Minnesota WeatherTalk January-December 2020

December Climate Summary

Minnesota WeatherTalk, January 03, 2020
By Mark Seeley, retired University of Minnesota Extension Climatologist

After fluctuating above and below normal for much of the December, temperatures remained well above normal during the last ten days of the month. As a result, most climate stations reported a mean monthly temperature that was from 1 to 4°F above normal, making December only the 3rd month in 2019 with above mean temperature values. Extremes for the month ranged from 51°F at Bemidji (Beltrami County) on the 22nd to -42°F at Isabella (Lake County) on the 18th.

Within the Minnesota climate network there were 26 daily maximum temperature records set or tied; 48 daily high minimum temperature records set or tied; 4 daily low maximum temperature records set or tied; and 15 new daily record low minimum temperature records set or tied. The warmest days statewide were the 8th and the 29th, while the coldest days were the 10th and 11th.

Thanks to the prolonged storminess over the December 28-30 the month ended up much wetter than normal. In fact, for only the second time in history (the other being December of 1968) the statewide average December precipitation exceeded two inches, a fitting end to the wettest year in state history. The wettest area was in the northeast where portions of Carlton, St Louis, and Lake Counties reported over 4 inches of precipitation. One of the driest spots was Madison in Lac Qui Parle County where less than 0.60 inches of precipitation was recorded. Snowfall data show that many areas of the state reported over 15 inches for the month, with observers in Carlton, St Louis, and Lake Counties reporting over 40 inches.

Within the Minnesota climate network, there were 92 new daily precipitation records set or tied; and there were 53 new daily record snowfall amounts set or tied, including a new all-time statewide record snowfall for December 1st at Cloquet (Carlton County) of 18.7 inches. By the end of the month, some areas of northeastern Minnesota reported over 2 feet of snow on the ground. By far the most disruptive weather event of the month was the storm over December 28-30. Widespread freezing rain and ice made for extremely hazardous travel on the morning of the 28th with hundreds of vehicle accidents as well as scores of pedestrian falls. More information on this storm can be found at the Minnesota State Climatology Office web site.

Weekly Weather Potpourri

The Rutgers University Global Snow Laboratory (GSL) provides measurements of snow cover. Now according to the NOAA Climate Program Office, you can use the global data

sets for both the Northern Hemisphere and Southern Hemisphere to graph the time course of snow and ice cover at high latitudes. Give it a try.
On the Weather Underground web site, there is an interesting article by Bob Henson about how new research from Switzerland reveals that global climate change can be tracked in the fingerprints of even daily weather, using tools to diagnose anomalies.

The BBC Weather Centre reported this week that Sunndalsora, Norway reported a high temperature of 66 degrees F on January 2, 2020. This is the highest January temperature ever measured in Norway and is over 40°F above normal.

The AGU-EOS bulletin this week contains an article about the rivers of air coming into the USA from the Pacific Ocean and how their characteristics govern the nature of the weather they bring (windy, wet, wet and windy combined, or neutral). It is an interesting read.

MPR listener question
I heard from a friend that northwest of Duluth they reported over 6 inches of precipitation in December as well as over 33 inches of snowfall. What are the state records for these measurements in December?

Answer
I am not sure that I believe that number. There has been no observation historically of precipitation over 5 inches during the month of December in Minnesota. So, any precipitation totals over 6 inches last month should be questioned and verified by the Minnesota State Climatology Office. The highest value I can find historically is 4.92 inches at Farmington (Dakota County) in 1982.

The statewide December total snowfall record is 55.2 inches northwest of Two Harbors in 2013. So that is almost a season load of snow in just one month.

Twin Cities Almanac for January 3rd
The average MSP high temperature for this date is 24 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 8 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for January 3rd
MSP weather records for this date include: highest daily maximum temperature of 46 degrees F in 1880: lowest daily maximum temperature of -12 degrees F in 1919; lowest daily minimum temperature is -26 degrees F in 1887; highest daily minimum temperature of 33 degrees F in 1992; record precipitation of 0.76 inches in 1906; and record snowfall of 9.0 inches also in 1906.

Average dew point for January 3rd 6 degrees F, with a maximum of 34 degrees F in

2006 and a minimum of -42 degrees F in 1919.

All-time state records for January 3rd
The state record high temperature for this date is 53 degrees F at Canby (Yellow Medicine County) in 1998. The state record low temperature for this date is -54 degrees F at Pokegama Dam (Itasca County) in 1904. State record precipitation for this date is 1.90 inches at St Cloud (Sherburne County) in 1897; and record snowfall of 15.5 inches at Willmar (Kandiyohi County) in 1943.

Past Weather Features

A slow-moving winter storm dropped 12-16 inches of snow across central Minnesota over January 2-3, 1897. Strong winds blew the snow into 5ft drifts.

January 2-5, 1919 brought a severe Cold Wave to Minnesota, with widespread subzero temperatures. Temperatures bottomed out on the 3rd with most areas reporting morning lows from -20°F to -30°F. It was -40°F or colder in portions of Roseau, Polk, and Clearwater Counties. The daytime high temperature at Rochester was just -15°F.

Another slow-moving winter storm brought heavy snow to many parts of central Minnesota over January 3-4, 1943. Many observers reported 8-15 inches and blizzard conditions prevailed in some far western counties.

January 3, 1998 brought an early taste of spring to many parts of the state. Daytime high temperatures reached the 40s F in most places, while portions of Pipestone and Yellow Medicine Counties saw temperatures in the 50s F.

Outlook

Partly sunny to start out the weekend, with temperatures somewhat closer to normal. Warmer with increasing cloudiness on Sunday, and a chance for snow. Another chance for snow later in the day Monday, with temperature dropping below normal for the beginning and middle of next week. There will be some moderation in temperatures to above normal values by Friday. No major storms are seen.

Highly fluctuating temperatures

Minnesota WeatherTalk, January 10, 2020
By Mark Seeley

On a statewide basis the first week of 2020 was over 14°F above normal, a mild start to the year. It was 48°F at Preston (Fillmore County) for New Year's Day. A good deal of cloud cover, as well as higher than normal wind speeds help keep the temperatures above normal throughout this interval. No long-term daily maximum or minimum temperature records were set during this warm period, although at Wheaton (Traverse County) on January 3rd they tied the record for the warmest minimum temperature with a reading of 33°F.

Following a cold front passage on January 7th, temperatures plummeted to subzero values around most of the state. In fact, it fell into the -30s F at Isabella, Cotton, Kabetogama, and Baudette. A reading of -30°F on the morning of January 8th was a record low at Kabetogama. Warroad only saw of a high temperature of 3°F on the 8th as well. The -34°F reading at Isabella (Lake County) was the nation's lowest temperature on the 8th and the first time Minnesota has been coldest in the nation in 2020.

Outlook models suggest a colder and snowier weather pattern will dominate Minnesota during the second half of January.

Weekly Weather Potpourri

NOAA National Centers for Environmental Information (NCEI) have compiled a summary of weather and climate disasters from the past decade (2010-2019) and they are summarized in an article by Adam B. Smith. This excerpt from the article should catch the attention of the insurance industry: "In broader context, the total cost of U.S. billion-dollar disasters over the last 5 years (2015-2019) exceeds $525 billion, with a 5-year annual cost average of $106.3 billion (CPI-adjusted), both of which are records. The U.S. billion-dollar disaster damage costs over the last decade (2010-2019) were also historically large, exceeding $800 billion from 119 separate billion-dollar events. Moreover, the losses over the most recent 15 years (2005-2019) are $1.16 trillion in damage from 156 separate billion-dollar disaster events."

Over the past two months the Australian Bureau of Meteorology has been documenting some extremes records of drought, high temperatures, and bush fires. Many of these records are unprecedented in the context of their historical climate measurements. The increase in extremely hot days is contributing to observed trends in fire danger across many parts of Australia over the past few decades, especially in the southeast during the Southern Hemisphere spring months of September-November.

NOAA announced earlier this week that 2019 was the 2nd wettest year in the historical

record for the USA. For the states of ND, SD, MN, WI, and MI it was the wettest year in their historical records. In addition, NC, GA, and AK reported their warmest year in history. For the first time on record, Alaska's annual average temperature was above freezing (32.2 degrees), 6.2 degrees above the long-term average. You can read more about this from NOAA and from Brian Donegan at the Weather Underground.

High nutrient concentrations cause water quality problems in lakes, and as the climate warms, these issues will only get worse. A new model assesses future scenarios and explores solutions. Perhaps this new model which was used in Norway can be applied to some of North America's lakes as well. You can read more from the Journal of Geophysical Research.

MPR listener question
What is the longest period in the climate record with consecutive morning low temperature readings that are subzero?

Answer
Not sure what Minnesota location you are talking about, but I will give a couple of answers. In the Twin Cities climate record, the longest such period is from January 18, 1936 to February 22, 1936, a period of 36 days. For the Red River Valley, the record is from Moorhead, MN, and spans from January 10, 1936 to February 22, 1936, a period of 44 days.

Twin Cities Almanac for January 10th
The average MSP high temperature for this date is 23 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 7 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for January 10th
MSP weather records for this date include: highest daily maximum temperature of 52 degrees F in 2012: lowest daily maximum temperature of -14 degrees F in 1912; lowest daily minimum temperature is -30 degrees F in 1886; highest daily minimum temperature of 33 degrees F in 1928; record precipitation of 1.13 inches in 1975; and record snowfall of 4.0 inches also in 1976.

Average dew point for January 10th is 3 degrees F, with a maximum of 39 degrees F in 1980 and a minimum of -39 degrees F in 1982.

All-time state records for January 10th

The state record high temperature for this date is 58 degrees F at Madison (Lac Qui Parle County) in 1990 and at Granite Falls (Chippewa County) in 2012. The state record low temperature for this date is -52 degrees F at Pokegama Dam (Itasca County) in 1905. State record precipitation for this date is 2.12 inches at Grand Portage (Cook County) in 1975; and record snowfall of 15.0 inches at Brainerd (Crow Wing County) in 1983.

Past Weather Features

On a statewide basis the coldest January 10th came in 1912 in the midst of a two weeklong Cold Wave. Every climate station in the state reported subzero temperature readings, with numerous communities reporting -40°F or colder in the north. The daytime high only reached 26°F at Angus (Polk County) in the Red River Valley.

One of the worst blizzards of the 20th Century occurred over January 10-12, 1975. Mixed precipitation (rain and snow) fell during the storm accompanied by constant wind of 30-50 mph, and gusts as high as 80 mph. Snow drifts piled up to 15 to 20 feet on Minnesota roads and highways. There were 35 storm related deaths, widespread power outages, and business and school closures. Numerous precipitation and snowfall records were established by this storm, with over 2 feet of snow in Crow Wing County. The National Weather Service was praised for its accurate weather forecasting.

The warmest January 10th in history was in 2012 when over 55 climate stations reported afternoon high temperatures in the 50s F. Little snow cover that winter allowed the sun’s energy to heat the landscape, as peak temperatures were reached between 2pm and 3pm.

Outlook

Cooler than normal, but dry and sunny through the early part of the weekend. Then increasing cloudiness on Sunday with a chance for snow flurries later in the day. Temperatures will warm a bit and be closer to normal for Sunday through Tuesday. Another chance for light snow will come later on Monday and early Tuesday. From Wednesday through next weekend temperatures will be trending sharply downward, several degrees colder than normal.

Roller coaster temperatures with a big snowstorm

Minnesota WeatherTalk, January 17, 2020
By Mark Seeley

The temperature roller coaster pattern continued this week, with many climate stations reporting daily temperatures that ranged from 7 to 13 degrees F warmer than normal (some daytime highs were above the freezing mark), then plummeting to temperatures that were 10 to 20 degrees F colder than normal by Thursday, January 16th. In fact, the reading of -35°F at Fosston (Polk County) on January 16th was the nation's lowest temperature reading, the 4th time this month that Minnesota has reported the nation's lowest temperature. Several places reported minimum temperatures of -20°F or colder on that date, including -26°F at Park Rapids and Staples.

In addition, another episode of dangerous windchill conditions occurred on Thursday the 16th, with many places reporting values of -40°F or colder, including a reading of -45°F at Waskish (Beltrami County). Other dangerous Wind Chill conditions had occurred in places on the 8th and the 11th of this month.

With the season's largest snowstorm upon us, there is an expectation that by midday Saturday most areas of the state will see significant snowfall accumulations, as well as significant drifting of snow because of high winds. Reviewing the snow season so far shows that many areas of the state have already reported over 50 inches, while some in the northeastern counties have reported over 60 inches (Duluth, Isabella). The expected footprint of the present snowstorm will be a large one, so that some areas of the state will undoubtedly exceed their average snowfall for the season by the time this storm passes. Both Friday and Saturday are expected to see some blizzard conditions prevail, making travel difficult.

Weekly Weather Potpourri

NOAA scientists released this week a recap of the 2019 global climate pattern. On a worldwide basis 2019 was the 2nd warmest year in the historical record dating back to 1880. The five warmest years in the global record have occurred since 2015, while 9 of the 10 warmest years have occurred since 2005. The only land area worldwide where temperatures averaged over the year were cooler than average was a small pocket of the northern United States, including portions of Minnesota.

From the BBC Weather Center: "Australians are celebrating the arrival of much-needed rain in parts of the nation's bushfire-ravaged south-east. Though more wet weather is needed to end the fires, the rain has brought a welcome reprieve to many areas. Other parts, however, have not been as lucky. Storms have also helped disperse smoke in Melbourne, which has endured hazardous air quality in recent days."

New research from the University of Colorado (as reported by Science Daily) shows a

link between climate change and violent crime. This study is published in Environmental Research Letters. As reported in Science Daily the authors conclude that “we are just beginning to scratch the surface on the myriad ways climate change is impacting people, especially through social systems and health," Karnauskas said. "We could see a future where results like this impact planning and resource allocation among health, law enforcement and criminal justice communities."

AGU-EOS reports this week on new research from the University of British Columbia which states that “climate change could significantly lower the number of skiable days across western North America, forcing some ski resorts to shut down entirely.” Snow seasons have already shown signs of shrinking in duration at some resorts.

MPR listener question
Is it my imagination or are the number of cloudy days increasing? Have the past few winters been as gloomy and cloudy as I think?

Answer
Indeed, based on measures of cloudiness as well as solar radiation (measured amounts of energy from the sun), six of the past eight winter seasons (Dec-Feb) have been gloomy with more than average cloudiness and less than average solar radiation. December of 2019 brought 20 mostly cloudy or fully cloudy days, while January so far has brought 10 mostly cloudy or fully cloudy days. Solar radiation measured at the University of Minnesota St Paul Climate Observatory shows than January is about 16 percent below average through the first two weeks of the month.

Even on an annual basis the measurements of solar energy from the University of Minnesota Climate Observatory on the St Paul Campus show less than normal solar energy for 7 of the most recent 10 years, including all of 2019, coincidentally the wettest year in state history.

Twin Cities Almanac for January 17th
The average MSP high temperature for this date is 23 degrees F (plus or minus 14 degrees F standard deviation), while the average low is 7 degrees F (plus or minus 15 degrees F standard deviation).

MSP Local Records for January 17th
MSP weather records for this date include: highest daily maximum temperature of 44 degrees F in 1894: lowest daily maximum temperature of -12 degrees F in 1962; lowest daily minimum temperature is -26 degrees F in 1967; highest daily minimum temperature of 35 degrees F in 1876; record precipitation of 0.90 inches in 1996; and record snowfall of 5.1 inches also in 1932.

Average dew point for January 17th is 5 degrees F, with a maximum of 39 degrees F in

1973 and a minimum of -37 degrees F in 1962.

All-time state records for January 17th
The state record high temperature for this date is 58 degrees F at Winona (Winona County County) in 1889. The state record low temperature for this date is -54 degrees F at Embarrass (St Louis County) in 2005. State record precipitation for this date is 2.20 inches at Byron (Olmsted County) in 1996; and record snowfall of 15.0 inches at Fort Ripley (Crow Wing County) in 1870.

Past Weather Features

With little or no snow cover a very warm day prevailed on January 17, 1919 across the state. Most areas of southern and western Minnesota saw afternoon high temperatures reach the 40s F, while Luverne measured a high of 53°F. The morning low temperature was just 32 degrees F at Albert Lea.

January 17, 1982 was the coldest in state history. With abundant snow cover and a polar high-pressure system settling over the state low temperature plummeted to the -30s and -40s F in much of central and northern Minnesota. Cook reported -50°F while Tower reported -52°F. The afternoon high temperature at Roseau and Cass Lake only reached -17°F.

January 17-19, 1996 brought heavy snows and even blizzard conditions to some parts of Minnesota. Many areas of the state reported 10-15 inches of snowfall, with Tower and Brimson reporting over 20 inches. In western counties wind gusts up to 60 mph were reported, with dangerous Wind Chill conditions. Many schools and businesses closed. Accumulating ice from freezing rain caused some power outages, and portions of Highway 14 were closed for a time between New Ulm and Sleepy Eye.

Outlook

Strong winds on Saturday will blow snow around and make visibility difficult in some areas of Minnesota. Snowfall will be tapering off by Saturday afternoon. Driving on Saturday may be difficult because of high winds and blowing snow. Sunday through Tuesday we will see partly to mostly sunny conditions but with colder than normal temperatures prevailing. A moderation in temperature begins the middle of next week as daytime highs return to above normal levels. Much of the week will be dry.

Special Edition: MCAP Award Winners for 2019

Minnesota WeatherTalk, January 29, 2020
By Mark Seeley

The **Minnesota Climate Adaptation Partnership (MCAP)** hosted the annual statewide conference last week on January 22nd at the University of Minnesota St Paul Campus. You can learn more about this conference at the Water Resources Center web site.

Each year MCAP presents awards for outstanding accomplishments in the area of climate adaptation. The awards cover four categories: Business, Institutional, Organizational, and Individual.

I had the honor to host the Awards Program and I wanted to highlight the wonderful award winners in this special edition of Minnesota WeatherTalk. You can read more online about the efforts of these people at the MCAP Awards Summary.

In the **Business Category** we have a wonderful example of collaboration from diverse expertise, as well as deployment of interdisciplinary knowledge and technology that created the first biosolar roof top in Minnesota upon the Guardian Building in downtown St Paul. The collaborators include the Capitol Region Watershed District (with grant monies), Sustology (consultants in sustainability), AD Greenroof (green roof consultants), (Hanging Gardens a Milwaukee-based green roof consultant), Sundial Solar (solar photovoltaic consultants), and AWH Architects. The biosolar roof on the Guardian building finished November of last year provides watershed protection, renewable clean energy, reduces the urban heat island, and establishes pollinator habitat. It will serve as a model for the design and deployment of urban roof technology for years to come. Craig Wilson and John Greene are here to pick up this award.

In the **Institution Category** our winner is the 2019 Minnesota State Hazard Mitigation Plan-a collaboration of Minnesota Homeland Security and Emergency Management with the Geospatial Analysis Center of the University of Minnesota-Duluth (U-Spatial). It is the first statewide Plan of any kind to comprehensively integrate climate change and climate adaptation knowledge and data. The Plan was adopted in March of 2019 and will be used by counties as a basis for their local hazard mitigation plans, and it will undoubtedly be used by other states our region as model for integrating climate change and adaptation knowledge into their plans for hazard mitigation.
Congratulations and work well done. Jennifer Nelson from the Department of Public Safety-Homeland Security and Emergency Management and Stacey Stark, Director of Geographic Information Systems Lab at UM-Duluth picked up the award.

For the **Organization Category** we have a salute to the great work from the partnership of the Mississippi Park Connection and the Science Museum of Minnesota. They took an idea planted by the MPCA and launched a major effort to establish multiple gravel bed tree nurseries and educate the public about the benefits of using them to grow resilient trees. A gravel bed nursery gives saplings a head-start on successful transplant as trees show less shock and higher survivability and at a reduce cost over the use of containerized or balled saplings. 6,000 bare root trees were planted along the Mississippi National River and Recreation Area, including 300 in an area where they replace ash trees lost to Emerald Ash Borer. As we journey through climate change in coming years, we must broaden the use of tree canopy cost effectively and especially in the urban environment. This project has been successful in securing investment for continued efforts in expanding gravel bed tree nurseries well into the future. Bravo! Mary Hammes and Pat Hamilton picked up the award.

In the **Individual Category** the MCAP award goes to a well-known and highly respected person known throughout the state as MPR's chief meteorologist Paul Huttner. Paul has earned the trust and praise of citizens across the great state of Minnesota for his meteorological expertise, not only to deliver a correct forecast (most of the time), but also for his ability to provide insights and knowledge about what went into the forecast. But since 2013 Paul has broadened his contributions to MPR in developing "ClimatCast", a one-of-a-kind weekly program which features knowledge and expertise about our changing climate, its impacts, and how we might adapt to climate changes, and move in the direction of mitigating the future pace of climate change. He has merged the disciplines of meteorology, climatology, and journalism to bring us all greater knowledge about the issue of climate change and its impacts in our own state, challenging us individually and collectively to think about things we can do to slow the trajectory of change, and make our lives and the lives of our children and grandchildren more hopeful. Paul Huttner received the award and thanked his MPR colleagues.

Lack of Sunshine Documented

Minnesota WeatherTalk, January 31, 2020
By Mark Seeley

Over the past week I have heard many people talking about the lack of sunshine. Indeed 22 days this month in the Twin Cities have brought mostly cloudy skies or completely cloudy conditions. And this followed nine consecutive days of cloudiness to conclude December in most places. The National Weather Service observations also show that fog or haze have plagued the Twin Cities on more than half of the days this month.

Further according to measurements of solar radiation from the University of Minnesota St Paul Climate Observatory the solar radiation received so far this January is the lowest amount in the records for the month which started back in 1963, worse than the very dim Januarys of 1969, 1980, 1998, and 1999. There have been 9 consecutive cloudy days in the Twin Cities, Rochester, and other cities.

The cloudiness has helped to keep the month of January warmer than normal. As is more commonly the case much warmer nights, and marginally warmer days. For example, in the Twin Cities daytime high temperatures have been averaging 3°F above normal, while nighttime lows have been averaging 6°F above normal.

You can read more about this gloomy January from the Minnesota State Climatology Office.

Obviously, many people have complained of Seasonal Affected Disorder, while many others are tired of the rutted roads and persistent slippery conditions, especially on north-facing roads and sidewalks.
Fortunately, it appears as though we will get some sunshine for this coming weekend under partly cloudy skies, at least some welcome relief.

Preliminary Climate Summary for January 2020

Yet another warmer and wetter than normal month for Minnesota. The average monthly temperature for January 2020 ranged from 4 to 7°F above normal across the state. The range of extreme temperatures was 54°F at Rushford (Fillmore County) on the 4th, to -40°F at Baudette (Lake of the Woods County) on the 11th. There were no new daily maximum temperature records set across the state. Within the climate station network, eleven locations reported tying or setting at least one warm daily minimum temperature record during the month. Minnesota reported the lowest temperature in the 48 contiguous states six times during the month.

Precipitation was slightly above normal for January at most locations across the state.

Wettest areas were northeastern and south-central counties. A few places in the northeast like Isabellla, Grand Marais, and Two Harbors reported over 2 inches of precipitation for the month. Some portions of western Minnesota were drier than normal. Within the climate station network, there were some daily precipitation and snowfall records set during January, including 7 inches of snowfall at Cotton (St Louis County) on the 18th and 1.10 inches of melted snow at Two Harbors on the same date. For January snowfall, Grand Marais led the state with over 31 inches during the month. Many other northern locations reported over 20 inches, while most climate stations reported between 6-12 inches.

Weekly Weather Potpourri

There is an interesting article this week from the US Climate Resilience Toolkit about how decreasing Arctic Sea Ice is allowing for more potential shipping routes across the Arctic Ocean during the late summer season. Beside shipping vessels even tourism vessels are considering new routes.

The United Kingdom Meteorological Office release a report earlier this month confirming that 2019 concluded the warmest decade globally in climate records dating back to 1850. Further 2019 was the 2nd warmest globally, trailing only 2016 when an El Nino Episode was in play.

NOAA's Storm Prediction Center estimated 1,520 tornadoes occurred in the U.S. in 2019, an active year. Two states reported a record number of tornadoes: In Oklahoma, 149 tornadoes were documented in 2019, topping the previous record of 145 tornadoes from 1999. Mississippi also tallied a record annual count of 115 tornadoes in 2019. According to the Weather Underground Utah, Alaska, New Hampshire, and Hawaii were tornado-free in 2019.

Weather in Miami, FL for the Super Bowl on Sunday appears to be dry and comfortable with temperatures in the 60s F. There will be rain on Saturday, so the field may still be wet. Winds are expected to be moderate from the northwest.

MPR listener question

Last winter only a small fraction of our snowfall came in the November through January period, then we got over 59 more inches from February to April. How often does the second half of the snow season bring more snow than the first half?

Answer

From the Twin Cities climate record back to 1885, the second half of the snow season (represented by February through April) brought more snowfall than the first half (November through January) only about 40 percent of the time (55 winters). So, it really is not that uncommon. So far for the winter of 2019-2020 MSP has reported 34.8 inches

of snowfall, so it is certainly conceivable that we get see more than that the second half of the snow season.

Twin Cities Almanac for January 31st

The average MSP high temperature for this date is 25 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 8 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for January 31st

MSP weather records for this date include: highest daily maximum temperature of 46 degrees F in 2009: lowest daily maximum temperature of -9 degrees F in 1887; lowest daily minimum temperature is -27 degrees F in 1887; highest daily minimum temperature of 34 degrees F in 1993; record precipitation of 1.16 inches in 1881; and record snowfall of 6.2 inches also in 1908.

Average dew point for January 31st is 4 degrees F, with a maximum of 39 degrees F in 1973 and a minimum of -37 degrees F in 1962.

All-time state records for January 31st

The state record high temperature for this date is 57 degrees F at Springfield (Brown County County) in 1989. The state record low temperature for this date is -55 degrees F at Embarrass (St Louis County) in 1996. State record precipitation for this date is 1.70 inches at Glenwood (Pope County) in 1986; and record snowfall of 14.8 inches at Burlington (Becker County) in 1858.

Past Weather Features

Warmest January 31st was in 1989 when most climate stations in the state reported daytime highs in the 40s F. Many southern and western Minnesota communities saw the afternoon temperature rise into the 50sF and people were seen taking their lunch outside. The low temperature never dropped below 37°F at the University of Minnesota St Paul Campus.

On January 31st last year (2019) most citizens were staying indoors as morning temperatures ranged from -20°F to -50°F in most places and even afternoon highs were subzero. Detroit Lakes reported an afternoon high of -23°F. Wind Chill values ranged from -40°F to -60°F, and many schools were closed.

Outlook

Cloudiness will continue on Saturday but with warmer temperatures. Some periods of sunshine will occur on Sunday with even warmer temperatures, in many areas ranging from 35°F to 45°F. Continued mild on Monday, but with a chance for flurries by Monday night. Temperatures will fall back to near normal for Tuesday and Wednesday, then

warm again by Thursday with a chance for flurries.

A Dose of Arctic Cold

Minnesota WeatherTalk, February 14, 2020
By Mark Seeley

The passage of a strong cold front brought very cold temperatures to all of Minnesota over February 12-13 this week. Subzero temperature readings prevailed, with single digits below to teens below zero in southern counties and lows in the minus 20s F to minus 30s F in the north. Kabetogama reported the state low with -39°F on the morning of the 13th, which was also the nation's lowest temperature. Then Isabella reported -40 degrees F on February 14th which was also the nation's lowest on that date.

Windchill readings ranged from the minus 20s to as cold as -48°F in the north (Fosston). For many parts of the state this was the third or fourth episode of dangerous wind chill conditions this winter, others having occurred over December 16-18, January 11-12, and January 16-17. Many stations reported high temperatures on Thursday that were still subzero. The Twin Cities made it up to a high of 1 degree F.

Spring snow melt flooding potential is still high

On Thursday, February 13th, the National Weather Service released an update for the risk of spring flooding this year. High levels of soil moisture, higher than normal flow volume on Minnesota rivers and streams, along with slightly above normal water content in the landscape snow cover are all factors that favor some chance for significant flooding. Fortunately frost depths in the soil are not unusually deep. The remaining unknown factors are the pace of snow melt that will occur as temperatures warm up, and the pattern of spring precipitation across the state (whether it will be above or below normal). Future updates will provide a better look at some of the uncertain factors, but the risk for significant spring flooding remains above normal in many areas of the state.

Weekly Weather Potpourri

AGU-EOS this week contains an interesting story about using the latest science to help communities to better respond to the rapid pace of climate change in Alaska. In many areas of that state climate is changing at a remarkable pace, threatening both community infrastructure as well as natural resources.

According to NOAA scientists January of 2020 was the 5th warmest for the 48 contiguous states. This was not due to a prolific number of record-setting temperatures, but to a persistent pattern that brought about normal temperatures for most the month, especially in the eastern half of the country.

MPR question
You have spoken on numerous occasions about how the pace of climate change has accelerated in our state, especially with respect to precipitation (increasing in all areas of the state). But what regions of the state have seen the largest increases in average precipitation?

Answer
Most clearly the data show the largest increases in average annual precipitation have occurred in the southern counties of Minnesota, which are getting commonly 20 to 30 percent more than they used to 60 years ago. Western counties have seen increases of 10 to 20 percent and northern counties have seen increases of 5 to 15 percent.

Twin Cities Almanac for February 14th
The average MSP high temperature for this date is 29 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 12 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for February 14th
MSP weather records for this date include: highest daily maximum temperature of 50 degrees F in 1882: lowest daily maximum temperature of -5 degrees F in 1920; lowest daily minimum temperature is -25 degrees F in 1875; highest daily minimum temperature of 33 degrees F in 2002; record precipitation of 0.43 inches in 1950; and record snowfall of 6.4 inches also in 1950.

Average dew point for February 14th 11 degrees F, with a maximum of 42 degrees F in 1954 and a minimum of -33 degrees F in 1946.

All-time state records for February 14th
The state record high temperature for this date is 66 degrees F at Windom (Cottonwood County) in 1954. The state record low temperature for this date is -47 degrees F at Bagley (Clearwater County) in 1906. State record precipitation for this date is 2.15 inches at Lynd (Lyon County) in 1919; and record snowfall of 22.0 inches at Grand Marais (Cook County) in 1936.

Past Weather Features

February 14, 1906 brought record-setting Arctic cold to many parts of Minnesota. Most climate stations reported morning temperatures in the minus 20s F to minus 30s F. Portions of Becker, Mahnomen, and Clearwater Counties reported readings in the -40s F. The temperature never rose about -4 degrees F all day at Crookston.

February 14, 1954 brought a touch of spring to the state, as many communities saw afternoon high temperatures climate into the 60s F. Several workers took their lunch

break outside.

Outlook

Early in the weekend will be mostly cloudy, but with warmer temperatures. Daytime temperatures will moderate in the 20s and 30s F Saturday through Monday, with a chance for snow on Monday. Then temperatures will decline by the middle of next week. Much of next week will be dry, with cooler than normal temperatures until late in the week, when temperatures will climb again to above normal values.

Perhaps the Last Arctic Blast

Minnesota WeatherTalk, February 21, 2020
By Mark Seeley

After moderating a bit since Valentine's Day (last Friday), temperatures plummeted over February 18-20 this week with an Arctic high-pressure system slowly moving over the state. Many portions of the state saw temperatures drop\ to the teens and twenties below zero, while areas in St Louis and Lake Counties reported low temperatures from -32°F to -40°F. For three days in a row this week Minnesota reported the nation's lowest temperature. Even with sunny skies the daytime high temperatures remained quite cold. For February 19th Detroit Lakes reported a maximum afternoon temperature of only 2°F, and Warren (Marshall County) in the Red River Valley only reached a high of -3°F.

The good news is that recent outlook guidance from the NOAA Climate Prediction Center indicates that for the balance of the month temperatures will trend upward either near normal or above normal. This means that at least for the southern half of the state we may have seen the last subzero temperature reading until next winter. Temperatures are expected to remain near normal as the month of March begins as well. For the most part the outlook models also call for an extended drier than normal period, with no major snowstorms on the horizon.

USGS Reports High Stream Flow Volumes

The USGS reports that 2019 brought record setting high volume stream flow for 46 percent of the gaged stations in southern Minnesota watersheds. The high-volume flow records were not set with peaks of record stream flow, but by persistence of high-volume flow. Even now as winter dissipates high volume flow remains in many streams and rivers.

29 percent of the gaged stations on the Mississippi, Minnesota, and St Croix Rivers report their greatest winter flow rates

More than half of the gaged stations report winter volume flow in the 95th percentile. Hydrologists hope that these high discharge volumes shrink significantly before a prolonged thaw period settles in, so that the risk of flooding along the major rivers will be reduced.

Weekly Weather Potpourri

Pete Boulay from the Minnesota State Climatology Office has produced the first comprehensive map of the precipitation values and their historical ranking for 2019, wettest year in state history. Roughly 40 percent of the state landscape received over 40 inches of precipitation in 2019, and about 80 percent of the landscape reported annual precipitation that was greater than the 90th percentile historically. Areas of

southern Minnesota received annual precipitation in 2019 that was 16 to 18 inches greater than normal.
In a rare event on Monday February 17th, US National Weather Service radar captured birds migrating from South America over Florida. Atmospheric conditions caused the systems to detect the birds, which took hours to fly over the Key West station. You can read more from the Tampa Bay Time.

On Wednesday, February 19th "pure whiteout conditions" along a highway near Montreal, Canada cause a 200-vehicle pile up to occur. At least two people were killed. Blowing snow was blamed for the blinding conditions. The incident was written up by the Weather Underground.

This week the AGU-EOS bulletin features an interesting article about how scientists have discovered that in the mid to high latitudes climate change has diminished the persistence of river ice on major rivers. Using 400,000 satellite images from 1984 to 2018, the researchers found that on average, ice cover declined by almost a week over those decades. This has important implications for the health of these river ecosystems.

MPR listener question
We were wondering about the state record climate readings for Leap Day, February 29th. Since they are measured only every 4 years, they are somewhat odd relative to the other calendar days?

Answer
Yes, and No. We have for our daily statewide climate records a sampling of measured data that go back 130 to 150 years. But for February 29th we have a much smaller pool with about 33 years measured. Here is what the statewide daily climate record values show for Leap Day in Minnesota:

Precipitation 2.23 inches at Faribault in 2012…..in range with all other dates just before and just after that date.

Maximum temperature 65°F at Forest Lake in 2000….this number is lower than the 7 days before Leap Day, and vastly lower than all days in March.

Minimum temperature -38°F at Roseau in 1916……this number is not as cold as the first 6 days of March and with the exception of February 27th (-40°F at Warroad in 1913) is nowhere near all the all minimum temperature records for February dates.

Snowfall inches of snowfall at Ortonville (Big Stone County) in 2012……this number is tied for the lowest daily snowfall record for any date in February (also 12.0 inches for February 3 at Caledonia in 1983.

So overall, the daily precipitation record for Leap Day appears to represent the overall climate record pretty well. But the other records are not especially representative since they come from a much shorter sampling period.

Twin Cities Almanac for February 21st
The average MSP high temperature for this date is 31 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 15 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for February 21st
MSP weather records for this date include: highest daily maximum temperature of 62 degrees F in 2017: lowest daily maximum temperature of -1 degrees F in 1963; lowest daily minimum temperature is -21 degrees F in 1873; highest daily minimum temperature of 44 degrees F in 1930; record precipitation of 0.82 inches in 1882; and record snowfall of 5.5 inches in 1962.

Average dew point for February 21st 13 degrees F, with a maximum of 52 degrees F in 1930 and a minimum of -33 degrees F in 1963.

All-time state records for February 21st
The state record high temperature for this date is 64 degrees F at Whitewater State Park (Winona County) in 1943. The state record low temperature for this date is -51 degrees F at Baudette (Lake of the Woods County) in 1966. State record precipitation for this date is 2.02 inches at Two Harbors (Lake County) in 2014; and record snowfall of 19.2 inches at Madison (Lac Qui Parle County) in 2011.

Past Weather Features

An Arctic Cold Wave gripped the state over February 20-22, 1939. The landscape was already blanketed with a heavy coating of snow, so temperatures fell to record cold levels. Much of central and northern Minnesota saw morning low temperatures of -30°F or colder. Over a dozen climate stations reported readings between -40°F and -50°F, and the high temperature never rose above 0 degrees F at Fosston for over 3 days.

In a relatively snow-free landscape temperatures across southern Minnesota soared into the 60s on February 21, 1981. Bright sun and thawed soils provoked some farmers to go out and till, while some even planted small grains.

A slow-moving low-pressure system crossed the state and brought heavy snowfall to many areas over February 20-21, 2011. So, climate stations reported record amounts including over 16 inches at Granite Falls, Montevideo, Milan, Dawson, and Springfield. Madison and Ortonville reported over 20 inches.

Outlook

Relatively sunny and warm over the weekend with some areas seeing 40 degrees F temperatures. Increasing cloudiness on Monday with a chance for light snow. Temperatures will cool back closer to normal for the Tuesday through Friday period with chances for light snow or snow flurries.

Preliminary February Climate Summary

Minnesota WeatherTalk, February 28, 2020
By Mark Seeley

Despite some erratic fluctuations in daily temperatures most areas of the state are reporting an average monthly temperature that is within 1°F of normal. Only the 9th time since 1895 that the February mean temperature has been that close to normal. Extremes for the month ranged from 58°F at Bemidji (Beltrami County) on the 22nd to -40°F at Isabella (Lake County) and Cotton (St Louis County) on the 20th. Minnesota reported the nation's coldest temperature (48 contiguous states) 8 times during the month and the National Weather Service had to issue a Wind Chill Advisory on several days.

Most climate stations in the state reported below normal precipitation for the month. The exception was in southeastern and south-central Minnesota where some areas reported over an inch of precipitation, mostly thanks to the winter storm of February 9th. The highest reported precipitation came from near Austin with 2.10 inches. Most areas reported just a few inches of snowfall, but near New Ulm and Mankato over 20 inches was reported.

Some climate stations reported 7-10 days with wind gusts over 30 mph. Thankfully over the last week of the month, some of the snow cover was beginning to melt and gradually run off, reducing the spring flood risk in some areas.

Weekly Weather Potpourri

This week NOAA released an updated article about scientific consensus on global climate change. In nearly all scientific societies and academies it is not a contentious issue. The vast majority agree that climate change is real and mostly driven by human activity.

"Inhaling particulate matter is hard on human health. New research shows that Southern California's Santa Ana winds can clear or exacerbate fine-particulate pollution depending on wildfire conditions." This is from a feature article in this week's AGU-EOS newsletter discussing the cases of wildfires and Santa Ana winds that have occurred in Southern California over the period from 1999-2012.

MPR listener question

We live off Minnesota Highway 2 between Crookston and East Grand Forks in the Red River Valley. Lately there has been a lot of talk about the spring flood threat along the Red River and how it may depend to a degree on whether March precipitation is above or below normal this year. Can you shed some perception about trends and outlooks for March precipitation in our area?

Answer
I understand your concern. Looking at the data for your area 3 of the most recent 5 years, 5 of the most recent 10 years, and 10 of the most recent 20 years have brought above normal March precipitation. No emphatic trend is evident. With respect to the weather outlook, it appears that March may start out a bit warmer than normal with a chance for above normal precipitation, but then the pattern is expected to turn cooler and drier for much of the month. Hopefully, the frozen water on the landscape will be slowly discharged by successive thaw cycles.

Twin Cities Almanac for February 28th
The average MSP high temperature for this date is34 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 18 degrees F (plus or minus 12 degrees F standard deviation).

MSP Local Records for February 28th
MSP weather records for this date include: highest daily maximum temperature of 57 degrees F in 1932: lowest daily maximum temperature of -9 degrees F in 1962; lowest daily minimum temperature is -26 degrees F in 1962; highest daily minimum temperature of 38 degrees F in 1895; record precipitation of 0.70 inches in 2012; and record snowfall of 8.0 inches also in 1907.

Average dew point for February 28th 15 degrees F, with a maximum of 40 degrees F in 1983 and a minimum of -40 degrees F in 1962.

All-time state records for February 28th
The state record high temperature for this date is 66 degrees F at Pipestone (Pipestone County) in 1924. The state record low temperature for this date is -50 degrees F at Pokegama Dam (Itasca County) in 1897. State record precipitation for this date is 2.21 inches at Isabella (Lake County) in 1998; and record snowfall of 16.5 inches at Gull Lake (Cass County) in 1948.

Past Weather Features

A slow-moving winter storm brought heavy, wet snow to many areas of the state over February 26-28, 1948. The storm initially brought rain, but soon turned over to snow. Many areas received 4-8 inches, while Brainerd reported 14 inches of snowfall. It was the last major snowstorm of the season for many.

Arctic high pressure dominated the state on February 27, 1962. Many areas set record cold temperatures with readings in the -20s and -30s F. In Angus and Red Lake Falls in the Red River Valley the afternoon temperature only climbed up to -12°F.

Widespread warmth prevailed on February 27, 2000, especially across southern and western counties where many afternoon temperatures climbed into the 50s F. Both Luverne and Winnebago reported 60°F under bright sunshine.

Outlook

Mostly sunny over the weekend with above normal temperatures. Some areas will see afternoon highs in the 40s F. Temperatures will drop back a little bit on Monday but generally remain near normal or a bit above normal next week, with little chance for precipitation until late Wednesday or Thursday.

Gentle, Lamb-Like Start to March

Minnesota WeatherTalk, March 06, 2020
By Mark Seeley

With many sunny days, little precipitation and temperatures averaging 6 to 10 degrees warmer than normal, March has started as gentle as a lamb. Well over 70 percent of all climate stations in the state have reported daytime high temperatures in the 40s F so far, with a few spots around the Twin Cities and Winona reaching 50°F. Overnight low temperatures have ranged for the most part from the single digits to the 20s F meaning a high frequency of freeze/thaw cycles.

With the frequent freeze-thaw cycles and the general lack of precipitation so far this month (many areas had not reported any precipitation or only a trace for 16 consecutive days), much of the water-laden snow cover across the state has been gradually disappearing, helping to alleviate some of the high flood risk. The National Weather Service did have a number of flood warnings in place this week in western portions of the state due to the rate of melting snow, and in some cases ice jams. Some areas of the state were finally getting some measurable precipitation on Thursday, March 5th, but mostly in the range of 0.10 to 0.20 inches. Ely and Kabetogama reported over 4 inches of snowfall.

Beginning this weekend and through much of next week temperatures are supposed to climb higher, perhaps 15-20 degrees F above normal, and we are supposed to see more frequent chances for precipitation. In fact, this climate outlook may prevail for most of the rest of March.

Weekly Weather Potpourri

NOAA writers feature an interesting article this week that describes the Indian Ocean Dipole, a coupled behavioral pattern involving atmospheric pressure and sea surface temperature anomalies similar to the behavioral pattern of El Nino in the Pacific Ocean. They go further to link the recent anomalies in the Indian Ocean Dipole to the severity of the bush fire season in Australia.

The United Kingdom Met Office reported this week that February of 2020 was the wettest in history. Parts of England recorded over four times the average monthly precipitation, and widespread flooding occurred and disrupted travel services. For the winter (Dec-Feb) it was the 5th wettest in history.

From the NOAA-National Weather Service in Nashville, TN: From late in the day on March 2 into the early morning hours on March 3, a regional tornado outbreak spawned numerous tornadoes across southeast Missouri, southern Kentucky, Tennessee, and central Alabama. The worst of these tornadoes, including two strong to violent tornadoes, touched down across Middle Tennessee during the early morning hours of

March 3, 2020, resulting in widespread damage and numerous injuries and fatalities. As of Friday, March 6th, damage surveys have determined four tornadoes touched down across middle Tennessee. There were over 20 fatalities, the worst fatal outbreak of tornadoes for the year 2020 so far.

MPR listener question
I have read in your book (Minnesota Weather Almanac, 2nd edition) about the remarkable month of March of 2012 when so many high temperature records were set. You called it the one of the most anomalous months in Minnesota history. How many Minnesota climate stations reported a temperature of 80°F or higher during that month?

Answer
Indeed, 7 all-time statewide daily high temperature records were set during March of 2012, including the hottest St Patrick's Day (March 17) in history with a reading of 83°F at St James, MN (Watonwan County). Across Minnesota 47 climate stations reported at least one day when the temperature hit 80°F. Even International Falls just missed with a high of 79°Fon the 18th. Overall, the mean monthly temperature across the state was 14 degrees F above normal.

Twin Cities Almanac for March 6th
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 20 degrees F (plus or minus 12 degrees F standard deviation).

MSP Local Records for March 6th
MSP records for this date include: highest daily maximum temperature of 69 degrees F in 2000; lowest daily maximum temperature of 6 degrees F in 1932; lowest daily minimum temperature of -16 degrees F in 1890; highest daily minimum temperature of 44 degrees F in 1983; record precipitation of 0.97 inches in 1983. Record snowfall is 7.0 inches also in 1900.

Average dew point for March 6th is 15°F; the maximum dew point on this date is 55°F in 2017; and the minimum dew point on this date is -18°F in 1955.

All-time state records for March 6th
The state record high temperature for this date is 76 degrees F at Canby (Yellow Medicine County) in 2000. The state record low temperature for this date is -41 degrees F at Embarrass (St Louis County) in 1996. The state record precipitation for this date is 2.50 inches at Austin (Mower County) in 2006. Record snowfall for this date is 16.0 inches at La Crescent (Houston County) in 1959.

Past Weather Features

A Cold Wave swept across the state on March 6, 1955 bringing record-setting subzero temperatures. Many communities in the state reported low temperatures in the teens to twenties below zero, while portions of Red Lake, Koochiching, Roseau, Lake of the Woods, Beltrami, and Polk Counties saw the thermometer drop into the -30s F. The daytime high at Bemidji only reached -5°F.

March 4-7, 1995 brought heavy snowfall to the Red River Valley and other portions of western Minnesota. Many areas reported 10-16 inches of snowfall. Some schools were closed, and many roads required two or more days of snowplowing.

Perhaps the warmest March 6th in state history occurred in 2000 when 50 communities reported an afternoon high of 70°F or greater. Even the nighttime temperature at Rothsay (Wilkin County) never dipped below 46°F. Spring fever prevailed!

Words of the Week: Scotch mist

To some people this is what you sip while sitting in front of a roaring fireplace in the winter. But my frame of reference is strictly meteorological!

This term has been used for generations to describe a combination of thick mist (or fog) and heavy drizzle in Scotland and parts of England. Droplets vary in size from less than .01 inches in diameter to .02 inches in diameter. Some remain suspended in the atmosphere while others fall to the ground. Visibility is greatly reduced. In southwestern England, particularly Devon and Cornwall, the same type of weather is referred to as "mizzle" (a combination of mist and drizzle).

Outlook

More rapid snow melt will occur over the weekend with daytime temperatures running 15 to 20 degrees F above normal, many areas seeing 50°F and some areas registering 60°F, may be a place or two will reach 70°F. A bit of a cool down for Monday, but still warmer than normal much of next week with a chance for precipitation by mid-week, especially in northern sections of the state.

Metering Out Snow Moisture Content

Minnesota WeatherTalk, March 13, 2020
By Mark Seeley

Despite some mixed light precipitation across the state this week (1-3 inches of snow across SE Minnesota), the month of March continues to run warmer and drier than normal. This has been a real blessing for many areas of the state that saw a high risk of spring flooding on the horizon about a month ago. Temperatures have been averaging 5-9°F warmer than normal, and only small doses of precipitation have been recorded so far.

A month ago according to snow surveys done by the National Weather Service many areas of Minnesota showed 4 to 6 inches of water in the surface snow cover, a large quantity to discharge into our already high flowing rivers and streams as the spring thaw began. However similar surveys this week show that much of southern Minnesota now has no snow cover, and where there is snow, the water content is less than one inch. Even in northern counties, especially the Red River Valley the water content has declined significantly to about 2-3 inches. This has certainly helped to alleviate the flood threat for many areas.

Frost has begun to come out of the soil with many areas showing thawing out down to 8 inches or deeper. The soil has it begins to dry will have some ability to take in more precipitation if it comes in light amounts. Still, gaged flow volume measurements from the USGS still show many southern Minnesota rivers are running at higher-than-normal volume for this time of year (90th percentile historically), so their ability to tolerate a high volume of runoff is diminished.

No major spring storms are in sight yet, so perhaps we can expect a continuation of the gradual metering out of the overwinter snow cover across the state.

Weekly Weather Potpourri

Earlier this week NOAA reported on the erratic distribution of precipitation across the nation during the month of February. Many areas of the west and north-central USA were near record dryness for February, while some areas of the SE USA reported close to record-setting wetness.

A recent report from the BBC Science Department describes the accelerated loss of ice from both the Greenland Ice Cap as well as Antarctica, as measured over the years by satellite-based systems. Both are now losing ice mass at six times the rate they were in the 1990s.

There is an interesting article this week posted by Bob Henson of the Weather Underground about the relationships of the Northern Hemisphere seasons with the

spread of the flu virus. Apparently atmospheric moisture content is an important variable. At higher atmospheric water vapor levels, the virus appears to be less stable, as the virus-bearing droplets attract more water vapor and fall out of the air more quickly before infecting someone.

MPR listener question
Please settle a bet we had in Mancini's restaurant of St Paul this week. Many remembered the unusually warm St Patrick's Day of 2012 (80°F in St Paul), but I said we often see at least one 70°F day during the month of March. Am I right?

Answer
Not exactly……since 1873 (147 years) the Twin Cities have seen at least one day in March reach 70°F or higher in only 34 years (about 23 percent of the time). However, over just a quarter of a century 10 years have brought a 70°F or higher temperature in March to the Twin Cities, a frequency of 40 percent. Perhaps this was what you were thinking of.

Twin Cities Almanac for March 13th
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 23 degrees F (plus or minus 12 degrees F standard deviation).

MSP Local Records for March 13th
MSP records for this date include: highest daily maximum temperature of 67 degrees F in 2012; 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 47 degrees F in 2016; record precipitation of 0.78 inches in 2006. Record snowfall is 9.9 inches also in 2006.

Average dew point for March 13th is 22°F; the maximum dew point on this date is 54°F in 1995; and the minimum dew point on this date is -11°F in 1960.

All-time state records for March 13th
The state record high temperature for this date is 80 degrees F at Waseca (Waseca County) in 1927. The state record low temperature for this date is -36 degrees F at Campbell (Wilkin County) in 1896 and at Embarrass (St Louis County) in 2009. The state record precipitation for this date is 1.85 inches at Winona (Winona County) in 1997. Record snowfall for this date is 18.0 inches at Cloquet (Carleton County) in 1940.

Past Weather Features

An Arctic air mass brought record setting cold temperatures to Minnesota on March 13, 1896. Subzero temperatures prevailed, except for far southern Minnesota. Many areas

reported morning lows of -20°F or colder, while portions of Polk, Roseau, Norman, and Wilkin Counties reported lows of -30F or colder. The daytime high temperature at Crookston was only 5°F.

Over March 12-14, 1940 a slow-moving low-pressure system brought a prolonged winter storm to Minnesota delivering very heavy amounts of snow. Many portions of the state reported 10-17 inches of snowfall, while Collegeville (Stearns County) and Minnesota City (Winona County) reported over 20 inches. March 13, 1990 was the warmest on a statewide basis with many climate stations reporting daytime highs in the 60s F. Portions of southern Minnesota saw temperatures climb into the 70s F and overnight lows remain in the 40s F.

Outlook

Partly sunny skies and dry over the weekend but starting out cooler than normal. Warming up into the low to mid 40s F for Monday through Wednesday. Slight chances for some rain on Monday and Wednesday in areas of the state, with the heavier rain possible on Wednesday. Temperatures will moderate around normal.

Significant Precipitation at Mid-March

Minnesota WeatherTalk, March 20, 2020
By Mark Seeley

For much of the southern half of Minnesota the most significant precipitation of the month occurred on Thursday (March 19) of this week. Many areas received between a half inch and an inch of rainfall, the most precipitation since the 2nd week of February. Some southern Minnesota climate stations reported over an inch of precipitation from the storm, including 1.65 inches in Albert Lea and 1.15 inches in Waseca. In some areas, winds gusted to over 30 mph as well, and even over 40 mph in western parts of the state later on Thursday night. A few areas reported less than an inch of snow from the storm. By Friday morning the drop in temperatures combined with the high winds produced Wind Chill Values from 0°F to -20°F around the state.

After a very warm start to the month, temperatures have moderated a few degrees either side of normal this week. Still, the continued loss of snow cover has progressed, especially in the southern half of Minnesota. Some citizens in southern Minnesota have taken the opportunity to clean up yards and gardens a bit where the soil frost is gone. Then again, there are areas of northeastern Minnesota where snow depths are still a foot or more for doing some outdoor recreation activities. Ely still reports 20” of snow depth and Wolf Ridge ELC (Lake County) reports 35 inches.

State and National Parks Open for Visiting

A reminder for citizens who are looking for outdoor destinations that preserve the mandate of “social distancing” during this time of the pandemic emergency: Both State and National Parks are open for visitors. You can take time to appreciate nature and get some fresh air. “Now is a great time to get outdoors,” said DNR Commissioner Sarah Strommen, in a statement noting that state parks, campgrounds, recreation areas and public lands remain open statewide. “Parks are a great place to do some social distancing and enjoy the health benefits of nature.” But with the advice of state health officials, the DNR is also canceling or postponing a number of public events in an effort to reduce the number of people congregating and hopefully slow the spread of COVID-19. So, while state parks are open for visitors, state park visitor centers, contact stations and other buildings are closed. Park admissions can be paid at self-pay stations, and visitors may purchase daily and yearly park passes online. Within the parks, restroom facilities and shower buildings will remain open, and the DNR has pledge increased cleaning.

In addition, CNN reports that Secretary of the Interior David Bernhardt has directed the National Park Serve to waive entrance fees at all national parks that remain open during the coronavirus pandemic in an effort to aid public social distancing.

For our own Voyageurs National Park in northern Minnesota the park remains open to visitors year-round and there is no entrance fee. Citizens are encouraged to get outdoors and experience the park.

New Seasonal Climate Outlooks

Amid all the news this week, the NOAA Climate Prediction Center released a new spring and summer outlook. For the April through June period Minnesota is expected to see a prevalence of warmer and wetter than normal conditions. For some parts of the state these trends are projected to last until August.

Weekly Weather Potpourri

NOAA reports this week that both the month of February and the 2020 winter season (Dec-Feb) finished as the 2nd warmest on record worldwide, trailing only 2016. Cooler than average temperatures prevailed only in portions of Alaska and Northern Canada and Eastern Russia.

As reported by the Associated Press and MPR News, NOAA's National Water Center released a spring flood outlook update this week. Many parts of the nation will see a higher-than-normal flood risk for the spring season. Major to moderate flooding is projected in 23 states, impacting 128 million people. The area's most likely to experience major flooding include parts of North Dakota, South Dakota, and Minnesota. The potential for major flooding is elevated along the Red River, the James River, and parts of the Upper Mississippi River, said Edward Clark, director of NOAA's National Water Center.

MPR listener question

With the current crisis over the coronavirus outbreak there have been dramatic reductions in emissions from airlines and auto traffic. Do you think this will improve air quality measurably?

Answer

It cannot hurt, but I do not know if there will be a measurable effect. According to EPA estimates the transportation industry is now the primary source of carbon dioxide emissions, surpassing power generation since 2017. Many studies have shown that the transportation industry in general contributes a significant fraction of the carbon dioxide and nitrogen dioxide emissions to the atmosphere. It is estimated that aircraft currently account for some 11 percent of CO2 emissions from U.S. transportation sources and 3 percent of the United States' total CO2 emissions. If the decline in motor vehicle and airline traffic persists during this declared pandemic emergency, the reduction in these gases may become measurable in areas that have a history of air pollution monitoring.

Twin Cities Almanac for March 20th
The average MSP high temperature for this date is43 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 26 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for 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 is -9 degrees F in 1965; highest daily minimum temperature of 57 degrees F in 2012; record precipitation of 0.86 inches in 1921; and record snowfall of 7.0 inches also in 1886.

Average dew point for March 20th 22 degrees F, with a maximum of 59 degrees F in 2012 and a minimum of -12 degrees F in 1965.

All-time state records for March 20th
The state record high temperature for this date is 80 degrees F at Cannon Falls (Goodhue County) and several other places in 2012. The state record low temperature for this date is -37 degrees F at Bigfork (Itasca County) in 1965. State record precipitation for this date is 2.12 inches at Browns Valley (Traverse County) in 1982; and record snowfall of 15.0 inches also at Browns Valley (Traverse County) in 1982.

Past Weather Features

Probably the coldest ever March 20th was in 1965 when subzero temperature readings prevailed across the state. Temperatures in the -20s F were observed as far south as Preston and New Ulm, while many northern areas were in the -30s F. The afternoon temperature at Roseau only managed to reach 7°F, while Rochester rose no higher than 10°F. There was deep snow cover all over the state.

A winter storm brought a mixture of rain, sleet, and snow over March 20-21, 1982. For many areas, the storm started out as rain, then turned to sleet and snow, with strong winds. Many areas of the state reported an inch or more of precipitation while communities in west central counties reported 10-15 inches of snowfall.

By far the warmest March 20th in state history was in 2012. Over half of the climate stations in the state reported afternoon highs in the 70s F. Observers in Redwood, Wabasha, and Goodhue Counties reported a high temperature of 80°F and the overnight low only fell to 62°F at La Crescent.

Outlook

The weekend will start out cooler than normal, but sunny. A bit warmer on Sunday and Monday, but with increasing cloudiness and a chance for light rain or snow on Monday. Then a warming trend for much of next week with temperatures above normal. Chance for rain again by late Tuesday and Wednesday. In fact, it is looking like the balance of March may overall have warmer than normal temperatures prevail across most of the state.

Preliminary Climate Summary for March

Minnesota WeatherTalk, March 27, 2020
By Mark Seeley

March will wind up as a warmer than normal month, with most climate stations reporting a mean monthly temperature from 3 to 6 degrees F above normal. Extreme temperature values for the month ranged from -30 degrees F at Cotton (St Louis County) on the 2nd to 65 degrees F at Granite Falls (Yellow Medicine County) on the 8th…although this temperature may be surpassed by high temperatures on Monday or Tuesday of next week. Minnesota reported the coldest temperature in the nation 5 times during March of 2020.

Although precipitation for the month to date has been less than normal, the forecast calls for better chances for precipitation during the last 4 days of the month, with some expected amounts over 1 inch. This may bring monthly totals closer to normal, or even push them above normal. Most climate stations are about a half inch below normal for the month as of Friday, March 27th. Some of the wetter areas of the state included portions of Steele, Winona, and Houston Counties which have reported over 2 inches of precipitation this month. The snowiest place this month was Isabella (Lake County) where over 17 inches of snowfall was measured. Many other areas of northern Minnesota reported over a foot of snow in this March.

Overall the month was a good one for diminishing the threat from spring snowmelt flooding, which has been minor to moderate in only some places. Temperature fluctuations above and below the freezing mark helped meter out the thawed snow-pack, and this was enhanced by higher-than-normal wind speeds. Many days produced wind gusts over 30 mph and several days there were gusts over 40 mph. Snow cover was all but lost across the southern part of the state, and many southern Minnesota lakes began to lose their ice cover. Over half a dozen lakes have already lost their ice.

Apology for No Broadcast

Unfortunately, the phone lines at the Minnesota Public Radio studio in St Paul were out of order on Friday, March 27 preventing the usual broadcast of the WeatherTalk chat with Cathy Wurzer. I am sorry for this. Hopefully in these challenging times, this issue will be cleared up. Thanks for your patience.

Weekly Weather Potpourri

NOAA'sClimate.gov website this week features a number of activities related to climate and energy that can be done by students and their parents at home while they are restricted by the coronavirus pandemic. These are excellent for their engaging content as well as their lessons.

Experience Magazine features an article about how to make decisions that affect your carbon footprint in everyday life. They include an examination of the trade-off features in (1) planning a wedding; (2) hosting a dinner party; (3) or taking a vacation. This might be a fun exercise to try with your family and friends.

Brian Donegan of the Weather Underground features a discussion of tornado distribution across the USA over the 1991-2010 period. He also talks about the distribution of tornado occurrences across the calendar. This is a good review article as we prepare for entering the severe weather season in April.

MPR listener question
I would like to know the outlook for spring and summer flooding. With all we are going through with the COVID-19 pandemic, spring floods would be overwhelming.

Answer
The threat for spring snowmelt flooding has been greatly diminished by the weather pattern of the past 30 days or so. However, flow volume on many Minnesota rivers and streams remains higher than normal, and soil moisture storage is above normal as well. So, this leaves little buffering capacity to withstand large doses of precipitation this spring. As a consequence, there is still a risk of flooding in many areas if the weather pattern were to suddenly turn very wet for a prolonged period. I do not see that characteristic in the outlook models, but we know how much those can change over time. Note that with an expected rainfall this weekend of over 1 inch in southwestern Minnesota, the National Weather Service has issued a Flood Watch for the Redwood and Cottonwood Rivers.

Twin Cities Almanac for March 27th
The average MSP high temperature for this date is 47 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 29 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for March 27th
MSP records for this date include: highest daily maximum temperature of 75 degrees F in 1946; lowest daily maximum temperature of 24 degree F in 1965; lowest daily minimum temperature of 5 degrees F in 1921; highest daily minimum temperature of 57 degrees F in 1910; record precipitation of 1.52 inches in 1998. Record snowfall is 5.6 inches in 1965.

Average dew point for March 27th is 25°F; the maximum dew point on this date is 58°F in 1989; and the minimum dew point on this date is -1°F in 2015.

All-time state records for March 27th
The state record high temperature for this date is 88 degrees F at Winona Dam (Winona County) in 2007. The state record low temperature for this date is -29 degrees F at Red Lake Falls (Red Lake County) in 1955. The state record precipitation for this date is 2.70 inches at Two Harbors (Lake County) in 1975. Record snowfall for this date is 15.0 inches at Virginia (St Louis County) also in 1975.

Past Weather Features

A slow-moving winter storm brought a mixture of rain, sleet, and snow to many parts of Minnesota over March 26-28, 1940. Many areas of the state recorded 4-8 inches of snowfall, and others set rainfall records with over 2 inches.

By far the warmest March 27th was in 1946 when most climate stations reported highs of 70° or higher. Several locations in the northwest reached 80 degrees F under sunny skies and southerly winds.

Very cold, mid-winter type air mass prevailed across Minnesota on March 27, 1996 bringing subzero temperature readings to most parts of the state. Temperatures fell into the minus 20s F in northwestern parts of the state, and the daytime high temperature only reached 6°F at Wadena.

Outlook

Rain likely on Saturday, even lingering into early Sunday in some parts of the state. Snow will likely occur in northeastern counties. This system will also bring high winds on Saturday night and early Sunday to parts of the state. Generally warmer for much of next week, with some chance for showers (rain/snow) from late Monday through Wednesday.

Mixed Start to the Month of April

Minnesota WeatherTalk, April 03, 2020
By Mark Seeley

The first two days of April brought mixed weather to the state. Many parts of southern and eastern Minnesota enjoyed mild, warmer than normal temperatures (commonly highs in the 60s F). But in the west and northwest (Red River Valley) a winter storm brought a mixture of significant precipitation, including rain, ice, and snow, with colder than normal temperatures. Roads were snow covered in some areas, while other areas reported ice on the roads late on Thursday afternoon and into early Friday morning. Wind Chill values dropped into the teens and single digits and travel was difficult in some areas. Snowfall amounts in the western counties ranged from 1 inch to 4 inches in many spots, with Crookston reporting 9 inches and Karlstad reporting 11 inches.

A Climate Scientist Blogs on the Coronavirus Pandemic and Our Response

Dr. Ben Santer is an esteemed climate scientist and Member of the National Academy of Science. He has lectured at the University of Minnesota a number of times, and I have known him for over 15 years. I trust both his science and his perspectives on the challenges before us as we cope with COVID-19 pandemic. His recent blog in Scientific American Magazine (online) is well worth the read.

There are many lessons from coping with the COVID-19 pandemic that apply to how we should cope with climate change as well. Two quick points he makes: Scientific ignorance can be fatal in some situations; and a political leader should not assume the mantle of expertise in areas where he or she has none. We need to invoke more trust in science and act to protect ourselves and future generations.

April 2-3, 1982 All Four Seasons Were Sampled

Following one of the snowiest winter seasons in state history (over 90 inches in the Twin Cities), April 2, 1982 brought the first severe weather day of the spring season to western Minnesota. Many portions of southwestern Minnesota were under a severe thunderstorm watch that day. Bright sun, strong southerly winds, recent loss of snow cover, accelerated the daily temperature rise, producing afternoon highs in the 70s F. It reached 78°F at Lamberton, 77°F at Worthington, 75°F at Windom, and 68°F at St Peter, all readings about 15-20 degrees F above normal.

Atmosphere instability brought by the clash of an air mass from the southwestern USA and an air mass which dropped down from Alberta, Canada caused huge billowing clouds and thunderstorms to form by late afternoon. No tornadoes, but some severe thunderstorms, with hail developed that afternoon dropping from 1 to 1.5 inches of rainfall in many places. Later that night the precipitation turned to snow, dropping an

inch at Luverne and Pipestone, but much more in northern communities, including a statewide record of 14 inches at Kettle Falls in Voyageurs National Park.

Strong northwest winds accompanied the cold front and temperatures dropped dramatically overnight, so that 12-14 hours later on the morning of April 3rd Lamberton reported 7°F, Windom 10°F, Worthington 12°F, and St Peter a record low of just 4°F. All of these climate stations saw a record drop of 64 to 71 degrees F in a 14-hour period.

Weekly Weather Potpourri

The Joint Typhoon Warning Center was tracking two tropical cyclones this week: Cyclone in the South Indian Ocean, southeast of Diego Garcia, was expected to grow stronger but remain out to sea; and Cyclone Harold located in the South Pacific east of Australia was also expected to grow stronger but largely remain out to sea.

The BBC Weather Centre this week featured a story about how measured air pollution and atmospheric carbon dioxide have both shown significant drop-offs during the global pandemic lockdown in many nations. These declines are especially significant in nitrogen dioxide as well as small particulate matter.

MPR listener question

I have heard your presentation on climate change in Minnesota many times and you have shown that the state is getting more precipitation now than ever, especially cited the month of April. How much has average monthly precipitation changed in April here in the Twin Cities?

Answer

Indeed, of all months of the year April shows one of the largest changes. For the 1931-1960 period in the Twin Cities average April precipitation was 1.84 inches. Over the most recent 30- year period the average is 2.94 inches, over a 59 percent increase. Generally other months also show an increase in precipitation but mostly not of that steep magnitude.

Twin Cities Almanac for April 3rd

The average MSP high temperature for this date is 51 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 32 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for April 3rd

MSP 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 degrees F in 1921; record precipitation of 0.84 inches in 1974. Record snowfall is 5.9 inches also in 1974.

Average dew point for April 3rd is 26°F; the maximum dew point on this date is 58°F in 1956; and the minimum dew point on this date is -6°F in 1995.

All-time state records for April 3rd
The state record high temperature for this date is 86 degrees F at Beardsley (Big Stone County) in 1929. The state record low temperature for this date is -19 degrees F at Big Falls (Koochiching County) in 1954. The state record precipitation for this date is 3.05 inches at Farmington (Dakota County) in 1934. Record snowfall for this date is 14.0 inches at Kettle Falls (St Louis County) in 1982.

Past Weather Features

There was a very warm start to April in 1921. On the 3rd of the month many climate stations reported afternoon highs in the 70s F, while portions of Brown, Big Stone, Waseca, Lac Qui Parle, and McLeod Counties reached the 80s F. Some farmers were seen plowing their fields.

A slow-moving winter storm brought mixed precipitation to the state over April 1-3, 1934. It was one of the most significant storms of that drought year in Minnesota. Many areas of the state received between 1 and 2 inches of precipitation, while Farmington (Dakota County) recorded a state record amount on April 3rd of 3.10 inches. In northern counties 4-9 inches of snowfall was reported.

The coldest April 3rd in state history was in 1954. Most observers in the state reported a morning low temperature in the single digits, while there were scores of subzero temperature readings in the northern counties where there was still a good deal of snow on the ground. The temperature never rose higher than 13°F at Detroit Lakes (Becker County) that day.

Outlook

Though starting out cooler than normal, the weekend will be most sunny. Temperatures will warm to above normal on Sunday and likely stay that way through Wednesday of next week. There will be a chance for showers by Tuesday and Wednesday with perhaps a scattered thunderstorm or two, before returning to cooler and drier weather towards the end of next week.

Brief Visit of Spring Weather

Minnesota WeatherTalk, April 10, 2020
By Mark Seeley

Over April 6-7 this week, spring emerged briefly with temperatures reaching the 60s F across much of the southern half of Minnesota and over 20 climate stations, including the Twin Cities, reported an afternoon high temperature of 70°F or greater. For the Twin Cities April 7th brought the first 70°F day since last October 9th. Dew points climbed into the 50s F as well, with the Twin Cities tying the all-time high dewpoint record for April 7th of 54°F. The higher dew points and instability in the atmospheric triggered some thunderstorms from Duluth to Rochester. A few areas got some snow, but most observers reported rain, with amounts from a few tenths to over 1 inch.

A cold front brought a dramatic drop in temperatures on April 8th, and some sleet, rain, and snow. Some areas of the northeast reported measurable snowfalls with 3 inches at Chisholm, and nearly 5 inches at Grand Marais. Daytime temperatures fell by 20 to 30 degrees F, and even felt colder because of the winds, which gusted from 30 to 45 mph. This brought Wind Chill Values ranging from just 10°F to 25°F, as people who were out went back to wearing mid-winter clothing.

Though temperatures so far this month have average 2 to 4 degrees warmer than normal across the state, most of the outlook models suggest that cooler than normal temperatures will dominate this weekend and through the 3rd week of the month. It appears it will be drier than normal as well.

Weekly Weather Potpourri

Science Daily reports that a new study from the Earth Institute at Columbia University finds that robin migration is kicking off earlier by about five days each decade. The study is also the first to reveal the environmental conditions along the migration route that help the birds keep up with the changing seasons. Bird migration of several species is expected to continue coming earlier with each passing decade.

The University Corporation for Atmospheric Research (UCAR) COMET Program provides a wide variety of educational materials for the atmospheric and climate sciences. This week they published the online version of the National Weather Service Fire Weather Program, which for years has been a great service to the USFS and land managers, especially in western states.

MPR listener question
I have heard you speak many times about the huge temperature extremes in Minnesota. What have been the temperature extremes so far this month, and what are the record extremes historically for April?

Answer
So far in April of 2020, the temperature extremes for Minnesota have been 74°F at Sherburn (Martin County) in southern Minnesota on April 7th, and -10°F at Goodridge (Marshall County) of the Red River Valley in northwestern Minnesota. The historical extremes are 101°F at Hawley (Clay County) on April 22, 1980, and -22°F at Karlstad (Kittson County) on April 6, 1979.

Twin Cities Almanac for April 10th
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 35 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for April 10th
MSP records for this date include: highest daily maximum temperature of 88 degrees F in 1977; lowest daily maximum temperature of 33 degree F in 1997; lowest daily minimum temperature of 18 degrees F in 1962; highest daily minimum temperature of 57 degrees F in 2005; record precipitation of 1.33 inches in 1883. Record snowfall is 6.0 inches in 1891.

Average dew point for April 10th is 29°F; the maximum dew point on this date is 61°F in 2011; and the minimum dew point on this date is 3°F in 1959.

All-time state records for April 10th
The state record high temperature for this date is 92 degrees F at Browns Valley (Traverse County) in 1977. The state record low temperature for this date is -8 degrees F at Brimson (St Louis County) in 1989. The state record precipitation for this date is 3.14 inches at Harmony (Fillmore County) in 2013. Record snowfall for this date is 14.0 inches at Lynd (Lyon County) also in 1913.

Words of the Week: lamb storm, lamb-showers, or lamb-blasts
Our April snow showers, not uncommon to northern Minnesota, do not have a colloquial name associated with them. But they certainly do in England and Scotland. These terms are used to refer to nuisance storms which produce a light falling of snow in the spring when new lambs are born, most often during March or early April. More severe snowstorms or squalls during lambing 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.

Past Weather Features

By far the warmest April 10 in state history was in 1977 when most of the state reported afternoon highs in the 80s F. Portions of Traverse and Lac Qui Parle Counties reached the 90s F. The cold spot in the state was an afternoon high of just 43°F at Two Harbors.

The coldest April 10 on a statewide basis was in 1989. Most climate stations reported morning lows in the single digits and teens F, but the northeastern counties (St Louis, Lake, and Cook) reported subzero lows. The daytime high temperature at Hallock only reached 25°F.

Outlook

A very unsettled weekend coming up, with cooler than normal temperatures and chances for rain or snow showers starting later on Saturday. Breezy as well, especially Sunday and Monday. Continued chance for mixed precipitation on Monday, then generally dry for the balance of next week, but with temperatures that are cooler than normal.

Snow and Cold Dominate the Week

Minnesota WeatherTalk, April 17, 2020
By Mark Seeley

Easter Sunday (April 12) brought nasty weather, with sleet, rain, and snow, along with gusty winds. In southeastern Minnesota, a number of observers reported up to 10 inches of snowfall (well below the statewide record for the date of 17.6 inches at Artichoke Lake in 2019). Nevertheless, a number of long- term climate stations in Minnesota reported new daily record snowfall amounts for the date, including:

6.6 inches at MSP (also the snowiest Easter Sunday in history)
7.5 inches at Rochester
10.0 inches at Elgin
7.8 inches at Wabasha
9.6 inches at Theilman
7.0 inches at Minnesota City
6.4 inches at Bricelyn
6.3 inches at Jordan

Very cold air ushered in my two consecutive cold fronts kept the snowfall from melting for a few days, and the northerly winds held daytime maximum temperatures down to record or near-record cold levels. On the morning April 14th this week 11 long-term climate stations set new record cold minimum temperature readings, including just 12°F at Lamberton, Marshall, and Theilman. MSP Airport just missed tying the record cold minimum by one degree with a reading of 19°F on the 15th.In addition over April 13-15, over 30 climate stations reported new record cold maximum temperatures as daytime highs climbed only into the 20s F to low 30s F. MSP tied the record cold daily maximum temperature on the 14th with a reading of only 30°F.

Monday through Wednesday brought average temperatures that were 20 to 25 degrees F colder than normal and kept many Minnesota citizens inside. Winter wardrobes were on display, along with facial masks, by those who did venture outside.

Weekly Weather Potpourri

At the end of 2019 climate researchers reported that the Greenland Ice Sheet was melting 7 times faster than it had in the 1990s. A recent study found that the melting rate during 2019 was enhanced by an unusually high frequency of clear days over Greenland which allow more of the sun's energy to directly reach the ice sheet and contribute to the high melting rate brought on by very warm temperatures.
The BBC recently reported on this.

NOAA scientists released a global climate summary for the month of March this week. For Minnesota, March of 2019 ranked among the 19 warmest in history, but for many other states it was among the warmest. It was the 3rd warmest March in history for

Texas, the 5th warmest March for Alabama and Georgia, and the warmest March ever for Florida. Among many other countries, including portions of Europe, Asia and South America March ranked among the warmest historically as well. Globally it was the 2nd warmed March in the historical record back to 1880.

A new study of mega-droughts in the western USA conducted by scientists from Columbia University and reported by the BBC highlights that the recent prolonged drought which started in 2000 ranks among the 4 or 5 worst over the past 1000 years according to tree ring evidence. The current drought episode may be amplified because of climate change impacts on atmospheric circulation patterns.

MPR listener question
I have read in your book and heard you say many times that on average the month of April is the windiest month of the year in Minnesota. It certainly seems to be the case this year. How many times have wind gusts exceeded 30 mph so far this month?

Answer
Indeed, even if the month ended today, April has already brought a number of days when wind speeds gusted over 30 mph. Here are some of the frequencies (number of days with 30 mph or greater gusts) for selected climate reports around the state:
MSP 9 days
Rochester 7 days
Mankato 5 days
Redwood Falls 8 days
Moorhead 9 days
St Cloud 5 days
Duluth 7 days
International Falls 5 days

Twin Cities Almanac for April 17th
The average MSP high temperature for this date is 59 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 is 10 degrees F in 1875; highest daily minimum temperature of 61 degrees F in 1976; record precipitation of 1.44 inches in 1975; and there was a record snowfall of 2.7 inches in 1939.
Average dew point for April 17th is 32 degrees F, with a maximum of 62 degrees F in 1977 and a minimum of 4 degrees F in 1989.

All-time state records for April 17th
The state record high temperature for this date is 91 degrees F at Tracy (Lyon County) in 1914. The state record low temperature for this date is -5 degrees F at Gunflint Lake (Cook County) in 1983. State record precipitation for this date is 4.00 inches at Belle Plain (Scott County) in 1894; and record snowfall is 13.0 inches at Detroit Lakes (Becker County) in 1945.

Past Weather Features

A strong late season winter storm paralyzed the state over April 16-17, 1945. Strong winds and heavy snowfall closed roads and highways in portions of central and northern Minnesota were 5 to 10 inches of snow occurred. In northwestern Minnesota places like Fergus Falls, Pelican Rapids, and Detroit Lakes reported 14 to 18 inches of snowfall. Farmers had not yet started their field working season.

Bright sun and strong south winds brought unseasonable warmth to the state on April 16, 1985. Over 35 climate stations reported daytime highs in the 80s F and it reached 90°F at Montevideo (Chippewa County).

In only three years, 1875, 1928, and 1983 has April 17 brought mid-winter cold to Minnesota with single digit lows reported around northern sections of the state, and teens in southern counties. All three years also produced persistent snow cover that lingered well into April.

Outlook

Saturday will start a drier trend across the state with many more sunny days during the second half of April. Temperatures will slowly warm to above normal, with a minor dip on Sunday to cooler than normal conditions. Generally dry and sunny next week with daytime highs in the 50s and 60s F.

Snow Season Review

Minnesota WeatherTalk, April 24, 2020
By Mark Seeley

Given the outlook models for the rest of April and beginning of May, it appears there is likely little if any chance for snow across the state, except for a few flurries in far northern counties Sunday and Monday. In that context, I thought it would be time to summarize the 2019-2020 snow season (generally October 1 to April 30) on a statewide basis.

At the top of the list is Isabella up above the north shore of Lake Superior in Lake County. They reported over 133 inches. The only other locations over 100 inches for the season were Two Harbors and Wolf Ridge Environmental Learning Center near Finland, both also in Lake County. But portions of the Red River Valley in northwestern Minnesota reported 50-60 inches, well above normal for them.

On the low end was Wheaton (Traverse County) in far west-central Minnesota which reported less than 25 inches of snowfall. In fact, many parts of west-central Minnesota had a fairly dry snow season.

Some of the major cities in Minnesota and their snow season totals include:
MSP 51.5 inches
Rochester 58.1 inches
St Cloud 44.7 inches
Duluth 90.5 inches
International Falls 66.5 inches
Redwood Falls 41.1 inches
Grand Rapids 62.1 inches

Overall, except for west-central, the recent snow season (Oct 1 to April 23) has produced above normal precipitation in most areas of the state. Only in the past few weeks have the volume flows in most Minnesota rivers and streams decreased back closer to normal, though flows are still higher than normal in some areas.

Agricultural Season Underway With Planting

The recent drier weather has combined with warmer than normal temperatures and more sunshine have combined to allow farmers to begin the field working season in earnest this week. Manure spreading, tilling, and planting have been common activities across many parts of the state. The first significant acreage of crops is being planted, while farmers growing alfalfa are inspecting the fields for winter injury. In addition, Master Gardeners have been active removing winter mulch and preparing garden beds for annuals, while many other crops have been started in high tunnels or hoop houses.

Shallow soil temperatures which were just in the 30s F last week have warmed into the 40s and low 50s F this week. Much of the state is expected to get planted over the next week as farmers and gardeners will work around light shower activity Monday and Tuesday but will benefit from drier and sunnier days into early May.

Weekly Weather Potpourri

To commemorate the 50th Anniversary of Earth Day on Wednesday of this week Climate Generation (the group founded by Will Steger) released a new book titled "Climate Eyewitness: Minnesota Voices on Climate Change." This book is full of storytelling, poetry, and art from a wide variety of Minnesota citizens, including me. I sincerely hope that every Minnesota citizen will read it as this is an important topic of our lifetime here on Earth. You can find it online at the Climate Eyewitness web site.

The BBC reported this week that 2019 was the warmest year of record for Europe, with three distinct Heat Waves and the warmest month of July ever. The second half of 2019 was also one of the wettest in history with many heavy rains that caused flooding.

A new research study by the University of Hamburg finds that the Arctic Ocean may be completely ice-free in the summer months by the year 2050. The researchers used 40 different climate models to examine the future projections of Arctic sea ice based on various emission scenarios for greenhouse gases. You can read a brief review of this work at the Science Daily.

The NOAA Storm Prediction Center in Oklahoma had a busy week. Since last Sunday there have been 76 tornado reports across the southern plain's states and the southeastern states. On Sunday, April 19 there were seventeen reports of tornadoes in Mississippi, while on Thursday, April 23 there were nine from the state of Georgia. Severe weather season is expected to show more evidence of storms over the remainder of April.

MPR listener question

As a long-time Minnesota climate observer, I am convinced that the 2019-2020 snow season brought a rare sequence of weather to the Twin Cities for the three major holidays of Thanksgiving, Christmas, and Easter. All three were white with snow. How often has this happened?

Answer

Historically (back to 1885), snow is present either on the ground or falling from the sky on Christmas Day in the Twin Cities about 74 percent of the time. For Thanksgiving Day and Christmas Day in the same year, snow is present on the ground or falling from the sky about 27 percent of the time. So, a white Thanksgiving and Christmas combination is only about 1 year in four.

When we add Easter Sunday to the mix, then there have only four snow seasons historically when snow was present on all three holidays: 1893-1894, 1949-1950, 1957-1958, and 2019-2020. So that is a mere 3 percent frequency historically, extremely rare indeed.

Twin Cities Almanac for April 24th
The average MSP high temperature for this date is 62 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 41 degrees F (plus or minus 9 degrees F standard deviation).

MSP Local Records for April 24th
MSP 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 degrees F in 1915; record precipitation of 1.43 inches in 1908. Record snowfall is 0.4 inches also in 1887.

Average dew point for April 24th is 24°F; the maximum dew point on this date is 66°F in 1948; and the minimum dew point on this date is 8°F in 1918.

All-time state records for April 24th
The state record high temperature for this date is 92 degrees F at Milan (Chippewa County) in 1962, and then also at Rochester (Olmsted County) and Springfield (Brown County) in 2009. The state record low temperature for this date is 8 degrees F at Embarrass in 2005 and also at Brimson in 2013 (both communities are in St Louis County. The state record precipitation for this date is 5.44 inches at Winona Dam in 1990. Record snowfall for this date is 15.0 inches at Fosston (Polk County) in 1937.

Past Weather Features

On a statewide basis April 24, 1909 was the coldest in history with many observers reporting morning low temperatures in the teens and twenties F. The only place above the freezing mark was Winona with a minimum temperature of 33°F.

Over half of the state saw afternoon high temperatures in the 80s F on April 24, 1962. In portions of west-central Minnesota many communities saw the mercury hit 90°F or greater. Farmers were out planting fields of corn.

Thunderstorms roared across the state over April 23-24, 1990 bringing heavy rains and hail. Across southeastern Minnesota 3-5 inches of rain fell which flooded roads and highways and many farm fields.

Outlook

Mostly sunny over the weekend with temperatures warmer than normal. There will be a chance for widely scattered showers both Saturday and Sunday nights, with some chance for snow flurries in the north. There will be a better chance for showers on Monday and Tuesday of next week, but with temperatures remaining warmer than normal. The balance of next week looks dry and sunny.

April Climate Summary

Minnesota WeatherTalk, May 01, 2020
By Mark Seeley

April was roughly an equal mixture of warmer than normal and colder than normal days, with the greatest departures on the cool side. A number of days tied or set records for cold daytime maximum temperature values with readings only in the twenties and low 30s F. Overall most climate stations in the state reported a mean monthly temperature that ranged from 3 to 5 degrees F colder than normal. Minnesota reported the coldest temperature in the nation only once during the month. Extremes for the month ranged from -10°F at Goodridge (Marshall County) on the 4th to 83°F at Sherburn (Martin County) on the 22nd.

April was a drier than normal month, with about 90 percent of the climate stations reporting less than average precipitation. The largest amounts were reported from western counties. Ottertail reported 3.03 inches. Many other areas reported less than 1 inch. In fact, April of 2020 will rank among the 20 driest historically with a statewide average precipitation total of only 1.36 inches.

Portions of Kittson and Polk Counties in northwestern Minnesota reported the most snowfall for the month with 12 inches.

Over half of the days in the month brought wind gusts over 30 mph. Several areas reported a few days with wind gusts over 40 mph and on the 20th a number of climate stations reported wind gusts over 50 mph.

Most of the state's thousands of lakes lost their ice cover during the month, and the last week of the month brought the best opportunities for farmers to get started on field work and planting. By the 26th of the month 40 percent of the corn crop was planted and nearly third of the sugarbeet crop was in the ground as well.

Weekly Weather Potpourri

This week NOAA features an interview with their chief climate monitoring scientists Deke Arndt. It is well worth reading. I met Deke years ago in Asheville, NC where he works. He is absolutely dedicated to his profession. The Climate Monitoring Branch of NOAA is in good hands.

Also, this week the NOAA blog at Climate.gov features an interesting article about how human activity influences tropical storms in the Atlantic and Gulf of Mexico. There is pretty clear evidence for effects from greenhouse gas emissions, but there are also countering effects from various atmospheric aerosols.
NOAA outlook models continue to favor a cooler and drier than normal first half of May. This may help farmers catch up on field work, and those workers deployed for the repair

and maintenance of Minnesota roads and highways will benefit from this outlook as well. You can see more at the Climate Prediction Center.

MPR listener question
Is it my imagination, or is the sky actually bluer in the Metro Area since before the pandemic? Can air pollution change the weather?

Answer
Certainly, the decline in airline traffic (40 percent worldwide, and even greater in some countries), as well as motor vehicle traffic during the pandemic has improved air quality. Overall emissions into the atmosphere are down. In addition, much of the agricultural field working season is just ramping up, so the countryside has been relatively quiet for most of April as well. This means that soil and dust particles have been relatively absent too.

Where solar radiation is measured (the total amount of sun's energy reaching the Earth) the numbers have been higher than normal on days without clouds. This means that atmospheric transmissivity has been exceptionally high. In other winds, a cleaner atmosphere has allowed more energy to reach the Earth's surface minus any cloud cover.

Bottom line is, that on clear days our view of the beautiful blue sky is less obstructed or distorted, and the clarity of the blue hue in the sky is indeed more vivid.

Twin Cities Almanac for May 1st
The average MSP high temperature for this date is 65 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 44 degrees F (plus or minus 9 degrees F standard deviation).

MSP Local Records for May 1st
MSP 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 degrees F in 1934; record precipitation of 1.26 inches in 1983. Record snowfall is 3.0 inches also in 1935.

Average dew point for May 1st is 36°F; the maximum dew point on this date is 66°F in 2001; and the minimum dew point on this date is 8°F in 1958.

All-time state records for May 1st
The state record high temperature for this date is 100 degrees F at Beardsley (Big Stone County) in 1959. The state record low temperature for this date is 4 degrees F at Pine River (Cass County) in 1909. The state record precipitation for this date is 3.83

inches at Winona (Winona County) in 1936. Record snowfall for this date is 8.0 inches at Hinckley (Pine County) in 1909.

Past Weather Features

The warmest May 1st was in 1959 when most communities saw the afternoon high climate into the mid-80s to mid-90s F. Beardsley reached 100°F. The nighttime minimum temperatures only cooled off into the 50s and 60s F.

One of the coldest ever May 1st came in 1966. Arctic high pressure brought single digit lows to portions of northeastern Minnesota, while much of the rest of the state saw morning lows in the teens and twenties F. Luverne measured a minimum temperature of 19°F and Hallock reached a daily high of only 30°F.

May started off winter-like back in 2013 with cold temperatures, as well as rain and snow over the first three days of the month. Many southeastern Minnesota communities measured from 8 to 15 inches of snowfall.

Outlook

Sunny with pleasant temperatures over the weekend. Increasing cloudiness on Monday and Tuesday with cooler temperatures (below normal) and a chance for showers. Continued cooler than normal temperatures for the second half of next week as well.

Dry With Frost Threats for this Week

Minnesota WeatherTalk, May 08, 2020
By Mark Seeley

A remarkable turn in the weather over the past week, or at least since May 2nd has taken place with respect to atmospheric moisture content. Not only has there been little to no rainfall since May 2nd, but relative humidity and dew point readings have been near record low values across the state. In the Twin Cities Metro Area afternoon relative humidity levels have ranged only from 14 to 24 percent over the past 5 days, while dew points have been in the teens and twenties. Combined with winds that have ranged from 20 to 30 mph, the landscape has dried out rapidly, especially the top 6 inches of the soil. The National Weather Service has issued Red Flag Warnings for fire danger on some of these days. On Thursday, May 7th MSP set a new low dew point record with a reading of just 5°F and associated relative humidity of just 14 percent.

Minnesota farmers have been rapidly planting, mostly corn and soybeans, and some crops have emerged. Vegetable growers have also been transplanting crops, and apple orchards are budding or even blooming in many areas. Unfortunately, the drier, cooler air from the northern latitudes is also bringing a repeating threat of frost, at least through next Tuesday morning. Some field crops, produce crops, and orchards may show signs of frost damage on Friday, Saturday, Monday, or Tuesday mornings. Friday morning (May 8th) brought some scattered frosts in southern Minnesota, and more widespread frosts in central and northern counties. Beyond May 12th the weather will bring more clouds and moderate temperatures to the state. But getting through this very dry, and unseasonably cool spell of weather unscathed may be too optimistic.

Despite following the wettest year in Minnesota history (2019) gardeners may need to water early this spring to keep the top layers of soil moist enough for emerge and growth of plants. Deeper layers of soils still have plenty of moisture in storage from last year.

Weekly Weather Potpourri

The BBC reports this week that portions of Ethiopia, Kenya, and Somalia are suffering from huge infestations of locusts that are destroying many food crops. They are trying to control the pests but lacking in some critical pesticides. Their food supply chains are already being affected by the pandemic, so it is a very challenging situation.

Further Ben Rich of the BBC Weather Center reported this week on features of the world's weather and climate that are being affected by the global pandemic. It is an interesting review on the reduction in greenhouse gas emissions, improved air quality, and impacts on food production systems.

The Weather Underground reported this week that parts of Eastern Asia broke many high temperature records for April as a huge early year Heat Wave emerged. Incredible heat for late April extended across parts of Central and East Asia. At least three all-time national heat records for April were set:

—Kyrgyzstan: 35.1°C (95.2°F) at Tokmak on April 27

—China: 43.5°C (110.3°F) at Ayding Lake on April 29 (Ayding Lake is one of the lowest spots on Earth, at 502 feet or 154 meters below sea level)

—Mongolia: 36°C (rounded) (96.8°F) at Ekhiyn-Gol (Oasis) on April 30

Even in these extreme desert climates, such temperatures are more on par with normal readings in July. Many other Chinese towns and cities set all-time April heat records.

Early May heat has been reported from the desert southwest of the USA as well with readings of 106 degrees F from Tucson, Phoenix, Yuma, and Imperial (CA). The heat is expected to last there throughout the weekend.

MPR listener question
With the threat of frost widespread over the coming weekend, we were wondering what are the latest spring dates reported for frosts in the Metro Area of the Twin Cities?

Answer
In recent years, late spring frosts are somewhat rare, though they still have some miniscule probability through early June. Here are some of the latest historical dates:

MSP May 24, 1925
Stillwater May 23, 1974
Forest Lake May 26, 1961
Maple Plain May 29, 1947
Chaska June 4, 1945
Farmington June 7, 1897
University of Minnesota St Paul Campus May 23, 2013

After we get past the third week of May, the historical probability for frost really tails off, typically less than 10 percent.

Twin Cities Almanac for May 8th
The average MSP high temperature for this date is 67 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 47 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 8th
MSP 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; lowest daily minimum temperature of 28 degrees F in 1960; highest daily minimum temperature of 67 degrees F in 1896; record precipitation of 1.73 inches in 1872. Record snowfall is 0.5 inches also in 1923.

Average dew point for May 8th is 38°F; the maximum dew point on this date is 67°F in 1965; and the minimum dew point on this date is 6°F in 1947.

All-time state records for May 8th
The state record high temperature for this date is 102 degrees F at Beardsley (Big Stone County) in 1934. The state record low temperature for this date is 10 degrees F at Pine River (Cass County) in 1907. The state record precipitation for this date is 4.85 inches at Santiago (Sherburne County) in 2014. Record snowfall for this date is 12.0 inches at Windom (Cottonwood County) in 1938.

Past Weather Features

Over May 8-9, 1924 a late spring snowstorm brought 1-5 inches of snow to many parts of eastern Minnesota. It was a surprise to the National Weather Service, and to farmers who were out planting their crops. Fortunately, the snow was short-lived.

By far the hottest May 8th in history was in 1934. Most places in Minnesota reported afternoon high temperatures from the mid-80s to mid-90s F. Portions of Big Stone and Chippewa Counties in the west broke the century mark. On the same day, Two Harbors reported a high temperature of only 48°F.

55-years ago this week the worst tornado outbreak in history for the Twin Cities Metro Area occurred. On May 6, 1965, the Twin Cities recorded a record high dew point with a reading of 66 degrees F, indicating a huge amount of latent energy in the atmosphere. Six tornadoes roared across the Metro Area between 6pm and 9pm causing widespread damage, injuring over 500 people, and killing 14. Some of the storms were EF-4 (winds over 207 mph), and 25 planes were destroyed at the Anoka Airport. The National Weather Service was credited with doing a good job in forecasting these storms and they were assisted in reporting on them by Charlie Boone and Dick Chapman of WCCO radio.

Outlook

Much cooler than normal weather will dominate Minnesota over the Saturday through Tuesday period. There will be multiple chances for early morning frosts, and even a chance for light rain and snow flurries on Sunday morning. A gradual warm-up will begin

by next Wednesday and there will be a chance for rain by Thursday, but temperatures will remain a bit below normal.

Snow on the Fishing Opener Followed by Multiple Frosts

Minnesota WeatherTalk, May 15, 2020
By Mark Seeley

For the Fishing Opener, Saturday, May 9th, Mother Nature brought a last gasp dose of snow to portions of Becker, Otter Tail, Aitkin, Cass, Wadena, Crow Wing, Cook, Beltrami, and Morrison Counties where typical reports included 1-2 inches of snow. Some of the snow was intense enough to actually stop fishermen and send them back to the docks.

Since talking about the dry, clean atmospheric conditions across the state last Friday, over 90 percent of the state landscape has seen at least one frost. In many areas of the state overnight lows have dropped into the 20s F and even the teens. Brimson (St Louis County) reported just 14°F on the morning of May 12th while Preston (Fillmore County) reported just 18°F on the morning of May 10th (Mother's Day), tying the coldest May temperature ever measured there.

Some areas of western Minnesota and the Red River Valley have seen 7 or 8 mornings so far this month with freezing temperatures. Many of the lowest readings occurred earlier the week over May 10-12, when 45 of Minnesota's long-term climate stations reported setting new daily low temperature records, including 18°F at International Falls (the Nation's Ice Box).

From early Extension reports it appears that some alfalfa fields were damaged by the frosts and as a result may see low first-cut yields. Damage reports on emerged corn and soybean fields were rare, and there may have been damage to some apple orchards. Thankfully, it looks like the last serious episode of frosts for most of the state is behind us now.

Following the frost on Tuesday morning (May 12) extremely dry air prevailed across the state with afternoon relative humidity readings in the teens and twenties and record low dew points. The Twin Cities tied the record low dew point of 10°F for May 12th, while some other areas of the state saw dew points in single digits.

Weekly Weather Potpourri

Typhoon Vongfong, first of the season in the Western Pacific Ocean Basin struck the Philippines on Thursday this week forcing the evacuation of tens of thousands of citizens who were on lockdown for the pandemic. Some areas received over 8 inches of rainfall, while peak wind gusts reached over 100 mph. There was also high surf ahead of the storm. The storm was expected to graze Taiwan as it headed back out to sea over the weekend.

Also, a tropical disturbance developed near the Florida Straits late this week and is expected to strengthen into a Tropical Storm (Arthur) that would be the first of the Atlantic Hurricane Season. If so, this storm would bring rain and high winds to the Florida Keys, southeastern Florida coastal communities and the Bahamas.

The BBC reports this week that for the first time in 37 years carbon dioxide emissions from India have declined. They dropped 15 percent during the month of March and 30 percent in April. Much of this was due to the pandemic lockdown, but also demand for coal-based electricity has dropped as more renewable energy sources have been deployed.

MPR listener question
Here in Rochester, MN last Saturday we had a morning frost at 27°F, but then the sun came out and the wind turned around and came out of the south pushing the temperature up to 66°F in the afternoon, a rise of 39 degrees F…Wow! That was unexpected. But we are wondering what is the record for a daily temperature rise in Rochester?

Answer
Good question...for the month of May the temperature rise you saw last Saturday (May 9) of 39°F was not a record. The daily record rise in temperature during the month of May at Rochester is from the Dust Bowl Era of the 1930s and it happened twice: May 23, 1931 after a morning low of 25°F the temperature rose 45 degrees to 70°F by 4:30pm; also on May 25, 1934 after a morning low of 29°F, the temperature rose 45 degrees to a high of 74°F. Dry air is needed for May frost, and also for those kinds of temperature rises.

Twin Cities Almanac for May 15th
The average MSP high temperature for this date is 69 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 49 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 15th
MSP records for this date include: highest daily maximum temperature of 94 degrees F in 2001; lowest daily maximum temperature of 39 degree F in 1907; lowest daily minimum temperature of 31 degrees F in 1980; highest daily minimum temperature of 70 degrees F in 2001; record precipitation of 1.95 inches in 1911. Record snowfall is 0.8 inches in 1907.

Average dew point for May 15th is 42°F; the maximum dew point on this date is 70°F in 1998; and the minimum dew point on this date is 20°F in 2011.

All-time state records for May 15th
The state record high temperature for this date is 103 degrees F at Winnebago (Faribault County) in 2013. The state record low temperature for this date is 16 degrees F at St Vincent (Kittson County) in 1888. The state record precipitation for this date is 4.20 inches at New London (Kandiyohi County) in 1911. Record snowfall for this date is 8.0 inches at Mount Iron (St Louis County) also in 1907.

Past Weather Features

Bitter cold prevailed across Minnesota on May 15, 1888. Temperatures fell into the teens in the far northwest and into the 20s F across much of the rest of northern Minnesota, with 30s F in the south. Duluth saw a daytime high temperature of only 42°F.

Winter revisited the state on May 15, 1907 with temperatures in the 30s F and measurable snowfalls in many areas. Much of western and central Minnesota saw 2-5 inches of snowfall, while the headwaters area of the Mississippi River reported over 6 inches.

The warmest May 15 came in 2013 when most of the state saw daytime temperatures range between 85°F and 95°F. In portions of Martin, McLeod, Freeborn, Watonwan, Faribault, Waseca, and Mower Counties the temperature reached or exceeded 100°F.

Outlook

Cloudy weekend coming up with cooler than normal temperatures. There will be a chance for showers on Saturday and into early Sunday, with the heavier amounts in southern and eastern portions of the state. Drier and warmer than normal for Monday through Wednesday of next week, then a chance for showers again by Thursday. Temperatures may run warmer than normal for the rest of the month.

Record Rainfalls on May 17th

Minnesota WeatherTalk, May 22, 2020
By Mark Seeley

A nearly all-day “soaker” rainfall on Sunday, May 17th brought 2 to 4 inches of rainfall to many parts of Minnesota. Portions of Goodhue and Wabasha Counties reported over 4 inches of rain. Many long-term climate stations reported new record high daily values of rainfall for May 17th, including:

2.47” at MSP
2.45” at Red Wing Dam
2.42” at Red Wing City
2.35” at Faribault
2.31” at Theilman
2.25” at Zumbrota
2.23” at Albert Lea
2.14” at Windom
2.09” at Jordan
2.03” at Minnesota City
1.98” at Owatonna
1.88” at Winona Dam
1.55” at Lakefield

Many other climate observers reported even higher amounts of rainfall but lack long-term climate records to compare to. Some areas of northern Minnesota were completely left dry and are starting to show larger rainfall deficits this month. For example, Wright in Carlton County has seen less than a third of an inch so far. Much of north-central Minnesota now shows up on the U.S. Drought Monitor as abnormally dry, for the first time since the spring of 2018. We may yet see enough rain over the rest of this month to alleviate some of these dry areas in the state.

Weekly Weather Potpourri

The same storm system that brought record rainfalls to portions of Minnesota last Sunday, also brought record rainfalls to portions of central Michigan, where observers measured 3 to 5 inches of rain. Swollen rivers in Midland County Michigan caused two dams to burst flooding hundreds of homes there. NBC News reported on the aftermath.

On Wednesday this week (May 20) Cyclone Amphan struck portions of India and Bangladesh with winds up to 115 mph and heavy rains. Over 14 million people were left without power, and more than 80 people were killed. The BBC reported extensively on this.

On Sunday and Monday of this week, Tropical Storm Arthur (the first named storm of

the Atlantic Hurricane Season) lashed portions of coastal North Carolina with strong winds and heavy rainfall in a glancing blow as it headed out to sea. A few areas along the coast received 3-5 inches of rainfall.

From research at the University of Wisconsin-Madison “In almost every region of the world where hurricanes form, their maximum sustained winds are getting stronger. That is according to a new study involving an analysis of nearly 40 years of hurricane satellite imagery.” This is consistent with climate models of a warming world, though precise details are still lacking. Science Daily reported on this study in recent days.

The Emmy Award winning PBS series “American Experience” featured a documentary titled “Mr. Tornado” which describes the life and times of meteorologist Ted Fujita of the University of Chicago. He dedicated his professional life to understanding tornadoes and providing better science on these severe storms. Sean Potter wrote an excellent review of this program for the Weather Underground this week.

MPR listener question
We received about 3.50 inches of rainfall last Sunday (May 17) in Wacouta, just south of Red Wing. That is the largest rainfall in May that I can remember. What is the local record and state record for a one-day rainfall during May?

Answer
The record one-day rainfall for the month of May in the Red Wing area is 3.42 inches which fell on May 30, 1942. The statewide one-day May rainfall record is 7.50 inches at Thief River Falls (Pennington County) on May 29, 1949. Historically both St Francis (Anoka County) and Chatfield (Fillmore County) climate stations have reported over 15 inches of rainfall in the month of May. So, indeed, May can delivery huge amounts of rainfall, rivaling just about any other month on the growing season calendar.

Twin Cities Almanac for May 22nd
The average MSP high temperature for this date is 71 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 51 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 22nd
MSP 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; highest daily minimum temperature of 74 degrees F in 1921; record precipitation of 1.95 inches in 1911. No snowfall has occurred on this date.

Average dew point for May 22nd is 46°F; the maximum dew point on this date is 73°F in

1991; and the minimum dew point on this date is 19°F in 1924.

All-time state records for May 22nd
The state record high temperature for this date is 100 degrees F at Fairmont (Martin County) in 1925. The state record low temperature for this date is 19 degrees F at Embarrass (St Louis County) in 2006. The state record precipitation for this date is 5.84 inches at Collegeville (Stearns County) in 1962. Record snowfall for this date is 2.5 inches at Big Falls (Koochiching County) in 2001.

Past Weather Features

The coldest statewide May 22nd came in 1924 when climate observers in 19 western and northern counties reported a hard freeze with morning temperatures in the 20s F. Frosts were reported as far south as Pipestone and Marshall. The daytime high temperature at Itasca State Park only reach 43°F

The very next year brought the hottest May 22nd in state history as over 40 climate stations reported afternoon high temperatures of 90 degrees F or greater. Portions of Lyon, Martin, and Brown Counties reached 100 degrees F.

Portions of Lake, Itasca, and Koochiching Counties saw snow on May 22, 2001. In fact, Big Falls reported 2.5 inches, their largest May snowfall in history/

Outlook

Warmer than normal temperatures throughout the Memorial weekend, but with daily chances for showers and thunderstorms. Drier on Tuesday. Then cooler temperatures next week with a chance for showers Wednesday and Thursday. A warming trend will start for the end of next week.

Preliminary Climate Summary for May of 2020

Minnesota WeatherTalk, May 22, 2020
By Mark Seeley

As the month of May winds down this weekend, we can summarize the character of its weather. It was a cooler than normal month (following the pattern of April) with most climate stations reporting a mean monthly temperature that was 1 to 3 degrees F below normal. There was roughly an equal distribution of warmer and cooler than normal days. The extremes for the month were 89°F at Granite Falls (Chippewa County) on the 1st and just 14°F at Brimson (St Louis County) on the 12th. No new high maximum temperatures were reported within the climate station network, but 46 climate stations reported tying or setting new low minimum temperature records. Many areas of the state reported multiple frosts during the month. The highest dew points (between 65- and 70-degrees F) were measured earlier this week.

May brought a mixture of precipitation. Many portions of northern Minnesota reported snowfall earlier in the month, some of which disrupted the Fishing Opener with up to 2 inches in portions of Becker, Cass, and Otter Tail Counties. Southern portions of the state saw above normal rainfall prevail with amounts that were typically 1-2 inches above normal. Portions of Winona, Wabasha, Mower, Goodhue, Washington, Dakota, and Olmsted Counties accumulated over 6 inches of rainfall. Across the southern part of the state within the climate station network over 25 climate stations reported at least one new daily rainfall record.

In central and northern counties most climate stations reported less than normal precipitation for the month. Some areas of the state received less than 1 inch, and many areas of central and northern Minnesota now show up as abnormally dry on the U.S. Drought Monitor Map.

May 26 brought severe weather to some parts of the state. Brief tornado touchdowns were reported from Freeborn and Dakota Counties, and strong winds that damaged trees were reported in Houston and Goodhue Counties.

Weekly Weather Potpourri

Earlier this week Tropical Storm Bertha (the 2nd named storm of the Atlantic Hurricane Season) brought heavy rains to portions of South Carolina. Some areas reported 2-3 inches of rain. But the storm soon dissipated out to sea and inflicted only a glancing blow. The National Hurricane Center is expecting a more active than usual 2020 season.

The BBC Weather Centre offers a retrospective on how 80 years ago the weather actually helped the Allied Evacuation of Dunkirk along the coast of France. Thanks to cloud cover that obscured the beaches from German aircraft, over 300,000 soldiers

were successfully evacuated by a mixture of military and civilian watercraft in an operation called Dynamo.

In addition, the BBC News Service reported this week that the United Kingdom looks to have one of the best strawberry crops in recent memory thanks to the sunniest spring of all time (at least back to 1929). Parts of England are also reporting the driest month of May in 124 years.

Reported this week from Science Daily was a new study from Imperial College in London that suggests that the asteroid which killed the dinosaurs struck Earth at an angle that maximized the disturbance to the atmosphere. The mathematical simulations of the impact show that the asteroid hit Earth at an angle of about 60 degrees, which maximized the amount of climate-changing gases thrust into the upper atmosphere.

MPR listener question
As you are aware, we have yet to have our first 80F high here in the Twin Cities. This got me wondering as to what is the latest first 80F day that has occurred in the Spring/Summer season?

Answer
For the Twin Cities climate record back to 1873, the only years when an 80 F temperature was not reached until June were:

1873
1878
1883
1888
1892
1893
1905
1924
1935
1983

Further the latest date in the year for a temperature reading of 80 degrees F or higher was June 16 in both 1878 (81°F on June 16th) and 1883 (88° F on June 16th).

This year the Twin Cities recorded the first reading of 80°F or higher on May 26th (with a maximum of 81°F). This is still much later than normal. Aside from the years listed above, the only other years when it has taken this long to see such a temperature are 1919, 1937, 1973, 1984, 1995, 1997, and 1999. It is not an indicator of a cooler than normal summer.

Twin Cities Almanac for May 29th
The average MSP high temperature for this date is 73 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 53 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for May 29th
MSP records for this date include: highest daily maximum temperature of 94 degrees F in 2018; lowest daily maximum temperature of 53 degrees F in 1947; lowest daily minimum temperature of 33 degrees F in 1965; highest daily minimum temperature of 74 degrees F in 2006; record precipitation of 2.49 inches in 1949. No snowfall has occurred on this date.

Average dew point for May 29th is 50°F; the maximum dew point on this date is 72°F in 1953; and the minimum dew point on this date is 25°F in 1947.

All-time state records for May 29th
The state record high temperature for this date is 101 degrees F at Chaska (Carver County) in 1934. The state record low temperature for this date is 20 degrees F at Bigfork (Itasca County) in 1965. The state record precipitation for this date is 7.50 inches at Thief River Falls (Pennington County) in 1949. Record snowfall for this date is 2.6 inches at Spring Grove (Houston County) in 1947.

Past Weather Features

By far the warmest May 29th in state history occurred in 1934. Well over half of the state landscape saw afternoon temperatures reach the 90s F. Portions of western Minnesota reached the century mark. This began a four-day Heat Wave.

A freak, and short-lived snowstorm brought a trace of snow to a few tenths across portions of Minnesota on May 29, 1947. Associated with this storm were some frosty temperatures as many climate stations in western and northern Minnesota reported temperatures in the 20s F which damaged the corn and wheat crops.

May 28-29, 1953 brought strong thunderstorms to the state. Many communities saw 2-4 inches of rainfall. Pelican Rapids reported over 4.5 inches with widespread flooding.

Outlook

A pleasant weekend coming up with slightly cool than seasonable temperatures and sunshine. Cloudiness with a chance for rain returns on Monday and Tuesday. Temperatures begin climbing into the 80s F for the middle of next week with higher dew points. Indications are that the first half of June will run warmer than normal.

June Begins Warm

Minnesota WeatherTalk, June 06, 2020
By Mark Seeley

The first week of June has brought warmer than normal temperatures to all parts of Minnesota. Most climate stations are reporting average temperatures so far that are 6 to 10 degrees F above normal. June 1-2 brought the hottest temperatures for the year so far with most observers reporting daytime high temperatures from 90°F to 99°F. There have also been a few warm nights with the overnight temperature remaining in the upper 50s to lower 60s F.

The first few days also brought severe thunderstorms with hail to parts of the state. Hail with 1 to 2-inch diameter stones occurred in several counties, while Blue Earth County also reported a brief tornado touchdown on June 2nd. On June 4 strong thunderstorm winds were reported from southwestern counties, where gusts reached 55 to 65 mph. More thunderstorm winds visited southwestern Minnesota again on June 6th with reported of gusts up to 75 mph.

These thunderstorms also brought variable amounts of rainfall, some of which was quite heavy. Austin reported over 2 inches from the thunderstorms on June 2nd, while Tettegouche State Park (Lake County) also reported over 2 inches. Many other climate stations reported an inch to 1.5 inches. Some areas of northern Minnesota were missed by the rains or just received a few tenths.

The warm temperatures are expected through mid-month, followed by a brief cool down. From June 7-10 will be an active period with a number of thunderstorms.

Weekly Weather Potpourri

The NOAA-National Hurricane Center is expecting Tropical Storm Cristobal to bring heavy rains and flash flooding to portions of LA and MS later this weekend. Its remnants as a low-pressure system will move north through the mid-section of the USA bringing heavy rains to Midwestern States and perhaps even Minnesota over the early part of next week.

MPR listener question

How does the daily maximum temperature in Minnesota vary from summer to winter in terms of the time of occurrence? It seems in the summer that it actually occurs after I get home from work.

Answer
Assuming you have a day job, you are absolutely right! In winter, the time of the daily maximum temperature is most generally between 2:00 and 3:00 pm, lagging solar noon (maximum elevation of the sun) slightly. However, in the summer (June, July, August), the time of maximum daily temperature is typically 5:00 to 6:00 pm, lagging solar noon by several hours.

Twin Cities Almanac for June 6th
The average MSP high temperature for this date is 76 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 56 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for June 6th
MSP records for this date include: highest daily maximum temperature of 97 degrees F in 2011; lowest daily maximum temperature of 52 degrees F in 2009; lowest daily minimum temperature of 36 degrees F in 1897; highest daily minimum temperature of 74 degrees F in 1925; record precipitation of 1.59 inches in 1974. And no snowfall has occurred on this date.

Average dew point for June 6th is 53°F; the maximum dew point on this date is 73°F in 1925; and the minimum dew point on this date is 26°F in 1926.

All-time state records for June 6th
The state record high temperature for this date is 106 degrees F at Pipestone (Pipestone County) in 1933. The state record low temperature for this date is 20 degrees F at Remer (Cass County) in 1985. The state record precipitation for this date is 6.51 inches at Luverne (Rock County) in 1896. And no snowfall has occurred on this date.

Past Weather Features

Frost damaged crops on June 6, 1897 across portions of Minnesota as a cold Canadian high-pressure system settled in from the north. Low temperatures ranged from 25°F to 32°F across western Minnesota counties.

June 5-6, 1914 brought heavy thunderstorms with hail and strong winds to many parts of Minnesota. Many southern counties received 2-3 inches, while portions of Winona and Mower Counties reported 4-5 inches of rain, washing out fields and filling creeks and ponds to capacity.

The hottest June 6th in state history was in 1933 when the majority of the Minnesota landscape experienced 90 F temperatures. Brown, Martin, and Pipestone Counties saw afternoon temperatures break 100 degrees F.

Outlook

Warming up over the weekend with a chance for showers, especially west and north each day. Even warmer on Monday with increasing cloudiness. Chance for showers and thunderstorms Tuesday through Thursday, then drier towards next weekend.

Warmest Start to June Since 1959

Minnesota WeatherTalk, June 12, 2020
By Mark Seeley

Has heat this month so far bothered you? I have heard many complaints about it, especially after experiencing a cooler than normal April and May. The average temperature for the first ten days of June was 5 to 9°F above normal and the warmest since 1959 across Minnesota. In the Twin Cities Climate record back to 1873 only 1959 and 1933 were warmer.

Since June 1st over 80 new daily high maximum and minimum temperature records have been set within the Minnesota climate station network, including a new high minimum temperature of 74°F at MSP on the 8th. Both Milan and Canby set new high minimum temperatures on that date as well with readings of 77°F. Sabin (Clay County), Artichoke Lake (Big Stone County), Milan (Chippewa County), and Morris (Stevens County) all hit 100 degrees F earlier this week, the highest statewide temperatures so far this year. The cool breezes and lower dew points brought by Canadian high pressure on Wednesday and Thursday brought real relief, especially for those engaged in outside activities.

In addition to the heat, the remnants of Tropical Storm Cristobal brought heavy rains to portions of southeastern Minnesota this week, where there were reports of 2-4 inches of rain. Portions of Fillmore and Winona Counties reported over 4 inches of rain on June 9th. There is a good description of this storm provided by the Minnesota State Climatology Office.

One further note, on June 7-8 severe thunderstorms brought high winds, large hail, and heavy rains to portions of eastern North Dakota and northwestern Minnesota. Lancaster (Kittson County) reported a record 4.70 inches of rainfall. Combined with thunderstorms earlier in the month, some very large June rainfall totals (over 6 inches) have already been reported from Kittson and Beltrami Counties. So, both northwestern and southeastern Minnesota are well above normal for June rainfall to date.

It has also been an unusually windy month of June so far, with six or more days bringing wind gusts over 30 mph.

Weekly Weather Potpourri

On the other hand, the NOAA-National Weather Service at Anchorage, Alaska reports that June has begun with a mixture of slightly above and below normal temperatures this year. A relief for residents there who experience one of the hottest summers in history last year, setting many new temperature records, including the first ever reading of 90°F at Anchorage.

The BBC reported this week that the unusual pattern of warm temperatures that prevailed across Siberia this spring has continued into June. The town of Nizhnyaya Pesha saw temperatures reach 86 degrees F this week, about 30 degrees above normal for this time of year. It is located at 72 degrees North Latitude. In fact, all of Siberia is continuing to record a record setting hot year in 2020. This is producing a dangerous wildfire season.

A recent paper from the Earth Institute at Columbia University documents many cases of lethal high heat and humidity that have occurred over the past four decades around the globe but have not been widely reported. Some areas have seen Heat Index Values soar well above 130°F at times, a level that can be lethal if exposure is very long. You can read more details from Science Daily.

MPR listener question
We've noticed, since the last week of May, what seems to us an unusual amount of wind activity in our Duluth back yard and up the shore. Seems like the lilacs and all the trees in sight are shaking around more vigorously and regularly than we remember. While we haven't had any record-breaking gusts, the sustained windiness has impressed us. Are we correct in this? Has June been at all notable for wind so far?

Answer
Yes, your perception is correct. During the last days of May, notably the 28th and 29th average wind speeds in Duluth were higher than normal by 20 percent (historical average is 10.4 mph), with peak gusts well over 30 mph. And for June so far, from the 5th through the 11th average wind speeds have been from 20 to 70 percent greater than normal (historical average is 9.3 mph), and 6 consecutive days saw winds gust to over 30 mph. On June 7th and 10th winds gusted to 40 mph. I might add that this pattern of higher-than-normal winds has been prevalent across most of the state.

Twin Cities 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 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 degrees F in 1920; record precipitation of 2.35 inches in 1899. No snowfall has occurred on this date.

Average dew point for June 12th is 55°F; the maximum dew point on this date is 74°F in 1961; and the minimum dew point on this date is 30°F in 1969.

All-time state records for June 12th
The state record high temperature for this date is 102 degrees F at Crookston (Polk County) in 1893. The state record low temperature for this date is 23 degrees F at Remer (Cass County) in 1985. The state record precipitation for this date is 8.00 inches at Minnesota City (Winona County) in 1899. No snowfall has occurred on this date.

Past Weather Features

June 12, 1893 brought extreme heat to most of Minnesota. Nearly all locations reported high temperatures in the 90s F, while Moorhead and Crookston broke 100 degrees F. Overnight lows did not drop below the mid-70s F, making sleeping very difficult.

June 11-13, 1899 brought a series of heavy thunderstorms to many parts of the state, especially southeastern Minnesota where 6-9 inches of rain fell. There were widespread flashfloods and mudslides. Minnesota City (Winona County) later reported a remarkable June rainfall total of 14.35 inches.

Campers in northern Minnesota awoke to one of the coldest ever June 12th mornings in 1985 with temperatures in the 30s F across most of the northern third of the state. Those in Cass, Lake, St Louis, and Carlton Counties appreciated a hot cup of coffee that morning as lows ranged in the mid to high 20s F.

Outlook

Generally sunny, dry, and pleasant with near normal temperatures over the weekend. Clouds will increase with a chance for showers on Monday and a warming trend starting. Temperatures will generally run 10 to 15 degrees F warmer than normal much of next week, with another chance for showers later on Wednesday and into Thursday.

Heat and Wind Persist in June

Minnesota WeatherTalk, June 19, 2020
By Mark Seeley

The stubborn weather pattern of June continues to bring above normal temperatures to most of Minnesota with winds that are stronger than normal. Many farmers will attest to the fact that it has been difficult to find suitable days with low wind speeds so that they can spray for weeds.

Many climate stations have already reported six days this June with temperatures in the 90s F, and several overnight low temperatures that remained in the 70s F. Of course, being Minnesota there are a few places in the northeastern part of the state that still reported frost last Saturday and Sunday, but most places have seen warm overnight low temperatures recently. Through the first 18 days of the month many communities have seen an average June temperature that ranges from 4 to 7 degrees F warmer than normal, and for the Twin Cities this June ranks so far among the warmest 10 percent historically.

The windiness continues to be remarkable for the month, though it has abated somewhat in the north. Many days have seen an average wind speed of 15 mph or greater, while most days have brought maximum wind gusts over 30 mph. The list below shows the number of days with wind gusts of 30 mph or greater:

MSP 17 days
Redwood Falls 14 days
St Cloud 13 days
Mankato 12 days
Rochester 12 days
Duluth 9 days
International Falls 9 days

As for rainfall, the month has been excessively wet in the far northwest and in the southeast, but drier than normal elsewhere. Thunderstorms brought some heavy rains on Thursday of this week (June 18) to portions of west-central Minnesota where Granite Falls, Sacred Heart, and Clara City reported 2-3 inches of rain. Also, over 2 inches fell near Marshall and Worthington. Forecast models suggest more rain may fall over the weekend and early next week as well.

New Seasonal Climate Outlook

The NOAA-Climate Prediction Center released a new seasonal outlook on Thursday of this week. For the balance of the growing season (July-September) they suggest warmer than normal temperatures across Minnesota.

They also suggest that for southern Minnesota the weather pattern will favor above normal rainfall as well. The rest of the state has equal chances for above or below normal rainfall.

Weekly Weather Potpourri

The summer solstice (longest day of the year) for the Northern Hemisphere will occur at 5:44 pm on Saturday (June 20) when the sun is directly over the Tropic of Cancer. For Minnesota this means that our daylength on Saturday will range from 15.5 hours to over 16 hours in the far north. This time of year the maximum daily temperature usually occurs between 4 pm and 6 pm. Brian Donegan of the Weather Underground has written a nice review article about the solstice.

An interesting article in this week's AGU-EOS discusses the opportunity for a "Green Recovery" as the economy of many nations slowly recovers from the pandemic lockdown. Some countries are considering measures to reduce fossil fuel dependence and keep overall emission scenarios lower as they restart economic activities.

Both the NOAA-National Weather Service Chanhassen, MN Office and the DNR-Minnesota State Climatology Office have featured reviews of the famous June 17, 2010 tornado outbreak on the occasion of the 10th Anniversary this week. This outbreak produced 48 confirmed tornadoes in Minnesota that day, three of those storms were classified EF-4 (166-200 mph) including one which damaged the Wadena High School.

According to National Weather Service Forecasts Death Valley in California is supposed to reach 120°F again next week. This would be the third time so far this year for the climate station that often reports the highest temperature in the USA.

MPR listener question

I am a big fan, first email. I never miss Weather Commentary on Friday mornings. In fact, every week I dance a manic little improvised jig to the theme music! Thanks for your steadiness at this terrible time. It's precious to us. Here in the Cities, we hit 90 degrees on the first two days of meteorological summer (June). Is that a first? If not, how rare is it?

Answer

Thanks for your kind words. You are correct that it is rare. In 147 years of daily climate record keeping (back to 1873) in the Twin Cities the first two days of June have registered 90 degrees F or greater only 3 time: 1923, 1934, and 2020.

Twin Cities 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 60 degrees F (plus or minus 7

degrees F standard deviation).

MSP Local Records for June 19th
MSP 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 degrees F in 1933; record precipitation of 4.13 inches in 2014. No snowfall has been reported on this date.

Average dew point for June 19th is 55°F; the maximum dew point on this date is 76°F in 1953; and the minimum dew point on this date is 31°F in 1992.

All-time state records for June 19th
The state record high temperature for this date is 108 degrees F at Beardsley (Big Stone County) in 1933. The state record low temperature for this date is 26 degrees F at Kelliher (Beltrami County) in 2001. The state record precipitation for this date is 5.13 inches at Moorhead (Clay County) in 2000. No snowfall has been reported on this date.

Past Weather Features

The hottest June 19th in state history was in 1933. Nearly every community in the state except Grand Marais reported an afternoon temperature in the 90s F or greater. Over 20 communities saw the mercury thermometer hit the century mark and at Morris the overnight low temperature only fell to 81°F.

Over the night of June 19-20, 2000, a series of super-cell thunderstorms passed over portions of eastern North Dakota and northwestern Minnesota. Climate stations in Polk and Clay Counties reported 3-6 inches of rain, while the Fargo-Moorhead area reported over 7 inches in just 7 hours. Over half of the area roads and highways were flooded and the Fargo dome filled with 8 feet of water. It was one of the worst flash floods in history for that area of the Red River Valley. Moorhead reported 12.55 inches of rain for the month of June.

Outlook

Somewhat cooler over the weekend with temperatures closer to normal. Partly to mostly cloudy skies will prevail with a chance for showers or thunderstorms each day through the weekend and including Monday and Tuesday. Then a bit drier with near normal seasonal temperatures later next week.

Preliminary Climate Summary for June 2020

Minnesota WeatherTalk, June 26, 2020
By Mark Seeley

With just four days left in the month, we can summarize the climate for the month of June: very warm; and very mixed rainfall amounts.

On a statewide basis this June is the warmest since 1995 and either the 7th or 8th warmest in state history back to 1895, with a mean monthly temperature near 68°F Within the Minnesota climate network 75 daily maximum temperature records were tied or set this month, along with 66 records tied or broken for warm overnight minimum temperatures, including 77° at Milan and Canby on June 8th. Average temperature for the month ranged from 3 to 5 degrees F above normal. Extremes for the month ranged from 102°F at Granite Falls (Yellow Medicine County) on June 7th to 29°F at Cotton (St Louis County) and Seagull Lake (Cook County) on June 13th.

Rainfall for the month was highly variable. In the northwest and southeast counties many climate stations reported well above normal rainfall amounts ranging from 6-9 inches, mostly because of a few very heavy thunderstorm rains. Lake Bronson in Kittson County reported a monthly total of nearly 11 inches, while Caledonia in Houston County reported over 9 inches. On June 8th Hallock (Kittson County) received 4.24 inches of rainfall, a new daily record, and the largest single day June rainfall in their climate record back to 1899. It was also the 5th largest one-day rainfall in history at that location. Across the state June 2020 produced 37 new daily rainfall records within the Minnesota climate network.

However, many areas of the state saw few storms pass over and were left with large rainfall deficits for the month, especially from west-central Minnesota through northeastern Minnesota. Unless some rainfall occurs over the last four days of the month residents of Duluth, Cloquet, Kimball, Bird Island, and Willmar will see less than an inch of rainfall for June. This trend has placed many of these areas in moderate drought according to the U.S. Drought Monitor. Perhaps scattered thunderstorms over the last few days of June will bring some relief to these areas.

The most unusual climate feature of the month was the high wind speed. Nearly all climate states reported greater than normal mean wind speed, and several reported from 14 to 18 days with wind gusts over 30 mph. Many areas of the state including Fergus Falls, Rothsay, Bemidji, and even the Twin Cities reported wind gusts that exceeded 50 mph. A tornado was reported as far north as Lake of the Woods County on June 7th. Fortunately, it was short-lived. The Minnesota State Climatology Office offers a description of these storms on its web site.

Weekly Weather Potpourri

A massive plume of desert dust has migrated across the Atlantic from the African Sahara and blanketed the Gulf of Mexico with a haze. This dust was also circulating across the southeastern states on Thursday and Friday this week, highly visible from satellite imagery. It enhanced the orange and red sky color of sunrise and sunset in many places. You can read more about this from CNN or the BBC web sites.

Scientists have studied the relationships of massive volcanic eruptions historically with the patterns of El Nino in the equatorial Pacific Ocean. Though there are no conclusions drawn about any certainties in the relationships of the El Nino pattern to past volcanic eruptions a recent article by Tom Di Liberto of NOAA makes for some interesting reading.

Linda Lam of the Weather Underground has written an interesting article this week highlighting the number of 90 degrees F days that have already occurred for several cities around the USA and comparing to the historical record for the greatest number of such days. It is interesting to note that in the Twin Cities there have been 5 days of 90 degrees F so far in June, but far off the pace of 1988 which produced 44 such days that summer. Not surprising is the record number of 90 degrees F days at Death Valley in a year which was 220 days back in 1934.

MPR listener question

I have heard you talk mostly about the wind this month, but it has also produced a number of 90 degrees F days (4 here in Kimball-Stearns County). Which communities in Minnesota have seen the thermometer hit 100 degrees this month?

Answer

So far, the climate stations at Granite Falls, Morris, Milan, Benson, Sabin, and Artichoke Lake have reported 100 degrees F or greater this month. A 102°F temperature at Granite Falls on June 7th just missed tying the all-time state record for the date of 103°F at Little Falls back in 2011. Reaching 100 degrees F in June is somewhat rare for these climate stations and occurs historically about once every 20 years or so.

Twin Cities Almanac for June 26th

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 7 degrees F standard deviation).

MSP Local Records for June 26th

MSP records for this date include: highest daily maximum temperature of 99 degrees F in 1931; lowest daily maximum temperature of 55 degree F in 1968; lowest daily minimum temperature of 46 degrees F in 1926; highest daily minimum temperature of 78 degrees F in 1931; record precipitation of 2.54 inches in 1998. No snowfall has

occurred on this date.

Average dew point for June 26th is 58°F; the maximum dew point on this date is 78°F in 2007; and the minimum dew point on this date is 37°F in 1926.

All-time state records for June 26th
The state record high temperature for this date is 106 degrees F at Faribault (Rice County) in 1934. The state record low temperature for this date is 30 degrees F at Fosston (Polk County) in 1929. The state record precipitation for this date is 5.20 inches at Morris (Stevens County) in 1914. No snowfall has occurred on this date.

Past Weather Features

June 26, 1933 was the hottest in state history with 17 counties reporting afternoon temperatures of 100 degrees F or higher. Most other places were in the 90s F. Grand Marais Harbor was the cool spot with an afternoon reading of just 59 degrees F.

A cold morning for campers in northern Minnesota on June 26, 1982 when they woke up to temperatures that ranged from 30 to 32 degrees F across portions of St Louis and Carleton Counties. It did warm into the 70s F by mid-afternoon.

June 26-27, 1998 brought strong thunderstorms to many parts of the state. Many portions of southern Minnesota report 2-3 inches of rain, while Scott, Olmsted, and Goodhue Counties saw rain totals of 4-6 inches. The storms also brought hail and high winds in some areas ruining the second crop of alfalfa hay.

Outlook

A mostly sunny weekend coming up with a warming trend, as temperatures will average several degrees above normal. Increasing cloudiness later on Sunday with a chance for showers or thunderstorms. There will be a continued chance for showers and thunderstorms Monday through Thursday, with temperatures remaining warmer than normal, and higher dew points.

July Starts Hot With Rain in Western Counties

Minnesota WeatherTalk, July 03, 2020
By Mark Seeley

The warmer than normal pattern of June carried over into the start of July, coupled with 70°F dew point readings. Many areas of the state reported daytime highs on July 1st that were in the upper 80s F to low 90s F. But when combined with the dew points over 70 degrees F the Heat Index values ranged from the upper 90s F to 102 degrees F in places. With the high dew points many overnight minimum temperatures remained in the 70s F. At least 35 climate stations reported daytime high temperatures in the 90s F on July 2nd. These warmer than normal temperatures are expected to persist through the entire first half of July.

Thunderstorms pushed into western Minnesota out of the Dakotas on July 1st bringing rainfall amounts from a half inch to over two inches. For some areas, the rainfall was record-setting, including 2.72 inches at Karlstad (Kittson County), 2.54 inches at Crookston (Polk County), and 2.07 inches at Warren (Marshall County). The rainfalls provoked the National Weather Service to issue some flood warnings for watersheds along the Red River Valley.

June 29 Brings Record Rainfall

The last few days of June brought above normal temperatures and record rainfall amounts to portions of Minnesota. Some of the climate stations reporting new daily record rainfall on June 29th included:
7.14 inches at Bird Island
6.00 inches at St Peter
3.56 inches at Faribault
3.20 inches at Hastings Dam
2.90 inches at Red Wing Dam
2.75 inches at New Ulm
2.40 inches at Morris

In addition, across the border in western Wisconsin many new daily rainfall records were set as well including:
8.22 inches at Baldwin
6,95 inches at River Falls
5,73 inches at Ellsworth
3.40 inches at Rice Lake

Because of these rains, the National Weather Service issued many flash flood warnings and some homes were evacuated. Further analysis shows that the 7.14 inches of rain at Bird Island (Renville County), MN and the 8.22 inches at Baldwin (St Croix County), WI

are new statewide records for June 29th….in other words it has never rained that much anywhere in the state's climate network on that date!

The rains in western Minnesota helped to shrink the moderate drought area this week according to the U.S. Drought Monitor. But moderate drought persists in other portions of central and northeastern Minnesota. The total June rainfall of only 0.69 inches at Duluth was the 3rd driest June in history there (back to 1872). The only drier Junes were 1910 and 1995.

Two final notes about June's climate: Kittson County (extreme NW Minnesota) reported its wettest June in history as three climate stations set records there for total monthly rainfall:

- Lake Bronson Dam 10.86 inches
- Karstad 8.93 inches
- Lancaster 8.63 inches

In addition, the warmer than normal temperatures to conclude the month brought the statewide average temperature for June to 68.4°F. This ties with 1995 as the 5th warmest June statewide in history back to 1895. MSP with a June average temperature of 72.8°F tied 1987 and 1991 for the 9th warmest June in history back to 1873.

Weekly Weather Potpourri

If you are interested to read about the history of 4th of July weather in Minnesota, the DNR-State Climatology Office web site has a very informed article for you. Nearly 10 inches of rain fell on July 4th of 1995 bringing widespread flooding to Milan, MN. There are many other weather stories about the July 4th holiday.

A recent paper in the journal Nature Climate Change documents how Antarctica has been warming at three times the global rate over the past three decades. Much of this is due to changes in sea surface temperature in the Southern Hemisphere and associated changes in the circulation pattern.

In this week's AGU EOS bulletin is an interesting article about the loss of permafrost in Arctic Regions. Scientists are now finding ways to map the risk of losing permafrost due to climate change and looking for carefully at mitigating the damaging impacts to infrastructure that has been built on the permafrost environment.

MPR listener question

I work at the University of Minnesota-Crookston Campus in Polk County. We started this month with over 2.5 inches of rainfall on July1st. Can you please tell me what the daily and monthly record rainfall values are for July? BTW we dearly love Cathy Wurzer and

have regularly listened to “Morning Edition” since 2002.

Answer
Glad to help. Your Crookston climate record goes back to 1890. The most ever one-day July rainfall was 5.40 inches on July 2, 1919. The 2.54 inches you received on July 1st this week is the 8th greatest one-day July rainfall in your climate record. Your wettest month of July was also in 1919 with total rainfall of 8.83 inches. You need another 6.29 inches this month to catch that record.

Twin Cities Almanac for July 3rd
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 64 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for July 3rd
MSP records for this date include: highest daily maximum temperature of 100 degrees F in 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 degrees F in 1949; record precipitation of 3.70 inches in 1879. No snowfall has been reported on this date.

Average dew point for July 3rd is 59°F; the maximum dew point on this date is 77°F in 1999; and the minimum dew point on this date is 38°F in 1941.

All-time state records for July 3rd
The state record high temperature for this date is 107 degrees F at Beardsley (Big Stone County) in 1949. The state record low temperature for this date is 29 degrees F at Meadowlands (St Louis County) in 1927. The state record precipitation for this date is 4.61 inches at Itasca State Park (Clearwater County) in 1983. No snowfall has been reported on this date.

Past Weather Features

On the morning of July 3, 1927 some Minnesota citizens in Itasca and St Louis Counties woke up to frost. Morning temperatures ranged from 29°F to 32°F. Fortunately a sunny afternoon skies pushed temperatures back up into the upper 60s and low 70s F.

July 3, 1949 was probably the hottest on a statewide basis. Most climate stations reported daytimes highs in the 90s F, but citizens in 17 Minnesota counties saw the mercury climb to 100 degrees F or higher. It was also a difficult night to sleep as overnight minimum temperatures ranged from the mid-70s F to low 80s F. The lowest temperature at Fergus Falls was 85°F.

Strong thunderstorms brought heavy rains to many parts of Minnesota over July 3-4,

1983. Many climate stations reported 3-4 inches of rain, topped by nearly 5 inches at Itasca State Park. These thunderstorms also produced a tornado near Andover (Anoka County) which damaged many homes. In other areas downburst winds of over 60 mph caused some damage as well.

Outlook

Saturday, July 4th will be a dry day, but hot. There will be increasing cloudiness on Sunday with a chance for showers and thunderstorms by evening mostly in northern areas. For most of next week temperatures continue to be warmer than normal, but with daily chances for thunderstorms, especially afternoon and evening. With the higher dew points many overnight low temperatures will remain in the 70s F. Some moderation in temperature may occur by the second weekend of the month.

July Heat Continues

Minnesota WeatherTalk, July 10, 2020
By Mark Seeley

The hot temperatures of July 4th weekend have persisted throughout the first 8 days of July. Most climate stations are reporting an average July temperature so far that ranges from 5 to 8 degrees F above normal. This is the warmest start to July since 2012 and among the ten warmest historically on a statewide basis. Generally, overnight minimum temperatures have been above normal to a greater degree than the daytime maximum temperatures. About 90 percent of all climate stations in the state have reported at least one day with 90°F or higher temperatures this month so far, including notoriously cooler places like International Falls, Gunflint Lake, and Ely. Many areas of the state have seen overnight minimum temperatures remain in the 70s F thanks to the very high dew points.

Most of the heat has not been record setting, but within the Minnesota statewide climate network there have been some reports of daily record temperature values. Seventeen climate stations have reported at least setting or tying one daily maximum temperature record so far this month, including 93°F at Tower (usually a cold spot in the state) on July 4th. There have been 19 high daily minimum temperature records set or tied so far this month as well.

With the frequency of dew points ranging from 70°F to 79°F around the state this week, the National Weather Service has had to issue several Heat Advisories, as well as an Excessive Heat Warning for some areas. On Wednesday, July 8th at least 20 communities reported an afternoon Heat Index Value ranging from 100°F to 105°F.

Rainfall has been less than normal in most places so far this month. But scattered heavy rains from thunderstorms have produced some record-setting values in places. Last week we talked about the record July 1st rainfalls in the far northwest at Crookston (2.54 inches) and at Karlstad (2.72 inches). This week record rainfalls were delivered to some central Minnesota locations, including:

2.25 inches at Pelican Rapids (July 8)
2.15 inches at Collegeville (July 8)
1.80 inches at Alexandria (July 8)
1.68 inches at Brainerd (July 8)

Then on July 9th the following record rainfalls were reported:

3.38 inches at Isle
2.33 inches at Floodwood
2.18 inches at Sandstone

2.12 inches at Wright

In addition, on July8th tornadoes were reported in Grant, Otter Tail, and Crow Wing Counties. Some damages to homes and farmsteads occurred near Dalton where storm chasers photographed a tornado that was on the ground for 8-9 miles. Unfortunately, a 30-year-old man was killed near Dalton. You can read more about these storms at the MN State Climatology Office web site and at the NOAA-National Weather Service Grand Forks Office web site.

Weekly Weather Potpourri

The NOAA-National Hurricane Center was issuing advisories on Tropical Storm Fay which expected to bring high winds and heavy rains to portions of Delaware, New Jersey, New York, and Connecticut Friday into early Saturday. Many areas may get 2-4 inches of rainfall.

NOAA this week produced a map to show when the climatological hottest day of the year occurs around the USA. There is quite a variation across June through August for most geographical locations. In Minnesota, the hottest day of the year typically falls somewhere between July15 and July31. In the southwestern USA the hottest day of the year is usually in June, while in the southern states and some of the northwest it occurs in the first half of August.

The BBC reported that parts of southern Japan saw over a foot of rain earlier this week causing widespread flooding and some very serious damage to infrastructure, especially on Kyushu. The rains are expected to continue as well, with thousands of people already displaced from their homes.

MPR listener question

Heard you talk about the high dew points (70°F or greater) in June and wondered if that trend has continued in July. How many hours of 70°F dew points have we had so far this month in the Twin Cities?

Answer

Thanks to Senior Climatologist Kenny Blumenfeld of the MN State Climatology Office for staying on top of these data. His analysis shows 98 hours with a 70°F dew point so far this month. Last year July produced only 111 such hours for the whole month. In 1983 there were 305 hours. What might be more remarkable is that since June 27th we have measured a dew point of 60°F or higher every hour, the longest such streak in the Twin Cities since 1987, the year of the Super Storm 10-inch rain on July 23rd.

Twin Cities Almanac for July 10th

The average MSP high temperature for this date is 84 degrees F (plus or minus 8 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 10th

MSP 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 1996; highest daily minimum temperature of 80 degrees F in 1936; record precipitation of 1.93 inches in 2002. No snowfall has been reported on this date.

Average dew point for July 10th is 59°F; the maximum dew point on this date is 77°F in 1999; and the minimum dew point on this date is 38°F in 1941.

All time state records for July 10th

The state record high temperature for this date is 112 degrees F at Wadena (Wadena County) in 1936. The state record low temperature for this date is 32 degrees F at Tower (St Louis County) in 1978. The state record precipitation for this date is 7.02 inches at Leech Lake (Cass County) in 1954. No snowfall has been reported on this date.

Past Weather Features

By far the hottest July 10th in state history was in 1936, when every climate station in the state reported a daytime high of 90 degrees F or greater, except for Grand Marais (81°F). Over 60 climate stations reported a maximum temperature of 100°F or greater. The overnight low never fell below 82°F at Moorhead and Beardsley.

July 9-10, 1954 brought powerful thunderstorms to many parts of the state. These storms brought high winds and hail, but also very heavy rains, especially across northern counties. Portions of Cass County saw flooding brought on by 5–7-inch rains.

On July 10, 1996 campers in St Louis, Beltrami, Carlton, Pine, and Cass Counties woke up to morning temperatures in the 30s F. At Embarrass, MN the temperature started out at 34 degrees F bit warmed up to 73°F by late afternoon.

Outlook

Near normal to even cooler than normal temperatures for Saturday with a chance for showers. Sunday and Monday will be dry with near normal temperatures and dew points. Later on, Monday there will be increasing chances for showers lasting through Wednesday. Temperatures will not stray far from normal for this time of year most of next week.

First Half of July: Warm With Mixed Rainfall

Minnesota WeatherTalk, July 17, 2020
By Mark Seeley

Through the first half of July average temperatures from around the state have been running 3-5 degrees F above normal, with widespread 90°F temperature readings. Across the Minnesota climate station network there have been 21 daily record maximum temperatures set or tied and 23 daily record warm minimum temperatures set or tied. These include normally some of the coolest locations in the state such as Cass Lake (with a record warm minimum temperature of 72°F on the 1st) and Gunflint Lake (with a record high maximum temperature of 92°F on the 5th.

It is unusual that Minnesota has not reported the nation's lowest temperature since May 30th when it was 30°F at Hibbing and Silver Bay.

Minnesota's northwestern most county, Kittson has been the wettest area in the state this month with rainfall totals so far on a record-setting pace: Karlstad 8.59 inches, Lake Bronson Dam 6.19 inches, and Hallock 5.70 inches. The number at Karstad is already a monthly record for July and will just grow the rest of the month. The monthly records at Lake Bronson (8.29 inches in 1982) and at Hallock (7.28 inches in 1982) are likely to be challenged before the end of July as well. All three of these locations had record rainfall on July 14th this week:
Karlstad 3.23 inches
Lake Bronson Dam 2.53 inches
Hallock 2.02 inches

These heavy rains caused the National Weather Service to issue a somewhat rare mid-summer flood warning for the Two Rivers in Kittson County.

In contrast Dawson, MN (Lac Qui Parle County) has seen just 0.26 inches of rain so far this month. Much of central Minnesota has seen less than normal amounts. However, the second half of July is expected to bring more than average rainfall to much of the state.

Weekly Weather Potpourri

NOAA scientists report that June of 2020 was the third warmest in history globally. In Russia, parts of Siberia reported the warmest June in history, For the USA June of 2020 was in the upper third of the historical distribution temperature-wise, but nowhere near record-setting.

The NOAA Great Lakes Environmental Research Laboratory reported earlier this week that Great Lakes water temperatures are running from 6 to 11 degrees F above normal this summer. Lake Michigan surface temperatures are in the 70s F. Even along part of

the shoreline of Lake Superior, some surface waters are flirting with the 70 F mark. The Weather Underground web site features an interesting report on this.

The BBC reported that a strong low-pressure system has produced massive waves and a great deal of coastal erosion in New South Wales north of Sydney. Waves as high as 36 feet have tempted surfers but have also eroded a great deal of land around expensive shoreline homes in the area.

July 9-15 was the hottest week of the season in Death Valley, CA. Daily maximum temperatures reached as high as 128°F and on two consecutive nights (July 12-13) the overnight low did not fall below 100°F. The weekly average temperature was 107°F, hot even for Death Valley, about 5-6 degrees F above normal for this time of year.

MPR listener question
Out here in Lac Qui Parle County we have had a lot of heat, but very little rain this month, just three-tenths in my farm rain gage. Has there ever been July without any rainfall?

Answer
I examined three locations in Lac Qui Parle County with long-term climate histories: Dawson, Madison, and Montevideo. The lowest total July rainfall I could find was in 1975 when Dawson reported 0.31 inches and Madison reported 0.42 inches; and in 1936 for Montevideo with just 0.12 inches. There have been a few other regions of the state that have historically been dry for the entire month of July. For example, Blooming Prairie (Dodge County) recorded no rainfall in July of 1894, while Little Falls (Morrison County) recorded no rainfall in July of 1936.

Twin Cities Almanac for July 17th
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 17th
MSP records for this date include: highest daily maximum temperature of 99 degrees F in 1936; lowest daily maximum temperature of 65 degrees F in 2009; lowest daily minimum temperature of 52 degrees F in 1976; highest daily minimum temperature of 79 degrees F in 2011; record precipitation of 3.71 inches in 1997. No snowfall has been reported on this date.

Average dew point for July 17th is 62°F; the maximum dew point on this date is 81°F in 2011; and the minimum dew point on this date is 38°F in 1911.

All-time state records for July 17th
The state record high temperature for this date is 110 degrees F at Worthington (Nobles County) in 1936. The state record low temperature for this date is 33 degrees F at Bigfork (Itasca County) in 1971. The state record precipitation for this date is 5.90 inches at Gull Lake (Cass County) in 1952. No snowfall has been reported on this date.

Past Weather Features

July 17, 1936 was the hottest in history with 25 Minnesota communities reporting afternoon temperatures of 100°F or greater. It was the middle of the deadly Heat Wave from July 5-19 that killed hundreds of Minnesota citizens.

Strong thunderstorms dropped 2-5 inches of rain across portions of central Minnesota over July 16-17, 1952. Gull Lake reported nearly 6 inches which washed out a number of roads in the area.

Campers in northern Minnesota woke up to temperatures in the 30s F on July 17, 1971. At Big Fork (Itasca County) the temperature started out at 33°F but rose by 40 to 73°F by 4pm.

Outlook

Warm and humid through Saturday night with a Heat Advisory and an Excessive Heat Warning issued for portions of the state. There will be a chance for showers and thunderstorms, some of which could be severe. Mostly sunny and cooler with near normal temperatures for Sunday and Monday. Near normal temperatures continue through Thursday, with slight chances for showers and thunderstorms. Then a warming trend for the end of next week as temperatures return to above normal.

Dry in Unusual Spots

Minnesota WeatherTalk, July 24, 2020
By Mark Seeley

Earlier this month I wrote about how normally cold spots in the state, Tower, and Gunflint Lake for example, were recording daily high temperatures in the 90s F and setting records. Always looking for the unusual weather situation, I also find that the weather pattern this month so far has produced significant rainfall deficiencies in some spots that are normally among the wettest in the state: Waseca and Faribault.

Currently the July total rainfall at the University of Minnesota Southern Research and Outreach Center at Waseca is only 0.79 inches, while at Faribault (Rice County) it is only 0.66 inches. This is well over 2 inches short of normal. Recall that Waseca has reported over 45 inches of annual precipitation in 4 of the past 5 years, with a record 56.24 inches (2016, then a state record), and Faribault has reported 40 or more inches of annual precipitation in 4 of the last 5 years, including 50.55 inches (a local climate record) just last year. So, these are typically wetter areas of the state. With the forecast for some intense rainfalls over the state this coming weekend, both Waseca and Faribault could make up for their July rainfall deficiencies in one serious thunderstorm.

In stark contrast, almost all the climate stations in Kittson County of northwestern Minnesota, historically one of the driest areas of the state, are reporting record or near record-setting July rainfall totals. Karlstad has reported 9.47 inches, already a monthly record for July, while Lake Bronson Dam has reported 6.90 inches, and Hallock has reported 6.58 inches. Across mostly northern and central Minnesota there have been 31 new daily record rainfalls so far this month.

Weekly Weather Potpourri

The NOAA-National Hurricane Center expects Tropical Storm Gonzalo in the Central Atlantic Ocean to develop into a hurricane over the weekend. It would be early in the season for such a storm. It is unclear whether Gonzalo would remain a hurricane for long or degrade back to Tropical Storm status as it passes south of Jamaica early next week. The BBC Weather Centre offers an interesting perspective.

In the Pacific Ocean Hurricane Douglas is expected to track towards Hawaii over the weekend. It may bring heavy rains and high winds to the big island by Sunday.

In this week's AGU-EOS newsletter we learn that Rio de Janeiro, Brazil, and Chicago, Ill., are using NASA Earth observations to map, monitor, and forecast water and air quality, urban heat island effects, landslide risks, and more. This seems like appropriate application of NASA technology that may be picked up by other cities.

MPR listener question
We live near Huddle's Resort on Leech Lake in northern Minnesota and we have measured over 7 inches of rainfall so far this month including 2.5 inches just last Saturday. Can you tell us what the July rainfall record is for Leech Lake?

Answer
The all-time record July rainfall at Leech Lake (1887-present) is 12.27 inches in 1949. So, you still have a long way to go to break that record. BTW the all-time July rainfall record for the state is from just north of Isle in Aitkin County where 22.70 inches fell in 1972, including 18.45 inches in one week (July 17-23).

Twin Cities Almanac for July 24th
The average MSP high temperature for this date is 83 degrees F (plus or minus 7 degrees F standard deviation), while the average low is 64 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for July 24th
MSP records for this date include: highest daily maximum temperature of 104 degrees F in 1941; lowest daily maximum temperature of 65 degrees F in 1915; lowest daily minimum temperature of 49 degrees F in 1891; highest daily minimum temperature of 78 degrees F in 1934; record precipitation of 1.69 inches in 2012. No snowfall has been reported on this date.

Average dew point for July 24th is 61°F; the maximum dew point on this date is 78°F in 1941; and the minimum dew point on this date is 39°F in 1946.

All-time state records for July 24th
The 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 state record low temperature for this date is 29 degrees F at Kelliher (Beltrami County) in 2003. The state record precipitation for this date is 5.80 inches at Rosemount (Dakota County) in 1987. No snowfall has been reported on this date.

Past Weather Features

Probably the hottest ever July 24 on a statewide basis was in 1901 when over 30 Minnesota climate stations reported an afternoon high temperature of 100°F or greater.

Even the overnight low temperature only dropped to 82°F at Faribault.

July 24, 1913 brought record low temperatures to the Red River Valley with many Minnesota climate stations reporting morning lows in the low to mid 30s F. Hallock started out at just 35°F but rose to a high of 78°F by the afternoon.

Striking during in the middle of what was regarded as a drought-prone year around Minnesota, the flash flood of July 23-24, 1987 is still vividly remembered by many eastern Minnesota residents, especially those in the Twin Cities Metro Area. As much as 5-10 inches of rain inundated the landscape, flooding roads, highways, and thousands of basements. At the MSP airport 10 inches of rain was measured in just 6.5 hours. Portions of the Interstate Highway system in and around the Twin Cities were closed due to flooding for days.

Outlook

Warm and muggy weekend with dew points in the 70s F, perhaps even reaching 80°F in some places on Saturday. Widespread showers and thunderstorms, some very heavy Saturday afternoon and night. A cold front will pass on Sunday bring temperatures by evening closer to normal. Temperatures will run near seasonal normals Monday through Wednesday, then warmer and a chance for showers and thunderstorms by Thursday.

July Climate Summary

Minnesota WeatherTalk, July 31, 2020
By Mark Seeley

It was warm and wet for the month of July across most of Minnesota. Statewide July of 2020 was both the 14th warmest and 14th wettest in history back to 1895.

Average monthly temperatures from the state climate network ranged from 1 to 4 degrees F warmer than normal. There were 25 daily high maximum temperature records tied or broken and 38 daily high (warm) minimum temperature records tied or broken with the state climate station network. Extremes for the month ranged from 97°F at a number of locations on the 3rd to just 40° at Brimson (St Louis County) on the 23rd. With extremely high dew points (many days produced a dew point of 70°F or greater) the National Weather Service had to issue Heat Advisories and Excessive Heat Warnings on a number of days as the Heat Index soared to 100 degrees F or greater. Interestingly enough Hallock (Kittson County) in extreme northwestern Minnesota reported one of the highest Heat Index values with 107°F on the 25th.

Rainfall around the state was generally above normal thanks to some very heavy thunderstorms. Portions of at least 15 counties reported monthly rainfall totals of 8 inches or more. For Kittson County in far northwestern Minnesota, it was the wettest July in history with Karlstad reporting 10.11 inches of rainfall. Suffice to say that small grain harvest was delayed there. Also, over July 25-26 a rare mega-storm occurred over portions of Sibley, Renville, Le Sueur, Nicollet, Waseca, Blue Earth, and Rice Counties dropping 6 inches or more over 1000 square miles. Many flash floods were reported from this storm. It was analyzed by the DNR State Climatology Office.

The storm produced over 10 inches of rain in a few locations and was the first mega-storm to occur in the state since 2016.

Across the state climate network 38 daily rainfall records were either tied or broken, including a new all-time statewide 24-hour record for July 26th of 8.63 inches at Mankato 2.9 SSW in Blue Earth County.

In portions of Fillmore and Winona Counties climate observers actually reported below normal July rainfall, something that is very rare for them in recent years. And some small pockets of moderate drought remained at the end of the month in west-central and northern Minnesota.

Unfortunately, severe thunderstorms produced tornadoes in Grant, Otter Tail Counties on July 8th. One fatality (the first from a tornado since 2011) was reported near Dalton, MN.

Weekly Weather Potpourri

The NOAA National Hurricane Center is tracking Tropical Storm Isaais (ees-ah-EE-ahs) this week. It is expected to strengthen into a hurricane and perhaps track off the east coast of Florida this weekend and towards the east coast of North Carolina Hopefully it will remain far enough out to sea so as not to force any evacuations of coastal communities, but it will likely bring some heavy rains.

A recent paper in Climate and Atmospheric Science documents the wetter climate of Alaska and how it is affecting the permafrost there. The increased rainfall is leading to a deeper summer thawing of the permafrost which is changing the structure and composition of ecosystems. Long term this may increase the risk of more wildfires there. You can read more from the Science Daily web site.

This week's AGU-EOS Bulletin highlights an article from India's first assessment of climate change. It discusses how climate change has hastened glacial melting across the Hindu Kush Himalaya region, home to some of the world's tallest peaks, including Mount Everest. This pace of change will have dramatic consequences on India's freshwater resources.

MPR listener question

To my eyes, the sky was bluer in April than I had ever noticed before. It seems less deep blue now. Is that true? How is sky color measured?

Answer

Indeed, many Minnesota citizens commented earlier in the current pandemic episode about the sky being so blue. Certainly, it is likely that both reduced airline traffic and vehicle traffic may have had something to do with this. But as spring and summer progressed more and more water vapor (evaporation), dust, and aerosols were released into the atmosphere and diminished the measurement of "atmospheric transmissivity." This is a scientific way of saying that more of the solar radiation (energy from the sun) was scattered by a dirtier atmosphere. The happens normally with the summer season but was especially observable thanks to the pandemic reducing our human activities that lead to greater emissions of dust, gases, and aerosols into the atmosphere.

By the way, I am not aware of any measurement that is specifically focused on the "blueness" of the sky. Perhaps someone has developed Munsell charts (color codes using Hue, Value, and Chroma) for the sky similar to those used to assess the color of soil or vegetation.

Twin Cities 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 64 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for July 31st
MSP 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 degrees F in 2006; record precipitation of 0.79 inches in 1911. No snowfall has been reported on this date.

Average dew point for July 31st is 60°F; the maximum dew point on this date is 78°F in 1987; and the minimum dew point on this date is 39°F in 1936.

All-time state records for July 31st
The state record high temperature for this date is 110 degrees F at Madison (Lac Qui Parle County) in 1988. The state record low temperature for this date is 31 degrees F at Sawbill Camp (Cook County) in 1937. The state record precipitation for this date is 6.70 inches at Albert Lea (Freeborn County) in 1961. No snowfall has been reported on this date

Past Weather Features

Cold camping in the northland back on July 31, 1903. Many parts of northern Minnesota reported morning low temperatures in the 30s F. It was just 32°F in parts of Roseau and Itasca Counties.

Strong thunderstorms brought heavy rains to the state on July 31, 1953. Southwester Minnesota was hit with hail and 2-4 inches of rain. Some roads were washed out and harvesting of wheat and oats was disrupted.

July 31, 1988 saw many record-setting daily high temperatures across Minnesota. High temperatures ranged from 100° to 110° across portions of 40 counties in the state. The nighttime temperature never fell below 80° at New London (Kandiyohi County).

Outlook

Near seasonal temperatures on Saturday but with chances for showers and thunderstorms. Then much cooler than normal for Sunday through Wednesday. Generally dry through the period. There will be another chance for rain by next Thursday.

Return to Cooler Than Normal Temperatures

Minnesota WeatherTalk, August 07, 2020
By Mark Seeley

The return of cooler than normal temperature this week brought a smile to most Minnesota citizens after the hotter than normal consecutive months of June and July. Most climate stations have been averaging 2 to 5 degrees F cooler than normal so far this month. Coupled with lower dew points in the 40s and 50s F the air has felt much more comfortable and house windows are typically opened to let in the "fresh air."

In portions of St Louis and Koochiching Counties up north morning low temperatures have even dipped into the mid to upper 30s F. Many northern Minnesota communities have seen daytime high temperatures remain in the 60s F this week. Grand Marais recorded a high of only 65°F on August 4th.

In terms of rainfall, the first week of August has brought little to most of the state. The exception is west-central Minnesota where thunderstorms on August 1st brought an inch or more of rainfall to many areas. These rains were well-received as this has been one of the drier regions of the state this summer. Some of the rainfall reports included:

2.10 inches at Ortonville (Big Stone County)
1.85 inches at Breckenridge (Wilkin County)
1.60 inches at Artichoke Lake (Big Stone County)
1.45 inches at Dawson (Lac Qui Parle County)
1.43 inches at Wheaton (Traverse County)
1.22 inches at Minneota (Lyon County)

The amounts at Ortonville, Artichoke Lake, and Dawson were new daily records for the date. Some southwestern Minnesota communities also reported between a half inch and an inch of rainfall on August 6th.

Weekly Weather Potpourri

NOAA released an Atlantic Hurricane Season Update this week. "The 2020 Atlantic hurricane season has been off to a rapid pace with a record-setting nine named storms so far and has the potential to be one of the busiest on record. Historically, only two named storms form on average by early August, and the ninth named storm typically does not form until October 4. An average season produces 12 named storms, including six hurricanes of which three become major hurricanes (Category 3, 4, or 5)." The outlook now calls for 19 to 25 named storms before the season ends in November.

The BBC Weather Centre reported that portions of England and Wales were having a Heat Wave this week. Temperatures on Friday (August 7th) reached the mid-90s F in some areas as citizens flocked to the coast and crowded beaches seeking relief.

Nighttime temperatures were also remaining unusually high with readings of 68°F or warmer in places.

Death Valley, CA has reported a warmer than normal summer so far with 18 days of maximum temperatures of 120°F or greater. The historical average is 16 days, but the record is 40 such days back in 1996. It appears as though that record is safe. The highest temperature there so far this year is 128°F back in July.

MPR listener question

We live in Hokah, MN (Houston County) and well remember August of 2007 when we received 23.86 inches of rainfall. The wettest single month in Minnesota history. We were wondering how many places in Minnesota have seen August deliver the most rainfall of any months of the year? Is this unusual?

Answer

About 15 percent of the Minnesota climate stations with a daily measurement history of 80 years or longer report the most every monthly rainfall in August. Several climate stations in southeastern Minnesota also report August of 2007 as their wettest month, including Spring Grove with 19.07 inches, Caledonia with 18.96 inches, Winona with 18.83 inches, and Rochester with 14.07 inches. But there are a large number of northern Minnesota climate stations that also report August as the wettest month in history including International Falls with 11.26 inches in 1942, Gunflint Lake with 10.84 inches in 1988, and Roseau with 10.97 inches in 1974. These northern communities often get some of their highest dew points in the month of August as well. The higher water vapor content is conducive to the potential for more intense rainfalls.

Twin Cities 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 63 degrees F (plus or minus 6 degrees F standard deviation).

MSP Local Records for August 7th

MSP 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 degrees F in 2001; record precipitation of 2.29 inches in 1984. No snowfall has been reported on this date.

Average dew point for August 7th is 60°F; the maximum dew point on this date is 77°F in 2001; and the minimum dew point on this date is 42°F in 1989.

All-time state records for August 7th
The state record high temperature for this date is 104 degrees F at Alexandria (Douglas County) in 1983. The state record low temperature for this date is 29 degrees F at Brimson (St Louis County) in 1989. The state record precipitation for this date is 8.62 inches at St Peter (Nicollet County) in 1968. No snowfall has been reported on this date.

Past Weather Features

Strong thunderstorms move across the state over August 7-8, 1968 bring heavy rains, high winds, and hail. Parts of Blue Earth, Faribault, and Nicollet Counties in southern Minnesota received 5 to 9 inches of rain causing widespread flash flooding.

The hottest August 7th in state history was in 1983 when just about every part of the state saw daytime temperatures reach the 90s F or higher. Temperatures broke the century mark in 14 of Minnesota's counties.

Campers awoke to a frosty morning on August 7, 1989. At least 9 Minnesota counties reported morning low temperatures in the 30s F, with just 29°F at Brimson (St Louis County). It did warm up into the 70s F that afternoon.

Outlook

Warmer than normal and more humid over the weekend with chances for showers and thunderstorms each day. Cooler and drier on Monday and Tuesday, then a chance for more showers and thunderstorms for Wednesday and Thursday of next week. Some of the rainfalls could be heavy.

Mid-August Climate Check

Minnesota WeatherTalk, August 14, 2020
By Mark Seeley

After a cooler than normal first week of the month, temperatures fluctuated above normal this past week evening things out. Most climate stations are now reporting average monthly temperature that is a degree or two either side of normal. Extremes so far have been 92°F at Redwood Falls on the 9th to 36°F at Seagull Lake (Cook County) on the 4th. No immediate shift to extreme temperatures, hot or cold, seems likely the rest of the month.

Rainfall has certainly been mixed this month. Over 50 climate stations have reported 3 inches or more of rainfall this month so far, while over 20 climate stations, mostly in southeastern Minnesota have reported less than an inch of rainfall. Since last Friday widespread thunderstorms have brought significant daily rainfall to many areas, and some climate stations saw daily records set. Some of the new daily record rainfalls over the past week at long term Minnesota climate stations include:

- August 8th: 1.80 inches at Cotton (St Louis County); 1.85 inches at Floodwood (St Louis County); 3.97” at Lake Winnibigoshish Dam (Itasca County); and 2.23 inches at Wright (Carlton County)
- August 9th: 2.00 inches at Zumbrota (Goodhue County); 1.37 inches at International Falls (Koochiching County)
- August 10th: 2.28 inches at Rockford (Wright County); 1.61 inches at Wright (Carlton County)
- August 12: 2.95 inches at Redwood Falls (Redwood County)
- August 13: 2.06 inches at Long Prairie (Todd County); 2.89 inches at New Ulm 3SE (Nicollet County)
- August 14: 2.30 inches at Alexandria (Douglas County)

A number of other locations that do not have long term climate records reported even heavier daily rainfalls, with observers in Edina, Excelsior, Eden Prairie, and Chanhassen reporting over 4 inches on the 10th.

August 8-10 (Sunday-Monday) were two of the busiest days of the summer so far for the NOAA Storm Prediction Center because of widespread severe weather reports (including the derecho storm described below in the “Weather Potpourri”). On Sunday, August 9th there were 48 reports of large hail filed across Minnesota, from 15 different counties. Hail sizes ranged from 1 inch diameter to 2.5-inch diameter. In addition, there was a tornado report from near Thief River Falls (Pennington County), as well as damaging wind reports from Roseau, Marshall, Beltrami, Itasca, Hubbard, Hennepin, and Pine Counties with many wind gusts over 60 mph.

Weekly Weather Potpourri

NOAA reports that a large derecho (straight-line windstorm with a bow echo on radar) formed in northeastern NE, and SW SD early on Monday, August 10th. It moved east over IA, WI, IL, and IN producing rain, hail, and serious wind damage. Wind gusts of 80-100 mph were common along a path that cut a wide swath. You can find more detailed information from the National Weather Service Forecast Office in the Quad Cities.

NOAA release its annual State of the Climate Report this week framing 2019 in historical context. The report confirmed that 2019 was among the three warmest years in records dating to the mid-1800s with a short-term warming, but weak, El Niño influence early in the year. It is interesting to note that the coldest geographic anomaly on Earth last year was in the middle of North America.

MPR listener question

We live in Loretto, MN (western Hennepin County) and saw tennis-size hail in our yard last Sunday (August 9th)? My husband and I wondered what was the largest hailstone that has been reported in Minnesota?

Answer

Yes, indeed there were many reports of large hail across Minnesota last Sunday, especially in Hennepin and Wright Counties. There have been many cases of tennis ball-size hail (2.5-inch diameter), and even softball-size hail (4-inch diameter) historically in Minnesota. According to official NOAA records the largest diameter hailstones measured in Minnesota were 6 inches, once at Edgerton (Pipestone County) on July 4, 1968; and once in Reading (Township in Nobles County) on July 28, 1986. According to the NOAA National Severe Storms Lab (NSSL) hail of this size mail fall to earth at a velocity of over 70 mph... quite destructive.

Twin Cities Almanac for August 14th

The average MSP high temperature for this date is 81 degrees F (plus or minus 7 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 14th

MSP 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 degrees F in 1978; record precipitation of 1.00 inches in 1981. No snowfall has been reported on this date.

Average dew point for August 14th is 59°F; the maximum dew point on this date is 76°F in 1978; and the minimum dew point on this date is 32°F in 1933.

All-time state records for August 14th
The state record high temperature for this date is 105 degrees F at Hawley (Clay County) in 1984. The state record low temperature for this date is 25 degrees F at Tower (St Louis County) in 1977. The state record precipitation for this date is 5.29 inches at Gaylord (Sibley County) in 1981. No snowfall has been reported on this date.

Past Weather Features

It was a frosty morning in northern Minnesota on August 14, 1964. Observers in St Louis, Itasca, Cass, Carlton, and Roseau Counties all reported frosts. The temperature at Cotton, MN started out at 27°F but warmed all the way up to 70°F by afternoon.

August 14, 1965 was the hottest in history for Minnesota with a majority of climate stations reporting afternoon highs in the 90s F. In western Minnesota, Lyon, Nobles, Traverse, Lac Qui Parle, Polk, Marshall, Wilkin, and Yellow Medicine all reported temperatures of 100°F or greater.

August 14-15, 1981 brought strong thunderstorms to portions of southern Minnesota. Many counties reported 2 to 5 inches of rainfall with some flooded fields and roads.

Outlook

Relatively cool, sunny, dry, and pleasant weather will settle into Minnesota over the period Saturday through Thursday. Temperatures will track a few degrees cooler than normal. They will be a chance of rainfall towards next weekend.

More Record Rainfalls

Minnesota WeatherTalk, August 21, 2020
By Mark Seeley

August 14-15 brought more thunderstorms to Minnesota. Widespread rains of 1-2 inches were reported and some record daily rainfalls as well. Some of those climate stations reporting new record rainfalls included:

Grand Rapids 4.17” (5th largest rain in history there)
Alexandria 3.58”
Melrose 3.21”
St Cloud 3.09”
Pokegama Dam 2.89”
Ottertail 2.85”
Hibbing 2.60”
Long Prairie 2.44”
Milaca 2.17”

In addition, the National Weather Service reported several tornadoes across the state on August 14th and did damage surveys of several of them. Most of them were classified as EF-0 (winds of 65-85 mph), but one near Glencoe (McLeod County) and one near Cushing (Todd County) were rated EF-1 (winds 86-110 mph) and produced some damage. No deaths were reported.

As a result of these recent thunderstorms and earlier ones in the month some observers in Aitkin, Cass, Itasca, Carver, and Clearwater Counties now report over 7 inches of rain for the month. Longville (Cass County) has reported nearly 8.5 inches. As a contrast, Caledonia (Houston County), usually one of the wetter spots in the state has reported just 0.28 inches so far this month.

Weekly Weather Potpourri

Earlier in the week NOAA reported that Death Valley, CA tied the all-time North America high temperature record with a reading of 130°F on Sunday, August 16. This is also reputed to be the hottest temperature ever measured on Earth, as some earlier reported records (134°F at Death Valley in July 1913 and 131°F Kebili, Tunisia in July 1931) are thought to have been erroneous.

This is certainly the highest temperature ever measured in the month of August. The next day, Death Valley reported a high of 127°F and a low of 104°F for a daily mean temperature of 115.5°F. This is the second highest daily mean temperature ever reported then (records extend back to 1911), topped only by a mean of 117.5°F on July 12, 2012.

Science Daily web site reported this week that a team of international scientists studying

the Greenland ice sheet found that a new record loss of ice mass occurred in 2019. The total loss amounted to 532 billion metric tons, more than in the previous record year 2012 (464 billion metric tons), which equates to an average global sea-level rise of 1.5 mm. This accelerated ice loss is expected to continue.

There is an interesting article in this week's AGU-EOS bulletin about the Heat Wave in Japan during July of 2018 when several days brought temperatures of 95°F or greater, topped by a reading of 106°F at Kumagaya, a suburb of Tokyo. Over a thousand citizen deaths were blamed on this Heat Wave and in 2019 the Japanese Meteorological Service researchers documented that it was the result of climate change.

MPR listener question
We live in Caledonia, MN and have received very little rain this month. All of the storms have gone either north or south of us. Our backyard rain gage has caught just 0.33 inches of rain. Can you tell us what has been the driest August in our area of the state?

Answer
The climate records at Caledonia go back to 1892. The driest August was in 1969 with just 0.71 inches of rain. In fact, several other Minnesota climate stations report 1969 as their driest August in history. That year Beardsley (Big Stone County) reported a total August rainfall of 0.01 inches.

With ten days left in the month, I would guess that you will end up with a few more rainy days, especially the last week of the month, and double or triple that measly total of a third of an inch so far.

Twin Cities 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 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 degrees F in 1968; record precipitation of 3.64 inches in 1924. No snowfall has been reported on this date.

Average dew point for August 21st is 58°F; the maximum dew point on this date is 78°F in 1903; and the minimum dew point on this date is 34°F in 2004.

All-time state records for August 21st
The state record high temperature for this date is 103 degrees F at Milan (Chippewa County) in 1976. The state record low temperature for this date is 23 degrees F at

Tower (St Louis County) in 2004. The state record precipitation for this date is 8.17 inches at Byron (Olmsted County) in 2007. No snowfall has been reported on this date.

Past Weather Features

An F-5 (winds over 260 mph) tornado struck Rochester about 5:30 pm on August 21, 1883, killing 37 people and injuring 200. This tornado also lifted a train off the tracks and tipped it over. Attending to the injured and rebuilding the city resulted in the formation of the Mayo Clinic.

August 21st in 1947 and 1976 brought plenty of heat to Minnesota with widespread readings of 90°F or higher. Many western communities reached 100°F in the afternoon.

Strong thunderstorms brought heavy rainfall to western and southwestern Minnesota over August 20-21, 2002. Portions of Lac Qui Parle, Yellow Medicine, Chippewa, Meeker, and Rock Counties received over 5 inches of rain. Dawson, Madison, Montevideo, Litchfield, Pipestone, and Amboy all reported daily record rainfalls.

August 21, 2004 brought very cold temperatures to the state. Many observers reported a morning low in the 30s F. Observers in Hubbard, Itasca, Cass, and St Louis Counties reported frost with temperature readings in the 20s F. Ground frost was reported as far south as Mower County.

Outlook

Temperatures will remain warmer than normal for Saturday through Wednesday. There will be a chance for showers and thunderstorms, mostly in central and northern counties on Saturday, and then again later on Wednesday. Temperatures will cool closer to normal for the end of next week.

Preliminary Climate Summary for August 2020

Minnesota WeatherTalk, August 28, 2020
By Mark Seeley

Warm and wet are to two words to describe the climate of August 2020 in Minnesota. Most areas of the state show average temperatures for August of 2020 that are 1-3°F above normal. Extremes for the month ranged from 97°F at Marshall (Lyon County) on the 24th to just 36°F at Seagull Lake (Cook County) on the 4th. There were several days that the NOAA National Weather Service issued Heat Advisories or Excessive Heat Warnings thanks to unusually high dew points. At MSP, the number of hours with dew point readings of 70°F or higher exceeded 100 for the month. The total of such hours is now well over 325 for the summer so far.

August wraps up meteorological summer and is the third consecutive warmer than normal month. The June-August period in 2020 will rank among the 5 warmest historically for the state of Minnesota.

August rainfall was above normal at most locations. Portions of Cass, Clearwater, Stearns, and Itasca Counties reported over 8 inches of rain for the month. Over 80 climate stations reported 5 or more inches of total rainfall. Within the Minnesota Cooperative Climate Station Network at least 42 daily rainfall records were tied or set during August. Artichoke Lake (Big Stone County) and Wright (Carlton County) reported three new daily rainfall records during the month. It is very unusual for a climate station to record 3 record-setting rainfalls in one month. Another oddity was the both Ottertail and Long Prairie reported back to back record setting rainfalls (over 2 inches) on August 13-14.

With a wetter than normal August the meteorological summer (June-August) in Minnesota will end up among the 20 wettest historically back to 1895, with a statewide average rainfall over 13 inches.

One of the drier areas was southeastern Minnesota where Caledonia (Houston County) has reported just 0.37 inches which will be their driest August in history if they get no more rain before the end of the month.

Weekly Weather Potpourri

The NOAA-National Hurricane Center reported that Hurricane Laura came ashore near Cameron, LA early in the morning on August 27 with winds up to 150 mph (Category 4). It also brought widespread 6-10 inches rainfall amounts and significant storm surge. Damage surveys were still being conducted in both LA and TX on Thursday and Friday this week. Over half a million people were without power. The Weather Underground web site reported extensively on this storm.
Also, earlier in the week Typhoon Bavi struck portions of South Korea and North Korea

bring 12-16 inches of rainfall and a good deal of flash flooding. It is somewhat rare for a typhoon to strike that far north. The BBC News reported more detail.

Researchers from the University of Arizona have reported from paleo-climate studies that the global average temperature during the Last Glacial Maximum, 20,000 years ago was about 46°F. This compares to a value of 57°F for the 20th Century global average. The Arctic Region during the Last Glacial Maximum was about 25 degrees F colder than it is today. You can read more from this study at Science Daily.

MPR listener question
We heard you speak last week about 1969 as a very dry August in southeastern Minnesota. It seems like recently August has been consistently wetter than normal. When was the last super dry August in Minnesota?

Answer
The last super dry August on a statewide basis was in 2003 when the average rainfall over the state was 1.41 inches. Historically this was 2nd driest behind 1.11 inches in 1930. I might add that in the 17 years since 2003 twelve years have brought a near normal or wetter than normal August to Minnesota.

Twin Cities 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 60 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for August 28th
MSP records for this date include: highest daily maximum temperature of 94 degrees F in 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 degrees F in 1969; record precipitation of 1.11 inches in 1950. No snowfall has been reported on this date.

Average dew point for August 28th is 59°F; the maximum dew point on this date is 77°F in 1955; and the minimum dew point on this date is 34°F in 1946.

All-time state records for August 28th
The state record high temperature for this date is 104 degrees F at Canby (Yellow Medicine County) in 1937. The state record low temperature for this date is 21 degrees F at Tower (St Louis County) in 1986. The state record precipitation for this date is 6.00 inches at Litchfield (Meeker County) in 1960. No snowfall has been reported on this date.

Past Weather Features

August 28, 1984 was the hottest in history with most parts of the state reporting afternoon temperatures in the 90s F. In the west, portions of Lyon, Marshall, Clay, Norman, and Traverse Counties saw the thermometer top 100°F.

Portions of ten northern Minnesota counties reported frost on the morning of August 28, 1986. Tower, Thorhult, Hibbing, and Cotton reported morning lows in the 20s F.

August 28-29, 2002 brought heavy thunderstorms to northwestern Minnesota and the Red River Valley. Many climate stations reported 2-5 inches of rain with hail. Red Lake Falls and Argyle reported nearly 6 inches of rainfall. It was the last heavy rains of a very wet summer in northwestern Minnesota.

Outlook

Sunny and cooler over the weekend, with lower humidity and pleasant temperatures. Increasing cloudiness on Sunday night with a chance for showers and thunderstorms late. Continued chance for showers and thunderstorms on Monday and Tuesday, then pleasant for the balance of next week.

Summer's Climate Ranking

Minnesota WeatherTalk, September 04, 2020
By Mark Seeley

Now that we have put the month of August (warm and wet) in the record books, we might assess the overall climate pattern across the state for summer (June-August). On a statewide basis this was one of the top 4 warmest summers in history (since 1895, averaging nearly 3 degrees F above normal for all three months combined. The summer of 1988 remains the warmest in state history, but 2020 will follow close behind with 1933 and 1983. Within the climate station network of Minnesota this summer 135 daily maximum temperature records were set or tied, while 143 warm daily minimum temperature records were set or tied. The highest temperature was 102°F at Granite Falls on June 7th. In addition, Benson, Sabin, Artichoke Lake, Milan, and Morris all reported at least one day with 100°F as well.

With a statewide average rainfall of about 13.75 inches for June-August, the summer of 2020 will rank as the 17th wettest in state history (back to 1895). Many climate stations reported over 20 inches of rainfall for the summer, while some reported their wettest summer in history, including:

Ottertail with 22.03 inches
New York Mills with 18.36 inches
Hallock with 17.21 inches

Within the statewide climate station network 142 new daily record rainfall values were recorded, with many over 3 and 4 inches. There were also a number of large hail reports around the state, especially in southern and western counties.

Overall, the summer growing season was favorable for many crops this year, and not just the large-scale ones like corn, soybean, potatoes, and sugar beets. Producers also reported bumper crops of tomatoes, green beans, squash, and cucumbers. Other garden crops have done well too.

24th Annual State Fair Weather Quiz

Even though the State Fair has been cancelled this year, Minnesota Public Radio will be hosting the 24th Annual Minnesota State Fair Weather Quiz Program on Labor Day (September 7) from 11am to noon on FM 91.1. Former Midday Host and anchor of political reporting at MPR Gary Eichten will host the show. Though we cannot give away prizes, we will take listener calls, and I will also get to ask listeners questions about weather and climate topics. It should be fun. If you cannot listener on Labor Day, the quiz will be hosted on the MPR web site to test your knowledge. Try it and see how well you can do.

Weekly Weather Potpourri

This week NOAA features an article about the wildfires in California which have burned over 1 million acres of land. They discuss the role of drought in wildfire risk, as well as how climate change is affecting the overall risk.

Typhoon Haishen in the Wester Pacific Ocean was producing sustained wind speeds over 140 mph this week, with wave heights of 45-50 feet. It is headed towards southern Japan, where it may make landfall later in the weekend, then move on towards South Korea. The BBC reports.

A report from the University of Alaska-Fairbanks featured in Science Daily this week documents the loss of sea ice in the Bering Sea. The loss of ice has been so extreme that it is estimated to be at the smallest extent in the last 5000 years. There has been a consequential shift in atmospheric patterns over that portion of the Arctic.

This week's AGU-EOS bulletin features an interesting article about the increased frequency of wildfires in eastern Siberia and the impact on the loss of permafrost there. There is a great deal of variability there in the rate and depth of sinking ground as a result of permafrost loss.

MPR listener question

I know this question may surprise some listeners but when was the last time it snowed during September here in the Twin Cities?

Answer

I know that some people get excited about the snow season, but it is a little early for that. There were traces of snow recorded during September in 2016, 2010, 20071998, 1995, and 1992. The last September that brought measurable snowfall was in 1985 (0.4 inches on the 24th).

Twin Cities Almanac for September 4th

The average MSP high temperature for this date is 76 degrees F (plus or minus 9 degrees F standard deviation), while the average low is 58 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for September 4th

MSP 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 1974; highest daily minimum temperature of 73 degrees F in 1960; record precipitation of 2.08 inches in 1911. No snowfall has been reported on this date.

Average dew point for September 4th is 55°F; the maximum dew point on this date is 74°F in 1960; and the minimum dew point on this date is 35°F in 1974.

All-time state records for September 4th
The state record high temperature for this date is 103 degrees F at Beardsley (Big Stone County) in 1922 and at Pipestone in 1925. The 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 state record precipitation for this date is 5.53 inches at Chanhassen (Carver County) in 2005. No snowfall has been reported on this date.

Past Weather Features

The hottest September 4th in state history occurred in 1925 when 9 Minnesota counties saw afternoon temperatures reach the 100°F mark. Much of the rest of the state reported temperatures in the 90s F.

Widespread frosts were reported on September 4, 1885 bringing an end to the growing season. Many observers in central and northern Minnesota reported morning lows in the 20s F. At Moorhead, the daytime high only climbed to 54°F

Strong and slow-moving thunderstorms brought very heavy rainfall to portions of central Minnesota over September 3-4, 2005. From 2 to 5 inches of rain fell in the southwest Metro Area of the Twin Cities. Flooding roads and parking lots were common throughout the west Metro Area and also around Sauk Center.

Outlook

Warming trend over the weekend with a chance for showers Saturday night, mostly in southern counties. Cooling down for Labor Day with increasing cloudiness and a chance for showers both Monday and Tuesday. Generally continuing cooler than normal much of next week as well, with periodic chances for showers.

Record Cold Prevails This Week in Minnesota

Minnesota WeatherTalk, September 11, 2020
By Mark Seeley

The passage of a strong cold front across the state on Labor Day (September 7) not only brought widespread rainfall to many areas, but it produced a dramatic drop in temperatures as well, accompanied by strong winds. Cloud cover, winds, and a warm ground kept overnight temperatures from setting too many records, but daytime temperatures were held down to near record or record cold levels this week over September 7-9. Some of the records set for cold daytime maximum temperatures included:

September 7: 52°F at Lakefield (Jackson County); and 55°F at Brainerd (Crow Wing County)

September 8: Over 100 climate stations set records for cold daytime maximum temperature.
Among these were long term climate stations like:

49°F at Rochester and Artichoke Lake (Big Stone County)
50°F at Canby, Redwood Falls, and Park Rapids
51°F at Marshall
52°F at MSP, Wheaton, Pokegama Dam, Leech Lake, Cass Lake, Ada, and Brainerd
53°F at Pipestone, Gaylord, Milan, Alexandria, and Long Prairie
54°F at Collegeville
55°F at Rosemount
56°F at Waseca
57°F at Windom

September 9th brought dozens of more record cold maximum temperatures as well, including:

44°F at Worthington
45°F at Pipestone
46°F at Austin
47°F at Albert Lea, Marshall, and Rochester
48°F at Canby and Lamberton
49°F at Windom, Wheaton, and Redwood Falls
50°F at MSP, Cass Lake, and Caledonia
51°F at St Cloud and Morris
52°F at Winona and La Crescent

Clear skies and less wind allowed some Minnesota climate stations to set or tied daily

minimum temperature records on September 9th and 10th.

For September 9th the following long-term climate stations reported record lows:

28°F at Thorhult and Floodwood
29°F at Park Rapids
30°F at Cass Lake
32°F at Brainerd
33°F at St Cloud
35°F at Wheaton

For September 10th the following long-term climate stations reported record lows:

27°F at Cotton and Babbitt
29°F at Kabetogama
30°F at St Cloud and Floodwood
33°F at Browns Valley
34°F at Redwood Falls and Litchfield

Many of these temperature readings were 20 to 25 degrees F colder than normal. The absolute coldest temperature this week was a morning low of 25°F at Brimson (St Louis County) on the 9th and that was a new record low there as well.

Weekly Weather Potpourri

NOAA reported this week that La Nina conditions (colder than normal phase of the equatorial Pacific Ocean surface waters) were present during August, and there is a 75 percent chance they will persist through the coming Northern Hemisphere winter. This translates to a higher risk of a colder than normal winter for Minnesota.

Thunderstorms brought record heavy rains to the Washington, D.C. area on Thursday September 10th. The Washington Post reported that some areas of the District received 2 to 6 inches of rainfall in just a few hours bring flash floods and closed roadways. Washington National Airport reported a record 2.88 inches.

A paper recently published in the journal Science reveals a geologically reconstructed picture of Earth's climate over the past 66 million years. One of the author's states that "now that we have succeeded in capturing the natural climate variability, we can see that the projected anthropogenic warming will be much greater than that." Earth may warm to a level not seen in 50 million years should we not find ways to mitigate the pace of climate change. Science Daily reports in detail on this study.

MPR listener question
I work at the information desk at the Mayo Clinic in Rochester, MN. On Tuesday and Wednesday this week we had daytime high temperatures that remained in the 40s F and patients were complaining of the Wind Chill. Can you tell me what has been the coldest daytime high temperature in Rochester during early September? Did we set any records this week?

Answer
Indeed, the daytime high temperature of just 47°F at Rochester on Wednesday (September 9) not only set a new record cold for the date, but that is the coldest daytime high temperature ever measured during the first ten days of September (going back to 1886) BTW the coldest daytime maximum temperature in Rochester for the entire month of September was 34°F on September 29, 1945

Twin Cities Almanac for September 11th
The average MSP high temperature for this date is 74 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 55 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for September 11th
MSP records for this date include: highest daily maximum temperature of 96 degrees F in 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 degrees F in 1931; record precipitation of 3.11 inches in 1900. No snowfall has been reported on this date.

Average dew point for September 11th is 52°F; the maximum dew point on this date is 72°F in 2000; and the minimum dew point on this date is 25°F in 1955.

All-time state records for September 11th
The state record high temperature for this date is 111 degrees F at Beardsley (Big Stone County) in 1931. The state record low temperature for this date is 22 degrees F at Ada (Norman County) in 1955. The state record precipitation for this date is 5.50 inches at Pleasant Mound (Blue Earth County) in 1900. No snowfall has been reported on this date.

Past Weather Features
By far the hottest ever September 11th was in 1931 when every place in the state saw afternoon temperatures climb into the 90s F, except for Two Harbors, Moose Lake, and Grand Marais. Ten climate stations hit the century mark in temperature.

A hard freeze in the north and widespread frosts in the central and southern counties were in the weather headlines for September 11, 1955. The growing season across Minnesota abruptly ended. Temperatures were as low as 22-26 degrees F in the Red River Valley of northwestern Minnesota.

This past Tuesday marked the 120th anniversary of the most lethal hurricane disaster in U.S. history. Galveston, TX was hit by 120 mph winds and a 20-foot storm surge on September 8, 1900. More than 6,000 people drowned and over 3600 homes were destroyed. 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. Other parts of southern Minnesota reported 4 to 6 inches of rainfall as a result of this storm.

Outlook

Following a cloudy, rainy, and somewhat cool Saturday, near normal conditions will return on Sunday with warming temperatures and sunny skies. Further most of next week will be dry with temperatures a few degrees warmer than normal.

Multiple Frosts This Month

Minnesota WeatherTalk, September 18, 2020
By Mark Seeley

Many climate stations are reporting multiple frosts this month, especially in the northern third of the state. Some places have seen 5-6 morning frosts. Minimum temperatures from 20°F (Embarrass, Babbitt, and Cotton) to 29°F have been reported from portions of Koochiching, Cook, Lake, St Louis, Carlton, Hubbard, Marshall, Clearwater, Lake of the Woods, Cass, Chisago, and Beltrami Counties. Some parts of these counties have already reported up to 50 percent autumn leaf color change according to the DNR.

Much of the southern half of Minnesota has yet to see a frost this month, and most of the next two weeks looks to be frost free according to the NOAA outlook models. The outlook for harvesting of crops looks good too with a general absence of rainfall over the remainder of the month, and good field dry-down rates expected for crops.

Weekly Weather Potpourri

According to NOAA Hurricane Sally brought massive amounts of rainfall to portions of coastal Alabama and the pan handle of Florida this week. Close to 500,000 people were without power, and at least two deaths were blamed on the storm. Many rainfall reports from the Florida panhandle ranged from 15 to 24 inches, while along coastal Alabama reports ranged from 12-14 inches of rain. The Weather Channel filed a detailed report on the storm.

The NOAA National Hurricane Center was tracking yet another Tropical Depression that had formed on Thursday in the Gulf of Mexico. It may mature into a Tropical Storm and affect the Texas Gulf Coast next week.

The BBC reports this week that an unusual tropical storm has formed in the Mediterranean Sea. This storm is called a Medi-cane. It is threatening to bring very heavy rains (8-12 inches) to Greece by the end of the week.

A team of international scientists have published an estimate of the contribution of melting polar ice to the rise in sea level over the rest of this century. Estimates of total sea rise due to melting in Antarctica and Greenland range from 16 to 20 inches, but this does not include continual sea level rise due to thermal (heat) expansion of the oceans. You can read more from Science Daily.

MPR listener question
It seems to have excessively windy in the Twin Cities, this summer. I can't recall any recent year where my gardens have been repeatedly damaged by strong wind gusts.

Can you please comment on the reason for the wind and also put it in a historical context?

Answer
Looking at the climate data for May through August in the Twin Cities shows that 2020 did generally bring higher average daily wind speeds, and a higher-than-normal frequency of days with wind gusts over 30 mph. Only the month of July brought less than average daily wind speeds on most days. June was the windiest month of the summer and had 23 days with wind gusts over 30 mph. There were 21 days during the growing season when wind gusts exceeded 40 mph, and on August 10th and 14th wind gusts peaked briefly over 60 mph. These are indeed higher numbers and may partially be caused by the polar jet stream taking up position over the Minnesota landscape more frequently this summer.

Twin Cities Almanac for September 18th
The average MSP high temperature for this date is 71 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 51 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for September 18th
MSP 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 degrees F in 1955; record precipitation of 3.75 inches in 1905. No snowfall has been reported on this date.

Average dew point for September 18th is 52°F; the maximum dew point on this date is 73°F in 1947; and the minimum dew point on this date is 23°F in 1929.

All-time state records for September 18th
The state record high temperature for this date is 100 degrees F at Montevideo (Chippewa County) in 1891. The state record low temperature for this date is 12 degrees F at Littlefork (Koochiching County) in 1929. The state record precipitation for this date is 7.25 inches at Albert Lea (Freeborn County) in 1926. Record snowfall for this date is 2.4 inches at Duluth (St Louis County) in 1991.

Past Weather Features
September 18, 1891 brought summer heat to most parts of Minnesota with daytime temperature readings in the 90s F. Montevideo (Chippewa County) reached a high of 100 degrees F by 3pm after starting out in the morning at just 51°F.

September 18, 1929 was the coldest in history statewide with many climate stations reporting minimum temperatures in the teens and twenties. Nearly every spot in the

state reported frost. The daytime high in northern Minnesota only reached the mid-40s F.

September 18, 1991 brought snow to many parts of western and northern Minnesota. Most climate stations just reported a trace of snow, but in portions of Marshall and Saint Louis Counties measurable snowfall was reported, with up to 2.4 inches at Duluth.

Outlook

Generally sunny and dry with a warming trend beginning this Saturday. Temperatures will average warmer than normal Sunday through Thursday with mostly sunny skies.

Warmest Week of the Month

Minnesota WeatherTalk, September 25, 2020
By Mark Seeley

This week, especially September 22-24, brought the warmest temperatures of the month to most parts of Minnesota. Over 85 climate stations reported daytime highs in the 80s F, as high as 88°F at Marshall (Lyon County), Granite Falls (Yellow Medicine County), and Sabin (Clay County). MSP had its warmest reading of the month on Wednesday (September 23) with a high of 84°F.

A few climate stations even set new record high temperature: On the 22nd Brimson (St Louis County) reported a new record high of 77°F; on the 23rd Cass Lake (Cass County) reported a new record high of 820176F; and on the 24th Redwood Falls reported a new record high temperature of 86°F.

Temperatures are expected to decline the rest of the month, so on balance I would not be surprised to see September finish with cooler than normal monthly mean temperatures. This would be the first cooler than normal month for the state since last May.

Weekly Weather Potpourri

The NOAA National Snow and Ice Data Center reported that Arctic sea ice reached its seasonal minimum on September 15th, covering 1.44 million square miles, the second lowest seasonal minimum observed in the 42-year satellite record. The average seasonal minimum Arctic sea ice extent for the period 1981-2010 was 2.46 million square miles, so 2020 was over a million square miles less.

NOAA also reports that earlier in the week Tropical Storm Beta brought heavy rains to southeastern Texas, especially the area around Houston where 10-14 inches of rain fell. There was widespread flooding, and many vehicles were abandoned. The Weather Underground reported in detail on this storm.

A recent research study from Stanford University reports that some droughts form as a result of pressure patterns over the oceans. These ocean-based drought areas are extensive and when they make landfall they can persist for long periods of time. As many as one in six droughts may be related to these atmospheric pressure patterns over the oceans. Science Daily reported on this study.

The AGU-EOS Bulletin this week highlights a study that found a dramatic decrease in lightning across the USA during the months of May and June this year. The researchers attribute this to an unusual high-pressure atmospheric pattern that set up over the Southern Plains.

MPR listener question
It seems like this month has been very dry throughout Minnesota. Many places have reported less than one inch of rain. Is there anywhere in the state that has had surplus rainfall this month?

Answer
The notable exception this month is southeastern Minnesota where 3-4 inches of rainfall has been pretty common. Both La Crescent (Winona County) and Caledonia (Houston County) are reporting over 4 inches so far. The surplus rain in September is welcome in those communities because they had an unusually dry August. In fact, Caledonia reported its driest August in history (back to 1892) with only 0.64 inches of rain last month.

Twin Cities Almanac for September 25th
The average MSP high temperature for this date is 68 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 48 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for September 25th
MSP 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 degrees F in 1908; record precipitation of 1.34 inches in 1934. No snowfall has been reported on this date.

Average dew point for September 25th is 45°F; the maximum dew point on this date is 70°F in 1903; and the minimum dew point on this date is 14°F in 1926.

All-time state records for September 25th
The state record high temperature for this date is 95 degrees F at Angus (Polk County) in 1938. The state record low temperature for this date is 11 degrees F at Alborn (St Louis County) in 1947. The state record precipitation for this date is 8.64 inches at Winnebago (Faribault County) in 2005. Record snowfall for this date is 6.5 inches at Fosston (Polk County) in 1912.

Past Weather Features

A significant early season snowstorm abruptly brought an end to the agricultural season in northwestern Minnesota over September 24-25, 1912. Many areas reported from 2 to 6 inches of snow with temperatures falling into the 20s and 30s F.

Frigid temperatures dominated Minnesota on September 25, 1926. Most places reported morning low temperatures in the 20s F. Daytime high temperatures only climbed into the 40s F, and International Falls had a record cold maximum temperature of just 35°F.

September 25, 1938 was the warmest in state history with most communities seeing afternoon temperatures in the 80s F. At least a dozen climate stations surpassed 90°F.

Outlook

Partly cloudy Saturday and still warmer than normal most places. Increasing chances for rain on Saturday night and Sunday, then cooler for Sunday through Thursday with chances for showers especially in northern areas. A chance for some frost by Wednesday and Thursday next week in many areas of the state.

Year To Date Precipitation

Minnesota WeatherTalk, October 02, 2020
By Mark Seeley

Last year (2019) was the wettest year in history for Minnesota with a statewide average precipitation of 35.66 inches, about 28 percent higher than the long-term annual mean for the state of 27.92 inches.

I thought for perspective we could look at statistics for the first nine months (Jan-Sep) of 2020 and examine the values of precipitation. On a statewide basis the first 9 months of 2020 delivered an average of 21.21 inches, down from the first 9-months of last year which was 28.45 inches. For the year so far, most climate stations in the state are reporting less than average precipitation, and some places are exceptionally dry. These include:
Duluth with 15.04 inches for Jan-Sep, the 3rd driest all-time (trailing 1918 and 1934)
Windom (Cottonwood County) with 17.55 inches for Jan-Sep, 13th driest in history
Pipestone with 17.14 inches for Jan-Sep, 13th driest in history
Canby (Yellow Medicine County) with 15.16 inches for Jan-Sep, 7th driest in history
Browns Valley (Traverse County) with 13.45 inches for Jan-Sep, 3rd driest in history
Montevideo (Lac Qui Parle County) with 12.54 inches for Jan-Sep, driest in history

In contrast, the northwest corner of the state has had a very wet year in 2020. Here are the numbers for the first 9-months:
Karlstad (Kittson County) with 28.81 inches for Jan-Sep, wettest in history
Lake Bronson (Kittson County) with 26.98 inches for January-September 2nd wettest in history

By the way, for Twin Cities residents MSP is reporting 25.38 inches for January-September, which is only slightly above normal (30-year average precipitation for Jan-Sep is 25.25 inches).

Weekly Weather Potpourri

NOAA scientists have commented that most outlook models favor a drier than normal October for the midsection of the country, including Minnesota. In this context the already drier than normal areas of the state may move into a drought category by the end of the month. Most likely geographic areas of the state to experience this are west-central counties and extreme northern counties.

There is an interesting article by the Weather Underground this week about the record temperatures set across the USA this year. Warm maximum temperature records and warm minimum temperature records have outpaced cold ones by a ratio of 2 to1. States that have seen an unusual number of record warm maximum and minimum

temperatures this year include TX, NM, AZ, and UT.
Speaking of record temperatures, the University of Wisconsin-Madison announced this week that nearly 30 years after recording a temperature of minus 93.2 degrees Fahrenheit (minus 69.6 Celsius) in Greenland, the measurement has been verified by the World Meteorological Organization as the coldest recorded temperature in the Northern Hemisphere. The measurement was first recorded by a University of Wisconsin-Madison Antarctic Meteorological Research Center Automatic Weather Station in December 1991. But extreme measurements like that undergo a rigorous review process to make sure they are accurate and there is agreement with other meteorological data and weather forecast models. Due to the quality and preservation of the AWS station data provided by the Antarctic Meteorological Research Center, the WMO was able to verify the 1991 temperature and log it as part of the official record. Science Daily reports on this in more detail.

MPR listener question
My 4th grader just set up a snow stake in the backyard to measure snow depth this winter. At least someone is excited for winter to happen. What percent of the time does October bring measurable snowfall to the Twin Cities?

Answer
Based on 135 years of measured snowfall, the Twin Cities reports a measurable amount in October about one third of the time (one year in three)

Twin Cities Almanac for October 2nd
The average MSP high temperature for this date is 65 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 45 degrees F (plus or minus 7 degrees F standard deviation).

MSP Local Records for October 2nd
MSP records for this date include: highest daily maximum temperature of 89 degrees F in 1953; lowest daily maximum temperature of 44 degrees F in 1944; lowest daily minimum temperature of 22 degrees F in 1974; highest daily minimum temperature of 65 degrees F in 2005; record precipitation of 0.90 inches in 2013. No snowfall has been reported on this date.

Average dew point for October 2nd is 42°F; the maximum dew point on this date is 68°F in 1951; and the minimum dew point on this date is 18°F in 2003.

All-time state records for October 2nd
The state record high temperature for this date is 95 degrees F at Wheaton (Traverse County) in 1953. The state record low temperature for this date is 9 degrees F at Karlstad (Kittson County) in 1974. The state record precipitation for this date is 4.33 inches at Sandy Lake (Aitkin County) in 1995. Record snowfall for this date is 5.4 inches

at Lakefield (Jackson County) in 1999.

Past Weather Features

The warmest October 2nd in state history was in 1953 when over 30 climate stations reported afternoon highs in the 90s F. The cold spot in the state was Grand Marais with a reading of 66°F.

October 2, 1974 brought a hard freeze to just about every corner of the state. Morning low temperatures ranged from the teens into the 20s F. The afternoon high temperature at Tower only reached 37°F.

October 1-2, 1999 brought an early season snowfall to Minnesota, especially the southwestern counties where 2-5 inches of snow was common. At least it proved to be the only snowfall of that month.

Outlook

A cooler than normal weekend coming up, with areas of frost, and perhaps even an isolated snow shower in places early on Saturday morning. A warming trend begins on Monday and should last most of next week, with only slight chances for a shower. It is certainly possible that some places will see temperatures in the 70s F next week.

WeatherTalk will be back October 16

Minnesota WeatherTalk, October 09, 2020
By Mark Seeley

Hello readers: WeatherTalk will not be published today, October 9. The next WeatherTalk will be available on Friday, October 16.

Sunday Night Soaker

Minnesota WeatherTalk, October 16, 2020
By Mark Seeley

Following a mostly drier than normal September, most places in Minnesota needed a good rainfall, not only for native vegetation, but to reduce fire risk in some area. That rainfall came Sunday night over October 11-12. Over a hundred of the state's climate stations reported a rainfall between 1-2 inches, mostly coming at night. Portions of Washington, Dakota, Rice, Nicollet, Blue Earth, Pine, and Kandiyohi Counties received over 2 inches. For many long-term climate stations new record daily rainfall amounts were reported, including:

Hastings 1.90"
Cloquet 1.88"
Milaca 1.80"
Lakefield 1.45"
Floodwood 1.44"
Windom 1.12"
Winnebago and Jordan 1.43"
Long Prairie 1.29"

Portions of western Minnesota were left out of this beneficial rainfall and only reported less than a tenth of an inch.

Winter Season Outlooks

I would describe the recent NOAA Climate Prediction Center winter season outlooks for the state as somewhat timid. For most of the November through March period the outlooks favor cooler than normal and wetter than normal for major portions of Minnesota. This is primarily based on the forming La Nina (cooler than normal seas surface temperatures in the Equatorial Pacific Ocean) Episode. Strong climatic trends have been in evidence for warmer conditions to prevail, but any early season major snowfall could greatly modify a persistence of cooler than normal temperatures. Suffice to say that there is not yet a strong confidence in the Winter Season Outlooks for our state at the present time.

Weekly Weather Potpourri

Many Minnesota communities saw snow for the first time this autumn season on Thursday and Friday this week. Portions of Itasca, Beltrami, and St Louis Counties reported snow flurries on Thursday, while many other areas of the state reported snow showers on Friday morning, including the Twin Cities. The National Weather Service issued a Winter Weather Advisory applied to Saturday morning for portions of northern Minnesota, where 1-4 inches of accumulating snow is possible.

According to the BBC Weather Center “Copernicus, the EU's climate change service, have said global temperatures for September 2020 were higher than in any previous September on record. They have also confirmed the average Arctic sea ice extent for September was the second lowest on record.”

Recent research shows that the Atlantic Ocean is warming as well. Sediments from a lake in the Canadian High Arctic allow climate scientists to extend the record of Atlantic sea-surface temperature from about 100 to 2,900 years. It shows that the warmest interval over this period has been the past 10 years. Science Daily reports in more detail on this.

MPR listener question
We live in Roseville, MN, and cross-country ski each winter, sometimes traveling far distances to do so. But we always take advantage locally in the Twin Cities when the snow depth reaches 4 inches or greater. Can you tell us how many times this has happened in October, and how often it happens in November?

Answer
Wow, I had not thought of cross-country skiing in the Twin Cities during October! There was year when it would have been possible, 1905. There was abundant snow the last few days of October that year and it persisted to the end of the month to a depth of about 5-6 inches.

It is more usual to find the conditions that you are looking for in the month of November. Over the most recent 30-year period, November has brought a 4-inch snow depth to the Twin Cities by the last week of them of the month in 13 years, so about 43 percent of the time you get suitable conditions for your cross-country skiing endeavors.

Twin Cities Almanac for October 16th
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 40 degrees F (plus or minus 8 degrees F standard deviation).

MSP Local Records for October 16th
MSP 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 degrees F in 1879; record precipitation of 2.10 inches in 1984. Record snowfall is 0.2 inches in 1992.

Average dew point for October 16th is 38°F; the maximum dew point on this date is 63°F in 1998; and the minimum dew point on this date is 9 degrees F in 1972.

All-time state records for October 16th
The state record high temperature for this date is 91 degrees F at Montevideo (Chippewa County) in 1958. The state record low temperature for this date is 4 degrees F at Bemidji (Beltrami County) in 1952. The state record precipitation for this date is 3.55 inches at Wadena (Wadena County) in 1998. Record snowfall is 10.0 inches at Bird Island (Renville County) in 1937.

Past Weather Features

Minnesota farmers were wrapping up fall field work in very mild conditions back in 1910. On October 16, most areas saw afternoon highs in the 70s and 80s F under bright sunny skies, with very low humidity prevalent.

October 16-17, 1937 brought a very early winter storm to Minnesota that produced rain, sleet, and snow. Many areas of the state reported over an inch of precipitation, and several areas got 3 to 6 inches of snowfall. Bird Island reported 10 inches at state record for the date.

A strong Cold Wave gripped the state on October 16, 1952. Most communities in the state reported morning low temperatures in the teens and twenties, but several climate stations up north reported single digit temperatures. Daytime high temperatures remained in the 30s F, while Babbitt saw a high of only 26F.

Outlook

Continued cooler than normal temperatures over the weekend (though Saturday will be warmer than Sunday) with widespread frosts and freezes, even a chance for mix precipitation including snow showers very early on Saturday. Mostly sunny on Sunday, but cool. Continuing cooler than normal much of next week with chances for rain and snow mixed in widely spaced areas. Best chances for precipitation will be on Tuesday and Thursday.

In the Grip of Cold and Snow

Minnesota WeatherTalk, October 23, 2020
By Mark Seeley

October 18-22, 2020 will be noted in the history books of Minnesota as one of the coldest and snowiest 5-day periods in October.

Despite an abundance of cloud cover over this period, temperatures have been exceptionally cold for this time of year, running from 12 to 18 degrees F below normal, especially daytime highs. On the 20th of October this week Orr, MN reported the coldest temperature in the nation with a reading of 9°F.

But the widespread significant snowfall has captured most of the media and public attention, starting a very early snow shoveling and snowplowing season. Several new daily snowfall records were set at long-term climate stations by the storm over October 20-21 including:
7.9” at MSP; 7.0” at St Cloud, 6.9” at Willmar, 6.5” at Redwood Falls, 6.4” at Jordan and Bird Island, 6.0” at Marshall, Red Wing Dam, Hastings, and Dawson, 5.8” at Duluth and Milan, 5.7” at Browns Valley and Brainerd, and 5.5” at Wabasha. Other locations not included in the long-term climate station records reported 7-10 inches. Addition snowfall on Thursday (October 22) fell in central and northern portions of the state. Alexandria and Long Prairie both report over 15 inches of snowfall so far this month. The statewide record in the modern era for total October snowfall is 19.4 inches at Mizpah (Koochiching County) in 1932.

The water content of the snowfall was high with melted snow amounting to 0.70 to 1.20 inches in some places. Red Wing Dam reported a daily record 0.91 inches of precipitation, while Faribault reported a daily record 0.79 inches, and Jordan a record 0.70 inches. Though the month started out very dry, some areas of the state have now reported a total of 2-4 inches of precipitation so far this month.

Back to the cold temperatures. On a number of days this week climate stations in Minnesota reported setting new record cold daily maximum temperatures, including:
October 18th: 28°F at Chisholm; 31°F at Brimson; and 32°F at Floodwood
October 19th: 28°F at Cotton, Tower, and Pokegama Dam; 29°F at Cass Lake; 30°F at Walker and Isle
October 20th: 32°F at Rosemount and Artichoke Lake; 33°F at Marshall and Ottertail; and 34°F at Waseca
October 21st: 31°F at Red Lake Falls; 32°F at Milaca and Wright; 34°F at Redwood Falls
October 22nd: 32°F at Kabetogama; 34°F at Owatonna; and 35°F at Lamberton and Madison

The persistent cold temperatures have accelerated early ice formation on many Minnesota lakes. The DNR reports that some of the earliest ice-in dates on area lakes range between October 22-29 historically. This may be one of those years, as cooler than normal temperatures look to be with us for the rest of the month.

Weekly Weather Potpourri

Since statehood (1858) only ten years have brought heavy snowfalls during the first four weeks of October to portions of Minnesota. In only three of those years (30 percent) was the heavy October snowfall a precursor to a consistently long and snowy season that lasted until the next spring (following April). Those snow seasons were 1880-1881, 1916-1917, 1951-1952. So heavy October snowfall does not predict an unusually large amount of snow for the coming snow season.

The Joint Typhoon Warning Center reports that Typhoon Saudel was in the South China Sea producing sea waves over 30 feet and wind gusts over 100 mph. It was expected to weaken over the weekend.

This week's AGU-EOS bulletin offers an update on the drought in the southwestern USA. The seasonal climate outlook models do not favor any mitigation of drought during 2021 in the southwestern states. In fact, drought may persistent or even worsen in those areas, continuing the higher risk of fire danger.

MPR listener question

What is the most ever total snowfall for the month of October anywhere in the state of Minnesota?

Answer

In the official state climate records three locations have reported 19 or more inches of snowfall during October:
Baudette (Lake of the Woods County) 19.0" in 1916
Farmington (Dakota County) 19.0" in 1926
Mizpah (Koochiching County) 19.4" in 1932

However, Pioneer diaries, records, and photographs would suggest that portions of southwestern Minnesota saw over 30 inches of snowfall during October of 1880. Laura Ingalls Wilder's story of "The Long Winter" was written about that snow season of 1880-1881.

Documents also suggest exceptionally snowy Octobers occurred in the Pre-Statehood Era during 1820 and 1835, but we have no measurements.

Twin Cities 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 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 degrees F in 2000; record precipitation of 1.01 inches in 1995. Record snowfall is 1.4 inches in 1938.

Average dew point for October 23rd is 36°F; the maximum dew point on this date is 65°F in 1973; and the minimum dew point on this date is 9 degrees F in 1981.

All-time state records for October 23rd
The state record high temperature for this date is 91 degrees F at Chatfield (Fillmore County) in 1927. The state record low temperature for this date is -10 degrees F at Grand Rapids (Itasca County) in 1917. The state record precipitation for this date is 3.00 inches at Garrison (Crow Wing County) in 1995. Record snowfall is 10.0 inches at Caribou (Kittson County) in 2001.

Past Weather Features

October 23, 1899 brought a brief return to summer with the vast majority of climate stations in Minnesota reporting daytime highs in the 70s and 80s F. Even the overnight temperature never fell below 67°F at Lake City.

October 23, 1917 was the coldest in state history. Most communities reported morning low temperatures in the single digits and teens. In portions of northwestern Minnesota temperatures were subzero. The afternoon high temperature at Hallock only reached 27°F.

Over October 23-24, 1933 an early season snowstorm dumped 4-11 inches of snow across many northern Minnesota counties. Duluth reported nearly a foot of snow.

Outlook

Continued cooler than normal temperatures for the weekend and much of next week. Chances for more snow late Saturday and on Sunday, then generally dry much of next week, but continued cold.

Preliminary Climate Summary for October 2020

Minnesota WeatherTalk, October 30, 2020

By Mark Seeley

Historically this will be known as one of the coldest and snowiest Octobers in history. The average October temperature was 6 to 7 degrees F cooler than normal, with over two-thirds of the days bringing cooler than normal daytime temperatures. With the state climate station network 72 daily low minimum temperature records were set or tied, and 275 daily cold high temperature records were set or tied. Many days, especially during the second half of the month brought daytime high temperatures that remained in the 20s and 30s F. This pattern caused early ice formation in many area lakes. The extremes for the month were 90°F at Granite Falls (Chippewa County) on the 9th and just 2°F at Lamberton (Redwood County) and Brimson (St Louis County) on the 27th.

Based on average month temperature, MSP reported the 9th coldest October in history, while on a statewide basis it was the 6th coldest October in history, and the coldest since 2002.

Most climate stations in the state reported near normal precipitation totals. There were 34 daily precipitation records set or tied within the state climate network, including many places that reported over 1.5 inches on the 11th and 12th. Some counties ended up with over 3 inches of precipitation for the month. The big event of the month was the snowstorm over October 20-21. Scores of climate stations reported record setting daily snowfall amounts ranging from 4 to 10 inches. Over 40 long-term climate stations established new total monthly snowfall records for October, rivaling the impact of historically snowy Octobers in 1880, 1916, 1917, 1925, 1933, and 1951. Because of the widespread snow cover, October 2020 will undoubtedly be remembered as one of the snowiest in state history as well.

Some of the long-term climate stations setting new October monthly snowfall records included:

MSP 9.3”, St Cloud 7.2”, Waseca 7.5”, Canby 10.0”, Granite Falls 12.5”, Ottertail 15.0”, Browns Valley 13,.1”, Lamberton 7.2”, Long Prairie 16.7”, Brimson 9.2”, Tracy 9.5”, Marshall 7.0”, and Wheaton 8.1”. An observer near Pine River in Cass County reported a monthly total of 18.1 inches of snowfall, near the statewide record of 19 inches for October held by a number of other climate stations.

Despite the challenging weather of October most Minnesota farmers were able to harvest their soybean crop (nearly complete) and get most of their corn crop harvested (about 75 percent finished). Yields were generally above average too.

Weekly Weather Potpourri

Hurricane Zeta made landfall late on Wednesday in Louisiana and moved across the southeast states with high winds and heavy rains. Many areas reported 4-8 inches of

rainfall and power outages. Over two million were left without power. Mississippi and eastern Louisiana were reporting a good deal of damage according to AccuWeather.

In the Western Pacific Ocean Super Typhoon Goni was increasing in strength as it headed towards the Philippines. It was producing winds 160-180 mph and sea wave heights up to 65 feet on Friday. According to the Joint Typhoon Warning Center Goni is not expected to reach the Philippines until late in the weekend but is likely to bring damaging winds and very heavy rainfall.

MPR listener question
We were finishing sewing Halloween costumes for the kids this week and wondered what have been the temperature extremes in Minnesota for this holiday? We moved here from Santa Fe, NM two years ago.

Answer
Our Halloween extremes are a bit frightening as far as tailoring costumes for the climate. On Halloween of 1950 the afternoon temperature hit 86°F at Worthington (Nobles County) in southwestern Minnesota. Perhaps a Tarzan costume would have been a good choice. Halloween in Red Lake Falls (northwestern Minnesota) in 1996 was a very cold -3°F. Perhaps an abominable snowman costume was appropriate for that one.

Twin Cities Almanac for October 30th
The average MSP high temperature for this date is 51 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 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 degrees F in 1933; record precipitation of 1.26 inches in 1971. Record snowfall is 0.8 inches in 1951.

Average dew point for October 30th is 35°F; the maximum dew point on this date is 63°F in 1946; and the minimum dew point on this date is 6 degrees F in 1984.

All-time state records for October 30th
The state record high temperature for this date is 90 degrees F at Canby (Yellow Medicine County) in 1950. The state record low temperature for this date is -8 degrees F at Duluth (St Louis County) in 1925. The state record precipitation for this date is 3.15 inches at Glenwood (Pope County) in 1979. Record snowfall is 12.0 inches at Sandy Lake (Aitkin County) in 1951.

Past Weather Features

The coldest October 30th was in 1925 when morning low temperatures were in the single digits and teens across most of Minnesota. Ten climate stations in western and northern Minnesota reported morning temperatures that were subzero, and the daytime high temperature at Waseca only reached 25°F.

The warmest October 30th was in 1950 when nearly all areas of the state reported afternoon temperatures in the 70s and 80s F. At Marshall, MN the morning low was 61° and the afternoon high 88°F, more like August than October.

An early season winter storm brought widespread snow to Minnesota on October 30, 1951. Many parts of central and northern Minnesota reported from 5 to 11 inches of snowfall. The subsequent polar air mass brought an especially frigid Halloween Day to most parts of the state.

Outlook

A mostly sunny weekend with temperature starting out on Saturday closer to normal, then cooling off for Sunday. Slowly warming for Monday through Friday of next week with several days warmer than normal. It will generally be a dry week as well. Some areas will see the return of 50s F and 60s F for a few days.

A Very Warm Start to November

Minnesota WeatherTalk, November 06, 2020
By Mark Seeley

After recording mostly cooler than normal temperatures on the first day of the month, temperatures have averaged 12 to 18 degrees F warmer than normal under mostly bright, sunny skies. The expected persistence of these warm temperatures through Sunday, November 8th may produce one of the warmest November weeks in state history, rivaling 1975 and 2016.

Many climate stations reported setting new record warm daily maximum temperatures and record warm daily minimum temperatures. On November 3rd over 20 new daily record high temperatures were reported within the long-term state climate network. On the 4th this number rose to over 40 stations, and on November 5 it was over 30 stations. Record warm minimum temperature in the 40s and 50s F prevailed on those nights as well.

Among the records set on November 3rd (Election Day) were a reading of 80°F at Milan and a reading of 81°F at Redwood Falls. Those setting records on November 4th included a daytime high of 80°F at New Ulm, Artichoke Lake, and Windom; and 82°F at Milan and Redwood Falls. The readings of 82°F at Milan and Redwood Falls set a new statewide record for November 4th surpassing the old record of 79°F at Redwood Falls in 1975. On November 5th many more record high temperatures were recorded including 80°F at Lamberton, 81°F at Windom and Wheaton, and 82°F at Redwood Falls and New Ulm. Yet more records may be set from November 6-8, before the warm spell comes to an end.

As most Minnesotans know the “other shoe” will begin to drop on Monday of next week with widespread precipitation, mostly rain, then perhaps some snow showers on Tuesday. Temperatures will trend cool than normal for the balance of the week.

Weekly Weather Potpourri

NOAA reports this week that a study of Atlantic marine species shows a migration northward and to deeper waters over recent years. This is likely a result of climate change effects in the North Atlantic Ocean.

Hurricane Eta, a Category 4 storm (winds over 130 mph) battered Honduras and Nicaragua this week. It was slow moving and so inflicted more damage, along with at least 50 deaths. In many areas rainfall measured 7-14 inches. It is still uncertain if Eta will reform over the Gulf of Mexico and move towards Florida. The Weather Underground reported on Eta in more detail.

A recent study by the University of Texas at Austin found no linkage between variations in temperature and humidity and outbreaks of COVID-19 infections. Researchers found complex relationships between human behavior and COVID-19, but little significant direct effects of weather. Science Daily reported on this study.

An interesting article appears this week in the AGU-EOS Bulletin about decarbonizing the aviation industry. There is strong motivation to do so, but it is highly complex given the current technology. Replacing jet fueled aircraft with hybrids or electric aircraft will be a formidable challenge.

MPR listener question
Wondering how many years historically have daytime temperatures around Minnesota reached the 80s F as they did this week?

Answer
Not very often. Only the years 1909, 1950, 1965, 1999, and 2006 brought temperatures of 80 degrees F to parts of Minnesota. Each episode was short-lived, never more than two days.

Twin Cities 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 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 degrees F in 1975; record precipitation of 1.54 inches in 2000. Record snowfall is 1.6 inches in 1933.

Average dew point for November 6th is 29°F; the maximum dew point on this date is 57°F in 2008; and the minimum dew point on this date is -5 degrees F in 1991.

All-time state records for November 6th
The state record high temperature for this date is 79 degrees F at Montevideo (Chippewa County) in 1934. The state record low temperature for this date is -16 degrees F at Moose Lake (Carlton County) in 1951. The state record precipitation for this date is 2.15 inches at Pigeon River (Cook County) in 1948. Record snowfall is 12.0 inches at Cloquet (Carlton County) in 1919.

Past Weather Features

For northern Minnesota communities one of the snowiest starts to November occurred in 1919. During the first week of the month, it snowed nearly every day and total snowfall ranged from 6 to 15 inches. Red Lake Falls ended up with 35 inches for the month.

November 6, 1991 brought record-setting cold temperatures to Minnesota with morning lows ranging from -1°F to -15°F. Record cold daytime maximum temperatures were reported as well, ranging from the single digits to teens. The daytime high at Ada (Norman County) was only 6°F.

It was truly an Indian Summer type of day on November 6, 2001 as over 50 climate stations in Minnesota reported afternoon highs in the 70s F. Coldest spot in the state was Roseau with a high of 50°F

Outlook

Warm and breezy throughout the weekend, with at least some areas of the state seeing record high temperatures. Increasing clouds with widespread rain on Monday, followed by much cooler temperatures. Chance for snow showers on Tuesday, then dry Wednesday and Thursday. Some moderation in temperature towards next weekend as they climb back towards normal.

November 3-9, 2020 was the warmest November week in state history

Minnesota WeatherTalk, November 13, 2020
By Mark Seeley

Now that all the data are into the state database, we can see that it was as we expected the warmest November week in state history (November 3-9) .... both on a statewide basis (back to 1895) and also in the Twin Cities climate record (back to 1871) .... here are the figures:

Twin Cities Top Three Warmest Weeks in November
1. Nov 3-9, 2020 Mean Daily Temperature 58.2°F
2. Nov 1-7, 2016 Mean Daily Temperature 55.0°F
3. Nov 12-18, 2001 Mean Daily Temperature 53.9°F

Statewide Top Three Warmest Weeks in November
1. Nov 3-9, 2020 Mean Daily Temperature 52.2°F
2. Nov 1-7, 2016 Mean Daily Temperature 50.8F
3. Nov 12-18, 2001 Mean Daily Temperature 48.9°F

All values ranged from 15 to 20 degrees F above the current normal temperature figures.

Within the Minnesota climate station network, the weeks listed above brought numerous record-setting values of both high daytime maximum temperature and high nighttime minimum temperature.

1. From Nov 12-18, 2001 455 daily temperature records were tied or broken
2. From Nov 1-7, 2016 175 daily temperature records were tied or broken
3. From Nov 3-9, 2020 273 daily temperature records were tied or broken.

November 8, 2020 minimum temperature at International Falls (the Nation's Icebox) was 53°F, the highest November minimum temperature ever measured at International Falls.

The November 7, 2020 minimum temperature of 60°F at MSP also represents the highest minimum temperature ever measured during November in the Twin Cities area (back to 1871), and the highest minimum temperature ever measured statewide on November 7th.

More details on this record November warmth can be found at the Minnesota State Climatology Office web site.

More snowfall this week and some records broken November 10-11

A low-pressure system brought widespread snowfall to Minnesota over November 10 (45th anniversary of the sinking of the Edmund Fitzgerald on Lake Superior) and 11 (Veteran's Day). Widespread amounts ranging from 3 to 8 inches were reported, the most snowfall for these dates since 201\4 in many areas, and for some the most snowfall since the Armistice Day Blizzard of 1940. A few places like Brainerd and Hibbing reported 9 inches.

Some climate stations reported new daily record amounts of snowfall, including:
5.5 inches at MSP
7.3 inches at Duluth
5.0 inches at Grand Rapids
9.0 inches at Brainerd
8.0 inches at Babbitt
7.0 inches at Cotton and Ely
6.8 inches at Cloquet
6.3 inches at Floodwood
6.2 inches at Embarrass
6.1 inches at Brimson
6.0 inches at Tower
5.0 inches at Cook
4.5 inches at St Peter

Yet more snow came on Thursday (November 12) during the morning and midday with many places reporting from 2 to 3 inches. Snow squalls reduced visibility severely and there was a 29-vehicle pile-up on I94 between St Michael and Monticello, causing the Minnesota DOT to shut down the Interstate for a period of time. The National Weather Service even issued a snow squall warning for Hennepin and Wright Counties at 9:54 am that morning, citing dangerous driving conditions.

Starting next week it looks like a warmer and drier period of weather may settle across Minnesota and prevail for the balance of the month.

Weekly Weather Potpourri

In the Western Pacific Ocean Typhoon Vamco was moving towards Vietnam this week with winds over 115 mph and sea wave heights in excess of 35 feet. It is expected to weaken but still bring heavy rains to portions of Vietnam by Sunday and Monday. The BBC reported on this.

Meanwhile Tropical Storm Eta brought heavy rains and strong winds (up to 60 mph at Punta Gorda) to portions of Florida on Wednesday and Thursday this week. Portions of

central Florida reported 4 to 6 inches of rain. Eta is expected to graze Georgia and Florida and then head out into the Atlantic Ocean.

Argonne National Laboratory reported this week that 3-D printed automated weather stations can be produced for just a few hundred dollars including the measurement devices. This technology may save thousands of dollars over the conventional deployment of automated weather stations. Laboratory personnel are comparing the reliability and accuracy of the two systems through comparison studies in Oklahoma. Science Daily reports on this.

MPR listener question
We live in Grand Rapids and have been getting plenty of snowfall this week. We wondered what is the state record single day snowfall in November, and what is the record monthly snowfall total?

Answer
For Grand Rapids, the record single-day snowfall for November is 17.0 inches on November 18, 2016. The record snowfall total for November at Grand Rapids is 28.7 inches in 1965.

The statewide record single-day snowfall for November is 26 inches which occurred at St James (Watonwan County) on November 9, 1943 and at Onamia Ranger Station (Mille Lacs County) on November 3, 1991. The statewide record November total snowfall is 58.6 inches in 1991 at Bruno (Pine County).

Twin Cities Almanac for November 13th
The average MSP high temperature for this date is 43 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 28 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for November 13th
MSP 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 degrees F in 2001; record precipitation of 1.04 inches in 1951. Record snowfall is 7.7 inches in 2010.

Average dew point for November 13th is 26°F; the maximum dew point on this date is 55°F in 2001; and the minimum dew point on this date is -7 degrees F in 1986.

All-time state records for November 13th
The state record high temperature for this date is 79 degrees F at Fairmont (Martin County) in 1999. The state record low temperature for this date is -24 degrees F at

Tower (St Louis County) in 1995. The state record precipitation for this date is 3.80 inches at Sawbill Camp (Cook County) in 1937. Record snowfall is 15.0 inches at Taylors Falls (Chisago County) in 1940.

Past Weather Features

A winter storm delivered 6-12 inches of snow across northwester and north-central Minnesota on November 13, 1909. Blizzard conditions prevailed in some areas with high winds. Moorhead reported nearly 15 inches of snowfall. Fairmont ended up reporting over 30 inches of snowfall that month.

With abundant snow cover across the state November 13, 1986 brought record cold temperature to many places. Morning low temperatures were subzero across most of the state. Readings in southern Minnesota were as cold as -9°F at Worthington and -7°F at Preston. The daytime high temperature was only 2° at Wadena and Warroad.

November 13, 1999 was especially warm statewide as most areas reported afternoon high temperatures in the 60s and 70s F. Some golf courses were even open for business.

Outlook

Mostly cloudy over the weekend with a chance for light snow or rain later on Saturday. Continued cooler than normal temperatures through Tuesday of next week, then gradual warming trend towards next weekend. It will generally be a dry period.

A Brief Look at Year-to-Date Climate Statistics

Minnesota WeatherTalk, November 20, 2020
By Mark Seeley

The recent moderation in temperature looks to prevail through the Thanksgiving holiday until the end of the month. As such it is likely that November 2020 will end up falling among the 20 warmest Novembers in state history, quite a remarkable turnaround from last month, when we recorded one of the coldest Octobers in history.

For the year 2020 so far Minnesota has recorded 7 warmer than normal months and 4 colder than normal months. Overall, the year is tracking to finish as another warmer than normal year but by less than 0.5 degrees F.

From a precipitation viewpoint most climate stations are reporting above normal values for this month so far. Portions of 9 counties have reported over 2 inches of precipitation, and some areas have already recorded over 9 inches of snowfall. The year-to-date precipitation totals are close to normal or below normal in many areas of the state. A few places are having a wetter than normal year in 2020 like Faribault, Gaylord, and St Peter, but most places are slightly drier than normal.

In portions of west-central, southwestern, north-central, and northeastern Minnesota 2020 precipitation has been lacking significantly and placed these areas in moderate drought. Some of the drier areas of the state for the year include:

Browns Valley (Traverse County) 8.03’ below normal
Indus (Koochiching County) 9.39” below normal
Morris (Stevens County) 9.69” below normal
Ortonville (Big Stone County) 8.20” below normal
Luverne (Rock County) 11.13” below normal
Madison (Lac Qui Parle County) 7.0” below normal
Big Falls (Koochiching County) 8.10” below normal
Ely (Lake County) 8.56” below normal
Grand Portage (Cook County) 9.81” below normal

Many of these areas would welcome more precipitation before the end of the year to help recharge soils and streams. Depending on the next several weeks Minnesota could end up the year overall wetter or drier than normal.

Update on Winter Season Climate Outlook

The NOAA Climate Prediction Center (CPC) released new seasonal climate outlooks this week, including one for the winter months of December-February. They call for above normal temperature trend through about the first half of December, then favor a colder than normal trend in temperature for most of the remainder of winter. They also favor dryness early in December, then above normal precipitation across much of the

state for the balance of winter. Much of the outlook is based on a persistent La Nina (cooler than normal equatorial Pacific Ocean) throughout the winter season.

Weekly Weather Potpourri

NOAA features this week a comprehensive article about potato production and climate change. The authors note that the genetic diversity of the potato will allow for varieties to be manipulated to match changing climates so that overall production should be maintained.

Science Daily reports this week on a new study from UC-San Diego: “A new kind of radar could make it possible for self-driving cars to navigate safely in bad weather. Electrical engineers at the University of California San Diego developed a clever way to improve the imaging capability of existing radar sensors so that they accurately predict the shape and size of objects in the scene. The system worked well when tested at night and in foggy conditions.” Further testing is expected.

Over the past 3 years, the Center for Climate Adaptation Science and Solutions (CCASS) at the University of Arizona has hosted three interdisciplinary conferences as well as a three-phase scenario planning process to discuss a range of science and policy topics related to managing the river under a broader Colorado River Conversations (CRC) initiative. CRC promotes integration of the latest social and physical science knowledge into the management of the Colorado River and is providing an informal scientific foundation for the pending renegotiation of the Colorado River management guidelines. AGU-EOS reported on this topic earlier this week.

MPR listener question

Since the new millennium (2000) how many winter seasons (Dec-Feb) have brought colder than normal temperatures to Minnesota? It seems like not many.

Answer

Of the 20 winter seasons since the new millennium started, only 7 have brought colder than normal temperatures to Minnesota. They were the following:
2000-2001
2007-2008
2008-2009
2009-2010
2010-2011
2013-2014
2017-2018

Five of the winter seasons since the new millennium rank among the 10 warmest winters in state history

Twin Cities Almanac for November 20th
The average MSP high temperature for this date is 38 degrees F (plus or minus 11 degrees F standard deviation), while the average low is 24 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for November 20th
MSP records for this date include highest daily maximum temperature of 63 degrees F in 1925; lowest daily maximum temperature of 17 degrees F in 1978; lowest daily minimum temperature of -3 degrees F in 1921; highest daily minimum temperature of 43 degrees F in 1930; record precipitation of 2.01 inches in 1975. Record snowfall is 8.0 inches in 1975.

Average dew point for November 20th is 24°F; the maximum dew point on this date is 54°F in 1982; and the minimum dew point on this date is -3 degrees F in 2014.

All-time state records for November 20th
The state record high temperature for this date is 74 degrees F at Faribault (Rice County) in 1897. The state record low temperature for this date is -31 degrees F at Roseau (Roseau County) in 1896. The state record precipitation for this date is 3.23 inches at Canby (Yellow Medicine County) in 1975. Record snowfall is 16.0 inches at Canby (Yellow Medicine County) also in 1975.

Past Weather Features

November 20, 1897 was very warm across southern and western Minnesota with afternoon high temperatures in the 60s and 70s F.

November 20, 1921 was the coldest in state history as nearly every corner of the state reported subzero morning temperatures. Only Mower, Winona, and Faribault Counties were above zero degrees. The daily high temperature at Morris, MN was zero degrees F.

Following the tragic Edmund Fitzgerald Storm of November 10, 1975, November 20-21 brought another strong winter storm to the state which delivered mostly heavy snow. Many parts of southern and central Minnesota reported 10 to 20 inches of snowfall. Canby received 24 inches from the storm.

Outlook

Temperatures will remain around seasonal averages for the weekend, but with a chance for rain or snow late Saturday and into early Sunday. More chances for precipitation later on Monday. Warming to above normal temperatures for Wednesday through Friday of next week, including Thanksgiving Day.

Preliminary Climate Summary for November 2020

Minnesota WeatherTalk, November 27, 2020
By Mark Seeley

In contrast to October, this November was very much warmer than normal. Most climate stations report an average monthly temperature that ranges from 4 to 6°F above normal. This means that November of 2020 will likely rank among the top 7 warmest in Minnesota history back to 1895.

The week of November 3-9 was the warmest week in November history here. Within the state climate observation network over 200 daily record maximum temperatures were recorded, along with over 120 record warm daily minimum temperatures. For the first time in history Minnesota recorded 4 days during November when the daily maximum temperature reached 80°F or greater. On the 4th, the 5th, and the 7th, new all-time state temperature records were set with readings of 84°F, 82°F, and 80°F. Extremes for the month ranged from 84°F at Granit Falls (Yellow Medicine County) on the 4th to -2°F at Camp Norris (Lake of the Woods County) on the 13th.

Precipitation for the month was highly variable, ranging from less than 1 inch in some western and northern counties, to over 2.5 inches in some parts of southeastern and northeaster Minnesota. Total snowfall amounts around the state ranged from just a trace in some southern and western areas to over 19 inches at Duluth. Most of the snowfall came over November 10-11 when 23 climate stations reported setting new daily record snowfall amounts, ranging from 4 to 9 inches.

The other weather feature of the month was sunshine. This was one of the sunnier Novembers, as a third of the days brought mostly sunny conditions to the state. November is historically the cloudiest month of the year, so this feature was very welcome.

Weekly Weather Potpourri

This week's AGU-EOS bulletin features a short article explaining the Northern Hemisphere winter of 2019-2020 and how its features were regulated in part by the stratospheric polar vortex and the \Arctic Oscillation patterns.

This week the BBC features a film about how the railways in the United Kingdom, Australia and India are tapping into solar arrays for some of their power and moving towards a greener future.

Researchers have been following vegetation trends across the planet's driest areas using satellite imagery from recent decades. They have identified a troubling trend: Too little vegetation is sprouting up from rainwater in developing nations, whereas things are headed in the opposite direction in wealthier ones. As a result, the future could see food

shortages and growing numbers of climate refugees. Science Daily reports on this study from the University of Copenhagen.

MPR listener question
We live in Marshall, MN (Lyon County) and earlier this month recorded three days in a row with a high temperature of 80°F on the 5th, 6th, and 7th of November. Two questions: have we ever recorded 80 degrees F in November before, and is the 7th the latest date to do so?

Answer
There is only one other time when Marshall has seen an 80°F temperature in November. That occurred on November 1, 1938 when the afternoon temperature hit 80°F. November 7th is the latest ever autumn date for such a temperature in the Marshall climate record.

Twin Cities Almanac for November 27th
The average MSP high temperature for this date is 34 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 20 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for November 27th
MSP records for this date include: highest daily maximum temperature of 64 degrees F in 1998; lowest daily maximum temperature of 7 degrees F in 1930; lowest daily minimum temperature of -13 degrees F in 1872; highest daily minimum temperature of 37 degrees F in 1962; record precipitation of 0.90 inches in 1905. Record snowfall is 4.9 inches in 1983.

Average dew point for November 27th is 17°F; the maximum dew point on this date is 44°F in 2005; and the minimum dew point on this date is -14 degrees F in 1996.

All-time state records for November 27th
The state record high temperature for this date is 71 degrees F at Fairmont (Martin County) in 1998. The state record low temperature for this date is -31 degrees F at Argyle (Marshall County) in 1887. The state record precipitation for this date is 2.75 inches at Pine River (Cass County) in 1988. Record snowfall is 24.0 inches at New London (Kandiyohi County) in 2001.

Past Weather Features

November 27, 1887 was likely the coldest in state history. Temperatures in the minus twenties prevailed across portions of central and northern Minnesota. It was -12°F as far south as Rochester. The daytime high at Moorhead only reached -4°F.

November 27, 1998 was the warmest in state history with most climate stations reporting afternoon high temperatures in the 60s F. Both Fairmont and Amboy reached 70 degrees F. Many area golf courses were open for business.

Outlook

A sunny weekend starting out very warm on Saturday with perhaps some highs in the 50s F, may be even 60°F in western Minnesota. Continued sunny on Sunday, but much cooler with temperatures closer to normal. Generally sunny and dry all of next week with temperatures a few degrees above normal.

Strong Warm Temperature Trend in December

Minnesota WeatherTalk, December 04, 2020
By Mark Seeley

We should not be surprised that December is bringing us warmer than normal temperatures. Since the new millennium (2000) 70 percent of Decembers have been warmer than normal, including the last six consecutive years based on statewide average temperature. This is a remarkable strong trend. In fact, eleven of the warmest Decembers in state history (back to 1895) have occurred since the year 2001, including the warmest December in history in 2015 which averaged nearly 12°F warmer than normal.

If the NOAA climate outlook for this December holds up, we will record a month that is 4 to 6 degrees F warmer than normal and be the seventh consecutive warm December. Caution: This is not a predictor of how January of 2021 will go. Reminder: we had a very warm December in 2003, followed immediately by a very cold January in 2004.

If this trend prevails in December 2020, then it will be the 7th month of the year with above normal temperatures statewide and likely make 2020 rank among the warmest 15 years in state history.

Weekly Weather Potpourri

World Soil Day (WSD) is held annually on December 5th to focus attention on the importance of healthy soil and to advocate for the sustainable management of soil resources. “Soil is one of the critical resources for life on earth,” said David Hoover, Director of USDA-NRCS, National Soil Survey Center. “There are already ‘world days’ for water, air, and sunlight. The soil resource needs to take a prominent place along with the others,” he added. It has taken thousands of years of weather interactions with the landscape to form the diversity of soils across our country. You can read more from the USDA-NRCS and order a poster of the soil colors in the USA.

Recent NOAA funded research shows that a large area of the ocean’s warmest surface waters stretching across the Indian and Western Pacific Oceans, has grown even warmer and almost doubled in size since 1900. This has major implications for global rainfall patterns, especially in late winter and spring seasons.

The Bureau of Meteorology in Australia reported that November 2020 was the hottest in the history of that country, averaging nearly 4.5°F above normal on a countrywide basis. Many daily temperature records were set, and numerous heat wave warnings were issued by the Bureau. Record maximum temperatures of 110 to 111°F were reported in some areas, all-time highs for the month of November.

MPR listener question

From your knowledge of Minnesota climate history can you tell us in what month have we seen the largest increase in temperature over the past 100 years or so? P.S. This is to settle a bet.

Answer
The month that shows the steepest increase in mean monthly temperature over the past century is the month of February. The average February temperature in Minnesota is 5°F greater than it was 100 years ago. That is significant in the context of climate change. Incidentally for the current month of December the change over the past 100 years in the monthly mean has been plus 3°F.

Twin Cities Almanac for December 4th
The average MSP high temperature for this date is 31 degrees F (plus or minus 10 degrees F standard deviation), while the average low is 16 degrees F (plus or minus 10 degrees F standard deviation).

MSP Local Records for December 4th
MSP 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 degrees F in 1941; record precipitation of 0.58 inches in 1877. Record snowfall is 4.2 inches in 1947.

Average dew point for December 4th is 17°F; the maximum dew point on this date is 55°F in 2017; and the minimum dew point on this date is -19 degrees F in 1991.

All-time state records for December 4th
The state record high temperature for this date is 71 degrees F at Long Prairie (Todd County) in 1941. The state record low temperature for this date is -38 degrees F at Fort Ripley (Crow Wing County) in 1873. The state record precipitation for this date is 3.00 inches at Thief River Falls (Pennington County) in 2006. Record snowfall is 14.0 inches at Campbell (Wilkin County) in 1927 and at Beardsley (Big Stone County) in 1955.

Past Weather Features

December 4, 1886 was bitter cold across the state. Morning low temperatures ranged from the minus teens F into the minus 30s F up north. Daytime highs were below zero in many areas and just in the single digits across the southern counties. The high temperature at Rochester was just -1°F.

On December 4, 1964 Arctic Cold gripped the state as most areas reported morning temperatures that were subzero, with lots of snow on the ground. The daytime high temperature at Hallock (Kittson County) only reached -5°F.

December 3-5, 1970 brought heavy snowfall across portions of north-central and northeastern Minnesota. Climate stations in those areas measured 4 to 13 inches of snowfall and snowplows were out keeping most highways open, but some county roads were closed.

December 4, 1998 was warm and sunny across southern Minnesota with afternoon temperatures in the 60s F and no snow on the ground. Golf courses were open for business. Even the nighttime lows were in the mid-30s F to mid-40s F.

Outlook

Mostly sunny with warmer than normal temperatures prevailing throughout the weekend and much of next week. Chance of passing snow flurries on Saturday. Temperatures by the middle of next week may reach the 50s F in some areas of the state as the mild spell continues.

Very Warm Start to December

Minnesota WeatherTalk, December 11, 2020
By Mark Seeley

Through the first ten days of the month temperatures are averaging 9-12°F warmer than normal across the state, making this the warmest December since 2015 and among the 6 warmest first ten days of the month historically back to 1895. Some daily record temperatures have been set, but day-to-day the values have consistently been warmer than normal. The 50°F reading at Browns Valley (Traverse County) on the sixth was a new record high. Then on Wednesday and Thursday more record high temperatures were reported around the state, including:

55°F at Caledonia
52°F at Rochester and Walker
50°F at Litchfield, Long Prairie, and Two Harbors
49°F at Brainerd

Several places in western Minnesota reached into the low to mid 50s F on Wednesday but fell short of setting any daily temperature records.

In the Twin Cities where climate records go back to 1872, the average temperature for the first 10 days of December is nearly 10°F above normal, ranking as the 4th warmest first ten days historically, trailing only 1939, 2015, and 1913,

Except for the northeastern most three counties (St Louis, Lake, and Cook) the Minnesota landscape is snow-free. As such it warms up more abruptly when the sun shines, with lots of daytime high temperatures reaching the 40s F this month so far. Even Cotton and Embarrass (both in St Louis County) usually some of the colder spots in Minnesota reached record highs on Wednesday this week with 44°F and 43°F, respectively.

Outlook models continue to favor generally warmer than normal temperatures for Minnesota through Christmas Eve. Some golf courses continue to be open for business.

Weekly Weather Potpourri

The NOAA Arctic Program released the Annual Arctic Report Card this week. It emphasized the continued loss of sea ice and declining glaciers in the area, as well as the early loss of snow cover, combined with warming temperatures. The extent of Arctic Sea Ice as measured by satellites on September 15, 2020 was the 2nd lowest of record for the period 1979-2020. There are many more details in the report.

“Minnesota. Maine. Upstate New York. The Allegheny Mountains of Pennsylvania and West Virginia. Practically anywhere in Idaho. And of course, the Rockies or the Sierra

Nevada Mountains. These are the parts of the Lower 48* where weather history suggests you want to be if you're looking for the best chance of a white Christmas." NOAA features an article on the historical frequencies for a White Christmas this week for most of the USA geography. Looks like Minnesota will have to see a snow storm or two before Christmas if we are to live up to our historical reputation.

The Weather Channel ran a feature this week showing areas of the USA that are recording their warmest year of record. All of the USA is recording a warmer than normal year in 2020 which may end up among the top 7 warmest historically.

MPR listener question
I walk the dog every day and he loves to fetch the frisbee. So, I pay careful attention to the wind. It seems that there has hardly been any wind this December over 10 mph? What has the average wind speed been so far this month, and is it less than average? BTW I live in Cottage Grove?

Answer
Indeed, you are very astute in your wind observation. Average wind speeds so far this month are only between 4-5 mph. Only one day have wind gusts approached 20 mph (December 3rd). This is kind of remarkable, but indicative of how most of the storm systems have been tracking south of us. Average wind speeds for all other months in 2020 so far have ranged from 7 to 10 mph in the Twin Cities, so it could be that December will deliver the lowest wind speeds of the year.

Twin Cities Almanac for December 11th
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 14 degrees F (plus or minus 13 degrees F standard deviation).

MSP Local Records for December 11th
MSP records for this date include: highest daily maximum temperature of 56 degrees F in 1913; lowest daily maximum temperature of -3 degrees F in 1995; lowest daily minimum temperature of -14 degrees F in 1972; highest daily minimum temperature of 36 degrees F in 2015; record precipitation of 1.16 inches in 2010. Record snowfall is 16.3 inches also in 2010.

Average dew point for December 11th is 10°F; the maximum dew point on this date is 49°F in 1949; and the minimum dew point on this date is -28 degrees F in 1962.

All-time state records for December 11th
The state record high temperature for this date is 67 degrees F at Long Prairie (Todd County) in 1913. The state record low temperature for this date is -41 degrees F at Pokegama Dam (Itasca County) in 1936. The state record precipitation for this date is 1.70 inches at Beaver Bay (Lake County) in 1870. Record snowfall is 18.0 inches at Montgomery (Le Sueur County) in 2010.

Past Weather Features

The warmest December 11th in state history was in 1913 when over 60 climate stations reported afternoon high temperatures in the 50s and 60s F. Most places reported little or no snow cover.

The coldest December 11th in state history was in 1936. Morning temperatures ranged from the teens below zero to -35°F. Pine River Dam reported -40°F, while Pokegama Dm reported -41°F. The warmest spot in the state was Fairmont with a morning low of -4°F and an afternoon high of 20°F.

December 11-12, 2010 brought a strong winter storm to Minnesota which delivered very heavy snowfall and blizzard conditions in some areas. This storm produced 14-20 inches across portions of southern and central Minnesota. Around La Crescent and Winona more than 20 inches fell. Blizzard conditions caused road and school closures and the heavy snow caused the collapse of the Metrodome roof Minneapolis.

Outlook

A mostly dry outlook through the weekend and next week. Generally sunny to partly cloudy skies. Temperatures will continue warmer than normal, but by fewer degrees. Possible hints of snowfall during Christmas week.

2020 Minnesota Climate Weather Review

Minnesota WeatherTalk, December 18, 2020
By Mark Seeley

As we wrap up the year 2020 it might be useful to review the episodes and events that the atmosphere produced across our state the past 12 months.

Even without the final statistics for December, we can say that in general it was a warmer and drier than normal year for Minnesota. December may end up among the 5 or 6 warmest in history and may be among the 10 driest in history on a statewide basis. The statewide average precipitation for this month so far is only 0.03 inches.

From a temperature standpoint three months of 2020 were colder than normal, two months were very close to normal, and 7 months were warmer than normal. Overall, the year 2020 will probably rank among the 15 warmest years in state history (back to 1895). Extremes for the year were 102 degrees F at Granite Falls on June 7th and -40 degrees F at Cotton and Isabella on February 20th.

Total precipitation for the year was generally slightly below normal. On a statewide basis six months wetter than normal and six months drier than normal. The wettest month was July and the driest month was December. The range in total precipitation for the year was just over 40 inches at Owatonna and New Ulm, to less than 16 inches at Browns Valley. The year will end with about 25 percent of the state in moderate drought and with very little snow cover.

Some of the more impactful weather from 2020 is currently described on the Minnesota State Climatology Office Facebook Page where you can vote for the top weather stories of the year.

This narrative includes:

Descriptions of the April ice and snowstorms, including one on Easter Sunday (April 12th)

An EF-4 (winds greater than 165 mph) tornado that traveled across Otter Tail County on July 8th causing some damage to rural buildings and killing one person. The first tornado of this strength since the year 2010.

There were two summer days that brought widespread large hail: July11th brought golf ball to tennis ball sized hail to portions of western and southwestern Minnesota where corn, soybean, and sugar beet crops were damaged; and August 9-10 brought golf ball to tennis ball sized hail to portions of the Twin Cities area where numerous hail insurance claims were filed on cars and homes (roofs).

July 25-26 brought a rare “mega-rain” event to portions of south-central Minnesota where over 1000 square miles of landscape received 6 or more inches of rainfall, topped by 11.50 inches at Winthrop (Sibley County). Some roads and highways were closed for a time.

Not one but two record-setting snowstorms in October, one on the 20th and another on the 22nd. Many areas reported 6-9 inches of snowfall. Pine River (Cass County) ended up with over 18 inches for the month.

November was the 5th warmest in state history and the first time Minnesota has recorded three days with 80°F temperatures during the month.

Depending on the weather for the remainder of December, this may be one of the driest in state history.

Weekly Weather Potpourri

The NOAA Climate Prediction Center released a new 90-day outlook this week which calls for equal chances for above or below normal temperatures across Minnesota during the January-March period, and generally wetter than normal conditions across the state as well. So, snow lovers may see better conditions prevail during the second half of winter.

While we have seen a dominance of warmer than normal weather this month, portions of Manitoba, Canada were being invaded by Artic air. Churchill reported temperatures in the minus 20s F, with wind chill values ranging from -44 to -51 F. There were also blizzard warnings released by Environment Canada.

After lashing Fiji with wind gusts up to 170 mph a somewhat diminished Tropical Cyclone Yasa was churning in the South Pacific Ocean southwest of Pago Pago. It was still producing wind gust up to 90 mph and sea wave heights of 20-25 feet. It is expected to remain mainly over the sea but may bring heavy rainfall to Tonga by Sunday. The Washington Post reported on this storm, as well as the BBC.

December 16-17 this week brought a huge winter storm to the northeastern USA affecting 14 states with significant snowfall and wind. Many places in New York state reported over 20 inches of snowfall, and some reported over 30 inches. There were numerous road and highway closures. The National Weather Service Office in Albany, NY provides a nice summary.

MPR listener question

From Tom Hoverstad at the University of Minnesota Southern Research and Outreach Center in Waseca, MN: “We just recorded our 33rd (now 35) consecutive day without measurable precipitation. Our records show we have not seen a dry spell like this in

more than 50 years. What is the all-time state record for consecutive days without any measurable precipitation?

Answer
The longest period without measurable precipitation anywhere in the state occurred from November 9, 1943 to January 26, 1944, a period of 79 days when Marshall, Beardsley, Dawson, and Canby reported no precipitation. Definitely a brown Christmas and New Years for them back then.

Twin Cities Almanac for December 18th
The average MSP high temperature for this date is 26 degrees F (plus or minus 13 degrees F standard deviation), while the average low is 11 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for December 18th
MSP 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. Record snowfall is 6.5 inches also in 2000.

Average dew point for December 18th is 9°F; the maximum dew point on this date is 43°F in 2002; and the minimum dew point on this date is -26 degrees F in 1983.

All-time state records for December 18th
The state record high temperature for this date is 69 degrees F at Lynd (Lyon County) in 1908. The state record low temperature for this date is -52 degrees F at Mora (Kanabec County) in 1983. The state record precipitation for this date is 1.70 inches at Montevideo (Chippewa County) in 1977. Record snowfall is 8.7 inches at Two Harbors (Lake County) in 1998.

Past Weather Features

December 18, 1923 was exceptionally warm with most areas of the state seeing temperatures in the mid-50s to low 60s F by the middle of the afternoon. The temperature never dropped below freezing at Two Harbors.

A winter storm delivered a mixture of rain, sleet, and snow to the state over December 17-18, 1977. Many areas received over an inch of precipitation, while in northwestern counties 3-5 inches of snowfall was reported.

December 18, 1983 was the coldest in state history as every climate station in the state reported subzero temperatures ranging from the minus twenties to -52 degrees F at Mora. The daytime maximum temperature at International Falls only reached -20°F. December of 1983 was the coldest of the 20th Century.

Outlook

Mostly sunny skies over the weekend with temperatures remaining warmer than normal across most of the state. Late Sunday there will be a chance for some snow showers. Monday will even bring some temperatures in the 40s F for portions of western and southern Minnesota. There will be a sharp cool down by Wednesday and Thursday of next week, with a chance for snow on Wednesday. But by next weekend it will be close to normal or even warmer than normal again.

Some Record Snowfalls on December 23-24

Minnesota WeatherTalk, December 26, 2020
By Mark Seeley

After a long warm and dry period that started in November, Minnesota was hit by a strong storm system that delivered very high winds, blizzard conditions, along with rain, sleet, and snow across most areas of the state over December 23-24. Blizzard conditions prevented effective snow plowing in many areas of the state as the howling winds would quickly blow in snow from cleared roads. Hundreds of vehicle accidents were reported, and, in some areas, motorists had to leave their vehicles and seek temporary shelter. Many areas of the state clocked wind gusts from 50 to 70 mph and reported damage to holiday light and ornament displays.

The storm produced widespread snowfall amounts from 4 to 6 inches, with peak amounts reaching 9 to 10 inches. Some of Minnesota's long term climate station reported new record daily snowfall amounts, including:
8.7" at MSP
9.5" at Two Harbors
8.0" at Owatonna
7.2" at Ely
7.0" at Babbitt
5.0" at Gunflint Lake

In addition, the high water content of the snow produced some daily precipitation record values as well, including:
1.24 inches at Hastings Dam
0.88" at Faribault
0.75" at Jordan
0.62" at Zumbrota
0.66" at Red Wing

The storm system ushered in the coldest air of the season so far. Many areas saw temperatures drop 40 to 50 degrees between the 23rd and the 24th. At Canby (Yellow Medicine County) the temperature dropped from a high of 57°F on December 23rd, to a low of -5°F the morning of the 24th. Wind chill values ranged through the minus 20sF and even some -30s F. International Falls dropped to -20°F on the morning of the 24th, the coldest reading in the state so far this season.

The Minnesota State Climatology Office web site provides a good summary description of the storm.

Weekly Weather Potpourri

AGU_EOS reports this week on a satellite-aided forecasting system for dust storms in the desert southwest of the USA developed by Daniel Tong of George Mason University. Tong and his team are trying to get everything right by using near-real-time satellite imagery. The satellite images can pick out surface conditions that breed dust storms so that forecasting models can incorporate data on active dust sources. This holds great potential to assist National Weather Service Forecasters in issuing timely warnings to motorists.

The International Falls, MN temperature of -20 degrees F on Christmas Eve morning was the lowest temperature reported in the USA that day, and the first time this month that Minnesota has reported the nation's lowest temperature.

MPR listener question

The snowstorm this week made us wonder what is the largest 24-hour snowfall to ever occur during the month of December in Minnesota?

Answer

The largest reported snowfall in 24 hours for the month of December came from Duluth on December 8, 1950 when they measured 23.2 inches. They ended up receiving 44.3 inches of snowfall that month.

Twin Cities Almanac for December 26th

The average MSP high temperature for this date is 25 degrees F (plus or minus 12 degrees F standard deviation), while the average low is 9 degrees F (plus or minus 14 degrees F standard deviation).

MSP Local Records for December 26th

MSP records for this date include: highest daily maximum temperature of 52 degrees F in 2011; lowest daily maximum temperature of -9 degrees F in 1934; lowest daily minimum temperature of -27 degrees F in 1996; highest daily minimum temperature of 38 degrees F in 1959; record precipitation of 0.60 inches in 1880. Record snowfall is 5.1 inches also in 1988.

Average dew point for December 26th is 10°F; the maximum dew point on this date is 48°F in 1936; and the minimum dew point on this date is -28 degrees F in 1996.

All-time state records for December 26th

The state record high temperature for this date is 57 degrees F at Fairmont (Martin County) in 1936. The state record low temperature for this date is -50 degrees F at Big Falls (Koochiching County) in 1933. The state record precipitation for this date is 2.50 inches at Marshall (Lyon County) in 1988. Record snowfall is 15.0 inches at Bricelyn

(Faribault County) in 1945.

Past Weather Features

Arctic air gripped Minnesota on December 26, 1933 when subzero temperatures were reported from all areas of the state, with values ranging from -9°F at Winona to -50°F at Big Falls. /The high temperature at Roseau and Babbitt only reached a reading of -18°F.

December of 1936 was the warmest in state history with high temperatures ranging from 35 degrees F to 55 degrees F across much of the state. In portions of southeastern Minnesota overnight temperatures remained in the 40s F.

Outlook

Moderating near-normal temperatures over the weekend with increasing cloudiness and a chance for snow. Colder on Monday, then another chance for snow on Tuesday and Wednesday next week. Temperatures will hover either side of normal.