given to the online marine weather forecast service provided by the United Kingdom Meteorological Service. This service offers hour by hour forecasts of important weather elements and a map viewer to analyze ocean routes or examine patterns where offshore operations are taking place. Its usage is very widespread among the maritime communities and shipping industries.

Outlook:

Generally dry with cooler than normal temperatures on Saturday. Warmer on Sunday. Chance of showers late Monday in the north and statewide by Tuesday and then drier and cooler for Wednesday and Thursday next week, with a warming trend towards next weekend.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, August 28, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, August 28, 2009

Minnesota WeatherTalk Newsletter for Friday, August 28, 2009

Headlines:

- Continuing catch up on rainfall
- Preliminary August Climate Summary
- Forecasting rules of thumb
- State Fair Weather Quiz
- Weekly Weather Potpourri
- MPR listener question
- Almanac for August 28th
- Past weather features
- storm surge, swash, and backwash
- Outlook

Topic: Continuing to catch up on seasonal rainfall....

Many weather observers in the state are reporting monthly rainfall amounts well above normal for August. Some of these include 5.33" at Red Lake Falls and 5.37" at Warroad; 6.44" at Cook, and 5.99 inches at Kabetogama; 5.26" at Montevideo and 7.14" at Ortonville; 10.15" at Chaska, 8.86" at Lester Prairie, and 8.23" at Willmar; 7.99" at Hinckley and 6.35" at MSP International Airport; 7.28" at Hastings, 5.67" at Owatonna, and 7.95" at Red Wing. Should the recent trend of wetter than normal fall seasons in Minnesota materialize again this year, areas with accumulated rainfall deficits for the year should continue to catch up.

Topic: Preliminary Climate Summary for August of 2009

It appears that August was yet another cooler than normal month for Minnesota, as most observers report a mean monthly temperature so far that is 2 to 4 degrees F cooler than normal. Extremes ranged from 96 degrees F at Moorhead and Marshall on the 12th to 33 degrees F at Brimson and Embarrass on the 22nd. But those low

temperatures may be surpassed by the very cool weather coming this weekend. This was the 4th consecutive month with widespread cooler than normal temperatures across Minnesota.

August for most weather observers in the state has been wetter than normal. For some this breaks the streak of four consecutive drier than normal months. Several observers reported twice the average rainfall for August, and for some it was record-setting, like Chaska which reported 10.15 inches. Severe storms brought tornadoes to the state on August 8th and 19th. Fortunately there were no fatalities reported.

Topic: Weather Forecasting Rules of Thumb

I often get asked about simple forecasting rules that might be used to anticipate weather conditions when radio and television information sources are not available. Each forecaster probably has his or her own rules of thumb, but some of the more common ones are....

Clear skies, low humidity and calm winds shortly after sunset produce very low overnight minimum temperatures and by late September or early October lead to frosts.

Towering cumulus clouds by mid morning can be an indicator of a stormy afternoon.

Conversely, the dissipation of overnight fog by mid morning usually ushers in a fair weather afternoon.

The dewpoint shortly after sunset is an indicator of the potential overnight minimum temperature.

When outdoors, stand with your back to the wind. Low pressure will be on your left and high pressure on your right. Remember that pressure systems often migrate from west to east in Minnesota and low pressure usually brings storms, so if you are facing north with the wind on your back, low pressure is to the west of you and associated disturbed weather is likely headed your way. This is called the Buys-Ballot law and is the reverse in the Southern Hemisphere.

Counterclockwise wind shifts usually usher in colder and drier air.

Topic: State Fair Weather Quiz Time

Gary Eichten and I hosted the 13th Annual Minnesota Weather Quiz from the Minnesota Public Radio booth at the State Fair on Thursday, August 27th. If you missed it and want to see how well you would do on the quiz you can go to the Midday web site at...<http://minnesota.publicradio.org/collections/special/columns/updraft/>

Good luck on the quiz.....and I hope you get to take in the Fair.....

Weekly Weather Potpourri:

The NOAA NWS Office at Peachtree, GA has put an online training module together that allows users to mimic the decisions made by forecasters in dealing with outbreaks of severe weather. It is called the Hot Seat Weather Simulator and provides user feedback to those who want to try to use NWS tools, including radar signatures, to forecast tornadoes and other severe weather elements. You can give it a try at...

<http://www.srh.noaa.gov/ffc/HotSeat/index.shtml>

A somewhat busy week occurred for the tropical forecast centers. The National Hurricane Center in Miami was tracking and advising coastal interests on Tropical Storm Danny which will perhaps turn into a hurricane over the weekend, and on Tropical Storm Ignacio in the Eastern Pacific Ocean which remains at sea and is weakening. The Central Pacific Hurricane Center was tracking the remains of Hilda, a tropical depression that was passing south of Hawaii. It was relatively quiet in terms of tropical weather systems in the Southern Pacific, Western Pacific, and Indian Oceans this week.

Reuters news agency this week reported that parts of Mexico are suffering from the driest year in the past 68. Many reservoirs used for municipal water supply and irrigation are less than half capacity, especially in northwestern regions. Water is being transported by truck to some communities.

Just across the border from Mexico, portions of Texas remain in exceptional drought. In Austin, TX where mandatory water restrictions are in place some city workers have been assigned to patrol and issue citations to water violators. Fines may vary from \$400 to \$2000. City fountains were shut off on August 24th until further notice. So they are getting pretty serious about restricting water usage there.

Parts of northern India and Nepal have been hit by monsoon related flooding this week. Heavy rains have washed out roads and caused rivers to flood, inhibiting the movement of supplies and food around the region. As a result there are some food

shortages in areas. In addition thousands of houses have seen flood damage and many acres of crops have be inundated.

MPR Listener Question: I have heard you say that in three of the last four summers for many Minnesota observers August has been the wettest month and helped make up for rain deficiencies earlier in the spring and summer. But often these amounts in August come from some of the heaviest rains of the year, like the 6 inch rain at Chaska a couple of weeks ago. How often do our heaviest rainfalls of the year come in the month of August?

Answer: Historically, many of our heaviest daily rainfalls occur in June and July. These are the months where you find more frequent reports of flash flooding and associated damages. But you are right in your perception about recent climate trends favoring heavy rainfalls in August. Over the past 3 decades, August has brought the heaviest 24-hour rainfall annually measured in the state 12 times, and most recently four years in a row (2006,2007,2008, and this year so far). Further the month of September has brought the heaviest statewide 24-hour rainfall on an annual basis 6 times over the past 3 decades, most recently in the back to back years of 2004 and 2005. This may indicate a changing climate pattern or just be a fluke. But time and more detail will give us an answer.

Almanac for August 28th:

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 59 degrees F (plus or minus 7 degrees F standard deviation).

MSP local Records for August 28th:

MSP weather records for this date include: highest daily maximum temperature of 94 degrees F in 1899 and 1955; lowest daily maximum temperature of 61 degrees F in 1935; lowest daily minimum temperature of 42 degrees F in 1934; highest daily minimum temperature of 75 F in 1969. Record precipitation for this date is 1.11 inch in 1950.

Average dew point for August 28th is 59 degrees F, with a maximum of 77 degrees F in 1955 and a minimum of 34 degrees F in 1935.

All-time state records for August 28th:

The all-time state record high temperature for this date is 104 degrees F at Canby (Yellow Medicine County) in 1937. The all-time state record low temperature for this

date is 21 degrees F at Tower (St Louis County) in 1986. Note this is also the coldest temperature ever measured in Minnesota during the month of August. The all-time state record precipitation for this date is 6.00 inches at Litchfield (Meeker County) in 1960. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

The famous State Fair flash flood occurred over August 30-31, 1977. Most of the rainfall came on the evening of the 30th between 8:30 and 10:00 pm with MSP International Airport reporting over 7 inches, and nearly 5 inches falling on the fairgrounds, washing out the evening Grandstand show. Hundreds of basements were flooded in the Metro area as a number of observers reported 5 to 7 inch amounts of rainfall.

August 27-28, 2002 brought a flash flood to portions of northwestern Minnesota. Slow moving thunderstorms crossed the area late on Tuesday, the 27th and lingered into early Wednesday the 28th bringing very intense rainfall amounts. Flooding was reported in the Breckenridge area and also further north at Argyle. Argyle and Red Lake Falls each reported close to 7 inches of rainfall from these storms while Crookston received over 5 inches. The Breckenridge area in Wilkin County reported 5.50 inches.

Words of the Week: storm surge, swash, and backwash

These terms all refer to actions of ocean waters as they erode shorelines and beaches. A storm surge is produced by the wind action of large storms such as hurricanes. They literally push water up on shore and inland beyond the limits of normal tidal actions. Swash is the action produced by waves as they intermittently break across shorelines and beaches, while backwash is the return flow of water back to the sea. The combined erosive effects of these actions can be quite destructive, depending on their intensity and duration. Hurricane Bill produced some long lasting erosive effects along shores of Maine and Nova Scotia last week.

Outlook:

Significantly cooler temperatures this weekend as daytime highs fall off into the 50s and 60s F. It will be quit windy on Saturday, then calming down Sunday and Monday. It will generally be a dry period going into next week with a warming trend starting on Tuesday getting temperatures back to near average for this time of year.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, September 4, 2009

Minnesota WeatherTalk Newsletter for Friday, September 4, 2009

Headlines:

- Thoughts on Fall Colors
- Hoping first frost is late
- Final Chance to Take the State Fair Weather Quiz
- Weekly Weather Potpourri
- MPR listener question
- Almanac for September 4th
- Past weather features
- Rules on Groundwater Rights
- Outlook

Topic: Thoughts About Fall Colors....

The summer drought along with a cold finish to the month of August may have some effect on fall leaf color this year. In general light frosts can accelerate the onset of color and in some cases enhance the color of deciduous species. Some of the Minnesota landscape along the Canadian border has already seen numerous frosts. Leaf color there may peak by mid-September. A nice discussion and outlook related to fall leaf color and its progress around the state can be found at the Minnesota-DNR web site....

http://www.dnr.state.mn.us/fall_colors/typical_peak.html

Topic: Farmers hope first frost is late....

September 1st brought the coldest temperature in the nation to Embarrass, MN where it was just 28 degrees F. Much of the coffee shop conversation obviously turned to frost and when it would occur elsewhere around the state.

Though mid-August did bring some warmer than normal days to Minnesota, most of the month was cooler than normal. As a result development of the corn crop still lags behind normal. Many farmers have remarked that their corn crop is still 8 to 14 days behind normal development and will need a frost-free month of September to reach maturation. If the crop is frosted before it is mature and the corn has made it past dent stage, yield loss may range from 5 to 10 percent depending on how far the milkline has progressed down the face of the corn kernel. The next threat of frost appears to be associated with a cool, Canadian air mass that will affect us over September 15-17. If that air mass passes without producing a frost, a warming trend is seen towards the second half of the month.

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http://minnesota.publicradio.org/collections/special/columns/updraft/archive/2009/08/the_13th_annual_midday_minneso.shtml

Good luck on the quiz.....and I hope you get to take in the State Fair.....

Weekly Weather Potpourri:

The United Kingdom Meteorological Office reports that parts of Scotland have recorded their wettest August in history with some areas receiving over 15 inches of rainfall during the month. This produced some flooding and loss of livestock in areas.

This week the World Climate Conference-3 has been going on in Geneva, Switzerland. Dr. Jane Lubchenco, NOAA Administrator has been attending to represent the USA. Discussion concerns the development and coordination of climate services that can best meet the needs of the public, as well as policy makers, and researchers. This is an important conference to lay the groundwork should a new National Climate Services be established as part of the Climate Bill being discussed in Congress this fall. Uniformity in climate services among nations would obviously be a goal, along with designing a system to meet the needs of public health, transportation, energy, agriculture, tourism and other others.

The NOAA Storm Prediction Center in Norman Oklahoma reported a relatively quiet August across the nation with respect to tornadoes. Despite the outbreak of 11 tornadoes across our region on August 19th, the nation reported only 58 tornadoes for the month of August, one of the lowest August number since 2003 (44).

A very interesting article appears in the latest Minnesota Conservation Volunteer magazine about severe winters and deer mortality in Minnesota. One conclusion is that no matter how harsh the winter and how high the winter mortality, thanks DNR deer herd management and to the reproductive dynamics of the deer population age distribution, this species has the ability to rebound in very short order. Thus deer herd population has significantly recovered from previous harsh winters, including back to back ones in the 1990s. You can read more at the DNR web site...

http://www.dnr.state.mn.us/volunteer/sepoct09/bounce_back.html

MPR Listener Question: I heard you say recently that every month since May has averaged cooler than normal in Minnesota. When was the last time this happened in Minnesota and how will this growing season rank historically?

Answer: Preliminary climate data for May through August of this year shows a statewide average temperature of about 61.5 degrees F. This is about 3 to 3.5 degrees F colder than the historical average for these four months and ranks as the 12th coldest May through August in state history. The most recent years that have produced a growing season that was similarly cold were 1992 and 2004. The year 1915 brought the all-time coldest May through August period averaging only 58.8 degrees F statewide.

Almanac for September 4th:

The average MSP high temperature for this date is 77 degrees F (plus or minus 9 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 4th:

MSP weather records for this date include: highest daily maximum temperature of 98 degrees F in 1925; lowest daily maximum temperature of 59 degrees F in 1920; lowest daily minimum temperature of 39 degrees F in 1885 and 1974; highest daily minimum temperature of 73 F in 1960. Record precipitation for this date is 2.08 inch in 1911.

Average dew point for September 4th is 55 degrees F, with a maximum of 74 degrees F in 1941 and a minimum of 35 degrees F in 1957.

All-time state records for September 4th:

The all-time state record high temperature for this date is 103 degrees F at Beardsley (Big Stone County) in 1922 and at Pipestone in 1925. The all-time state record low temperature for this date is 22 degrees F at Park Rapids (Hubbard

County) in 1885 and at Grand Rapids (Itasca County) in 1918. The all-time state record precipitation for this date is 5.50 inches at Hallock (Kittson County) in 1900. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

On September 4, 1941 an F-2 tornado (winds 113-157 mph) traveled 30 miles across portions of Hennepin, Ramsey, and Washington Counties in the early afternoon. Cottages along Lake Gervais were damaged, two people were killed there, and a third person drowned after being blown into the lake. At White Bear Lake 20 cottages were damaged as well. This tornado overturned 200 Soo Line freight cars, some containing as much as 40 tons of coal. In all 50 people were injured by the storm.

September 3, 1980 brought an F-3 tornado (winds 158-206 mph) to Stearns County. It was on the ground for only 5 miles but it caused widespread devastation to Waite Park near St Cloud, where 6 homes, 14 trailers, and 16 apartment buildings were lost to the strong winds. In all over \$9 million in damages were inflicted by this short-lived tornado.

Words of the Week: English Rule and American Rule of Groundwater Rights

Historically, under the common law doctrine, rights to utilize groundwater resources have been granted to landowners in the United States and many European countries. In humid climates with abundant precipitation and adequate recharge, the English Rule has applied which grants landowners absolute rights to pump as much water as they wish. This rule does not recognize the fact the pumping water from beneath one property will deplete aquifers that are shared with other property owners. In climates with deficit precipitation, inadequate recharge, and multiple users of groundwater resources, the American Rule applies, which allows landowners a so-called "reasonable use" taking into account the impacts on the water rights of others and depletion limits for specific aquifers. There are still many inconsistencies among states in groundwater rights, but the number of locations and situations where the English Rule applies is continuing to decline as a result of pressures to protect and conserve groundwater resources.

Outlook:

Dry with seasonable temperatures over Labor Day weekend. There will be an increasing chance for rainfall by Tuesday and Wednesday next week, with somewhat cooler temperatures.

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Minnesota WeatherTalk Newsletter for Friday, September 4, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, September 4, 2009

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Minnesota WeatherTalk Newsletter for Friday, September 11, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, September 11, 2009

Minnesota WeatherTalk Newsletter for Friday, September 11, 2009

Headlines:

- Great weather run for the Minnesota State Fair
- Weekly Weather Potpourri
- MPR listener question
- Almanac for September 11th
- Past weather features
- Station Model
- Outlook

Topic: Great run of weather for the Minnesota State Fair.....

Our Minnesota State Climatology Office reports "Persistent high pressure over the eastern half of the United States enabled balmy skies, mild temperatures and little rain for the end of August and the first week of September over the Twin Cities. Thus 2009 was one of the driest Minnesota State Fair on record with .08 inches precipitation during the 12 day run from August 27 to September 7. The driest fair on record is 2003 with .02 (two-hundredths) of an inch of precipitation. Another dry fair was 1968 with .08 inches of precipitation." In addition, all 12 days brought comfortable daytime temperatures in the 60s and 70s F, and nighttime temperatures in the 50s F, with relatively low dewpoints. Average high during the fair was 74 degrees F, while the average low was 54 degrees F. No wonder it was reported that total paid attendance was 1,790,497, surpassing the previous record attendance set in 2001 by 27,521. The State Fair had 97,000 more attendees than last year.

Weekly Weather Potpourri:

NOAA announced this week that the average summer temperatures (June through August) across the contiguous 48 states were generally cooler than normal. The composite mean summer temperature across all the states ranked as the 34th coolest

summer since 1895. Several midwestern states reported a summer mean temperature that ranked among the 10 coldest in their respective climate histories, including Minnesota, Iowa, Wisconsin, Michigan, and Nebraska. In contrast, Florida reported its 4th warmest summer in history. You can read more from the NOAA press release at...

http://www.noaanews.noaa.gov/stories2009/20090910_summerstats.html

Though the Storm Prediction Center of NOAA has reported a diminished frequency of tornadoes since August across the nation (just 58 tornado reports in August), NOAA researchers warn that recent trends have shown more tornadoes than usual are being produced by landfall tropical storms and hurricanes. Recent research published in the Geophysical Research Letters suggest that larger hurricanes are producing more tornadoes at landfall and thereafter. You can read more about this research at...

<http://www.sciencedaily.com/releases/2009/09/090908103625.htm>

With the North Atlantic Hurricane Season continuing for at least two more months, it is premature to say that 2009 tornado threats may be tapering off.

MODIS images from the NASA Aqua Satellite positioned over California earlier this month showed a vivid depiction of the wildfires (known as the Station Fires) near Los Angeles. These fires, some of the largest and costliest in California history have burned over 160,000 acres and cost over \$27 million to fight. You can read more at...

http://news.satimagingcorp.com/2009/09/satellite_images_from_modis_sensor_cover_southern_california_forest_fires.html

MPR Listener Question: I heard you say at Farmfest that most of the state's corn crop needs a frost-free September to reach full maturation. Is this still the case and what do you see for the rest of this month?

Answer: Indeed, the state's corn crop would benefit from a frost-free September in the agricultural counties. The current weather pattern does not favor any frost out to about the 25th of the month when another cool, Canadian high pressure system will pass across our region. Perhaps by then the corn crop will be near enough to maturity that a frost will matter less in terms of yield loss.

Almanac for September 11th:

The average MSP high temperature for this date is 73 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 53 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for September 11th:

MSP weather records for this date include: highest daily maximum temperature of 96 degrees F in 1895 and 1931; lowest daily maximum temperature of 51 degrees F in 1924; lowest daily minimum temperature of 35 degrees F in 1962; highest daily minimum temperature of 75 F in 1931. Record precipitation for this date is 3.11 inch in 1900.

Average dew point for September 11th is 52 degrees F, with a maximum of 72 degrees F in 1951 and a minimum of 25 degrees F in 1955.

All-time state records for September 11th:

The all-time state record high temperature for this date is 111 degrees F at Beardsley (Big Stone County) in 1931. The all-time state record low temperature for this date is 22 degrees F at Warroad (Roseau County) in 1910 and at Ada (Norman County) in 1955. The all-time state record precipitation for this date is 5.50 inches at Pleasant Mound (Martin County) in 1900. No measurable snowfall has occurred in the state on this date.

Past Weather Features:

The 109th Anniversary of hurricane effects in Minnesota might be noted this week. Tuesday, September 8th marked the anniversary of the most lethal hurricane disaster in U.S. history. Galveston, TX was hit by 135 mph winds (Class 4 Hurricane) and a 20 foot storm surge on September 8, 1900. More than 8,000 people drowned and over 3600 homes were destroyed. The remnants of this hurricane tracked north over Texas and the southern plains to merge with a cold front over Iowa by September 10th. The storm then produced a period of very heavy rains over Minnesota. In fact, the record Twin Cities rainfall for today's date of 3.11 inches is a direct result of this storm. Over two days St Paul recorded a rainfall total of 6.55 inches. Other parts of southern Minnesota reported 4 to 6 inches of rainfall as a result of this storm.

September 11, 1942 brought a damaging derecho (straight-line wind storm) to Minnesota. A powerful squall line developed along the western border and produced damaging winds at Granite Falls. The squall line hung together and passed across central Minnesota carving a 30 mile wide swath of wind damage, before dissipating just east of North Branch in Chisago County. Willmar reported winds up to 66 mph,

while Monticello reported a wind gust of 70 mph. More than 650 barns were destroyed and 1700 homes damaged by these strong winds.

September 12, 1923 brought snow flurries and sleet to Warroad and Virginia, Minnesota, where temperatures hovered in the 30s F with cold northwest winds.

Words of the Week: Station Model

In the meteorological community this refers to a specific set of symbols and a pattern for using them to show the state of the weather at each observing station plotted on the map. The symbols and numbers used typically represent air temperature, dewpoint, pressure, sky cover, wind speed and direction, and character of the weather (snowing, raining, fog, dust, etc). More on the station model and interpreting data presented in this form can be found at the Unisys Weather web site:

<http://weather.unisys.com/surface/details.html>

Outlook:

Chance of showers and thunderstorms on Saturday, with some lingering in eastern sections on Sunday. There is about a 40 percent chance that showers will occur Saturday night during the first football game at the new TCF stadium on the University of Minnesota Minneapolis Campus. Temperatures will be mostly in the 70s F. Warmer Monday, then cooler by mid-week, with generally a dry pattern dominating our weather next week.

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Minnesota WeatherTalk Newsletter for Friday, September 18, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, September 18, 2009

Minnesota WeatherTalk Newsletter for Friday, September 18, 2009

Headlines:

- Run of warmth, longest of the year so far
- Seeking agricultural relief in northern counties
- New Seasonal Climate Outlook
- Global Framework for Climate Services
- Weekly Weather Potpourri
- MPR listener question
- Almanac for September 18th
- Past weather features
- Seistan
- Outlook

Topic: Warm stretch of weather

Since September 5th most Minnesota weather observers have reported above normal temperatures. In fact the string of consecutive days with above normal temperatures through Friday of this week (September 18th), 14 in all, is the longest stretch of days with warmer than normal temperatures for the entire year of 2009. This is a great pattern for the state's corn and soybean crops which are slowly nearing maturity. Many locations are averaging 6-7 degrees F warmer than normal for the month so far, and it has been as warm as 88 degrees F in western counties (Canby).

Topic: Governor Pawlenty seeks federal agricultural disaster declaration for northern counties

Earlier this week Governor Pawlenty petitioned the USDA for a federal agricultural disaster declaration in Kittson, Roseau, Pennington, Marshall, Koochiching, and Lake of the Woods Counties as a result of persistent wetness there and the associated estimated crop loss. The Minnesota Farm Service Agency has estimated crop loss of

30 percent or greater due to prevented planting of corn, soybean, wheat, canola, sunflowers, flax, and barley crops. A USDA declaration would allow farmers in those counties to become eligible for low-interest emergency loans. Some areas in these counties have received up to 150 percent of normal precipitation over the past 12 months and experienced spring snow melt flooding in April and May of this year.

Topic: New agreement for on a Global Framework for Climate Services

Upon her return from the World Climate Conference in Geneva, Switzerland, NOAA Administrator, Dr. Jane Lubchenco was pleased to announce that all participating countries have agreed upon a framework to develop and deliver climate services. Climate services will develop in coming years to assist governments, local communities, industries, and individual citizens in planning for climate variability and change that will impact their operations and infrastructure. Indeed, the development of climate services is a part of the House and Senate Climate Bills before Congress. More on this can be found at...

http://www.noaanews.noaa.gov/stories2009/20090904_wcc3closing.html

Topic: New Seasonal Climate Outlook

The NOAA Climate Prediction Center released a new seasonal climate outlook on Thursday this week. Based on a strengthening El Nino episode in the equatorial Pacific Ocean, they see an above normal temperature pattern dominating our region and the states west of us for the October, November, and December period. This late fall and early winter temperature pattern is associated with historical El Nino events. For seasonal precipitation the CPC outlooks suggest there are equal chances for wetter or drier than normal conditions across Minnesota during the next three months.

Weekly Weather Potpourri:

The NOAA National Snow and Ice Center announced this week that the summer loss of polar sea ice this year ranked as the third biggest melt since 1979, but less than that of the last two summers. The minimum ice cover reached last week in the polar sea was just under 2 million square miles. You can read more at....

http://www.usatoday.com/weather/climate/2009-09-17-arctic-sea-ice-minimum_N.htm

The Joint Typhoon Warning Center was putting out forecasts for Typhoon Choi-Wan this week as it churned away in the western Pacific southeast of Japan. It was on a

track to pass east of Japan and it good thing it was as this typhoon packed 155 mph winds, with gusts over 180 mph and was producing sea waves of near 40 feet.

Earlier in the week Typhoon Koppu hit Hong Kong with strong winds and very heavy rains that caused flash flooding in many areas. Some streets were closed by the floods, while some buildings were damaged by the strong winds.

The BBC News reported earlier this month that Australia recorded its warmest August in history, concluding on one of its warmest winters (June, July, August) in history as well. In some areas August was 4.5 degrees F warmer than normal with some daily reports of temperatures as high as 100 degrees F. In many areas rainfall was short as well and the anticipated bush fire season this spring may be a bad one.

MPR Listener Question: Several television meteorologists have remarked this week about the unusual frequency of days with daytime maximum temperatures 80 degrees F or higher this month. What is average for the month of September?

Answer: The long term average for the Twin Cities in September is 7 days with temperatures of 80 F or higher. So far this month there have been 9 days. Back in 1908 the Twin Cities reported 18 days in September when the temperature hit 80 degrees F or higher. At Rochester the historical average for September is 4 days, which is exactly the number so far this month, while at St Cloud the historical average is 6 days and so far they have reported 8 days at 80 F or above.

Almanac for September 18th:

The average MSP high temperature for this date is 72 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 September 18th:

MSP weather records for this date include: highest daily maximum temperature of 93 degrees F in 1891; lowest daily maximum temperature of 47 degrees F in 1991; lowest daily minimum temperature of 32 degrees F in 1929; highest daily minimum temperature of 71 F in 1955. Record precipitation for this date is 3.75 inch in 1905.

Average dew point for September 18th is 52 degrees F, with a maximum of 73 degrees F in 1947 and a minimum of 23 degrees F in 1929.

All-time state records for September 18th:

The all-time state record high temperature for this date is 100 degrees F at Montevideo (Chippewa County) in 1891. The all-time state record low temperature for this date is 12 degrees F at Littlefork (Koochiching County) in 1929. The all-time state record precipitation for this date is 7.25 inches at Albert Lea (Freeborn County) in 1926. The state record snowfall for this date is 2.4 inches at the Duluth Airport in 1991.

Past Weather Features:

The heat wave of mid-September in 1891 was one of the worst ever for western and southern Minnesota locations. From the 15th to the 23rd of September temperatures averaged 25 to 30 degrees F warmer than normal, with 90s F reported as far north as Crookston and temperatures exceeding 100 degrees F at Montevideo. In fact high temperatures averaged near 97 degrees F over the eight days at Montevideo.

September of 1926 was traumatic for Minnesota agriculture. On the 24th a widespread freeze brought an end to a short and cool growing season, severely damaging the corn crop. Much of the corn was harvested for silage rather than grain that year. In addition some flash flooding occurred across southern Minnesota on the 17th and 18th as strong thunderstorms brought heavy rainfall amounts to the area. Worthington, Waseca, Winnebago, Faribault, Fairmont, Maple Plain, and Chaska all reported over 3 inches of rain, while Mankato and St Peter reported over 4 inches. At Albert Lea flash flooding and severe erosion of agricultural lands occurred with 7.35 inches of rainfall. Little Falls, New Ulm, and St Cloud ended the month of September, 1926 with over 10 inches of rainfall.

A severe September cold outbreak in 1929 was evident across much of Minnesota, especially on the 17th and 18th when many locations reported overnight lows in the teens F including Littlefork 12 F, Hallock 16 F, Ada 17 F, Angus 14 F, Argyle 16 F, Beardsley 19 F, Crookston 18 F, Detroit Lakes 17 F, Mahnommen 14 F, Park Rapids 19 F, Itasca State Park 19 F, Roseau 16 F, and Red Lake Falls 15 F. Even as far south as Waseca and Zumbrota temperatures fell to 28 degrees F, abruptly ending one of the shortest growing seasons in Minnesota history. Fortunately most of the corn crop had already reached maturation.

Words of the Week: Seistan (Sistan) or Wind of 120 Days

In the Seistan (Sistan) Basin of southeastern Iran and southwestern Afghanistan, there is a strong and persistent summer wind of monsoon origin which blows from the north-northwest from May through September. It is also called the wind of 120 days.

The deep summer low over northwest India provides the pressure gradient for this wind, which may blow up to speeds of 70 mph and carries a good deal of sand and dust. It is an irritating and highly erosive type of wind which can produce a sandblasting effect. Buildings are eaten away and undercut during the summer. For this reason, the north-facing sides of buildings are often left blank, with no windows, frescos or other designs. Wandering sand dune deposits sometimes crowd buildings and choke surface water supplies. Because of the persistent wind, much of the vegetation that survives there can be used as a compass because the stems and shoots are often oriented north to south.

The Seistan is coming to an end this month as the Indian monsoon weakens with the southerly migration of the sun.

Outlook:

Continuing warm and sunny into the weekend, with increasing clouds later on Sunday. A chance for showers and thunderstorms Monday and Tuesday, with cooler temperatures for the balance of next week.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, September 25, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, September 25, 2009

Minnesota WeatherTalk Newsletter for Friday, September 25, 2009

Headlines:

- Records falling in September
- October is a favorite
- Weekly Weather Potpourri
- MPR listener question
- Almanac for September 25th
- Past weather features
- Michael-riggs
- Outlook

Topic: Records fall in September

The streak of consecutive days with above normal temperatures now stands at 20 for most Minnesota weather observers this month, by far the longest stretch of above normal warmth for the year 2009. Indeed, this is the longest persistence of above normal temperatures since late October and early November of 2007. After a cool, dry summer for most areas of the state, September has brought warm and dry conditions. It appears this will be the warmest September in state history, surpassing that of 1897. Minnesota has reported the nation's lowest temperature only once this month (28 F at Embarrass on the 1st). Miraculously for Minnesota crop producers many areas of the state will make it to the end of September without a frost. Canby reached a statewide high on September 18th when they reported 90 degrees F.

In addition, depending on rainfall for the balance of the month, September of 2009 will likely be one of the driest in state history on a statewide basis. Many observers have reported less than 0.10 inches so far this month, and Rochester did not report a drop of rainfall until the 21st this week, their driest ever start to September. At the University of Minnesota Research and Outreach Center in Waseca, scientists reported the lowest values of stored soil moisture ever measured in mid-September with less

than 3 inches of water stored in the top 5 feet of the soil profile. In addition most watersheds in the eastern counties of the state show September flow volumes in the lowest 25 percent historically. Portions of Washington and Chisago Counties in east-central Minnesota are designated to be in extreme drought, while much of the Twin Cities Metro Area is designated to be in severe drought. Some of this may be alleviated by shower activity during the next five days.

Topic: Topic: Is October Your Favorite Month Too?

Thinking ahead to next month, I came across this commentary about October's weather in an October, 1895 edition of the Minneapolis Journal....

"October is generally a kingly month in Minnesota. It opens with the usual affluence of sunshine and quickening, bracing air, which stimulates our senses..... Day after day, the transformation of summer greenery into the royal and gorgeous tones of autumn will go on and 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...."

From numerous conversations with friends, I have drawn the conclusion that many Minnesotans cherish October as their favorite month of the year. Some of their October memories and visions include: A pageantry of landscape color; Harvest festivals and dinners; Visits to the applehouse and glasses of fresh cider; Picking out pumpkins for Halloween; Song-filled hayrides across harvested fields or through colorful woodlands; Stocking the pantry with the garden harvest, including homemade pickles; Walks on frosty mornings with clear, blue skies; Wearing handmade sweaters and embroidered sweatshirts; Attending the bonfire rally; The last boat trip on the river or lake; Watching migrating formations of birds; Drying the last of the cut flowers; Going to outdoor football or soccer games on a comfortable Saturday afternoon, and many, many more.

Of course this affection for the month of October may be conditioned by the juxtaposition of arguably one of the worst months of the year, November, which has some rather negative connotations: Freezing rain; Frozen ground and icing lakes; Howling winds and first windchills: Low, grey decks of clouds that last all day; Blowing, raking, and bagging leaves; Putting up the storm windows; shortening days that bring on Seasonal Affective Disorder; Getting out the gloves, parkas and hats; Onset of the flu season; atmospheric inversions that leads to morning fogs; All-day rain showers and first snows. For many the month is salvaged by the gathering of friends and family to enjoy Thanksgiving!

Weekly Weather Potpourri:

British scientists reported in the science journal Nature this week that 81 of 111 glaciers studied on Greenland show accelerated thinning and melting. Comparing recent data for 2003 to 2007 shows that some glaciers are melting at a rate that is 50 percent higher than those rates measured over the 1995 to 2003 period.

Persistent rain produced widespread flooding in and around Atlanta, GA this week. Many areas reported 5 to 10 inches of rainfall this week. Both Atlanta (7.79 inches) and Athens (8.64 inches) recorded 7 consecutive days with rain, while Macon reported 8 consecutive days with rain totaling 9.83 inches. Roads and athletic fields were flooded and there were reports of widespread water damages to homes.

A new study from the journal Environmental Science and Technology documents the greenhouse gas emissions associated with many of the worlds largest cities. Denver, CO was listed as the largest emitter of greenhouse gases, followed by Los Angeles, Toronto, Cape Town, and New York City among others. You can read more about it at...

<http://www.sciencedaily.com/releases/2009/09/090923133007.htm>

A tropical storm in the Western Pacific Ocean is expected to move across Manila in the Philippines this weekend, bringing heavy rains, strong winds and high surf. It will then intensify over the South China Sea and crash into Vietnam by Tuesday and Wednesday next week. More information can be found at...

<http://metocph.nmci.navy.mil/jtwc.php>

MPR Listener Question: Why have we had such warm, dry weather? Does it have to do with the jet stream?

Answer: Indeed, the polar jet stream has been displaced to the north for much of September, as the pressure/height patterns known as the Arctic Oscillation and North Atlantic Oscillation have been in the positive phase most of the month. Since September 5th we have seen little activity in terms of active weather fronts. As a result we have had no invasion of Canadian or polar air masses across the state, leading to a dominance of warm days and nights. Churchill along the shores of Hudson Bay in Manitoba has seen temperatures in the 70s F several days this month, while Winnipeg has been as warm as 86 degrees F. Even Arctic Canada has seen a run of warm weather with Clyde River (over 70 degrees north latitude) on Baffin Island reporting above freezing temperatures for the first 21 days of this month.

Following a cold frontal passage on Sunday and Monday, it appears that temperatures will fall back closer to seasonal normals and we will see more frequent chances for rainfall during the first half of October.

Almanac for September 25th:

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 September 25th:

MSP weather records for this date include: highest daily maximum temperature of 91 degrees F in 1920; lowest daily maximum temperature of 44 degrees F in 1926; lowest daily minimum temperature of 31 degrees F in 1926; highest daily minimum temperature of 68 F in 1908. Record precipitation for this date is 1.34 inch in 1934.

Average dew point for September 25th is 45 degrees F, with a maximum of 70 degrees F in 1903 and a minimum of 14 degrees F in 1926.

All-time state records for September 25th:

The all-time state record high temperature for this date is 95 degrees F at Angus (Polk County) in 1938. The all-time state record low temperature for this date is 11 degrees F at Alborn (St Louis County) in 1947. The all-time state record precipitation for this date is 5.22 inches at Willmar (Kandiyohi County) in 1929. The state record snowfall for this date is 6.5 inches at the Fosston (Polk County) in 1912.

Past Weather Features:

On September 24-25, 1912 one of the heaviest September snowfalls in history hit portions of northwestern and north-central. A deep low pressure system (29.5 inches on the barometer) moved across Minnesota bringing high winds and a drop in temperature. This storm started out with rain, setting a record daily amount in some places like Crookston with 1.90 inches on the 24th. But as the temperature dropped into the low to mid 30s F the storm brought snowfall. All of the following amounts are records for September 25th at these respective locations: Fosston 6", Bagley 6", Warroad 6", Thief River Falls 6", Warren 5", Crookston 3", Angus 2.4", and Roseau 1.3". This remained the heaviest September snowfall in Minnesota history until September 26, 1942 when 7.5 inches fell at Bird Island.

Words of the Week: Michael-riggs

This is an old term relating to Michaelmas, an English name for the fall season. Celebrated for St Michael, the patron saint of healing, Michaelmas Day falls on September 29 and is commonly marked by a harvest festival in many towns. Symbols of the festival include a glove, representing openhanded generosity, a cooked goose as the centerpiece of the harvest dinner, and gingerbread or gingerbeer because ginger is recognized as a healing spice.

Michael-riggs is the term given to the occasional strong gales which blow over England during this season. Rig by itself is an old English term for a gale, derived from the observation of how quickly a strong wind can fill the sailing rigs of ships.

Outlook:

Cloudier this weekend with a chance for showers Saturday in the east and then later on Sunday as well. Stronger winds will begin on Sunday and carry on into Monday. Cooler temperatures will be evident for early next week, with some frost in places by Tuesday morning. There will be another chance for showers by Thursday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, October 2, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, October 2, 2009

Minnesota WeatherTalk Newsletter for Friday, October 2, 2009

Headlines:

- Cold snap brings an end to an otherwise warm September
- Very strong winds
- Wet start to October
- Weekly Weather Potpourri
- MPR listener question
- Almanac for October 2nd
- Past weather features
- Mush-faker
- Outlook

Topic: September ends with a cold snap

Finally after over 3 consecutive weeks with above normal temperatures across the state, a strong cold front ushered in a spell of below normal temperatures for the 28th through the 30th this week. Indeed, some observers reported a record-setting cold minimum temperature on Wednesday morning the 30th, including 24 degrees F at Orr, 23 degrees F at Crane Lake and Babbitt, and 20 degrees F at Embarrass. The cold finish to the month produced an embarrassment for me as I had said last week that I was certain September of 2009 would be the warmest in Minnesota history on a statewide basis. As it turns out it appears that this September will be among the top 5 warmest in Minnesota history falling short of the warmth measured in 1897, 1908, and 1931. For observers at Park Rapids, Tower, and Embarrass it was the warmest September in history.

September ended as the 14th driest in Minnesota history with a statewide average precipitation of about 1.50 inches. Some individual observers certainly reported one of the driest Septembers in local history including MSP International Airport with just

0.46 inches, Willmar with 0.41 inches, St Clouds with 0.61 inches, Forest Lake with 0.57 inches, and Grand Rapids with 0.59 inches.

Topic: Wind damages on Sunday and Monday....

Up until Sunday, September 27th the month of September had brought little wind to the state. Most locations were reporting very low wind speeds for the month, most frequently less than 10 mph. But strong low pressure moved across southern Canada on Sunday night and Monday bringing very strong pressure gradient winds to the area. MSP reported gusts to 54 mph on Sunday and 47 mph on Monday, while Rochester and Duluth reported winds as high as 48 mph and 45 mph, respectively. St Cloud and Alexandria also reported peak wind speeds over 50 mph, unusual for the month of September. There were reports of toppled trees and downed power lines in a number of places. Strong winds also prevailed during the first two days of October (Thursday and Friday) in northeastern Minnesota as wind gusts well over 40 mph were measured at Duluth and Two Harbors.

Topic: Wet start to October

A large storm system passed across the region on October 1st and 2nd bringing abundant rainfall (up to 3-4 inches over the two days) to many parts of southern, western, and central Minnesota. Some observers reported more than 2 inches of rain on the 1st, a good start to a month when most Minnesota farmers and gardeners would like to see some replenishment in soil moisture. Daily rainfall records set on October 1st included the Twin Cities (MSP Airport) with 1.29", Rochester with 1.45", Moorhead with 1.96", Jackston with 2.34", Windom with 2.12", and Browns Valley with 2.20" among many others. Historical monthly normals for October range from 1.5 to 2.5 inches of rainfall around the state. So far this year on a statewide basis all months have been drier than normal except for February, March, and August.

Weekly Weather Potpourri:

TPT's Mary Lahammer has put together a documentary television program about Minnesota's Deadliest Tornadoes. Paul Douglas and I helped provide content for this historical look at the state's weather history and it will be broadcast twice this month in primetime, at 9:30 pm on Thursday October 8th (TPT 2) and again at 10:00 pm on Sunday, October 11th. If you are interested in Minnesota's weather history, I encourage you to watch.

It was announced during the summer that among all National Parks in the USA Grand Teton National Park is the first to achieve StormReady status according to the NOAA National Weather Service. In order to achieve StormReady status for the 484 square

mile park, officials there had to establish a 24-hr staffed center to receive NWS warnings, create an emergency operations center, offer seminars on storm readiness to educate visitors and improve public awareness, set up a system to monitor local weather, and create a hazardous weather plan for all staff. Both NOAA and National Park Officials hope that other National Parks may follow Grand Teton's example to protect visitors from hazardous weather.

After being flooded by Typhoon Ketsana last week citizens of the Philippines were preparing for Super Typhoon Parma this week. Areas of Luzon were hit with over 13 inches of rainfall in half a day by Typhoon Ketsana last weekend. This caused widespread flooding and loss of lives and property. Later, Ketsana produced even more flooding in Vietnam. Super Typhoon Parma is expected to cross the northern part of Luzon over the weekend, though it will weaken somewhat before doing so. Nevertheless this storm should bring abundant rain, wind gusts near 140 mph and wave heights of 30 to 35 feet, so significant damages are a threat in many areas. Super Typhoon Melor (even stronger) is in the same vicinity as Parma but it is expected to stay to the north and track toward southern Japan early next week.

Late last month the United Kingdom Meteorological Office announced that it would offer online advertising on its public web site. This is a first among European Union countries which have government weather offices providing public, marine, and aviation weather services via the Internet. For years the UK Met Office has operated with the support of both government funding and private revenues generated by their services.

MPR Listener Question: As I look at the 2009 cumulative rainfall deficits for some places in Minnesota I see some locations are still 7 to 10 inches short of normal. What are the extremes for abundant rainfall this month? Can these deficiencies be made up for with a wet October?

Almanac for October 2nd: Lately we have been experiencing a trend toward wetter Octobers anyway. But the all time historical extremes for most observers in the state range from 5 to 8 inches. In the Twin Cities the wettest October was in 1911 with 6.42 inches. However places like Fosston and Zumbrota have both recorded over 10 inches of rainfall during October. That probably represents a maximum potential for the state. We are certainly starting out wet this month.

The average MSP high temperature for this date is 64 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 2nd:

MSP weather records for this date include: highest daily maximum temperature of 89 degrees F in 1953 lowest daily maximum temperature of 44 degrees F in 1888 and 1944; lowest daily minimum temperature of 22 degrees F in 1974: highest daily minimum temperature of 65 F in 2005. Record precipitation for this date is 0.85 inch in 1900.

Average dew point for October 2nd is 42 degrees F, with a maximum of 68 degrees F in 1951 and a minimum of 18 degrees F in 1974.

All-time state records for October 2nd:

The all-time state record high temperature for this date is 95 degrees F at Wheaton (Traverse County) in 1953. The all-time state record low temperature for this date is 9 degrees F at Karlstad (Kittson County) in 1974. The all-time state record precipitation for this date is 4.33 inches at Sandy Lake Dam (Aitkin County) in 1995. The state record snowfall for this date is 5.4 inches at the Lakefield (Jackson County) in 1999.

Past Weather Features:

October of 1840 started very cold at Fort Snelling with temperatures in the 30s F. About 1 inch of snow was reported overnight from October 1st to 2nd and the afternoon high on the 2nd barely reached the mid 30s F. The snow was short-lived as the next day rebounded to an afternoon high of 64 degrees F.

October 1-3, 1995 brought a very wet period to portions of northern Minnesota. Very heavy bands of showers crossed north central and northeaster sections of the state bringing well over a month's worth of moisture in three days. Sandy Lake Dam in Aitkin County reported over 5 inches, while Tower and Remer recorded over 4.5 inches, and Brainerd, Melrose, and Lake Winnie reported over 3.5 inches.

Friday and Saturday, October 1-2, 1999 brought a significant snowfall to southwestern Minnesota and along the international border with Canada. Among southwestern communities Lakefield reported 5.4 inches, Lake Wilson 5 inches, Marshall 4.5 inches, Springfield 3.75 inches, Worthington 3 inches, and Mankato 2.75 inches. Up north Ash River reported 4 inches and Crane Lake reported half an inch.

Word of the Week: Mush-faker

This is an old British term from the 19th Century and refers to a mender of umbrellas. The canopy or umbrella over a cab or taxi pulled by a horse was called a mush or mushroom. Thus a mushroom-faker or mushtopper-faker was a person who mended such canopies. In modern times we do not mend umbrellas, but buy new ones when

the old ones break. I suppose there may be some antique or extraordinary hand-crafted umbrellas that may be mended from time to time.

Outlook:

Showers ending in eastern Minnesota on Saturday and mostly dry on Sunday. Another chance for showers by Monday and Tuesday next week. Temperatures will remain generally cooler than normal and more precipitation may be in store towards the end of next week with a threat of snow along the Canadian border areas.

Further Information:

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For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, October 9, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, October 9, 2009

Minnesota WeatherTalk Newsletter for Friday, October 9, 2009

Headlines:

- Wet, cool start to October
- Annual Kuehnast Lecture Set for October 15th
- Weekly Weather Potpourri
- MPR listener question
- Almanac for October 9th
- Past weather features
- Haugull
- Outlook

Topic: Wet, cool start to October

Through the first 8 days of the month, wet and cool describe the character of the weather. Temperatures are averaging 3 to 6 degrees F cooler than normal, while many observers are reporting rainfall in abundance. In fact a number of places already report over 4 inches for the month, including Montevideo with 4.07", Buffalo with 4.53", Litchfield with 4.17", Willmar with 4.34", Marshall with 4.11", St James with 4.60", and Grand Meadow with 4.16" among others. For all of these locations except Montevideo this month already ranks among the ten wettest Octobers historically.

The mid-range outlook favors continued cool temperatures and continued frequent chances for precipitation. Delays due to wet soils will likely push the peak workload for corn harvesting into the second half of October.

Topic: 17th Annual Kuehnast Lecture is on October 15th

The 17th Annual Kuehnast Lecture, public engagement on the topics of climate and atmospheric sciences, is scheduled for next Thursday, October 15th. Our speaker this year is Dr. Dennis Baldocchi from UC-Berkeley, recognized in 2009 by the American

Meteorological Society for his outstanding contribution to the field of biometeorology. Dr. Baldocchi will speak on the University of St Paul Campus at 3:30 pm on October 15th in Rm 335 Borlaug Hall. His topic is "Breathing of the Biosphere: How Physics Sets the Limits and Biology Does the Work." This lecture is open to the public. You can read more about the lecture at.....

http://climate.umn.edu/doc/journal/kuehnast_lecture/

Weekly Weather Potpourri:

The National Oceanic and Atmospheric Administration, NASA, the US Geological Survey and several professional scientific organizations such as the American Geological Institute are recognizing next week (11-17 October 2009) as Earth Science Week to help the public gain a better understanding and appreciation for the earth sciences and to encourage stewardship of the Earth. This year's theme is "Understanding Climate", with materials designed to "promote scientific understanding of a timely, vital topic: Earth's climate." You can read more about Earth Science Week at

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

It was announced this week that land which belongs to the St John's Abbey in Collegeville will be used to construct the largest solar farm in the state. Ground breaking ceremonies were held there on Wednesday of this week. The solar panel collector arrays will occupy about four acres of land and produce enough energy to power about 65 homes. More on this story can be found at the MPR web site...

<http://minnesota.publicradio.org/display/web/2009/10/07/solar-farm-um/>

Typhoon Melor hit Japan this week with winds of up to 120 mph, heavy rains and high seas. Tens of thousands of homes were left without power and two people were killed across central portions of Japan. The typhoon has since moved out over the cooler Pacific Ocean to the northeast of Japan and is dissipating. But winds were still gusting to over 50 mph as of Thursday.

UCLA researchers reported this week on a climate reconstruction study using the ratio of boron to calcium in shells of ancient single-celled marine algae. This ratio is a marker of the atmosphere's carbon dioxide content. Using this technique to study the past 20 million years, they determined that the current content of carbon dioxide in the atmosphere (approx 387 ppm) was last matched approximately 15 million years ago when the Earth was 5 to 10 degrees F warmer. This study represents one of the few

ancient reconstructions of the Earth's atmospheric carbon dioxide content. You can read more at...

<http://www.sciencedaily.com/releases/2009/10/091008152242.htm>

MPR Listener Question: With a cold, and even snowy forecast for Minnesota, I was wondering how often snow is reported during the month of October?

Answer: This depends on what region of the state you live in. For example October snow, if considered as trace amounts or greater, is a standard feature of the climate in International Falls or at Gunflint Lake. Around the Twin Cities Metro Area, since 1884 the month of October has brought snow, at least in trace amounts, 59 percent of the time. Down along the Iowa border at Fairmont, MN October snow has been observed only about 30 to 35 percent of the time historically. The bottom line is that snow in an October forecast is not terribly unusual. In fact in the Twin Cities area at least a trace of snowfall has been reported for October in 12 of the past 14 years. You can read more about October snowfalls in the Twin Cities in the Climate Journal Section of our web site....

http://www.climate.umn.edu/doc/journal/October_snow.htm

Almanac for October 9th:

The average MSP high temperature for this date is 60 degrees F (plus or minus 10 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 9th:

MSP weather records for this date include: highest daily maximum temperature of 86 degrees F in 1938 lowest daily maximum temperature of 38 degrees F in 1906, 1925, and 1985; lowest daily minimum temperature of 22 degrees F in 1895: highest daily minimum temperature of 67 F in 1879. Record precipitation for this date is 1.82 inch in 1904.

Average dew point for October 9th is 40 degrees F, with a maximum of 68 degrees F in 1973 and a minimum of 16 degrees F in 1932.

All-time state records for October 9th:

The all-time state record high temperature for this date is 91 degrees F at Montevideo (Chippewa County) in 1980. The all-time state record low temperature for this date is

5 degrees F at Mizpah (Koochiching County) in 1932. The all-time state record precipitation for this date is 4.44 inches at Grand Rapids (Itasca County) in 1973. The state record snowfall for this date is 7.5 inches at Slayton (Murray County) in 1970.

Past Weather Features:

The Great Lakes States suffered perhaps their worst ever fire season in the fall of 1871. The summer had been a very dry one. The Pioneer Press newspaper reported on the very low stage of the Mississippi River, the St Croix River, and the Red River of the North. The Mississippi River running through the Twin Cities was reportedly at its lowest stage in seven years. This suggests that the surrounding landscape was indeed very dry. Farm reports spoke of parched fields and large cracks in the soil.

Fires began in western Minnesota, from Breckenridge south to the Iowa border during the month of September. By October, the Pioneer Press was reporting smoky air, clouds of dust, fires lighting up the western horizon, obscured sunlight, and cinders in the air. The prairie fires peaked on October 8th in a very destructive manner. Fires destroyed farm fields, buildings and homes in the New Ulm area. Elsewhere at the same time, even greater destruction occurred: a fire broke out near Peshtigo, WI destroying the town in less than one hour and claiming 1200 lives in Door and Kewaunee Counties while scorching 1.2 million acres; the Great Chicago Fire began on the evening of the 8th of October in a stable behind the O'Leary home and was not completely extinguished until October 10th by which time it had destroyed over 17,000 buildings and killed over 200 people*; numerous fires also broke out in Michigan and burned over 2 million acres, mostly forested lands, killing 200 people. Snow and rain during the remainder of October helped to bring an end to this terrible fire season.

Interesting narratives about these fires can be found on the Internet at...

<http://www.crh.noaa.gov/grb/peshtigofire.php>

(Green Bay, WI Weather Service Office)

<http://www.thechicagofire.com/>

(Chicago, IL Weather Service Office)

*Footnote: the Chicago Weather Office of the Army Signal Corps was destroyed in this fire, along with all the early climatological data records. They had reportedly only recorded 1 inch of rainfall from July to October.

On October 9, 1879 an all day rain at Ft Snelling kept temperatures in a very narrow range. The morning low was 67 degrees F, above average even for July, while the

afternoon high was just 73 degrees F. In fact the first 16 days of October 1879 were unusually warm, all days reaching a temperature of 70 F or higher and 7 days reaching 80 degrees F or higher.

October 10, 1949 brought one of the worst wind storms in Minnesota history. A low pressure system in SD intensified as it moved across the region, producing tremendous pressure-gradient winds. A gust of 100 mph was reported at Rochester, while Duluth reported gusts up to 76 mph. Between 9:30 am and 4:30 pm on that Monday the Weather Service in the Twin Cities reported consistent winds speeds of 40 mph or more, and between 1:00 pm and 2:00 pm gusts were over 80 mph, peaking at 89 mph. Trees were snapped, windows were blown out, chimneys collapsed, and cars were blown off the road. Many boats, not yet taken out of the water for the season, were wrecked by the winds on Lake Minnetonka, and some were sunk. A wooden structure on the roof of the old Northwestern Bank building in Minneapolis that had been used to help inaugurate the "weatherball" for giving a visible sign of the weather forecast of the day, was completely blown away by the strong winds. In all 4 people were killed and at least 80 injured by this wind storm.

Word of the Week: Haugull

This is not a type of seabird, but a Scottish term used to describe a cold, damp wind blowing from the sea. This type of wind often brings either fog, rain or mist. The literal meaning of this word is a "gray coastal meadow." The term is also used in Norway. It could apply equally to the type of weather experienced in Duluth and along the north shore of Lake Superior when a cool east wind brings fog, rain and mist inland over the hills and meadows of the Superior National Forest.

Outlook:

Much colder over the weekend with a chance for snow in some sections, especially the southeast. Mostly cloudy on Sunday with slightly warmer temperatures. Increasing clouds Sunday night and Monday with a chance for rain and or snow. Drier and warmer for the middle of next week, then increasing chances for precipitation by Thursday. In all temperatures will be several degrees F cooler than normal.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, October 16, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, October 16, 2009

Minnesota WeatherTalk Newsletter for Friday, October 16, 2009

Headlines:

- Are we speeding towards winter?
- October snows
- A salute to Mr. Feser
- Weekly Weather Potpourri
- MPR listener question
- Almanac for October 16th
- Past weather features
- Pennant
- Outlook

Topic: Accelerating into winter.....

After one of the warmest Septembers in state history, with the longest run of above normal temperatures for the entire year, we have recorded sixteen days with colder than normal temperatures this month (19 consecutive days if you count that last three days of September too). Many areas of the state reported the first freeze of the fall season last Friday, Saturday, and Sunday mornings. Nearly all locations have now recorded overnight lows in the 20s F and many have seen the thermometer drop into the teens F. Both Wells and Pipestone in southern Minnesota dropped to 18 degrees F this week, and Brimson in northeastern Minnesota reported the nation's low on Wednesday (Oct 13) with a reading of 11 degrees F. Daytime maximum temperatures were very cold on the 10th, 12th, and 15th of the month, remaining in the 30s F. As a result some observers reported new record cold maximum temperatures on these dates. Overall observers are reporting monthly temperatures that average 7 to 11 degrees colder than the long-term values for October, and the coldest since 2002.

Topic: October snows.....

Multiple episodes of snow have occurred since last week, the first coming on October 10th when a number of observers reported 1 to 2 inches. A few locations reported record-setting amounts for the date of October 10th including Brimson with 2.0 inches, Embarrass with 2.5 inches, Bruno with 1.6 inches, Cloquet with 1.5 inches, and Waskish with 2.0 inches (tied a record).

Another round of snow occurred on October 12th, lasting for much of the day in some areas. MSP Airport reported a record 2.5 inches, while Rochester Airport also had a record 2.6 inches. In central and western sections of the state, Willmar reported a record amount of 2.5 inches and Morris a record 1.8 inches. In southeastern Minnesota Grand Meadow reported a record 2.5 inches and Winona 2.0 inches. Up north, Waskish in Beltrami County near the Red Lakes reported a record 4 inches on the 12th and a monthly total that is nearly a foot of snow. This is still well below the state monthly record for October of 18.9 inches of snow at Virginia in 1951, though more snowfall may be in store for the second half of the month.

Then on the 14th yet more snowfall occurred in some places with record amounts of 0.6 inches at Rochester and 1.2 inches at Spring Valley in southeastern Minnesota. Yet, more snow may be in store later next week, so significant October snowfall totals may be in store this year.

Topic: A Salute to Richard Feser of Springfield, MN

The NOAA-National Weather Service presented Mr. Richard Feser of Springfield, MN with his 45 year Service Award as a Cooperative Weather Observer this week. The dedication and diligence required to make 45 years of daily weather observations without missing a beat cannot be overstated. Mr. Feser certainly deserves our thanks. Without his work it would be awfully difficult to describe the character of the climate in Brown County, Minnesota. Mr. Feser has logged 11 daily snowfalls of a foot or more, including 18 inches on January 11, 1975. On at least 7 occasions he has recorded a low temperature of -30 degrees F or colder. And on April 2, 1982 after remaining alert under a severe thunderstorm watch when the afternoon high reached 76 degrees F, he watched as it snowed half an inch that night and the temperature plummeted to 15 degrees F. I'll bet he changed clothes that day. Anyway, our hearty congratulations to Mr. Feser for a job well done!

Weekly Weather Potpourri:

NOAA, NASA, and the USGS are observing Earth Science week October 11-17. These organizations are promoting the value of the Earth Sciences especially in understanding the Earth Climate System. You can read more about this at...

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

The Joint Typhoon Warning Center reported that yet another typhoon (Lupit) in the Western Pacific Ocean was tracking westward towards the Philippines. It may intensify further before next Monday before when it approaches the northern part of that island nation with winds over 150 mph and wave heights of 30 feet or more. This storm threat emerges on the heels of a report that the United Nations emergency relief funds to the Philippines following earlier storm disasters have been inadequate to meet the needs and challenges of the people there.

The first wind-powered fire station opened recently in Lincolnshire in the United Kingdom. The wind generated power provides electricity for the station, which also boasts a rain-water harvesting system for storing fresh water. More fire stations in the U.K. are expected to follow suit in the years ahead.

Also this past week the U.K. Met Office announced the publication of "The Health Practitioner's Guide to Climate Change" a book that details climate changes and how these might affect the health care industry. Chapters include discussions about adapting to climate change, anticipating patient loads, making investments in mitigation activities. among other topics. You can read more at...

<http://www.metoffice.gov.uk/corporate/pressoffice/2009/pr20091008.html>

Though the North Atlantic Hurricane Season still has 6-7 weeks to go, the insurance industry is relieved that it has been such a quiet season so far. Tropical storm activity in the basin has been the lowest since 1997 with just two named hurricanes and eight tropical storms so far. Meteorologists mostly attribute this to the developing El Nino episode in the Pacific Ocean which accelerates the winds aloft in the subtropical jet stream and shears off the top of developing tropical storms, not allowing them to grow strong. You can read more about this at...

http://www.usatoday.com/weather/storms/hurricanes/2009-10-14-quiet-hurricane-season_N.htm

MPR Listener Question: I was intrigued by your conversation with Bill Hudson on WCCO-TV News this week ("Good Question" segment) regarding October snowfall in the Twin Cities and the lack of correlation with a long, snowy winter. What about a correlation with a snowy month of November? Does this have any significance historically?

Answer: First of all the Twin Cities records a measurable October snowfall in only about one year in three (33% of the time, 43 cases in the past 130 years). Among

those years with measurable October snowfall, only nine (21%) exhibited an especially snowy November (snowfall totals of 10 inches or greater). Further, among these 9 years are some truly memorable long and snowy winters, including those of 1880-1881, 1919-1920, 1951-1952, 1981-1982, 1991-1992, and 2001-2002. However, considering all cases, there is little correlation historically that ties a significant October snowfall to a snowy November.

Almanac for October 16th:

The average MSP high temperature for this date is 61 degrees F (plus or minus 12 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 16th:

MSP weather records for this date include: highest daily maximum temperature of 86 degrees F in 1938; lowest daily maximum temperature of 32 degrees F in 1952; lowest daily minimum temperature of 23 degrees F in 1952; highest daily minimum temperature of 63 F in 1879. Record precipitation for this date is 2.10 inch in 1984. The record snowfall is 0.5 inches in 1992.

Average dew point for October 16th is 38 degrees F, with a maximum of 63 degrees F in 1968 and a minimum of 9 degrees F in 1972.

All-time state records for October 16th:

The all-time state record high temperature for this date is 91 degrees F at Montevideo (Chippewa County) in 1958. The all-time state record low temperature for this date is 4 degrees F at Bemidji (Beltrami County) in 1952. The all-time state record precipitation for this date is 3.55 inches at Wadena (Wadena County) in 1998. The state record snowfall for this date is 10 inches at Bird Island (Renville County) in 1937.

Past Weather Features:

October 16-18, 1880 brought one of the worst early season blizzards in Minnesota history. It affected the Dakotas and much of western Minnesota. Thus began "the long winter" that Laura Ingalls Wilder wrote about. The Minnesota Historical Society photographic collections have a number of pictorial examples from the aftermath of this blizzard taken around St James, Canby, Mankato, and Sleepy Eye, among other places. The Army Signal Corps Office in downtown St Paul measured a barometric pressure of just 28.85 inches associated with this intense storm. It brought high winds,

rain, hail, sleet, and snow to many areas. Though the Army Signal Corps in downtown St Paul reported only about 3 inches of snow from this storm, many southern and western reaches of the state reported snowfall substantially greater than a foot, with drifts up to 20 feet blocking the railroads. The Signal Corps Office in New Ulm reported 15 inches from the storm and later in mid-winter a snow depth that was 3 feet. The Signal Corps Office in St Paul reported a total snowfall for the winter of 1880-1881 of 110.3 inches, never matched in the record since that horrific winter.

Heavy snows affected parts of southwestern, central, and southern Minnesota on this date (Oct 16) in 1937. Some amounts that still represent records for the date include: 10" at Bird Island; 6.5" at Worthington; 6.0" at Pipestone; 6.0" at Redwood Falls; 5.5" at Tracy; 5.0" at Windom; and 4.0" at Albert Lea. This snowfall ushered in a period of constant snow and rain which delayed crop harvesting that year until the end of October.

A mini-heat wave occurred over the week of October 12-16 in 1958, especially across western sections of Minnesota. Many areas reported temperatures in the 80s F each day, and several locations hit 90 F or higher during this period, including Canby, Madison, Montevideo, Tracy, New Ulm, Mankato, and St Peter. Despite this unusual spell of October warmth, there were 8-9 frosts recorded during October.

Word of the Week: Pennant

This is the name for the award given to the winners of the Major League Baseball American and National League Championship Series being contested this week. It is also a nautical term used for various flag signals which are hoisted on ships. Ships may use these pennant flags to signal others that they are disabled, they have a man overboard, or they are under quarantine do not approach. In meteorology the pennant is used on a synoptic chart to indicate high wind speed at a particular place MPR listeners who view the weather depictions on the Internet may have noticed the appearance of pennants on the upper air (Jet Stream) charts or on rare occasions the surface weather maps association with tropical storms and hurricanes. It is a triangular flag pointing towards lower pressure and designates a wind speed of 50 knots (approx 58 mph). Lower wind speeds are denoted by the use of barbs (10 knots) and half-barbs (5 knots). More about these weather symbols can be found at the NOAA web site...

http://www.srh.weather.gov/jetstream/synoptic/sfc_plot_symbols.htm#ddff

Outlook:

Partly cloudy, but with more sun, and warmer during the weekend. Somewhat breezy on Sunday, as some highs reach into the 50s F and 60s F. Increasing clouds on

Monday with a chance of mixed precipitation (rain/shower) across the state late in the day and lingering into Wednesday. Temperatures will drop again to be cooler than normal by mid-week.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, October 23, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension

Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, October 23, 2009

Minnesota WeatherTalk Newsletter for Friday, October 23, 2009

Headlines:

- Wet October Continues
- Weekly Weather Potpourri
- MPR listener question
- Almanac for October 23rd
- Past weather features
- Freezing level
- Outlook

Topic: Wet October Continues....

Measurable precipitation has occurred on over half the days so far this month, including a record 2.60 inches at Buffalo (Wright County) on the 1st and a record 1.57 inches at Rochester on the 21st. As a result of these persistent rains most observers are reporting well above normal precipitation for the month, and several have already accumulated over 5 inches, which is over twice normal for the month. Some locations with very large amounts of precipitation this month include Browns Valley (5.58"), Montevideo (5.95"), Morris (5.28"), Wheaton (5.25"), Melrose (5.41"), Buffalo (5.62"), Willmar (5.93"), Marshall (5.47"), Redwood Falls (5.45"), Waseca (5.94"), Wells (5.55"), Albert Lea (5.27"), La Crescent (5.51"), and Rochester (5.53"). A few observers have reported six or more inches of precipitation which ranks among the wettest Octobers in their history. These include: 6.41 inches at Collegeville which ranks as their 3rd wettest October; 6.13 inches at Winnebago which ranks as the 3rd wettest October; 6.12 inches at Winona Dam which ranks as their wettest October; and 7.29 inches at Grand Meadow which is tied for 2nd wettest October that occurred in 1900. The all-time state record for October precipitation is over 10 inches, and given the forecast some locations may approach this value by the end of the month, as forecast models suggest continued above normal precipitation for the next 10 days.

Delays in corn and soybean harvesting activity will undoubtedly continue into the month of November.

Weekly Weather Potpourri:

A recent paper by scientists from Norway, Finland, Estonia, and the United Kingdom published in the Journal Climate of the Past documents a 9000 year reconstruction of northern Europe's temperatures based on sediment derived pollen analysis. It is noteworthy that the scientist cannot find a strong correlation to solar variability, but they do note that temperature variability across the centuries may be related to changes in oceanic and atmospheric circulation patterns. The paper is found online at...

<http://www.clim-past.net/5/issue3.html>

A recent paper from the Alaska Climate Center (Dr. Martha Shulski et al) shows that over the past six decades the mean annual temperature taken from all of the state's first order stations has increased by 3.1 degrees F. Imbedded in this temperature record they see that the seasonal contribution to this trend has come primarily from warmer winters and springs. This fits well with the temperature analysis from other landscapes that reside at high latitude positions on Earth. You can read a brief account of this at...

<http://climate.gi.alaska.edu/ClimTrends/Change/TempChange.html>

Meetings held by the Army Corps of Engineers in the Fargo-Moorhead area this week drew large audiences as they presented flood control options for the Red River. The three options proposed included a diversion channel cut along the Minnesota side, a similar diversion channel cut in North Dakota, or construction of higher and stronger levees along the Red River channel. Local community leaders will have a major voice in the decision to pursue federal funding for one of these flood mitigation projects. Area residents were subjected to 61 consecutive days above flood stage during the snow melt of last spring.

Typhoon Lupit pounded parts of the northern Philippines this week with heavy rain, high surf, and strong winds. Winds well over 100 mph were generating sea waves of 30 to 35 feet at one time. Fortunately by Friday, the typhoon was pulling away towards the northeast and weakening.

MPR Listener Question: Has anyone in the state reported a 70 degrees F temperature this month? I see the highest reading in the Minneapolis-St Paul Metro Area so far is

only 64 degrees F on the 7th. How often does the Metro Area record an October without a 70 degrees F reading.

Answer: So far this month only Preston (71 F) and Rushford (70 F) have seen temperatures of 70 degrees F or higher and those occurred briefly between 3:00 and 5:00 pm on Monday (Oct 19th) of this week. The month so far is tracking to be among the coldest 8 Octobers in state history. After reviewing the Twin Cities Metro Area records back 139 years to 1871, the only years when October never saw a temperature of 70 degrees F were in chronological order: 1873, 1877, 1890, 1917, 1925, 1981, and so far this year. That amounts to a 5 percent occurrence historically, or about one year in twenty!

Almanac for October 23rd:

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 37 degrees F (plus or minus 8 degrees F standard deviation).

MSP local Records for October 23rd:

MSP weather records for this date include: highest daily maximum temperature of 82 degrees F in 1899; lowest daily maximum temperature of 34 degrees F in 1981; lowest daily minimum temperature of 17 degrees F in 1936; highest daily minimum temperature of 58 F in 2000. Record precipitation for this date is 1.01 inches in 1995. Record snowfall for this date is 1.4 inches in 1938.

Average dew point for October 23rd is 36 degrees F, with a maximum of 65 degrees F in 1973 and a minimum of 9 degrees F in 1981.

All-time state records for October 23rd:

The all-time state record high temperature for this date is 91 degrees F at Chatfield (Olmsted County) in 1927. The all-time state record low temperature for this date is -10 degrees F at Grand Rapids (Itasca County) in 1917. The all-time state record precipitation for this date is 3.00 inches at Garrison (Crow Wing County) in 1995. The state record snowfall for this date is 10 inches at Duluth in 1933 and 10 inches at Caribou (Kittson County) in 2001.

Past Weather Features:

205 years ago, October 23, 1804 the journal from the Lewis and Clark expeditions notes snowfall from 8:00 to 11:00 am along their journey northwest of Mandan, ND.

The snow was of little consequence to them but was some of the first they encountered along their journey across the High Plains.

On October 23, 1943 a German U-boat deployed and activated an automated weather station (perhaps the first of its kind) on the Canadian Island of Killiniq along the Labrador Sea. The station was intended to supply meteorologists with pressure, temperature, wind speed and wind direction that would be useful in forecasting the weather across the North Atlantic, a major supply shipping route for the Allies during WWII. Though it successfully transmitted its data for a couple of days, its transmission frequency was randomly jammed and for the balance of the war no data were received. This automated weather station in the Canadian Arctic was discovered by the Canadian Department of Defence in 1981. The story is documented in the October-November issue of the Canadian magazine Up North.

A snow storm on October 22, 1917 ushered in some of the coldest air ever seen in Minnesota during this month. With a fresh 2 to 5 inches of snow on the ground many observers woke up to some bone-chilling cold on the morning of the 23rd. Fosston, Angus, Itasca State Park, Grand Rapids, Red Lake Falls, Pokegama Dam, and Warren reported low temperatures that were below zero F. That October proved to be the 2nd coldest in Minnesota history, surpassed only by that of 1925.

The most unusual outbreak of October tornadoes in Minnesota history occurred on the 26th of the month in 1996. Fourteen tornadoes were reported across the central part of the state between 3:00 pm and 7:00 pm that day. Eleven injuries were reported with these tornadoes, and fortunately no fatalities.

Snow spread across the northern reaches of the Red River Valley on October 24, 2001. Many observers reported 4 to 10 inches of snowfall out of this storm. The observer at Thief River Falls reported 11 inches of snow, one of the heaviest amounts ever measured in October.

Again on October 20-21, 2002 another early season snow storm passed across central Minnesota counties bringing several inches to many cities. Milaca recorded 8 inches of snow, Long Prairie received 6.5 inches, and Little Falls reported a record 9 inches.

Word of the Week: Freezing level

This is a term used in meteorology to refer to the lowest altitude in the atmosphere over a given location at which the air temperature is 32 degrees F (0 degrees C). In other words, the height of the 32 degree F temperature surface. It is highly variable and changes significantly with the seasons in Minnesota. In summer it might be as high as 10,000 ft, while in winter it comes right down to the ground at times. Average

height of the freezing level over the Twin Cities during the first week of November is about 3200 ft, but by the end of the month it is about 1200 ft. This change in average freezing level during the month of November is associated with a number of other changes in climate during the month including: a 1 hour reduction in day length (over 10 hrs to just over 9 hrs); an 18 degrees F decline in daily mean temperature (from 40 degrees F to 22 degrees F); an increase in cloudiness; and an increase in the occurrence of freezing precipitation (freezing rain, sleet, snow). Often times the height of the freezing level dictates whether our precipitation is liquid or frozen.

Outlook:

Chance of rain or snow again on Sunday. Continued cool temperatures. Mostly dry on Monday, then cloudier Tuesday with a chance for rain and snow later in the day. Showers continuing on Wednesday with a respite on Thursday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, October 30, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, October 30, 2009

Minnesota WeatherTalk Newsletter for Friday, October 30, 2009

Headlines:

- Preliminary October Climate Summary
- Weekly Weather Potpourri
- MPR listener question
- Almanac for October 30th
- Past weather features
- Pagophobia
- Outlook

Topic: Wrap Up on October....good riddance....

October of 2009 was very unusual in that it behaved much more like November. It was cold and wet, with measurable precipitation on at least half the days in the month and mostly cloudy skies on two-thirds of the days. There were no perfectly clear days, and only three days registered less than 3 tenths cloud cover. When all of the data are assembled October of 2009 is likely to be the 5th coldest and perhaps the 3rd wettest in history on a statewide basis.

Temperatures for October 2009 averaged 5 to 8 degrees colder than normal, with a number of observers reporting some record-setting overnight lows and cold daytime highs. Extremes in the state ranged from 71 degrees F at Preston on the 19th to just 11 degrees F at Brimson on the 13th.

Nearly all observers reported above normal precipitation for the month, except for those in the northeastern counties. Several daily records were set at many locations. Most recently, Rochester reported a record 1.21 inches on the 29th. Many reported two or three times normal monthly amounts. Browns Valley, Montevideo, Marshall, Redwood Falls, Wheaton, Collegeville, St Cloud, Fairmont, Winnebago, Waseca, Preston, Spring Grove, Austin, Albert Lea, Lake City, La Crescent, and Willmar

reported well over 6 inches, exceeding or threatening the monthly record values for October. Moose Lake with 7.77 inches and Winona with 7.44 inches reported their 2nd wettest October in history, while Rochester with 8.37 inches, Wabasha with 7.43 inches, Austin with 7.49 inches, and Grand Meadow with 10.24 inches reported the wettest ever October. In fact the value at Grand Meadow is a new statewide record for wettest October, at least from preliminary data, surpassing the 10.23 inches at Zumbrota in 1911.

Snowfall was recorded several times this month around the state, and in many places it was substantial. At Waskish (12 inches), Rochester (7.9 inches), Brimson (6.1 inches), and Grand Meadow (6.0 inches) it was the most October snow in their respective climate records. For the Twin Cities, 2.8 inches of October snowfall was the most since 1991.

Solar radiation measured at the University of Minnesota Climate Observatory on the St Paul Campus was the lowest of record for the month of October dating back to 1963. The average daily solar radiation for October is about 233 calories per square centimeter per day. This October was about 163 calories per square centimeter per day, or about 30 percent less. This dovetails with the cloud cover conditions reported by the National Weather Service during the month. Only three days (7th, 9th, and 27th) were designated as mostly sunny. All other days of the month were mostly cloudy or cloudy, promoting an earlier onset of Seasonal Affective Disorder for Minnesota citizens who suffer from this malady (see Weekly Weather Potpourri for how the British deal with this).

Weekly Weather Potpourri:

Gloomy weather can seriously impact some people bringing about sustained low mood and lack of energy. Clinically this is called Seasonal Affective Disorder (SAD). Because of short winter days and persistent cloud cover many citizens of the United Kingdom suffer from SAD. Last year the U.K. Met Office initiated a new service called Brighter Outlook. This forecast service pinpoints days with weather that will stimulate SAD, so that citizens who suffer from this malady might make use of light therapy or Cognitive Behavioral Therapy (CBT) to help alleviate it. Citizens who participate in the Brighter Outlook project are given a full spectrum light box to use as therapy, along with a booklet on CBT practices, including relaxation and distraction techniques that have shown positive results for those who suffer from SAD.

A joint project involving the University of Sunderland, the United Kingdom Met Office, and the U.K. National Archives will digitize the weather observations and data from 18th Century and 19th Century ship's logs and lighthouse records. The goal is to have a fully searchable data base available on the National Archives web site next

year. These data may be useful in the study of climate patterns over the major ocean basins. Some of the logbooks being used include those of famous explorers such as Parry, Bligh, and Cook.

Yet another typhoon in the Western Pacific Ocean was taking aim at the Philippines this week. Typhoon Mirinae with winds greater than 100 mph, heavy rain bands and sea waves of 30 feet was expected to hit the islands on Friday and Saturday this week. After crossing the Philippines on the weekend, Mirinae will weaken over the South China Sea.

Heavy snow blanketed portions of CO, WY, NE, and SD during mid-week as a strong mid-latitude cyclone made its way east across the nation. Snowfalls were being measured in feet out in Colorado and closed many highways and schools in that state. Snowfalls of 6 to 12 inches were being reported in western Nebraska and South Dakota, along with eastern Wyoming. Winds of 25 to 35 mph were blowing the snow into sizable drifts and making travel very difficult. National Weather Service Offices in these states were doing a good job in forecasting and tracking this storm.

MPR Listener Question: We live in Eyota just east of Rochester, MN along Highway 14. We have emptied our rain gage on 18 separate days this month already and my husband was wondering what is the record for most number of days with precipitation during the month of October?

Answer: For your area of the state you have set a record in October for number of days with precipitation. The old record was 15 days with measurable precipitation back in October of 1919, and again in 1984. So you can add that note to your weather diary for this month. This is extraordinary for the month of October, though Minnesota history shows some other months have produced measurable precipitation on over 20 days.

Almanac for October 30th:

The average MSP high temperature for this date is 53 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 35 degrees F (plus or minus 9 degrees F standard deviation).

MSP local Records for October 30th:

MSP weather records for this date include: highest daily maximum temperature of 83 degrees F in 1950; lowest daily maximum temperature of 29 degrees F in 1873; lowest daily minimum temperature of 10 degrees F in 1925; highest daily minimum

temperature of 57 F in 1933. Record precipitation for this date is 1.26 inches in 1971. Record snowfall for this date is 0.8 inches in 1951.

Average dew point for October 30th is 35 degrees F, with a maximum of 63 degrees F in 1946 and a minimum of 6 degrees F in 1984.

All-time state records for October 30th:

The all-time state record high temperature for this date is 90 degrees F at Canby (Yellow Medicine County) in 1950. The all-time state record low temperature for this date is -8 degrees F at Duluth in 1925. The all-time state record precipitation for this date is 3.15 inches at Glenwood (Pope County) in 1979. The state record snowfall for this date is 12 inches at Sandy Lake Dam (Aitkin County) in 1951.

Past Weather Features:

The coldest last week of October in the Twin Cities climate history was that of 1873. From October 25 to 31 the daily high temperature was only around freezing or colder, while the overnight lows were consistently in the teens and twenties F. In addition precipitation came on five days, with a weekly snowfall of 9.5 inches. On Halloween, the mean temperature for the day was just 22 degrees F.

The back to back Halloween's of 1950 and 1951 provide a striking contrast in weather. Over October 30-31 daytime temperatures reached the low to mid 80s F in most of western, central and southern Minnesota. It was generally a dry and sunny period. Canby reached 90 degrees F on the 30th, while Worthington recorded 86 degrees F on the 31st. The next year, 1951, October 30-31 brought daytime temperatures in the 20s and 30s F with several inches of snowfall. Sandy Lake Dam reported a foot of snow on the ground on Halloween, while Park Rapids reported a temperature of just -2 degrees F. Virginia set a record for total snowfall that October with 18.9 inches. For many observers Halloween of 1951 was the snowiest until 1991 came along.

Word of the Week: Pagophobia

As we migrate deeper into the fall season many Minnesota citizens begin to show symptoms of SAD (Seasonal Affective Disorder), and a very small minority may show signs of pagophobia, the irrational fear of ice and frost. This word is derived from the Greek word "paggos" for ice and "phobia" for fear. Most of this fear stems from concern over injuring oneself in a fall. It is so extreme in some cases that people will not go out of the house unless the sidewalk or ground is frost-free and dry.

Outlook:

Continuing chance cloudiness with a chance of rain and/or snow flurries in northern counties on Saturday. Breezy with generally cool and dry conditions elsewhere. Chance for scattered showers later on Sunday, then a mostly dry day on Monday. A trend toward warmer and drier weather begins on Tuesday and may last for several days. This respite in early November will finally bring some reasonable field working days for Minnesota farmers.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, November 6, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, November 6, 2009

Minnesota WeatherTalk Newsletter for Friday, November 6, 2009

Headlines:

- Snow, wind, and cold early this week
- Record October Precipitation Revisited
- Weekly Weather Potpourri
- MPR listener question
- Almanac for November 6th
- Past weather features
- MIRAS
- Outlook

Topic: Some early November snow up north

A cold front brought strong winds, mixed precipitation and very cold temperatures to some areas of the state earlier this week. Winds gusted over 30 mph in many places on Monday and Tuesday, with temperatures taking a plunge into the teens F. Park Rapids, Warroad, Thief River Falls, Grand Rapids, Brimson, Floodwood, Embarrass, Hinckley, Long Prairie, and even Byron in Olmsted County plunged into the teens F overnight. A variety of northern Minnesota observers reported some snow on Tuesday and Wednesday this week (Nov 3-4). Brimson, Two Harbors, Little Fork, Northome, Kabetogama, and Duluth were among others places reporting measurable snowfalls. Following this weather disturbance high pressure settled over the area, bringing brighter days and much warmer weather. In fact the rebound from the early cold of November will be felt as 50 and 60 degree days across much of the state this weekend.

Topic: Record October Precipitation Amounts Widespread

The Midwest Climate Center reported earlier this week that at least 192 climate stations across the region reported a record setting amount of precipitation during

October of 2009. A map of the stations reporting these record amounts can be found at their web site..

<http://mrcc.isws.illinois.edu/cliwatch/0910/climwatch.0910.htm>

Figure 4 on the web site shows at least 20 Minnesota locations that set records for precipitation in October. Many Minnesota locations received between 7 and 9 inches of precipitation and I reported last week that Grand Meadow (Mower County) likely set a new all-time state record for October with 10.29 inches. However, I was wrong. The state record precipitation for October dates back over 100 years ago. After checking the state historical data base I find that there were four other years that produced October precipitation totals exceeding 10 inches: in 1998 Lutsen reported 10.03 inches; in 1984 Fosston reported 10.14 inches; in 1911 Zumbrota reported 10.23 inches; and in 1900 St Charles (Winona County) reported an incredible 11.35 inches. In 1900 St Charles was hit with six significant thunderstorms during October, one of which delivered 4.25 inches of rainfall (on the 27th).

Weekly Weather Potpourri:

An update winter season outlook from NOAA-CPC was released this week. It is weighted to the effects of a modest El Nino episode, and as a result it still favors warmer than normal temperatures for the December through February period across the western Great Lakes and High Plains states. Equal chances are seen for above or below normal precipitation. Read more at...

http://www.noaanews.noaa.gov/stories2009/20091015_winteroutlook.html

A report was issued in the current Upper Mississippi River Conservation Committee Newsletter about the clarity of the water in the river this summer at Lock and Dam 8 (near Genoa, WI) and Lock and Dam 9 (near Lynxville, WI). Based on measurements of light penetration into the river, the clarity of the water at these sites during June through August was the best it has been since measurements began in 1988. The Wisconsin DNR suggests that low flows, zebra mussel filter feeding and perhaps cooler than normal summer temperatures contributed to improved clarity of the water this year.

A study published in the International Journal of Climatology shows that most land use changes across the USA have resulted in reduced vegetative cover and increased temperature. Researchers from Purdue University, University of Maryland, and University of Colorado collaborated on the study to examine the effects of land use change across the continental USA. One striking exception in their findings was that land use conversion to agriculture results in a net cooling effect in surface

temperature, primarily due to increased evaporation. The researchers recommend incorporation of more land use data into climate models so that these effects can be compensated for in assessing future climate change. You can read more at...

<http://www.sciencedaily.com/releases/2009/11/091102172243.htm>

Hurricane Ida was affecting portions of Nicaragua and Honduras on Thursday this week. The 9th named storm of the North Atlantic Hurricane Season, Ida was a Category I storm with winds of 75 mph. Greatest concern by forecasters was the total amount of rainfall potential contained in Ida as it moved slowly over land. Some areas were expected to see rainfall totals over 20 inches that may induce local flash flooding and mudslides. Ida was expected to track north and pass over Cancun, Mexico on Monday before entering the southern portion of the Gulf of Mexico.

A recent paper from researchers at the University of Pittsburgh documents the use of a nanoparticle-based coating that stops the buildup of ice on solid surfaces like power lines, roads, and aircraft wings. This so-called superhydrophobic coating combines a silicone resin-solution with nanoparticles of silica that are extremely small. The coating has been tested outdoors in freezing rain environments and worked successfully on aluminum surfaces and commercially produced satellite dishes. Read more at...

<http://www.news.pitt.edu/m/FMPro?-db=ma&-lay=a&-format=d.html&id=3886&-Find>

A new report from the Association of British Insurers and the United Kingdom Met Office highlights potential consequences of climate change on the insurance industry. Using future climate projections for various countries the investigators found that insurance claims associated with flooding and wind storms could rise from 14 to 30 percent across the United Kingdom. Similarly those claims associated with landfall typhoons could rise over 30 percent in China.

MPR Listener Question: I know that the historical temperature extremes for the state increase as we migrate into the winter season. But what are the statewide extremes of temperature for the month of November?

Answer: They are rather widely apart. The all-time high is 84 degrees F at Winona on November 1, 1950, while the all-time low is -45 degrees F at Pokegama Dam in 1896. This spread of 129 degrees F is larger than the one for October (95 F to -16 F, 111 degrees F difference) and considerably larger than that of September (111 F to 10 F, 101 degrees F difference). By the time we get to December the difference in statewide extremes is 131 degrees F (74 F max and -57 degrees F min).

Almanac for November 6th:

The average MSP high temperature for this date is 47 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 31 degrees F (plus or minus 9 degrees F standard deviation).

MSP local records for November 6th:

MSP weather records for this date include: highest daily maximum temperature of 73 degrees F in 1893; lowest daily maximum temperature of 14 degrees F in 1991; lowest daily minimum temperature of 0 degrees F in 1991; highest daily minimum temperature of 53 F in 1975. Record precipitation for this date is 1.54 inches in 2000. Record snowfall for this date is 1.6 inches in 1933.

Average dew point for November 6th is 29 degrees F, with a maximum of 56 degrees F in 1975 and a minimum of -5 degrees F in 1991.

All-time state records for November 6th:

The all-time state record high temperature for this date is 79 degrees F at Montevideo (Chippewa County) in 1934. The all-time state record low temperature for this date is -16 degrees F at Moose Lake (Carlton County) in 1951. The all-time state record precipitation for this date is 2.15 inches at Pigeon River Dam (Cook County) in 1948. The state record snowfall for this date is 12 inches at Cloquet (Carlton County) in 1919.

Past Weather Features:

Surely the coldest early November period in the Pioneer Era for the Twin Cities was November 2-9, 1853. The region was dominated by several dry, arctic air masses that brought many morning low temperatures in the single digits, just 1 degree F on the 6th at Ft Snelling. In addition, afternoon high temperatures only ranged from 23 to 30 degrees F, never reaching the freezing mark over 8 days. Consequently the soil froze early that fall.

November 6, 1896 began an unusual period of weather which brought 7 consecutive days of snowfall to many areas of the state. In the Twin Cities it snowed each day from November 6 to 12 totaling over a foot of snow. It was terrific for sleighing. That November proved to be one of the coldest and snowiest in state history.

Early November of 1947 brought another period of persistent precipitation and snow. Many observers reported 5 consecutive days with precipitation over November 4-8.

Several observers along the north shore of Lake Superior reported over 2 inches of precipitation. Some areas also reported heavy snowfalls, including 8 inches at Canby and Aitkin, over 9 inches at Willmar, a foot of snow at Elk River, and nearly a foot and a half of snow at Virginia.

Following the Halloween Blizzard in 1991, the first week of November brought record-setting cold temperatures to Minnesota. On the morning of November 6th, most observers were reporting below zero F readings, including -8 degrees F at Park Rapids, -9 degrees F at Tower, -11 degrees F at Delano, and -15 degrees F at Isabella. Communities as far south as Rochester, Austin, and Rushford also reported morning lows that were below 0 F.

Word of the Week: MIRAS

This term is an acronym for the sensor aboard the European Space Agency Soil Moisture and Ocean Salinity (SMOS) satellite. It stands for Microwave Imaging Radiometer with Aperture Synthesis (MIRAS), a remote sensing system that contains 69 small antenna that measure the emitted radiation with an "L-Band", around 1.4 GHz. These frequencies provide a sensitivity to variations in soil moisture and ocean salinity and is not affect much by weather. Once fully operational the data from the MIRAS sensor will help scientists study how soil moisture and ocean salinity patterns behave and influence the Earth climate system. More information can be found at....

<http://www.sciencedaily.com/releases/2009/11/091102111845.htm>

Outlook:

Nice Indian Summer like day on Saturday around the state. Temperatures will be well above normal. Increasing clouds on Sunday with a chance for precipitation later in the day. Continued chance for precipitation on Monday and cooler temperatures, but still remaining warmer than normal. Another chance for precipitation by next Thursday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, November 13, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate
Subject: Minnesota WeatherTalk Newsletter for Friday, November 13, 2009

Minnesota WeatherTalk Newsletter for Friday, November 13, 2009

Headlines:

- Warm Veteran's Day
- Excellent week for farmers
- Weekly Weather Potpourri
- MPR listener question
- Almanac for November 13th
- Past weather features
- Occultation ring
- Outlook

Topic: Warm Veteran's Day

Wednesday, Veteran's Day was extraordinarily warm for some Minnesota communities. Most of the daytime highs were in the mid 50s F to low 60s F, about 15 to 20 F above normal. In addition, the combination of wind and cloud cover kept the overnight minimum temperatures from falling very low. A number of observers reported new record warm minimum temperatures, including Fargo-Moorhead with 43 degrees F (tied record from 1964), Thief River Falls with 42 F, Duluth Airport with 42 F, Alexandria with 47 F, Artichoke Lake with 45 F, and Redwood Falls with 41 F. For many it was the warmest Veteran's Day since 1964. Then again, on Thursday, November 12th some western locations also reported record or near record warm minimum temperatures, including Fargo-Moorhead with 49 degrees F, Bemidji and Wadena with 45 F, Duluth with 44 F, and Marshall with 48 F.

Topic: Excellent week for farm field work

Since last Friday (Nov 6) daily temperatures have been averaging 15 to 20 degrees F warmer than normal and most days have been dry or brought little precipitation. This has been a stroke of luck for farmers who are trying to catch up on soybean and corn

harvesting. In fact progress this week has been remarkable in many areas where farmers are working extra long days. After reporting 77 percent of the state's soybean crop harvested this past Monday, Agricultural Statistics Service will probably report the soybean harvest nearly complete by this coming Monday. In addition there should be a big jump in harvested acres of corn which set at only 23 percent on Monday of this week. It may well approach or exceed 50 percent by next Monday.

Weekly Weather Potpourri:

A paper published this week by NCAR and NOAA scientists documents that the frequency of record-setting high temperatures across the USA over the past decade out paces record-setting low temperatures by a ratio of 2/1. If overall temperature trends were not significantly upward, then the ratio of record-setting high and low daily temperature values would be closer to 1/1. For the period from January 1, 2000 to September 30, 2009 the continental USA posted 291,237 record high temperatures, and 142,420 record setting low temperatures. The study showed that record highs were reported with a higher frequency in the western states than the eastern states. More can be found at....

<http://www.sciencedaily.com/releases/2009/11/091112121611.htm>

The remains of Tropical Storm Ida in combination with a mid-latitude cyclone brought very heavy rains to portions of North Carolina, Virginia and Maryland on Thursday, November 12th. Radar derived rainfall amounts around Virginia ranged from 5 to 8 inches. The Weather Service Offices there were busy putting out flash flood warnings, coastal flood warnings, high surf warnings, wind advisories, small craft advisories, and gale warnings. On Friday the storm system was bringing heavy rain, wind, and high surf to New Jersey.

During the 1870s there was increasing use of photography in scientific investigations. In meteorology, one of the pressing needs was to photograph cloud forms and publish a cloud atlas which would illustrate the cloud classification system proposed by Luke Howard in the early 1800s and serve as a reference to meteorological organizations making daily weather observations. Up until that time, drawings and sketches of cloud forms had served as observational guidelines for classifying cloud types. To meet the need of the international meteorological community, English photographer Ralph Abercromby made a series of voyages around the world from 1884 to 1886 with the express purpose of taking as many pictures of different cloud forms as he could. His camera was bulky and unwieldy, using large gelatin plates to capture the images. By 1887 his collection was large and diverse enough to publish the first cloud atlas using photographs. Today, the modern International Cloud Atlas not only contains color photos of cloud types taken from observers on the ground, but also images taken from

airplanes and orbiting satellites. There is a wonderful online index of cloud photos kept at the Cloud Appreciation Society web site:

www.cloudappreciationsociety.org

MPR Listener Question: I heard you talk about famous November storms at the Split Rock Lighthouse Edmund Fitzgerald Day a few years ago. There were a large number of significant November storms that you described, including the one that sunk the Fitzgerald. But my question is which date in November has the highest probability for a snow storm?

Answer: This is an interesting question. I would have guessed that there might not be much difference in probability from day to day, but after checking the Twin Cities historical records back to 1871 I find there is quite a difference. The dates with the highest probability for measurable snowfall are November 23 and 26, both showing close to a 33 percent occurrence, one year in three. This confirms the public perception that we often have snow around Thanksgiving in Minnesota, dating back to the famous Thanksgiving blizzard in central and northern counties on November 26, 1896.

The November date with the lowest probability for snowfall is the 7th with just a 5 percent occurrence, while today's date, the 13th has about a 1 in 5 chance (20 percent) for snowfall.

A final note on November storms. The very first winter storm warning issued in the United States by the U.S. Army Signal Corps Weather Service came on November 8, 1870.

Almanac for November 13th:

The average MSP high temperature for this date is 41 degrees F (plus or minus 11 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 13th:

MSP weather records for this date include: highest daily maximum temperature of 71 degrees F in 1999; lowest daily maximum temperature of 15 degrees F in 1940; lowest daily minimum temperature of 0 degrees F in 1986; highest daily minimum temperature of 50 F in 2001. Record precipitation for this date is 1.04 inches in 1951. Record snowfall for this date is 4.0 inches in 1997.

Average dew point for November 13th is 26 degrees F, with a maximum of 55 degrees F in 2001 and a minimum of -7 degrees F in 1986.

All-time state records for November 13th:

The all-time state record high temperature for this date is 79 degrees F at Fairmont (Martin County) in 1999. The all-time state record low temperature for this date is -24 degrees F at Tower (St Louis County) in 1995. The all-time state record precipitation for this date is 3.80 inches at Sawbill Camp (Cook County) in 1937. The state record snowfall for this date is 15 inches at Taylor's Falls (Chisago County) in 1940.

Past Weather Features:

One of the wettest November periods in state history occurred over the 13th to the 16th in 1909. The period started out warm with rain, then a dramatic temperature drop brought some significant snowfall over the 15th and 16th with many observers reporting 3 to 10 inches. Total precipitation for the period was commonly over 2 inches, while Zumbrota in SE Minnesota reported 3.30 inches and Two Harbors on the north shore of Lake Superior reported 5.57 inches.

Saturday, November 13, 1999 was an unusual day weather wise as scores of Minnesota communities reported afternoon highs in the 70s F with bright sunny skies. It was in the 70s F as far north as Two Harbors and Detroit Lakes. As a result many golf courses were open and food was being served on a number of picnic tables during Saturday afternoon cookouts. Nobody was think about winter.

Word of the Week: Occultation Ring

This is a shielding mechanism used in solar radiation measurement systems. It is an arched metal ring, painted black, that is positioned over the top of a pyranometer in such a manner that the direct beams of the sun are always blocked from the sensor throughout the day, from sunrise to sunset. In this manner, the only radiation measured by the pyranometer is diffuse light coming from the sky the clouds above. In this manner the energy arriving at the sensor from diffuse radiation can be discriminated from that arriving by direct sunlight.

Outlook:

Cooler, under partly cloudy skies this weekend, with perhaps some lingering showers in the NE on Saturday. Temperatures will still be a few degrees F warmer than normal in most places. Much of next week looks dry with somewhat warmer temperatures by Wednesday.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, November 20, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, November 20, 2009

Minnesota WeatherTalk Newsletter for Friday, November 20, 2009

Headlines:

- Twin Cities Thanksgiving Climatology
- Coldest temperatures of the month arrived this week
- Weekly Weather Potpourri
- MPR listener question
- Almanac for November 20th
- Past weather features
- Hythergraph
- Outlook

Topic: Thanksgiving Day Climatology for the Twin Cities

A typical Thanksgiving Day in the Twin Cities is mostly cloudy with daytime temperatures in the 30s F. It has been as warm as 62 degrees F in both 1914 and 1922, and as cold as a daytime high of only 7 degrees F in 1930. At least a trace of snow falls on the Metro Area Thanksgiving Day about 44 percent of all years. In 1896 a heavy rains dropped 1.76 inches, while in 1970 the day brought 5 inches of snowfall. In 1998 with sunny skies and afternoon temperatures between 55 and 60 degrees F, many citizens chose to play golf or have a cookout. High flying kites were seen over Como Park that year. You can read more about the history of weather on Thanksgiving Day at

<http://climate.umn.edu/doc/journal/thanks0811.htm>

Topic: November continuing to be mild, though cooler

November temperatures continue to run warmer than normal, though this week brought the coldest air of the month so far to many areas of the state. Brimson reported just 11 degrees F on the morning of the 17th while Embarrass and Hibbing reported 13 degrees F. Floodwood reported 14 degrees F, while St Cloud, Hinckley,

Byron, and Zumbrota reported just 18 degrees F. Ice was reported along the edges of many ponds and lakes. Hallock (Kittson County) was as cold as 16 degrees F on November 20th. Looks like a wrinkle in the polar jet stream will bring even colder temperatures to us next week.

Weekly Weather Potpourri:

Portions of Scotland and West Cumbria in northwest England received heavy rainfalls on Wednesday and Thursday this week. Amounts from 2 to 7 inches were reported. The wet period had started with rains last weekend which saturated the ground. Many severe flood warnings have been issued by the UK Met Office as high water closed several roads and schools in those areas. Additional rains are expected this weekend which may lead to some ongoing flooding problems in places.

The Bureau of Meteorology in Australia was issuing both heat warnings and fire weather warnings this week across New South Wales and Victoria where temperatures soared to as high as 113 degrees F, unusual for the month of November. The Health Department was cautioning people to stay well hydrated, avoid alcohol and caffeine beverages, stay out of the sun and limit physical activity.

A research paper published last week out of Georgia Tech University (Dr. Brian Stone) suggests that the upcoming Copenhagen negotiations on climate change consider land use and landscape change as much as greenhouse gas emissions. The paper documents that nearly half of the warming that has occurred since 1950 is due to land use changes (deforestation, urbanization, etc). Slowing or better managing the rate of land use change is a topic for treaty negotiators to consider as well. Read more at...

<http://www.gatech.edu/newsroom/release.html?nid=47354>

MPR Listener Question: You and Cathy have spent a good deal of time talking about drought areas and rainfall deficiencies this year. But what about places that have been too wet? Which locations in Minnesota have recorded an extraordinarily wet 2009?

Answer: Approximately 75 percent of the weather observers in the state are reporting a dry year, so finding regions of the state that have seen a precipitation surplus is difficult. Generally northwestern Minnesota counties have seen wetter than normal conditions prevail this year with places like Crookston, Warroad, Red Lake Falls, and Ottertail reporting precipitation values from 3 to 4 inches greater than normal. Elsewhere, Aitkin, Cloquet, and Grand Meadow are reporting wetter than normal years. At Aitkin nearly 35 inches of precipitation has been reported so far, their wettest year since 1986, and 6th wettest all-time.

Almanac for November 20th:

The average MSP high temperature for this date is 40 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 25 degrees F (plus or minus 10 degrees F standard deviation).

MSP local records for November 20th:

MSP weather records for this date include: highest daily maximum temperature of 63 degrees F in 1925; lowest daily maximum temperature of 17 degrees F in 1872, 1937, and 1978; lowest daily minimum temperature of -3 degrees F in 1921; highest daily minimum temperature of 43 F in 1930 and 1990. Record precipitation for this date is 2.01 inches in 1975. Record snowfall for this date is 8.0 inches in 1975.

Average dew point for November 20th is 24 degrees F, with a maximum of 54 degrees F in 1934 and a minimum of -1 degrees F in 1950.

All-time state records for November 20th:

The all-time state record high temperature for this date is 74 degrees F at Faribault (Rice County), Pleasant Mound (Blue Earth County), and St Charles (Winona County) in 1897. The all-time state record low temperature for this date is -31 degrees F at Roseau in 1896. The all-time state record precipitation for this date is 3.23 inches at Canby (Yellow Medicine County) in 1975. The state record snowfall for this date is 16 inches also at Canby (Yellow Medicine County) in 1975.

Past Weather Features:

This date (Nov 20) is remarkable in Minnesota climate history for the back to back extreme years of 1896 and 1897. A cold spell gripped the state in 1896. In addition to a state record low of -31 degrees F at Roseau, it was -26 F at Tower, and -14 F at Ada and Bemidji. Previous to the 20th of November winter-like weather systems had produced over a foot of snow in many northern Minnesota locations. The very next year November 20th was suitable for golf and fishing as the afternoon temperature skyrocketed into the 70s F at a number of locations, including 74 degrees F at St Charles, Pleasant Mound, and Faribault, 72 degrees F at Worthington and Albert Lea, 71 F at Lake City, and 70 degrees F at Grand Meadow. That warm spell was short-lived as temperatures fell by 30 to 40 degrees F on the 21st.

November 19-21, 1975 brought a very slow moving snow storm to many parts of the state. Canby reported 2 feet of snow while Willmar had 17 inches, Montevideo and Tracy 16 inches, and Marshall and Vesta over 15 inches. The snow closed many roads

and schools a week ahead of Thanksgiving, and made travel difficult into the Twin Cities for the Minnesota-Wisconsin football game on Saturday, November 23rd. After the University of Minnesota Memorial Stadium field was cleared of the snow, over 37,000 fans turned out to see QB Tony Dungy lead the Gophers over the Badgers that day by a score of 24-3.

Word of the Week: Hythergraph

Rarely used anymore, hythergraph found in the old glossary of meteorology refers to a climate diagram which shows temperature along one axis and some form of moisture, such as humidity or precipitation along the other axis. Certain climate zones can be characterized by the shape of a hythergraph using mean monthly values for example. Another form of hythergraph is the Comfort Chart which shows values of temperature vs values of humidity. For indoor environments in the winter our comfort zone is most tolerable from 68 to 70 degrees, if the indoor humidity remains between 35 and 60 percent. If humidities are lower than this range we tend to feel too cool (and get dry lips, dry sky and itchy eyes sometimes), if higher than this range, we tend to feel too warm.

Outlook:

Continued mild temperatures into the weekend with mild temperatures. A chance for rain later on Sunday and into Monday. Cooler temperatures by Tuesday and Wednesday with a chance for light snow or rain, then generally dry for Thanksgiving. Temperatures may cool to a few degrees below normal after Thanksgiving.

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Minnesota WeatherTalk Newsletter for Friday, November 27, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, November 27, 2009

Headlines:

- November warmth continues
- Holidays and Climatology
- Weekly Weather Potpourri
- MPR listener question
- Almanac for November 27th
- Past weather features
- Cold Soak
- Outlook

Topic: Remarkable warmth continues, especially at nights

Most observers continue to report one of their warmest Novembers despite some persistent cloudiness this past week. All of the clouds and moisture in the air produced some record-setting warm nights. New record warm minimum temperatures were reported from St Cloud on three consecutive mornings, 22nd, 23rd, and 24th. Likewise, the Twin Cities reported record warm minimum temperatures on the 22nd and 23rd (45 and 46 degrees F, respectively). Obviously these were not the only climate stations reporting record-setting warm nights, as Jordan, Redwood Falls, Grand Rapids, and New Ulm also reported new record warm minimum temperatures on at least one of those dates. Mean monthly temperatures for November are ranging from 9 to 11 degrees F above normal around the state.

Topic: Jet Streaming Resurrected

The former MPR podcast will be resurrected for an hour long program on December 13th with host Paul Huttner, chief meteorologist for MPR. For those who have missed the in-depth discussion of weather and climate matters, and the Q&A with renowned atmospheric scientists, the program will air on Sunday, December 13th at 6:00 pm. I am excited to participate again.

Topic: Thanksgiving Day, Fasting Day, and Climatology

Historically, Christian people have held Thanksgivings to celebrate and recognize the gifts and mercies of God. This has often taken the form of a harvest festival or a banquet in the fall. Conversely, Fasting Days were often scheduled as a recognition of God's harsh judgements, a way for reconciliation or atonement. These quite often occurred in the spring. But long ago neither of these events were typically observed on fixed calendar dates. Some would say that they were more related to climate.

When harvests were made bountiful by a blessed rain or abundant sunshine or when fish and game were caught in great numbers by hunters and fishermen, a community might declare a Thanksgiving Day to celebrate these gifts. Alternatively, if the winter was harsh, game was scarce, there was spring flooding, or drought related forest fires, then a community might declare a Fasting Day in an attempt to reconcile with God. Often times this was coincident with the depletion of winter stored food anyway, so there was little to eat. Thus many of these occasions were at least partially dictated by climate and weather variations as they affected agriculture, fish and game, or the hospitality of the local environment.

In early American history, Thanksgiving could be declared independently by a local community, church or colonial government. These were often celebrated on a weekday that was called "Lecture Day", typically a Wednesday or Thursday when a topical sermon was given each week. An annual autumn Thanksgiving was pretty well established in many American colonies by the middle of the 17th century and a feast or banquet built around harvested crops and game became customary. The Continental Congress and early Presidents like Washington and John Adams declared periodic Thanksgivings, often in the month of December. In 1815, President James Madison declared two national Thanksgivings. In 1863, President Lincoln declared a Thanksgiving for the last Thursday of November which became a national holiday of sorts until President Franklin Roosevelt signed a bill in 1941 officially making Thanksgiving Day the fourth Thursday of each November. This date which varies from November 22nd to November 28th adheres to the tradition of following the agricultural harvest and hunting seasons, however it also coincides with a highly volatile climate transition from fall to winter, especially in Minnesota. Thus, the Thanksgiving holiday in particular is perhaps loaded with more weather-related memories than any other American holiday.

Weekly Weather/Climate Related Potpourri:

Some tropical weather was making headlines this week. Cyclone Bongani was off the north coast of Madagascar bringing some heavy rains and sea waves of 10 to 15 feet. It is expected to dissipate greatly before reaching Mozambique as more a complex of

thunderstorms this weekend. Super Typhoon Nida SSW of Guam in the Western Pacific was packing wind gusts over 180 mph and producing sea wave heights of 40 feet. This storm will mainly stay out to sea and weaken by Sunday and Monday.

For those who cannot read enough about tropical weather NASA has announced a new Hurricane Twitter Page where updates will be provided worldwide on a daily basis. You can check out more at...

http://www.nasa.gov/mission_pages/hurricanes/features/twitter.html

The Chief Science Officer of the United Kingdom Meteorological Office issued a public statement supporting how science underpins the Copenhagen climate treaty negotiations slated to begin next month. His message can be found at....

<http://www.metoffice.gov.uk/corporate/pressoffice/2009/pr20091124a.html>

After a week of heavy rainfall many parts of the Republic of Ireland were experiencing severe flooding, said to be the worst in centuries. The city of Cork in southern Ireland was especially hit hard. The University of Cork was shut down for a time and members of the armed forces were assisting with response and recovery.

MPR listener question: Can you explain the 20/20 rule for Minnesota winters?

Answer: This rule states that for any winter month (Dec, Jan, Feb) if 20 or more inches of snowfall is recorded there is a high correlation with a minimum temperature falling to -20 degrees F or colder on at least one night. The rule generally holds true across Minnesota's climate history, with very few exceptions.

Almanac for November 27th:

The average MSP high temperature for this date is 32 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 18 degrees F (plus or minus 10 degrees F standard deviation).

MSP local Records for November 27th:

MSP weather records for this date include: highest daily maximum temperature of 64 degrees F in 1998; lowest daily maximum temperature of 7 degrees F in 1872, 1897, and 1930; lowest daily minimum temperature of -13 degrees F in 1872; highest daily minimum temperature of 37 F in 1913 and 1962. Record precipitation for this date is 0.90 inches in 1905. Record snowfall is 4.9 inches in 1983.

Average dew point for November 27th is 17 degrees F, with a maximum of 44 degrees F in 2005 and a minimum of -14 degrees F in 1955.

All-time state records for November 27th:

The all-time state record high temperature for this date is 71 degrees F at Fairmont (Martin County) in 1998. The all-time state record low temperature for this date is -31 degrees F at Argyle (Marshall County) in 1887. The all-time state record precipitation for this date is 2.75 inches at Pine River Dam (Crow Wing County) in 1988. State record snowfall for this date is 24.0 inches at New London (Kandiyohi County) in 2001.

Past Weather Features:

Three of the coldest Novembers in Twin Cities history were recorded during the decade of the 1870s. In 1872 eight November dates brought below zero F temperatures, bottoming out with -21 degrees F on the 27th. In 1873, three November snow storms ushered in arctic air masses that brought below zero F readings. The mornings of the 27th and 28th started out at -7 degrees F. In 1875 November brought 7 days with below zero F minimum temperatures, with a low of -25 degrees F on the 29th, the coldest November reading in Twin Cities history.

Conversely, the El Nino year of 1998 brought record warmth during the last week of November to many Minnesota locations. Fairmont and other communities reported four consecutive days with daytime highs in the 60s and 70s F from the 26th to the 29th. Many golf courses were open for business during that time.

November 26-28, 2001 brought a big snow storm to the state, one of the heaviest in the past decade. Marshall, Granite Falls, and Minneota reported nearly 2 feet of snowfall. Colledgeville reported over 25 inches and Willmar surpassed 30 inches, one of their heaviest all-time snowfalls.

Words of the Week: Cold Soak

This is what some Minnesotans do after they emerge from several minutes in a hot sauna. It is also a term used by climatologists and engineers to describe equipment exposure in cold climates, especially in polar regions. Machinery or engines which are stored or left idle in cold climates experience a cold soak. Metal becomes more brittle, lubricants thicken and operational tolerances are diminished. Preheating of the machinery before use is often prescribed for equipment that has been cold soaked for extended periods.

Outlook:

Mostly cloudy with near seasonal average temperatures over the weekend. Slight chances for snow late Saturday and early Sunday. Some chances for light snow next week, but mainly cooler weather towards the end of the week, as daytime highs remain in the 20s and 30s F.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, December 4, 2009

To: MPR's Morning Edition

From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, December 4, 2009

Headlines:

- Remarks on November climate
- December starts with snow and cold
- Weekly Weather Potpourri
- MPR listener question
- Almanac for December 4th
- Past weather features
- Flettner spray vessels
- Outlook

Topic: Remarks on climate of November 2009

Preliminary data indicate that this past November was the 3rd warmest in history on a statewide basis. In fact, three of the four warmest Novembers in state history have occurred in the past ten years: 1999, 2001, and 2009. For the Twin Cities metro area, Rochester, and Duluth Airport 2009 brought the 2nd warmest November in history, while for International Falls it was the 3rd warmest historically. Another anomaly worth noting is that for some climate stations the November average daily maximum temperature was higher than the average daily maximum temperature in October, very rare indeed.

Dave Ruschy who manages the University of Minnesota Climate Observatory on the St Paul Campus reports that average daily solar radiation in November was 157 calories per centimeter squared per day, 7th highest historically and very close to the average for the month of October which was only 162.7 calories per centimeter squared per day during a very cloudy month. This is the first time in history that solar energy for October and November in the Twin Cities area was nearly equal.

MSP airport reported only a trace of snowfall during November which tied the historical record for least amount that occurred in 1928, 1939, and 1963.

Topic: December starts with snow and cold

As December began this week the National Weather Service issued a winter weather advisory for many northern counties with the passage of a significant snow storm. A record 5.6 inches of snowfall was measured at International Falls on December 1st, while a new record for December 2nd of 4.6 inches was reported from Kabetogama. Storm totals over the 1st and 2nd of December were 8.5 inches at International Falls, 6.2 inches at Kabetogama, 5.5 inches at Baudette, 5.3 inches at Roseau, 4 inches at Warroad, 3.4 inches at Orr, and 2.9 inches at Ely. More snow fell across much of the state on Wednesday night and Thursday, bringing from 1 to 5 inches across portions of southwestern and southern Minnesota. The new snow cover and colder Canadian air following the storm dropped overnight temperatures into the teens. International Falls reported just 14 degrees F on December 2nd, while Embarrass reported 17 degrees F. By Thursday morning, many locations were reporting lows in the teens F, while Hallock and Grand Marais airport reported just 9 degrees F. Single digit lows will become more common place over the next few days and accelerate ground freezing, as well as lake ice cover formation.

Topic: Jet Streaming Resurrected

The former MPR podcast will be resurrected for an hour long program on December 13th with host Paul Huttner, chief meteorologist for MPR. For those who have missed the in-depth discussion of weather and climate matters, and the Q&A with renowned atmospheric scientists, the program will air on Sunday, December 13th at 6:00 pm. I am excited to participate again.

Weekly Weather/Climate Related Potpourri:

The United Nations International Climate Change Conference begins in Copenhagen next week on December 7th and runs through December 18th. This will be a very important conference in negotiating strategies to cope with climate change. The calendar and general agenda can be found at...

<http://en.cop15.dk/calendar>

The Met Office in the United Kingdom reported that November was the wettest in history across the country, averaging 8.6 inches of rain from among all the climate stations. Floods were reported with the heavy rains, especially in western parts of the country.

The Hadley Center seasonal forecast released last week indicates that the western Great Lakes Region (including Minnesota) is likely to see above normal temperatures

over the December through February period. The center also forecasts a wetter than normal winter season for Minnesota. You can see the graphics at the following web site.....

<http://www.metoffice.gov.uk/weather/world/seasonal/>

MPR listener question: I heard you and Cathy talk about the rollercoaster ride in weather this fall with a warm September, dreary October, and warm sunny November. How did the fall season (Sep-Nov) across Minnesota rank with respect to temperature and precipitation?

Answer: Overall the fall season can be characterized as wet, ranking 84th out of the last 115 years in terms of average statewide precipitation which was nearly 7.25 inches for the September through November period. This helped recharge many soils which had been in drought status for much of the growing season. From a temperature standpoint this year ranked 101st warmest out of the past 115 years with a statewide average of nearly 47 degrees F over the September to November period. The warmth certainly helped Minnesota corn reach maturation, as it was significantly behind in development as we entered the fall season.

Almanac for December 4th:

The average MSP high temperature for this date is 32 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 16 degrees F (plus or minus 11 degrees F standard deviation).

MSP local Records for December 4th:

MSP weather records for this date include: highest daily maximum temperature of 56 degrees F in 1941; lowest daily maximum temperature of 2 degrees F in 1991; lowest daily minimum temperature of -15 degrees F in 1886; highest daily minimum temperature of 44 F in 1941. Record precipitation for this date is 0.58 inches in 1877. Record snowfall is 4.2 inches in 1947.

Average dew point for December 4th is 19 degrees F, with a maximum of 49 degrees F in 1960 and a minimum of -19 degrees F in 1991.

All-time state records for December 4th:

The all-time state record high temperature for this date is 71 degrees F at Long Prairie (Todd County) in 1941. The all-time state record low temperature for this date is -38 degrees F at Fort Ripley (Crow Wing County) in 1873. The all-time state record

precipitation for this date is 1.57 inches at Lac Qui Parle Reservoir in 1951. State record snowfall for this date is 14.0 inches at Campbell (Wilkin County) in 1927 and at Beardsley (Big Stone County) in 1955.

Past Weather Features:

December 4-5, 1873 brought extremely cold weather to downtown St Paul, MN. Both days the morning low was -18 degrees F, and on December 5th the temperature never rose above -2 degrees F.

December started out exceptionally snowy in both 1950 and 1985. Over the first week of December in 1950 snow accumulated at record-setting levels in some parts of the state. Duluth reported over 40 inches, while Cloquet reported over 30 inches. Further south Maple Plain reported nearly 2.5 feet of snowfall during that week, while most other observers reported a foot to foot and a half of snow. Again in 1985 the first week of December was very snowy. Almost all areas of the state received significant snowfall. Exceptional amounts were recorded at Morris with 17.5 inches, Two Harbors, Fairmont, Spring Grove, and La Crescent with 19 inches, and Winona, St Peter, Maple Plain, and Waseca reported 18 inches.

Words of the Week: Flettner Spray Vessels

This jargon refers to a ship invented by German engineer Anton Flettner that is powered by wind blowing across rotating vertical cylinders. The vessels, sometimes called "rotor ships" could be unmanned and programmed to navigate around the various ocean basins pumping water through their towers and spraying the sea mist upward to supply water vapor for enhancing cloud formations over the oceans. It is hypothesized that the water vapor from the sea would amplify the reflectivity of stratocumulus clouds over the oceans and therefore reflect more incoming solar radiation. The net result of higher cloud albedo would help offset the enhanced warming of greenhouse gases. Some suggest a fleet of 1500 such vessels might be effective in this regard. You can read more about this at....

<http://inoneday.ca/?p=400>

Outlook:

Continued cold into the weekend with a chance for flurries Sunday and Monday. Some indications for a significant snow storm across the state by Wednesday of next week. Temperatures will continue to average colder than normal.

Further Information:

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Minnesota WeatherTalk Newsletter for Friday, December 11, 2009

To: MPR's Morning Edition
From: Mark Seeley, University of Minnesota Extension
Department of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, December 11, 2009

Headlines:

- Comments on "climategate"
- Big storm this week
- Jet Streaming Resurrected
- Weekly Weather Potpourri
- MPR listener question
- Almanac for December 11th
- Past weather features
- Mustard Wind
- Outlook

Topic: Comments on "Climategate"

Much public discussion has already occurred on this topic, but many MPR listeners have asked me for an opinion. The disclosure and dissection of the thousands of email messages hacked from the University of East Anglia Climate Research Unit is an act of deplorable vandalism. Nevertheless it exposes poor judgment and behavior on the part of some of the most visible and outspoken climate scientists. This is seen as a black eye to many who work in the climate sciences, but it represents an extremely small fraction of those involved in climate science and investigations worldwide, and more importantly it does not negate the hundreds, if not thousands of published studies that document climate change and its significance. The labeling of climate change as a political issue has been in existence for decades. The frequent public debates and discussions, especially in the common media, have brought many scientists to the table as adversaries and in some of the written and verbal exchanges there have been personal affronts, degrading remarks, and outright anger. Such exchanges have existed in the science professions for centuries, though often not in such a public manner. After all, science is about hypothesis testing, challenging the results, and retesting, until the truth is no longer disputable. In this public context, some individuals have found their personal integrity and pride shaken and their

emotions rise to the surface (everyone of us has a personal tolerance boundary beyond which are emotions may take over our words and actions). Shaken, and angry certain words and actions that reflect bad judgment may come out. I am not suggesting absolute forgiveness, but I think I understand why this happens.

In the context of the "body of evidence" used to conclude that climate change is happening and that the human fingerprint is upon it, "climategate" does not negate the science that has been done. It is too voluminous, diverse, and significant to ignore. Please check out a "science community" statement on this from the United Kingdom at...

<http://www.metoffice.gov.uk/corporate/pressoffice/2009/pr20091210.html>

Those of you who have heard me speak about this know that I am a slow learner, and it took me a long time to be convinced of this. But there are three forms of evidence that I cannot dismiss:

1. Nearly all of the world's climate data, gathered and analyzed by many (not just those at University of East Anglia or Penn State University) shows significant climate change is going on, especially at mid to high latitude positions on Earth.
2. The climate models all more accurately mimic the measured climate attributes of the Earth system if they parameterize the human impacts (land use change and anthropogenic emissions). Driven only by physical and natural parameters which have affected the Earth's climate behavior for over 4 billion years (solar radiation, orbital features, ocean currents, arctic ice, etc), the models do not fit the measurements very well.
3. Observations of the physical and biological changes and consequences around us (lakes, terrestrial ecosystems, storm patterns, wildlife behaviors) are consistent with the measured and estimated climate changes that scientists have documented.

Just as we have allowed our health care system to become broken, we have allowed our climate system to become broken. Individual human flaws and misjudgments should not dissuade us as a community from seeking a cure for these broken systems. Enough said.

Topic: Winter Storm and Blizzard on December 8-9, 2009

A massive and intense winter storm crossed the country this week and impacted southern and eastern Minnesota counties. At one time the diameter of this storm system was huge, over 1800 miles across, and the intensity of the low pressure center was as low as 28.80 inches on the barometer. Blizzard warnings were posted from late in the day on December 8th through December 9th, with winds in Minnesota as high

as 53 mph (at Windom). Elsewhere wind speeds were even higher. Many areas in southeastern Minnesota reported storm total snowfall of 8 to 16 inches. Some climate stations reported record setting or record tying daily amounts of snowfall, including MSP airport with 4.7 inches on the 8th (tied record), Rochester with 8.3 inches, La Crosse, WI with 9 inches, and for December 9th record setting amounts were reported from Spring Valley and Preston with 14 inches, Hokah with 13 inches, Caledonia, Wabasha, and Zumbrota with 11 inches. Many roads and schools were closed across SE Minnesota, eastern Iowa, southern Wisconsin, and western Michigan. The last heavy snowfall to strike in this part of Minnesota during early December was over December 9-10 of 2003 when 6 to 12 inch amounts were recorded from Freeborn County north through the Twin Cities and across parts of western Wisconsin, but that storm was not as sizable as the one this week. More information is available on the web at...

http://www.climate.umn.edu/doc/journal/blizzard091208_09.htm

Most observers have reported colder than normal temperatures on 8 of the first 11 days of December. So clearly the climate is tracking colder than normal in December and with the additional snow cover and arctic air mass affecting us this week it appears that this trend will continue well into the month.

Topic: "Jet Streaming" to be broadcast on MPR presents this Sunday, December 13th at 6:00 pm

The former MPR podcast will be resurrected for an hour long program on December 13th with host Paul Huttner, chief meteorologist for MPR. For those who have missed the in-depth discussion of weather and climate matters, and the Q&A with renowned atmospheric scientists, the program will air on Sunday, December 13th at 6:00 pm as MPR presents (FM 91.1). During this broadcast there will be discussions about El Nino and Climate Change with Dr. Kevin Trenberth from NOAA, assessment of modern technologies used in forecasting with Paul Douglas, description of snow flake form and structure from Dr. Ken Libbrecht of Cal Tech, comments on how to talk to a climate change skeptic by Coby Beck, winter outlook predictions from Paul Huttner and myself, as well as a presentation of the top 5 Minnesota weather events of the past decade submitted by climatologist Pete Boulay of the Minnesota State Climatology Office. Don't miss it. This will be an entertaining broadcast.

Weekly Weather Potpourri:

NOAA scientists announced this week that the cooler temperatures observed over North America during 2008 were the result of natural causes. Cooling in the tropical Pacific (La Nina), along with cooler sea surface temperatures in the northeastern

Pacific Ocean as well produced the cooler than normal temperature pattern across the continent. This does not indicate a refusal in the long term trend towards warm, but is regarded as an aberration that persisted for a year. You can read more about this at...

http://www.noaanews.noaa.gov/stories2009/20091204_cooling.html

In other NOAA news this week, the first successful instrumented ocean glider crossed the Atlantic, a journey of 7300 miles making continuous measurements of ocean temperature, salinity, and density as it dove to depths of 200 meters. The 7 foot long, 135 pound glider is similar to the one being used in Lake Superior studies. Data collected by the glider will help scientists better understand ocean currents and changes going on in the ocean environment. Read more at...

http://www.noaanews.noaa.gov/stories2009/20091207_glider.html

According to the NOAA Storm Prediction Center both November and December have been unusually quiet when it comes to nationwide tornado reports. In the month of November there were only 4 tornadoes reported, and from November 7th to the 29th (23 days) there was not a single tornado report in the nation. So far in December there has been only one tornado report. According to Greg Carbin at the NOAA SPC there were no tornado and severe thunderstorm watches issued during the month of November. Historically there have been periods as long as 57 days without a single tornado report (1952).

In a news release this week the United Kingdom Meteorological Office is forecasting that 2010 will be a warmer year worldwide than 2009. The current year ranked as 5th warmest in the global records. The Met Office said they base their forecast for 2010 on the presence of a warm tropical Pacific Ocean (El Nino) and trend analysis from recent decades. You can read more at...

<http://www.metoffice.gov.uk/corporate/pressoffice/2009/pr20091210b.html>

Research published in the magazine Science this week suggests that the Earth's atmosphere formed from gases that had space origins, such as from meteors or comets, and not from the emission of volcanic gases formed entirely in the Earth's interior. A discussion of this research can be found at...

<http://www.sciencedaily.com/releases/2009/12/091210153538.htm>

MPR Listener Question: Where's the El Nino effect? I thought our winter was supposed to bring warmer than normal temperatures because of El Nino in the Pacific Ocean.

Answer: Indeed. After having an exceptionally warm November, it sure looks like December is going to be colder than normal. The use of El Nino to forecast the winter climate is based on historical correlation with approximately 23 episodes. It is not a perfect correlation, and there are obviously other factors that might offset El Nino effects. Some argue that this year the minimum in the solar sunspot cycle may have an effect on our winter season bringing greater frequency of arctic outbreaks. Perhaps this is what is happening this month.

Almanac for December 11th:

The average MSP high temperature for this date is 27 degrees F (plus or minus 12 degrees standard deviation), while the average low is 12 degrees F (plus or minus 13 degrees standard deviation).

MSP Local Records for December 11th:

MSP weather records for this date include: highest daily maximum temperature of 56 degrees F in 1913; lowest daily maximum temperature of -3 degrees F in 1962 and 1995; lowest daily minimum temperature of -14 degrees F in 1972; highest daily minimum temperature of 35 degrees F in 1965; record precipitation of 0.61 inches in 1909 and record snowfall of 5.2 inches in 1909.

Maximum snow depth has been 16 inches in 1950.

Average dew point for December 11th is 10 degrees F, with a maximum of 49 degrees F in 1949 and a minimum of -28 degrees F in 1928.

All-time state records for December 11th:

Scanning the state climatic data base: the all-time high for this date is 67 degrees F at Long Prairie (Todd County) in 1913; the all-time low is -41 degrees F at Pokegama Dam (Itasca County) in 1936. The all-time record precipitation amount for this date is 1.70 inches at Beaver Bay (Lake County) in 1870 from an all day rain and snow event. The all-time record snowfall is 16 inches at St Charles (Winona County) in 1899.

Past Weather Features:

December 11-12, 1899 brought a heavy snow storm to SE Minnesota, where St Charles reported 17 inches over the two days, while Caledonia reported 20 inches.

The first half of December in 1927 brought two blizzards to Minnesota. One struck over the 6th through the 8th depositing over a foot of snow in places and leaving drifts

several feet high in western counties. A second blizzard struck over December 14-15 and again brought a foot of snowfall to many western counties closing down many roads. Observers in western Minnesota reported over 40 inch snow depths and Campbell (Wilkin County) reported 49.5 inches of snowfall by the end of the month, a record there.

December 11, 1936 brought a cold wave to many parts of Minnesota as 8 communities reported temperatures of -30 degrees F or colder. Pokegama Dam tender reported a morning low of -41 degrees and an afternoon high of 7 degrees F, a 48 degrees F warm up. The next day it was 37 degrees F there, 78 degrees F warmer than the previous day!

Words of the Week: Mustard Winds

The English have several interesting expressions for weather conditions and this is one of them. When we have a cold front or cold wave move through the midwest, as we did this week, our meteorologists sometimes refer to the wind as a "biting wind", a penetrating wind", or a "bitter wind." The English will sometimes refer to a wind that brings on severe windchill conditions as a "mustard wind." This is most commonly a cold and damp northeasterly wind off the North Sea.

In fact mustard used as an adjective generally has a negative connotation: mustard gas was an irritating and blistering gas used in WWI; mustard oil has a very unpleasant odour; mustard beetle is a destructive insect pest; mustard plaster or mustard paper is a counter-irritant used in medicine; and anybody who has done laundry knows that a mustard stain is one of the most difficult to remove (just look at my tie collection!).

We certainly had winds "as keen as mustard" this week around Minnesota with windchills of -20 to -30 degrees F being reported.

Outlook:

Some moderation in temperatures across the state for Saturday through Monday as daytime highs climb into the 20s F. There will be chances for snow showers and flurries throughout the period. Colder temperatures will return on Tuesday and remain for the balance of next week, but it will continue mostly dry.

Further Information:

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<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>

Minnesota WeatherTalk Newsletter for Friday, December 18, 2009

To: MPR Morning Edition Crew
From: Mark Seeley, University of Minnesota Extension
Dept of Soil, Water, and Climate

Subject: Minnesota WeatherTalk Newsletter for Friday, December 18, 2009

Headlines:

- Persistence below the freezing mark
- Snow drought along the north shore
- Hour-long Jet Streaming online
- Weekly Weather Potpourri
- MPR listener question
- Almanac for December 18th
- Past weather features
- Taiga
- Outlook

Topic: Persistently below freezing....

Since about 4:00 pm on December 2nd the thermometer has been below the freezing mark (32 F) in the Twin Cities, 15 consecutive days. Furthermore, the forecast out to Christmas Day suggests we will remain below freezing, marking 25 consecutive days. This is somewhat unusual persistence of cold December weather. Back in December of 2000, 2nd coldest in the modern record, there were 27 consecutive days below the freezing mark, while in 1983, coldest December of modern times, all 31 days of the month were below freezing, with a thaw finally arriving on January 3, 1984 when the temperature rose to 41 degrees F. Should temperatures remain below the freezing mark for the rest of this month it will likely mean this December will fall among the coldest 25 of the last 115 years.

Topic: Lack of snow along the north shore...

Despite abundant snowfall in many areas associated with the blizzard on December 8-9, and the snow storm on December 14th, north shore areas have seen little snow so far this month. From Two Harbors along Highway 61 to Grand Portage snow depths are only 1 to 2 inches, unusually low mid-December numbers. The greatest snow

depths in the state this week are found in the SE counties where 8 to 12 inches is more commonly reported. You can find more information about this at the State Climatology web site....

http://www.climate.umn.edu/doc/snowmap/snowmap_091217.htm

Topic: New Seasonal Outlook

The NOAA Climate Prediction Center released new seasonal outlooks on Thursday, December 17th. The temperature outlook favors warmer than normal conditions for January and the remainder of the winter season across our region. The precipitation outlook favors drier conditions in January, then equal chances for wetter or drier conditions for the remainder of winter.

Topic: "Jet Streaming" is available online

The former science podcast "Jet Streaming" was recently resurrected for an hour long episode on December 13th. For those of you who missed the broadcast on FM 91.1 you can still listen to the show online. The link is...

http://minnesota.publicradio.org/collections/special/columns/updraft/archive/2009/12/jet_streaming_show_links.shtml

There are many interesting segments hosted by MPR chief meteorologist Paul Huttner, including discussions of El Nino, climate change, modern technologies used in forecasting, the physics of snow, how to talk to a climate change skeptic, and the top 5 Minnesota weather events of the past decade. I hope that you will listen and enjoy the program.

Weekly Weather Potpourri:

A study presented at the American Geophysical Union Annual Meeting in San Francisco this week documents how wind shear aloft affects the interaction of pollution plumes (particulates and aerosols) with the formation of isolated thunderstorms. Under conditions of weak wind shear pollution can strengthen individual thunderstorms, while when wind shear aloft is strong, pollution can hamper thunderstorm development. More about this paper can be found at...

<http://www.sciencedaily.com/releases/2009/12/091215145048.htm>

Tropical Cyclone Laurence was bringing heavy rains and strong winds to parts of northwestern Australia this week. It was expected to weaken and break up, but still bring some significant rainfall to the coastal regions into the weekend.

Thursday and Friday brought significant snowfalls to portions of eastern and southeastern United Kingdom. Some observers there reported up to 8 inches of snowfall on Thursday night, with more expected on Friday. Many schools were closed on Friday and a number of power outages were reported. Traffic accidents and stranded motorists were common sights and in some areas travel was not advised. For those who did travel the conditions were very challenging weatherwise. See more at...

http://news.bbc.co.uk/2/hi/uk_news/8420057.stm

Thursday and Friday also brought a large storm system to the southeastern USA, and also to the mid-Atlantic states. South Florida reported flash flooding as a result of heavy thunderstorms that brought 7 to 14 inches of rainfall to the area. There were numerous flooded roads and stalled cars, especially in the Hollywood area. Some neighborhoods had standing water 15 inches deep. The same complex storm system was moving north and bringing significant snowfalls to parts of VA, MD, and the Washington D.C. area on Friday. It was expected to sock the northeastern states this weekend.

President Obama spoke passionately about climate change and the need for cooperation among governments during the final session of the Copenhagen Conference this week. With the conference concluding without binding agreements, some doubts about the scientific certainty of climate change continue to obstruct negotiations. But, a podcast made available by the United Kingdom Met Office shows Professor Julia Slingo answering some questions about climate change that help to alleviate some of these doubts. You can view her responses to these questions at the Met Office web site....

<http://www.youtube.com/user/TheMetOffice>

NOAA's National Weather Service encourages us to consider the purchase of a NOAA All Hazards Weather Radio as a gift for this upcoming holiday season. Whether for home use or as a travel companion, the NOAA weather radio keeps you informed of weather conditions that can threaten to disrupt your plans or activities. It is a great gift priced from \$35.00 to \$75.00. See the following web site for more details....

http://www.noaanews.noaa.gov/stories2009/20091210_holidaygift.html

MPR Listener Question: I heard MPR's chief meteorologist Paul Huttner say earlier this week that on a global basis 2009 may rank among the top 5 warmest years. That has certainly not been the case for Minnesota's climate. Where will 2009 rank in Minnesota's climate history?

Answer: With two weeks to go in the year 2009 it appears that the statewide mean temperature value (currently about 41.3 degrees F) for this year will rank about 60th among the past 115 years. So that places 2009 close to the middle of the statistical distribution on temperature. Similarly the statewide value of precipitation for 2009 (25.65 inches) will rank close to 51st among the last 115 years. So both of these annual statistics, though representing a cooler and drier than normal year fit well into the middle of our climate statistics for the state.

Almanac for December 18th:

The average MSP high temperature for this date is 25 degrees F (plus or minus 13 degrees standard deviation), while the average low is 10 degrees F (plus or minus 14 degrees standard deviation).

MSP Local Records for December 18th:

MSP weather records for this date include: highest daily maximum temperature of 55 degrees F in 1923; lowest daily maximum temperature of -11 degrees F in 1983; lowest daily minimum temperature of -24 degrees F in 1983; highest daily minimum temperature of 36 degrees F in 1877; record precipitation of 0.28 inches in 1939 and record snowfall of 6.5 inches in 2000. Maximum snow depth has been 19 inches in 1983; the worst windchill conditions were -55 degrees F at noon in 1924.

Average dew point for December 18th is 9 degrees F, with a maximum of 43 degrees F in 2002 and a minimum of -26 degrees F in 1983.

All-time state records for December 18th:

Scanning the state climatic data base: the all-time high for this date is 69 degrees F at Lynd (Lyon County) in 1908; the all-time low is -52 degrees F at Mora (Kanabec County) in 1983. The all-time record precipitation amount for this date is 1.70 inches at Montevideo (Chippewa County) in 1977. The all-time record snowfall is 8.7 inches at Two Harbors (Lake County) in 1998.

Past Weather Features:

This week in 1877 was perhaps the mildest pre-Christmas week ever in the Twin Cities region. It was mostly cloudy with precipitation on six consecutive days (Dec 18-23) and very warm nights with many overnight lows in the mid 30s F. In addition on three consecutive days (Dec 21-23) the daytime highs were 56 F, 52 F, and 52 F, cooling down to 42 degrees F on Christmas Eve, and 38 F on Christmas Day. In the Pioneer Era this was known as the "muddy Christmas" with all the rain, or as the "fresh flowers" Christmas because the temperatures were mild enough to take fresh flowers on visits to family members, traveling by horse drawn wagon back then.

On December 18, 1923 Minnesota was in the grip of a four day mid-December heat wave with daytime temperatures consistently well into the 50s F. At Montevideo, New Ulm, Bird Island, Pipestone, St Peter, Tracy, and Winnebago the temperature reached 60 degrees F or higher. By the last week of the month temperatures plummeted to below zero F at many locations.

This week in 1983 was the coldest in state history as many observers reported overnight lows of -40 degrees F or colder. On the 19th both Ada and Lake Winnibigoshish could warm no greater than -20 degrees F after starting out in the -30s F that morning. Tower and Mora both bottomed out at -52 degrees F. Wind chill readings were in the -50 to -60 degrees F range at times as AAA and wrecker services were kept busy starting cars on most mornings.

Words of the Week: Taiga

This is a Russian word (pronounced ti-ga) used to refer to the Boreal woodlands or open forest which lies just south of the tundra in high latitudes. It consists of coniferous trees growing in cold and swampy soils, occupied by lichens. In these areas trees can grow for a limited time each year. The landscape is often flooded in the spring by north flowing rivers. Some climatologists refer to these areas as subarctic climates.

Outlook:

Somewhat cooler than normal temperatures into the weekend with a chance for light snow or flurries. Then colder for Monday and Tuesday. A chance for snow on Wednesday (Christmas Eve) and continuing into Thursday morning (Christmas Day). But generally remaining colder than normal.

Further Information:

For older versions of the "Minnesota WeatherTalk" newsletter go to

<http://www.climate.umn.edu/weathertalk/>

For access to other information resources go to

<http://www.climate.umn.edu/Seeley/>