

Natural Hazards Assessment

Grant County, WI

Prepared by: NOAA / National Weather Service La Crosse, WI



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Prepared by National Weather Service – La Crosse

Overview

Grant County is in the Upper Mississippi River Valley of the Midwest with terrain ranging from rolling hills to farm land to steep valleys and bluffs. It is bordered by the Mississippi River to the west and the Wisconsin River to the north.

The area experiences a temperate climate with both warm and cold season extremes.

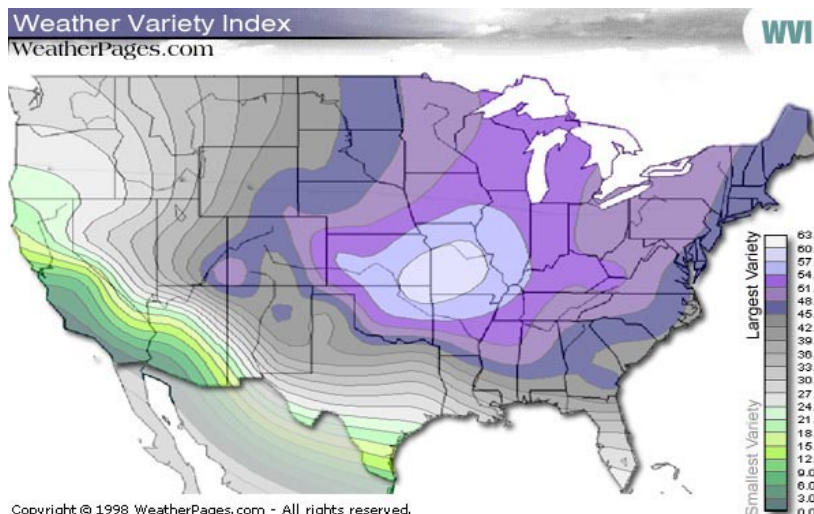
Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 3 to 4 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

Temperatures between river valleys and surrounding ridges can vary greatly. Typically high temperatures on ridges are 3° to 5°F colder than valleys. This can lead to slightly more average snowfall on ridge tops and occasionally a difference in winter precipitation types from ridge to valley.

Thunderstorms occur on average 30 to 50 times a year, mainly in the spring and summer months. The strongest storms can produce associated severe weather like tornadoes, large hail, or damaging wind. Both river flooding and flash flooding can occur, along with urban-related flood problems. The terrain can lead to mud slides and generally increases the flash flood threat. Heat and high humidity is occasionally observed in June, July, or August.

The autumn season usually has the quietest weather. Valley fog is most common in the late summer and early fall months. On calm nights, colder air settles into valleys leading to colder low temperatures compared to ridge top locations. High wind events can also occur occasionally, usually in the spring or fall.

The variability in weather can be seen in the following graphic, created by a private company (weatherpages.com) that rated each city on variations in temperature, precipitation, and other factors. Dubuque, IA ranked 29th, La Crosse, WI ranked 27th, and Madison, WI ranked 8th highest in variability out of 277 cities.

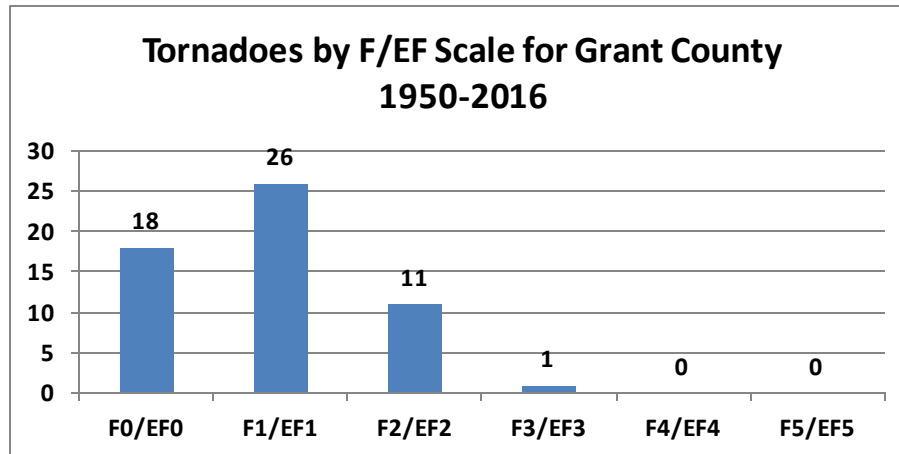


Since 2000, Grant County has been included in a FEMA Federal Disaster Declaration 8 times:

- 2000 – Severe storms / flooding
- 2001 – Flooding
- 2004 – Severe storms / flooding
- 2007 – Severe storms / flooding
- 2008 – Severe storms / flooding
- 2010 – Severe storms / flooding
- 2011 – Winter storms
- 2013 – Severe storms / flooding

Tornadoes

Grant County has had the third most tornadoes of any county in Wisconsin. Even though Wisconsin averages about 23 tornadoes per year, Grant County has had 53 tornadoes since 1950, averaging about one tornado every year. Most tornadoes are short-lived and small. May and June are the peak months and most occur between 3 and 9 p.m., but they can occur nearly any time of year and at all times of the day.



Most recent tornadoes:

- June 29, 2014 (EF1)
- June 16, 2014 (EF1)
- June 16, 2014 (EF2)
- May 29, 2013 (EF0)
- Sept. 4, 2012 (EF2)
- April 26, 2009 (EF0)
- Jun. 12, 2008 (EF0)
- Jun. 7, 2008 (EF0)
- Jun. 3, 2007 (EF0)
- May 26, 2007 (EF0)
- Mar. 31, 2007 (EF0)
- Aug. 18, 2005 (F1)

Although Grant County has had many tornadoes through the years, luckily most are on the smaller side. There are several days where multiple tornadoes hit on the same day – May 8, 1988 had 7 tornadoes (F1-F2) causing \$500,000 in damage to numerous farms, homes, and trees. There were 3 tornadoes on June 19, 1993 but again, they were all small. A killer tornado last hit on June 22, 1944 when seven people were killed and 65 were injured, mainly around the Belmont, WI area. About 25 homes and 60 barns were destroyed. And an EF2 tornado hit UW-Platteville in 2014.

Strongest tornadoes: (1850-2016)

- June 22, 1944 (F4) – 65 inj, 7 dead
- May 21, 1918 (F4) – 100 inj, 8 dead
- Mar. 10, 1876 (F3) – 50 inj, 9 dead
- May 30, 1985 (F3) – 27 inj, 2 dead
- June 26, 1969 (F2) – 2 inj, 0 dead

Grant County Tornado Facts:

- No F5 or EF5* tornadoes
- Last violent tornado – 1944 (F4)
- 27 deaths and 248 injuries since 1850
- Tornadoes have occurred March – October
- Most have occurred in June (21)

Tornado Watches		Tornado Warnings	
Year		Year	
2016	0	2016	0
2015	2	2015	3
2014	2	2014	2
2013	3	2013	6
2012	0	2012	1
2011	2	2011	0
2010	7	2010	1
2009	5	2009	4
2008	15	2008	3
2007	7	2007	4
2006	3	2006	0

Enhanced Fujita (EF) Scale	
EF0	65-85 mph
EF1	86-110 mph
EF2	111-135 mph
EF3	136-165 mph
EF4	166-200 mph
EF5	>200 mph

Severe Thunderstorms / Lightning

Grant County averages 42 thunderstorm days per year. The National Weather Service (NWS) considers a thunderstorm severe when it produces wind gusts of 58 mph (50 knots) or higher, 1 inch diameter hail or larger, or a tornado.

Downdraft winds from a severe thunderstorm can produce local or widespread damage, even tornado-like damage if strong enough. Most severe thunderstorm winds occur in June or July and between the hours of 4 and 8 p.m., but can occur at other times. Most damage involves blown down trees, power lines, and damage to weaker structures (i.e. barns, outbuildings, garages) with

occasional related injuries. In August 2003, 80 mph thunderstorm winds ripped the roof off schools in Potosi and Patch Grove, WI. In September 2000, trees and power lines were flattened between Dickeyville and Platteville, WI leaving hundreds of people without power. And on July 20, 2006 a wind gust of 65 mph knocked a tree down on a camp during the early morning hours killing a 6-year old girl at Nelson Dewey State Park near Cassville, WI. There have been 131 damaging wind reports since 2000.

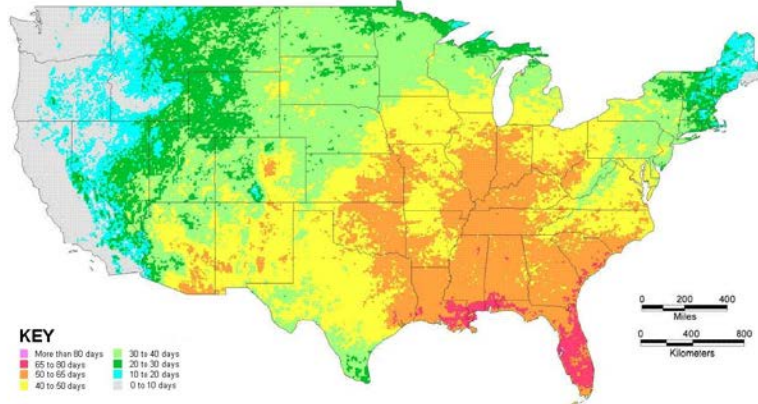
Large hail can also occur in a severe thunderstorm. June is the peak month with the most common time between 1 and 9 p.m., but it can occur in other warm season months and at any time of day. Hail is typically a crop damaging hazard but can damage roofs, windows, and vehicles if large enough (> 1"). Expenses can be high. Injuries or fatalities are rare for hail. Baseball size hail fell in April 2006 causing extensive damage. There have been 159 large hail ($\geq 3/4"$) reports in the county since 2000.

Non-severe thunderstorms still pose a lightning risk. According to the Vaisala Group, an average of just under 300,000 cloud-to-ground strikes hit Wisconsin each year based on data from 2006 to 2015.

Nationally, Wisconsin ranks 11th in lightning related fatalities with 8 deaths reported between 2006 and 2015. There were lightning fatalities in Wisconsin 2007, 2008, 2011 and 2016. In August 2001, a man was killed while walking in a field near Bloomington, while in 2005 a woman was injured while talking on a telephone from a nearby lightning strike.

Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2016	8	2016	3
2015	5	2015	3
2014	11	2014	11
2013	8	2013	16
2012	6	2012	7
2011	8	2011	13
2010	11	2010	9
2009	9	2009	11
2008	18	2008	18
2007	15	2007	13

Average Number of Thunderstorm Days per Year



Flooding and Hydrologic Concerns

On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms (“training”) can bring excessive rainfall and lead to flash flooding in Grant County. The hilly terrain promotes rapid run-off and enhances the threat. Mudslides can occur in extreme cases. Intense rainfall rates also lead to occasional urban street flooding.

June is the most common month for flash floods, but they can occur from May through September. They are most common in the evening hours, between 8-10 p.m., but can occur at other times and typically last from 3-6 hours. Since 1982, there have been 9 deaths from flooding in Wisconsin.

In July 2007, nearly ten inches of rain fell across western ends of the county and led to tremendous run-off and flash flooding. Mudslides and drainage areas flash flooded the town of Bagley, WI where nearly 400 homes were flooded. In June 2008, 3 to 4 inches of rain in a short period of time produced flash flooding in the southwest part of the county, including Potosi, WI. Many county roads were washed out with nearly 600 homes impacted.

Five main rivers can impact Grant County – the Mississippi, the Wisconsin, the Blue, the Platte, and the Grant Rivers. The Mississippi River is often highest in the spring associated with the seasonal snowmelt, but on rare occasions can reach flood stage during the summer or fall from heavy rain patterns. The combination of up-river snowmelt and area rain brought major flooding along the Mississippi River in April 2001, setting the 2nd highest crest levels in many locations. The record crest year remains 1965.

Flash Flood Warnings	
Year	
2016	3
2015	0
2014	7
2013	8
2012	3
2011	4
2010	6
2009	5
2008	10
2007	4
2006	0

Mississippi River @ Guttenberg, IA Top 5 Crests (FS: 15 feet)	
Year	Crest
1965	23.65'
2001	21.68'
1993	20.15'
1969	19.84'
1952	19.69'

Flooding along the Wisconsin River can occur from snowmelt or heavy rain patterns, but does not typically cause problems since the river is wide and empties into the Mississippi River. Flooding along the other smaller rivers, creeks, and drainage areas can be a bit more frequent, usually stemming from heavy rain patterns or ice jams as opposed to snowmelt. These rivers tend to rise and fall relatively quickly with rare property damage concerns.

The US Army Corps of Engineers maintains a Lock and Dam (#10) at Guttenberg, IA that is used to manage navigational water levels.

Flooding at Bagley, WI (July 2007)



Ice jam flooding in Grant County



Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Grant County. Since 1982, an average of 3-4 winter storms impact the area each season. The hilly terrain in the county does limit the number of true blizzards (only 6 since 1982) but heavy snow, blowing snow, ice, and sleet all occur. There have been a total of 6 documented deaths and 51 injuries as a direct result from winter storms in Wisconsin since 1982.

The 30-year average seasonal snowfall at Lancaster, WI is 39.5 inches. Blowing or drifting snow is more common on the ridge tops or open, high areas compared to valleys. The all-time record one-day snowfall in Lancaster was 13.0 inches set on January 3, 1986 and March 6, 1959. The bulk of snow falls between December and March. The largest winter storms tend to form over the central or southern Plains, then move northeast towards the western Great Lakes.

There have been numerous heavy snowfalls through the years. On February 5-6, 2008 heavy snow hit extreme southern Wisconsin ranging from 5" near the Wisconsin River valley to as much as 18" in the Sinsinawa, WI area. Platteville had 10.5" of snow and Hazel Green, WI had 14" from just this one storm. On December 3-4, 1990, a snow storm dropped 18.4" of snow on Platteville while a two-day total of 16" was recorded at Lancaster, WI. Platteville had their snowiest month on record in December 2008 when 35.2" fell.

Top 5 Seasonal Snowfalls in Lancaster	
Years	Snowfall
1925-26	90.3"
1950-51	77.5"
2007-08	75.4"
1951-52	74.5"
1922-23	68.4"



A massive storm on February 1, 2011 brought true blizzard conditions to the county with impassable roads across southern parts of the county (12"+ inches) and drifts larger than "tractors."

March can often be a snowy month. Even though snowfall may be less frequent, heavy wet snow can form from large spring storms. On March 6, 1959, 13" of snow fell in Lancaster, WI while 13" also was reported in Platteville on March 8, 1961.

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 6 occurrences since 1982.

Arctic cold outbreaks can occur in the upper Midwest as well. Snow depth can modify these cold temperatures leading to sub-zero readings on average 21 times a winter. Occasionally strong northwest winds will combine with arctic outbreaks to create dangerous wind chill conditions as well. The coldest temperatures are usually in January and February with average lows in the single digits and record lows colder than -25°F most days. The all-time record low is -31°F set in 1996.

In 1996, Grant County went 7 consecutive days with temperatures falling below zero degrees (F) following a blizzard about a week earlier. Record low temperatures of -31°F, -31°F, and -26°F were set on three straight mornings.

Since 1982 there have been 38 fatalities in Wisconsin from cold weather.

The La Crosse National Weather Service issues Wind Chill Advisories when wind chill readings of -20°F to -34°F are expected. Wind Chill Warnings are issued when wind chill values at or below -35°F are expected or occurring. On January 30, 2008, the wind chill hit -37°F at Fennimore, WI.

Coldest Lows at Lancaster, WI	
Low	Date
-31°F	2/3/1996
-31°F	2/2/1996
-31°F	1/23/1963
-30°F	2/13/1905
-29°F	1/17/1930

Heat, Drought, and Wildfires

On occasion the weather pattern across the upper Midwest favors prolonged heat and humidity, leading to heat waves. June through August are the warmest months with average high temperatures in the 80s and record highs above 100°F most days. The warmest temperature on record at Lancaster, WI is 108°F set on July 14, 1936. The warmest reading ever in Platteville, WI is 103°F set in August 1988.

Since 1982, there have been 125 fatalities directly related to heat waves and another 95 indirectly, in Wisconsin. In Grant County, there have been 16 heat waves since 1982.

One of the longest heat waves on record occurred in July 1936 when Lancaster, WI hit 90°F or higher for 15 consecutive days, including 10 days at or above 100°F and an all-time record of high of 108°F as noted above. July 1901 was also an abnormally hot month with high temperatures at or above 100°F on 11 days of the month, twice hitting 107°F. In July 2011, warm temperatures combined with high dew points to create heat index values over 105 for several days. On July 18, 2011, the heat index topped off at 117 deg F in Boscobel while Platteville hit 108. And in early July 2012 the high temperature hit 100 deg F or warmer 4 of 5 days at Boscobel, WI, with a peak heat index of 111.

Warmest Highs at Lancaster, WI	
High	Date
108°F	7/14/1936
107°F	7/13/1936
107°F	7/24/1901
107°F	7/21/1901
106°F	7/12/1936



Prolonged dry spells can also lead to drought causing extreme damage to crops. Droughts vary in length and intensity but abnormally dry to moderate drought conditions can occur quite frequently. Severe to extreme droughts occur far less frequently.

In 2012, A Secretarial Drought Designation included the southern half of Wisconsin.

Dry weather can also lead to a wildfire threat, especially in the spring before foliage has emerged (i.e. before green up) or in the fall after vegetation has started to die off. Warm, dry (i.e. lower relative humidities), and windy conditions all favor higher fire danger and can lead to sporadic grass fires in Grant County. Thick, wooded areas also pose a threat for wildfires under extremely dry conditions but occur far less frequently.



Local Climatology

Here are some basic climatology figures for the Grant County area. Data is valid for Lancaster, WI based on normals from a 30-year period (1981-2010).

Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	25.2	8.8	17.0	0.90"	10.4"
FEB	30.5	13.6	22.1	1.07"	7.7"
MAR	42.7	24.9	33.8	1.98"	5.6"
APR	57.2	36.7	47.0	3.64"	1.8"
MAY	68.0	47.4	57.7	4.15"	0.2"
JUN	77.3	57.1	67.2	5.25"	0.0"
JUL	81.1	61.2	71.1	4.32"	0.0"
AUG	79.2	59.5	69.3	4.21"	0.0"
SEP	71.4	50.8	61.1	3.14"	0.0"
OCT	59.0	38.7	48.9	2.58"	0.3"
NOV	43.5	27.3	35.4	2.45"	2.9"
DEC	29.1	13.7	21.4	1.46"	10.9"
Year	55.4	36.6	46.0	35.14"	39.5"

Note: Climate records for Lancaster, WI began in 1893.

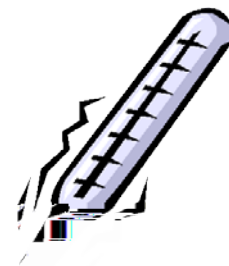
Miscellaneous facts:

- Warmest year on record – 1931 (52.0°F)
- Warmest month on record – July 1916 (81.3°F)
- Warmest day on record – July 14, 1936 (108°F)
- Greatest number of days with 90°F or warmer – 1936 (51 times)

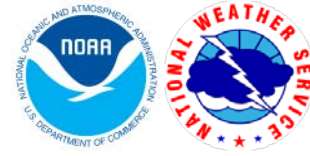
- Coldest year on record – 1996 (42.9°F)
- Coldest month on record – January 1912 (1.2°F)
- Coldest day(s) on record – February 2-3, 1996 (-31°F)
- Greatest number of days at 0°F or colder – 1893 (54 times)

- Wettest year on record – 1938 (48.17")
- Wettest month on record – June 2008 (12.63")
- Wettest day on record – July 26, 1940 (6.17")
- Driest year on record – 1988 (17.58")
- Driest month(s) on record – October 1952 and March 1910 (0.00")

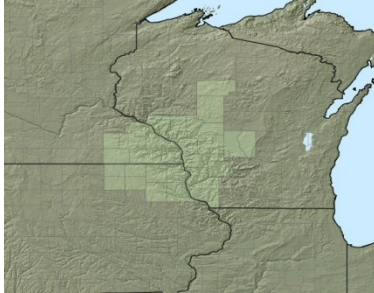
- Highest seasonal snowfall on record – 1925/26 (90.3")
- Highest monthly snowfall on record – March 1923 (34.5")
- Highest one-day snowfall on record – January 3, 1986 and March 6, 1959 (13.0")
- Least seasonal snowfall on record – 1967/68 (8.0")



NOAA/National Weather Service Support and Weather Monitoring



NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Grant County with weather information and support on a continuous basis. Operating 24 hours a day, a staff of 23 issues routine and non-routine informational products for the area, including all watches, warnings, and advisories related to natural hazards. Doppler radar (WSR-88D) is co-located with the La Crosse NWS office and covers the region.



NWS La Crosse has a web site at: www.weather.gov/lacrosse

Normal communication during hazardous weather scenarios is via telephone, National Warning System (NAWAS), and amateur radio.

NOAA Weather Radio coverage in Grant County includes:

- WXL64 (Dubuque) on 162.400 MHz
- WWG86 (Prairie du Chien) on 162.500 MHz.

Storm spotter groups consist of a mix of volunteer fire department personnel, amateur radio operators, law enforcement, and the general public. At least one spotter training class is held annually with an average annual attendance in the past 5 years of 188.

There are a variety of weather monitoring sources in Grant County, including:

Automated weather station(s):

- Boscobel, WI (KOV5)
- Platteville, WI (KPVB)
- Nearby sites include Dubuque (KDBQ), Prairie du Chien (KPDC), and Mineral Point (KMRJ).

River Gauge(s):

- Mississippi River Lock & Dam #10 @ Guttenberg, IA
- Mississippi River @ McGregor, IA
- Mississippi River @ Clayton, IA
- Wisconsin River @ Muscoda, WI
- Platte River @ Rockville, WI
- Grant River @ Burton, WI

Cooperative Observers

- Cuba City 2NW
- Lancaster 4WSW
- Platteville

In addition, numerous volunteer reports from around the county are received at the La Crosse NWS office including rainfall, snowfall, and temperatures, on a routine basis.



Resources

National Weather Service – La Crosse	www.weather.gov/lacrosse
NWS La Crosse Tornado Database	www.weather.gov/arx/tornadomain
NWS La Crosse River Monitoring	http://www.crh.noaa.gov/ahps2/index.php?wfo=arx
NWS La Crosse Climate	www.weather.gov/climate/index.php?wfo=arx
NWS La Crosse Drought information	www.weather.gov/arx/drought
NWS La Crosse Storm Summaries	www.weather.gov/arx/events
NWS La Crosse NOAA Weather Radio page	www.weather.gov/arx/nwr
NWS Storm Prediction Center	http://www.spc.noaa.gov/
SPC Online Severe Weather Climatology	http://www.spc.nssl.noaa.gov/climo/online/grids/ http://www.spc.noaa.gov/climo/online/rda/ARX.html

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