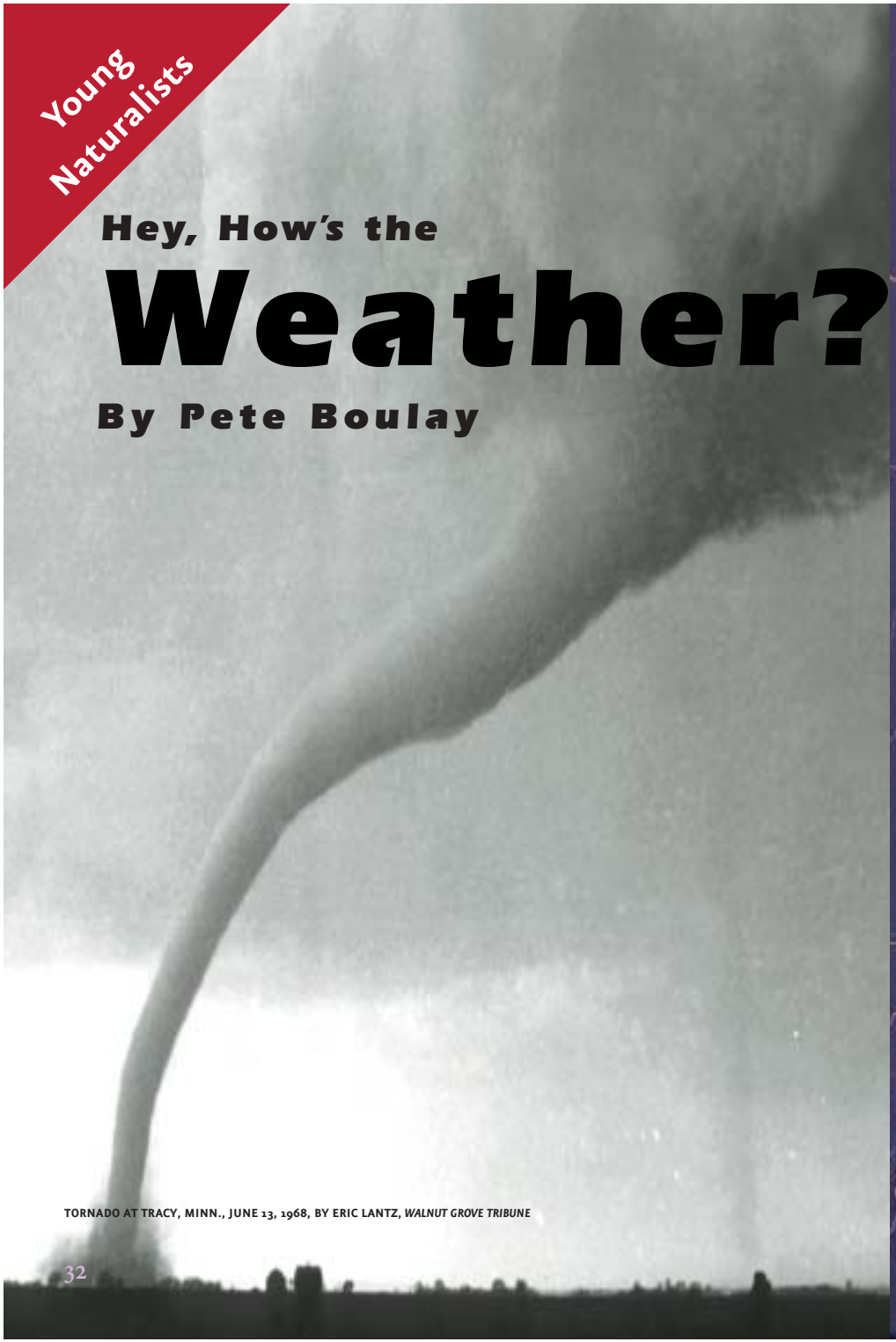
Young Naturalists

Hey, How's the Weather?

Don't like it? Wait a little while!

By Pete Boulay



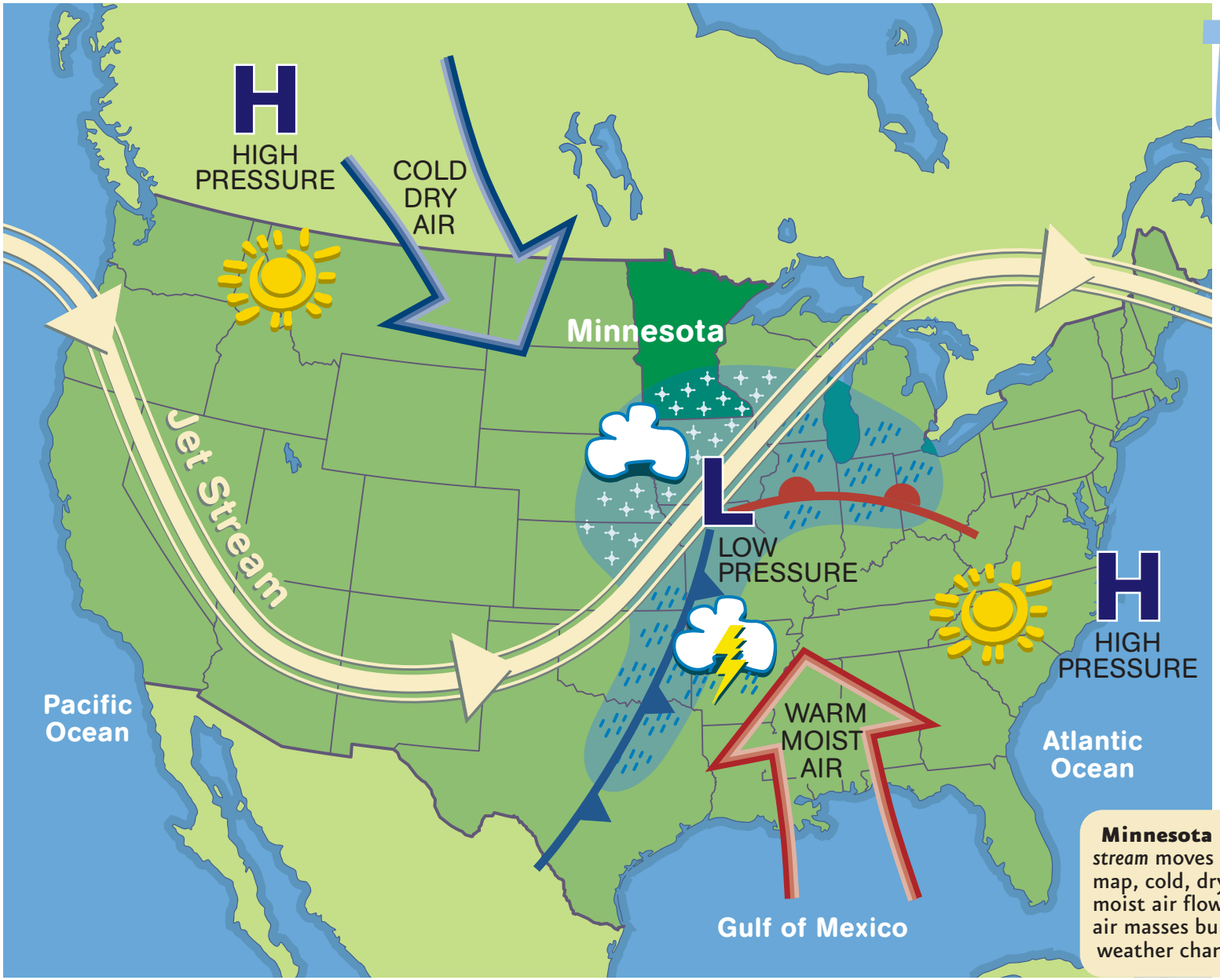
TORNADO AT TRACY, MINN., JUNE 13, 1968, BY ERIC LANTZ, *WALNUT GROVE TRIBUNE*

MINNESOTA HAS AN AMAZING MIX OF weather. The air temperature, wind, clouds, and other weather factors vary day by day, and sometimes hour by hour. Our state sits right on the 45th line of latitude—halfway between the North Pole and the equator. Minnesota is also hundreds of miles away from any ocean. Without an ocean's natural temperature control, Minnesota air temperatures can reach extremes of hot and cold.

LIGHTNING STORM IN EXCELSIOR AND DOUBLE RAINBOW IN CHANHASSEN, MINN. BY MIKE MAGNUSON

weather wise:

major weather patterns



MAP BY MATT KANIA. SOURCE: DNR STATE CLIMATOLOGY OFFICE AND FRANK AND BRUCE WATSON

Television meteorologists (weather forecasters) talk about "high" and "low" pressure. Where there is high pressure, the air tends to be dry. Because clouds don't develop in dry air, high pressure usually means sunny weather. With low pressure, the air is moist and promotes cloud development. If enough clouds get together, we might see rain or snow.

Areas of high and low pressure are pushed along by something called the *jet stream.* Think of a great river of fast-moving air high above the ground. Our weather today may have been over Colorado two days ago, and tomorrow the jet stream will carry it over Illinois.

The air the jet stream brings to Minnesota has the flavor of where the air came from. Arctic air from northern Canada tends to be cool and dry, while air from the Gulf of Mexico is warm and moist. The boundary between air masses is called a *front.* A cold front is the edge of cool air that is moving into warm air. A warm front is warm air trying to replace cool air.

Minnesota Mix. A river of air called the *jet stream* moves major air masses. In this weather map, cold, dry air comes from the Arctic. Warm, moist air flows in from the Gulf of Mexico. When air masses bump up against each other, the weather changes.

summer: living is easy

Taking a bike ride on a trail, swimming or fishing at a lake cabin, or camping in a state park—summertime is when the outdoors comes alive.

In July the average high temperature climbs to the upper 70s in northern Minnesota and the lower 80s in the south. It can still be chilly along the shores of Lake Superior.

Occasionally a heat wave pushes temperatures over the 100-degree mark. July 29, 1917, was a hot and stifling day in Beardsley. Corn crops were withering and potato plants wilted in dusty gardens. When J.L. Fitzgerald opened the door of his weather instrument shelter, he noted a temperature of 114 F—a state record. Nineteen years later, July 6, 1936, Moorhead tied the record.

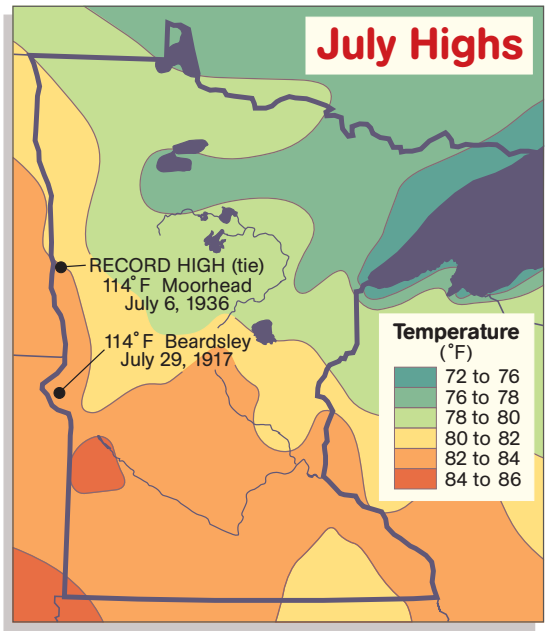
Sticky and wet. Minnesota can be very humid. The dew point—a measure of moisture in the air—can reach the tropical 70s and sometimes even 80 degrees. This happens in summer because warm air holds more water vapor than cool air does.

Moisture-laden air can help cause some heavy downpours. The more moisture, the greater the chance of jumbo raindrops reaching the ground.

The most rain officially recorded in 24 hours in Minnesota was 10.84 inches, July 22, 1972, at Fort Ripley.

The best weather. People often ask the State Climatology Office to help them choose the best date to plan an outdoor activity. The records show mid-August has the best weather. The peak heat of the summer has usually passed, and the chance of rain is lower than it was in June and July. Of course, a dry day is never a sure thing in Minnesota.

July Highs. The normal range of high temperatures for a July day varies in different parts of our state. For example, people in the Twin Cities can expect most July days to warm up to 82 to 84 F—though some days will be hotter and others will be cooler.



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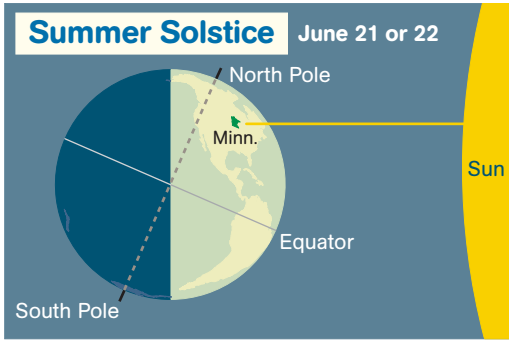


ILLUSTRATION BY MATT KANIA

Summer Solstice. The North Pole tilts toward the sun when it's summer in Minnesota. The sun shines round-the-clock on the North Pole. Minnesota's days grow longer too. June 21 or 22 is the longest day of the year north of the equator.

Castles in the Sky. Bubbles of warm air sometimes rise from the ground and gather into heaps of billowy, flat-bottomed clouds on warm summer days. These cumulus clouds usually forecast pleasant weather.

GARY ALAN NELSON

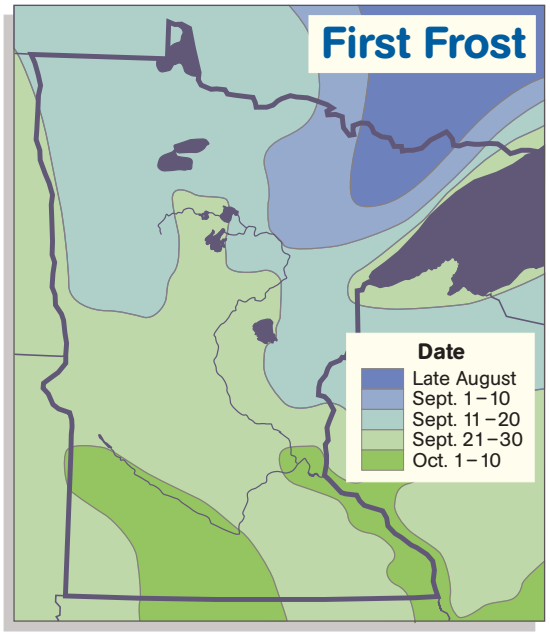
fall: tilting makes it cool

As the State Fair sells its last Pronto Pup, summer begins to draw to a close. In the fall, nights become frosty, days grow shorter, and leaves on the trees turn brilliant colors.

Early fall is one of the most beautiful times in Minnesota. The peak of the fall leaf color occurs between mid–September and late September in the Boundary Waters and along the North Shore. Color peaks in late September to early October over central Minnesota, and early to mid–October in the Twin Cities and southeastern Minnesota.

The temperature cools down in late fall. The average October high temperature is in the mid-50s at Grand Rapids, and in the low 60s at Winona. Most places in Minnesota will have the first few flakes of snow in the air sometime in October, but the first inch of snow usually doesn't fall until November.

Pete Boulay, *assistant state climatologist for the DNR State Climatology Office, loved to watch weather as a kid.*



MAP BY MATT KANIA. SOURCE: FRANK AND BRUCE WATSON AND DNR STATE CLIMATOLOGY OFFICE

First Frost. This map shows the dates when the first frost usually arrives. On a clear, cold night when the temperature drops to freezing, water vapor can turn into ice crystals—frost—on grass, rooftops, and windows. Weather forecasters warn of a killing frost. You sometimes can't see this frost, but you know the frost has arrived when you see dead flowers and other garden plants in the morning. During the frosty night, water in the leaves froze and damaged plant cells.

online

Web sites to explore on weather and climate:

National Weather Service
www.crh.noaa.gov

State Climatology Office
www.climate.umn.edu

Storm Prediction Center
www.spc.noaa.gov

Tornado Project Online
www.tornadoproject.com

U.S. Naval Observatory
sunrise and sunset tables
aa.usno.navy.mil/data

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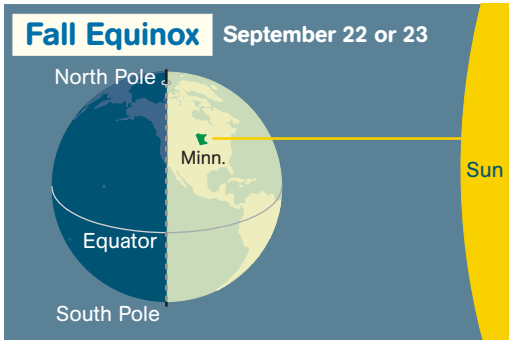


Fall Equinox. In fall the sun shines equally on the North and South poles. On Sept. 22 or 23 Minnesota has 12 hours of daylight and 12 hours of night. *Equinox* is Latin for *equal night*.

GARY ALAN NELSON

Fall Display. As summer gives way to fall, the shifting balance of daylight and night triggers leaf color change in deciduous trees. In fall trees stop making the green leaf pigment called *chlorophyll*. As chlorophyll fades, yellow and orange leaf colors show.

winter: how cold is it?

When you think of winter in Minnesota, you might think about going sledding, skiing, snowmobiling, or ice fishing. You might also think of shivering in the freezing cold air for which Minnesota is famous.

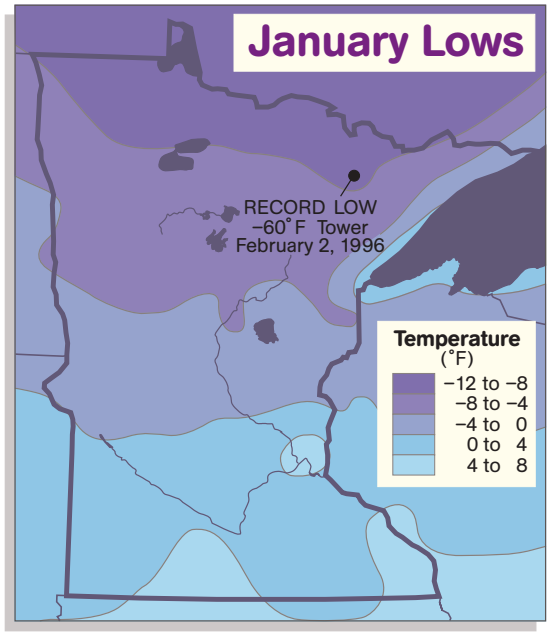
The coldest temperature recorded in Minnesota since 1891 occurred on the morning of Feb. 2, 1996. Throngs of reporters and TV cameras surrounded Kathleen Hoppa's thermometer in rural Tower: The temperature had dropped to a bone-chilling 60 degrees below zero. It made front-page news across the state, with newspaper headlines usually reserved for events of great importance. It *was* important to people in Minnesota!

Blizzards. Winter has a dangerous side. In a blizzard, snow falls fast and furious, driven by powerful winds. Besides blinding snow, extreme cold makes blizzards dangerous. A blizzard is most deadly when people aren't expecting it. For example, on Nov. 11, 1940, the famous Armistice Day blizzard struck. The weather was mild in the morning before the blizzard. It was a holiday so many people were outside, away from the safety of their homes. Suddenly temperatures dropped, and rain quickly turned into snow. Many duck hunters and other people were stranded outdoors in below-freezing temperatures. Forty-nine people died in the storm.

Another memorable snowstorm was the Halloween blizzard of 1991. That storm heaped 28.4 inches of snow on the Twin Cities. In Duluth the snow piled up an impressive 36.9 inches.

Floods. While many people hope for a white Christmas, heavy snow on the ground in late winter can lead to spring flooding. In the fall of 1996, many places in northwestern Minnesota had heavy rainfall. Then, in the winter, some of these places had near-record snowfalls. In the spring snow melted rapidly, and more heavy rain and snow fell. All of this weather led to huge, destructive floods on the Red River.

January Lows. The average daily low temperature generally decreases as you move north. However, you can find cold spots in any area. For instance, the temperature in the tiny town of Tower often drops below the area's average January low of -8 to -12 F.



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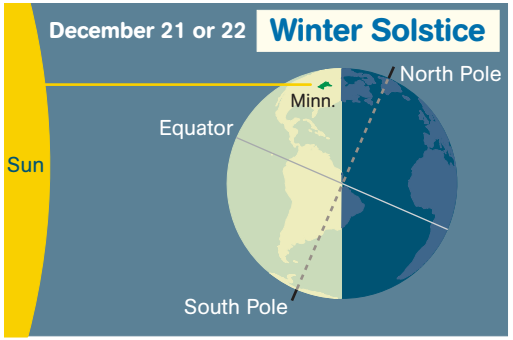


ILLUSTRATION BY MATT KANIA

Winter Solstice. In winter the North Pole tilts away from the sun. Now the sun never shines on the North Pole. Minnesota's days grow shorter too. Dec. 21 or 22 is the shortest day of the year in Minnesota.

"Iceworks" Show. A winter camper in the Boundary Waters waves a ladle of hot water through frigid air, creating an ice-crystal cloud and a trail of crystallized water vapor.

LAYNE KENNEDY

spring: when will it come?

People who live in a cold winter climate appreciate the warmer days of spring. Snow and ice gradually melt. The ice usually leaves the bigger lakes in southern Minnesota by late March or the beginning of April. Gunflint Lake in the far north has one of the state's latest average ice-out dates—around May 7.

Spring also heralds the severe weather season. In April the National Weather Service hosts Severe Weather Awareness Week to remind people what to do if a tornado or other harsh weather suddenly strikes.

Whirlwinds. Tornadoes have been reported in Minnesota for centuries. On April 19, 1820, a tornado struck the camp that would eventually become Fort Snelling, near the Mall of America.

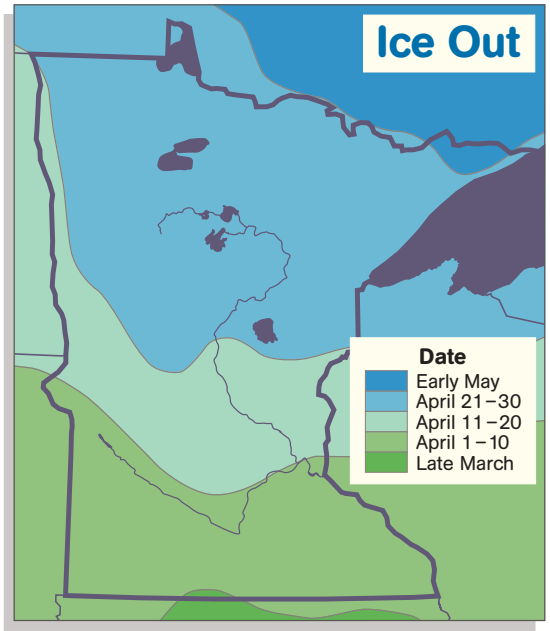
When cold, dry air clashes with warm, sticky air, powerful thunderstorms can form. When strong winds twist rising hot air, a funnel can whirl up from the ground or down from the storm cloud. Winds inside a tornado can twist faster than any hurricane—more than 300 miles per hour.

Meteorologists rank tornadoes by the Fujita Scale, created by tornado guru Tetsuya Fujita. The scale ranges from F0 (winds of 40 to 72 miles per hour) to F5 (261 to 318 miles per hour).

Minnesota has only had seven F5 tornadoes out of the 1,356 tornadoes reported from 1820 to 2002. The last F5 tornado to hit the state devastated the small town of Chandler on June 16, 1992.

Hail. Some storms bring damaging straight-line winds and large hail. On July 4, 1966, Mother Nature provided fireworks of her own when a storm pelted the Detroit Lakes area with the largest hailstones ever officially recorded in the state. The hail was 12 inches in circumference. That's as big as a softball or grapefruit. Hail the size of baseballs fell on the Twin Cities suburb of Eagan on April 18, 2002.

Ice Outs. Ice on rivers and lakes breaks up and melts as spring air temperatures rise. The map shows the average dates when the last ice disappears from an area's waterways. Minnesotans have been recording ice-out dates for more than 100 years.



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Attention Teachers!
To find an online teachers guide for this article, visit www.dnr.state.mn.us/young_naturalists/weather. To learn more about using *Minnesota Conservation Volunteer* as a teaching tool, contact Meredith McNab, meredith.mcnab@dnr.state.mn.us or 651-215-0615.

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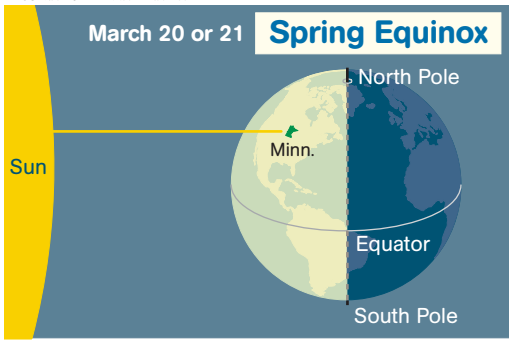

Spring Equinox. In spring the sun shines equally on the North and South poles. On March 20 or 21, Minnesota has 12 hours of daylight and 12 hours of night.

How Hail Happens. Strong winds in storm clouds blow water droplets up into colder air, where they freeze. The frozen balls of ice drop back to the warm part of the cloud. They continue to circulate from warm air to freezing air, adding layer after layer of ice, until they grow too heavy for the wind to carry. Then the hail falls to earth.

LAYNE KENNEDY