Natural Hazards Assessment

Juneau County, WI

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

Natural Hazards Assessment
for
Juneau County, WI

Prepared by NOAA / National Weather Service – La Crosse
Last Update: June 2010

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Overview

Juneau County is in the Upper Mississippi River Valley of the Midwest with terrain ranging from flat, Cranberry bogs in the north to relatively steep hills and valleys in the south. It is bordered by the Wisconsin River to the east.

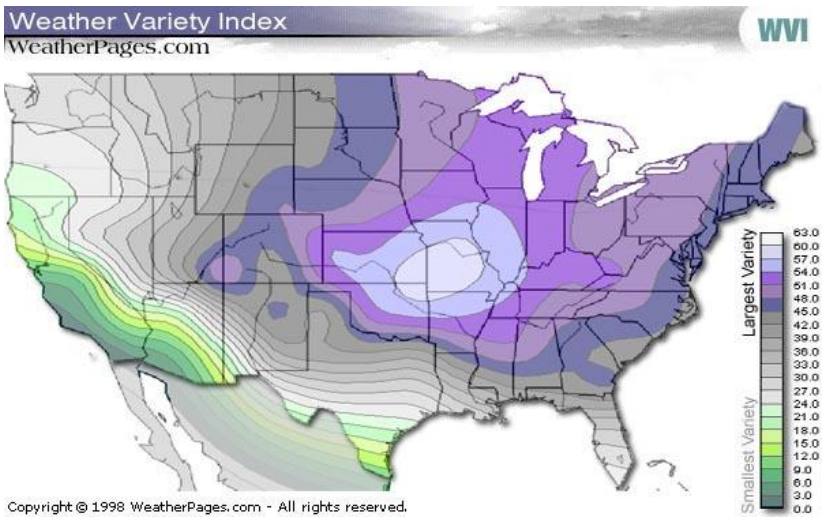
The area experiences a temperate climate with both warm and cold season extremes. The lower areas, including Cranberry bogs, can reach unusually cold temperatures even in summer.

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.

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. Heat and high humidity is occasionally observed in June, July, or August.

The autumn season usually has the quietest weather. River valley fog can occur. 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. Madison, WI ranked 8th and La Crosse, WI ranked 27th highest in variability out of 277 cities.

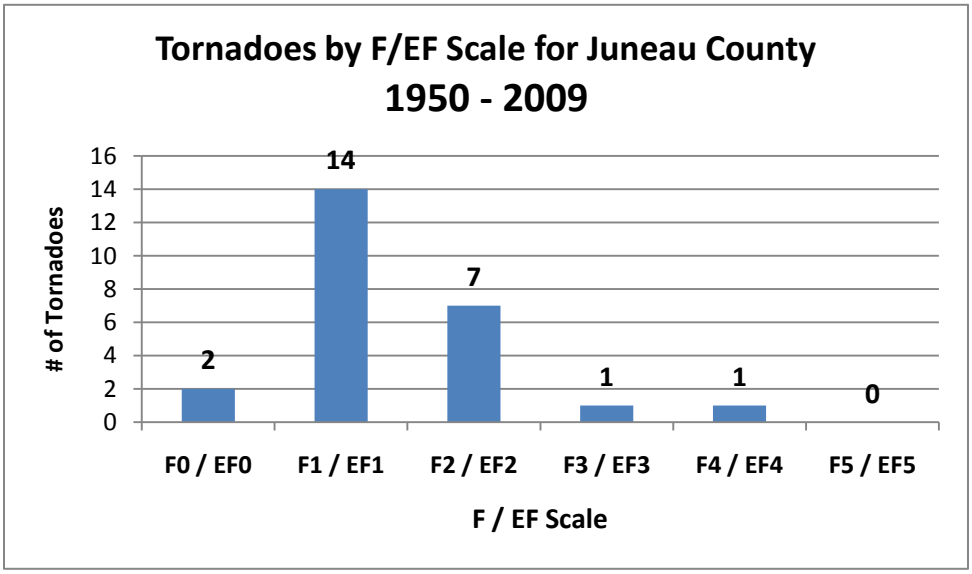


Since 1998, Juneau County has been included in a FEMA Federal Disaster Declaration 4 times:

2000 – Severe storms / flooding
2001 – Flooding
2004 – Severe storms / flooding
2008 – Severe storms / flooding

Tornadoes

Juneau County has had 25 tornadoes since 1950, averaging about one tornado every 2-3 years. Wisconsin averages 21 tornadoes per 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:

- Aug.18, 2005 (F1)
- June 23, 2004 (F1)
- June 1, 2000 (F1)
- Aug.27, 1994 (F1)
- Oct.8, 1992 (F1)
- May 8, 1988 (F1)
- Aug.12, 1985 (F2)
- Oct.16, 1984 (F2)
- July 3, 1983 (F0)
- July 3, 1983 (F3)
- Mar.30, 1982 (F1)

Juneau County has a history of tornadoes, especially given the relatively flat terrain in parts of the county. In August 1985, a tornado tracked through much of the county hitting parts of New Lisbon. A couple was killed and 22 others were injured when 35 mobile homes were destroyed. In June 2000, a tornado formed north of New Lisbon and traveled to areas north of Mauston shearing numerous trees and damaging several buildings near Highway 58.

Strongest tornadoes: (1850-2008)

- July 3, 1907 (F4) – 40 inj, 11 dead
- Apr.19, 1957 (F4) – 0 inj, 1 dead
- Aug.12, 1985 (F2) – 22 inj, 2 dead
- July 3, 1983 (F3) – 8 inj, 0 dead
- June 7, 1908 (F3) – 3 inj, 2 dead

Juneau County Tornado Facts:

- No F5 or EF5* tornadoes
- Two F4 and three F3 tornadoes
- 16 deaths and 89 injuries since 1850
- Tornadoes have occurred March – October
- Most have occurred in August (7)

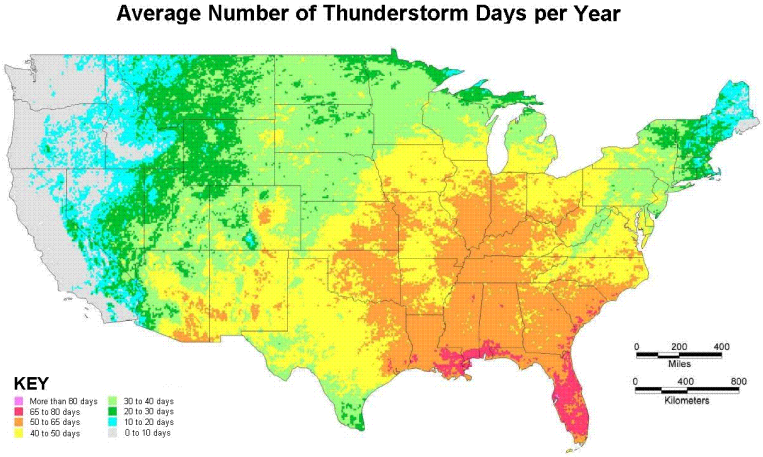
Tornado Watches		Tornado Warnings	
Year		Year	
2009	2	2009	0
2008	6	2008	2
2007	8	2007	1
2006	2	2006	0
2005	8	2005	1
2004	5	2004	1
2003	2	2003	0
2002	5	2002	0
2001	4	2001	0
2000	2	2000	1

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

* Started February 1, 2007

Severe Thunderstorms / Lightning

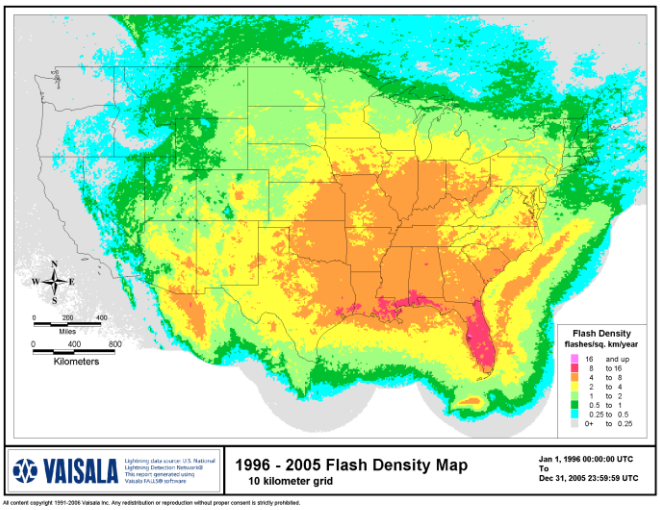
Juneau County averages 39 thunderstorm days per year. The National Weather Service (NWS) considers a thunderstorm severe when it produces wind gusts of 58 mph (50 knots) or higher, 3/4 inch diameter hail or larger, or a tornado.



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 June 2000, strong thunderstorms produced nearby tornadoes and large hail, but also extensive wind damage near Interstates 90/94 from Camp Douglas to near Mauston. Wind gusts were in excess of 90 mph. In August 2007, wind gusts reached 70 mph in the Necedah area knocking down trees and power lines. There have been 91 damaging wind reports since 1982 in the county.

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. Golf ball size or larger hail hit the county hard in Sept.1994, along with June 2000 and Aug.2006. There have been 90 large hail (≥ 3/4”) reports in the county since 1982.

Non-severe thunderstorms still pose a lightning risk. According to the Vaisala Group, an average of nearly 300,000 cloud-to-ground strikes hit Wisconsin each year based on data from 1996 to 2005. There was a lightning fatality in Wisconsin both in 2007 and 2008. In Juneau County, there has not been any lightning related fatalities since 1982, but 8 known injuries.



Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2009	3	2009	4
2008	9	2008	9
2007	16	2007	3
2006	28	2006	13
2005	13	2005	7
2004	12	2004	6
2003	8	2003	3
2002	18	2002	5
2001	16	2001	8
2000	13	2000	5

Flooding and Hydrologic Concerns

On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms ("training") can bring excessive rainfall leading to flash flooding in Juneau County. Given the relatively flat terrain, ponding of water is more likely, but true flash flooding and erosion problems can develop if rainfall is excessive enough. This is especially true in southern parts of the county where hills and valleys can enhance the flash flood threat.

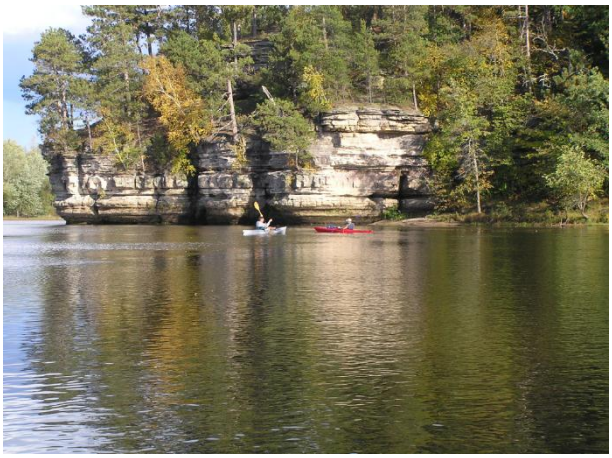
Flash Flood Warnings	
Year	
2009	0
2008	4
2007	0
2006	0
2005	0
2004	0
2003	0
2002	0
2001	0
2000	0
1999	0

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. Between 1982-1997, there were 8 deaths from flooding in Wisconsin.

In early June 2008, a weekend of repeat thunderstorm activity led to record flooding on area rivers and tremendous flash flooding. Sand bagging was widespread with several communities damaged and roads closed. The Elroy and Wonewoc areas were hit hard, and there was concern about high water in Mauston as well. Evacuations were commonplace for several days.

Juneau County is bordered by one major river - The Wisconsin River. There are two hydro-electric dams (Castle Rock and Petenwell) that maintain pool or lake levels and control flow. Water levels are typically high in the spring from snowmelt, but can also develop during the summer or fall from heavy rain patterns. Failure at either dam would lead to flash flooding and inundation near the river, including some campgrounds, resorts, and residences. (Photo below: Petenwell Dam)

The county is also bisected by 3 smaller rivers – The Yellow, Lemonweir, and Baraboo Rivers. They can also run high during spring snowmelt, but more typically are highest after heavy rain events and can rise and fall very quickly. The Baraboo River set an all-time record crest in June 2008. (Picture below: Lemonweir River meeting the Wisconsin River)



Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Juneau County. Since 1982, there have been 69 winter storms to hit the county with an average of 2-3 each season. Heavy snow, blowing snow, ice, and sleet all occur, although blizzards are more rare (only 3 since 1982). There have been a total of 4 documented deaths and 49 injuries as a direct result from winter storms in Wisconsin since 1982.

The 30-year average seasonal snowfall at Mauston, WI is 48.0 inches. The all-time record one-day snowfall is 14.3 inches that occurred at Mauston on March 8, 1946. 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.

The winter of 2007-2008 was one of the worst on records with six winter storms that dropped at least 6" of more of snow on Juneau County. On December 22-23, 2007 about 16" of snow fell in the Mauston area, with over 20" of snow both in January and February 2008. This led to the largest seasonal snowfall on record.

Top 5 Seasonal Snowfalls at the Mauston, WI

Years	Snowfall
2007-08	89.5"
1961-62	84.3"
1958-59	79.7"
1996-97	77.1"
1970-71	73.6"

March can often be a snowy month. Even though snowfall may be less frequent, heavy wet snow can form from large spring storms. In 1997, a large winter storm dropped nearly 22 inches of wet snow in Juneau County on March 13-14th. In March 1959, about 26 inches fell in the Necedah, WI area over a few days.

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 5 occurrences since 1982. On January 4-5, 1998 glaze ice was nearly ¾ inch thick and led to many injuries across central Wisconsin.

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 19 times a winter, although in Cranberry Bog areas the average of sub-zero readings is closer to 35 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 at Mather, WI is -43°F set in 1951.

Coldest Lows at Mauston, WI

Low	Date
-38°F	2/1/1918
-37°F	1/13/1912
-37°F	1/12/1912
-36°F	1/15/1963
-35°F	1/20/1994

In late January and early February 1996, the Juneau County area went 6 consecutive days with temperatures below zero degrees (F) following a blizzard about a week earlier. Low temperatures during that stretch at Mauston were -29°F, -29°F, -30°F, -34°F, -33°F, and -30°F over six straight mornings.

Since 1982 there have been 27 fatalities in Wisconsin from cold weather and 42 direct injuries.

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. The wind chill hit -41°F on January 30, 2008 at Volk Field/Camp Douglas.

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 Mather, WI is 107°F set on August 24, 1948.

Warmest Highs at Mauston, WI	
High	Date
103°F	7/14/1995
102°F	8/17/1988
102°F	8/2/1988
102°F	8/1/1988
102°F	8/21/1955

Since 1982, there have been 115 fatalities directly related to heat waves and another 95 indirectly, in Wisconsin. In Juneau County, there has been 13 heat waves since 1982 but no heat related fatalities documented.

One of the longest heat waves on record occurred in July 1936 when the Juneau County area hit 90°F or higher for 14 consecutive days, including 8 days at or above 100°F. In July 1964, Mauston hit 90°F eleven times while in July and August of 1988 the temperature hit 102°F three times.

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.

Droughts have occurred in Wisconsin as recently as 2005 to 2009.

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 Juneau County. April is typically the busiest fire weather month. Thick, wooded areas, especially in areas thick with Jack Pines or pine plantations, 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 Juneau County area. Data is valid for Necedah, WI based on normals from a 30-year period (1971-2000).

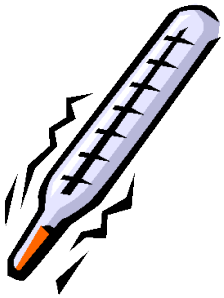
Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	25.3	5.6	15.5	0.97”	7.9”
FEB	32.1	11.2	21.7	0.90”	5.0”
MAR	43.7	22.0	32.9	1.91”	4.6”
APR	59.2	33.8	46.5	3.04”	1.5”
MAY	72.5	45.5	59.0	3.46”	0.0”
JUN	80.7	54.5	67.6	3.74”	0.0”
JUL	84.2	59.8	72.0	4.30”	0.0”
AUG	81.4	57.5	69.5	4.66”	0.0”
SEP	72.8	48.9	60.9	3.79”	0.0”
OCT	60.7	37.9	49.3	2.25”	0.3”
NOV	42.8	25.6	34.2	2.14”	3.2”
DEC	29.4	12.2	20.8	1.18”	7.9”
Year				32.34”	30.4”

(Note: Climate records for Necedah are only available from 1953 on)

Miscellaneous Climate Facts for Mauston, WI (Data begins in 1905):

- Warmest year on record – 1987 (48.3°F)
- Warmest month on record – July 1916 (77.5°F)
- Warmest day on record – July 14, 1995 (103°F)
- Greatest number of days with 90°F or warmer – 1955 (37 times)

- Coldest year on record – 1912 (41.9°F)
- Coldest month on record – January 1912 (-1.7°F)
- Coldest day on record – February 1, 1918 (-38°F)
- Greatest number of days at 0°F or colder – 1978 (57 times)

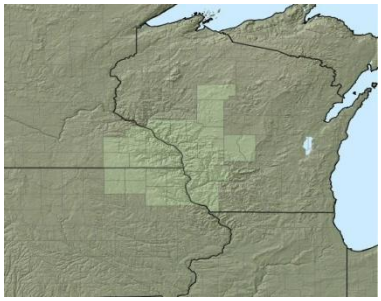


- Wettest year on record – 1965 (52.72”)
- Wettest month on record – August 2007 (11.91”)
- Wettest day on record – August 14, 1909 (4.65”)
- Driest year on record – 1958 (17.24”)
- Driest month on record – Numerous dry months (0.00”)

- Highest seasonal snowfall on record – 2007/08 (89.5”)
- Highest monthly snowfall on record – December 2008 (43.2”)
- Highest one-day snowfall on record – March 8, 1946 (14.3”)
- Least seasonal snowfall on record – Incomplete

NOAA/National Weather Service Support and Weather Monitoring

NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Juneau 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 and amateur radio.

NOAA Weather Radio coverage in Juneau County includes WWF40 (Coloma) on 162. 400 MHz.

Storm spotter groups consist of mainly amateur radio operators, the general public, with some involvement from law enforcement and fire departments. Spotter training is held almost every year with an average attendance in the past 5 years of 50.

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

Automated weather station(s):

- Camp Douglas/Volk Field (VOK)

River Gauge(s):

- Wisconsin River @ Petenwell Dam
- Wisconsin River @ Castle Rock Dam
- South Branch Baraboo River @ Hillsboro, WI

Cooperative Observer Locations:

- Mather, WI
- Mauston, WI
- Necedah, WI

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/lacrosse/?n=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/lacrosse/?n=drought
NWS La Crosse Storm Summaries	www.weather.gov/lacrosse/?n=events
NWS La Crosse NOAA Weather Radio page	www.weather.gov/lacrosse/?n=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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