

Natural Hazards Assessment

Trempealeau County, WI

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



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Natural Hazards Assessment

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Prepared by National Weather Service – La Crosse

Overview

Trempealeau County is in the Upper Mississippi River Valley of the Midwest with relatively hilly terrain and bluffs. It is bordered by the Mississippi River to the southwest.

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

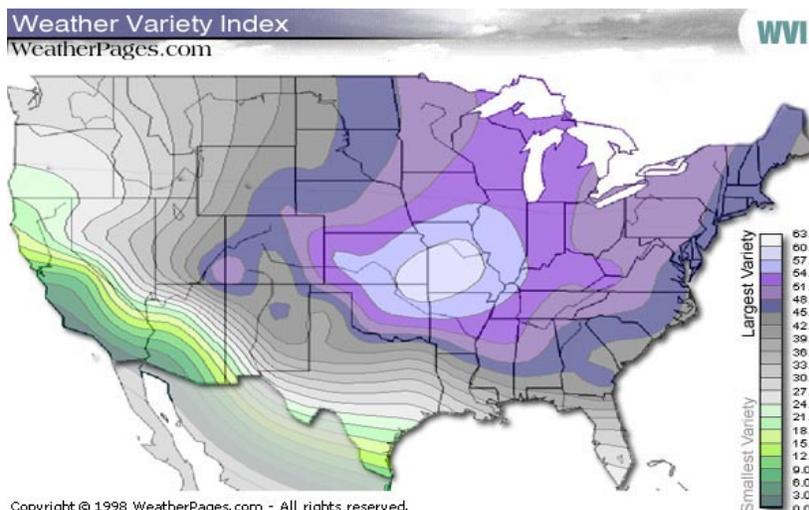
Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 3 to 4 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

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. La Crosse, WI ranked 27th highest in variability out of 277 cities.



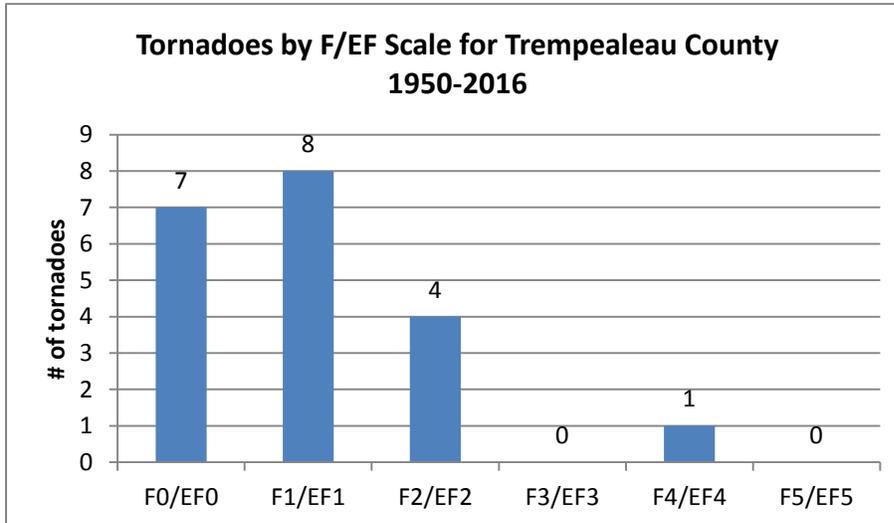
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Since 1998, Trempealeau County has been included in a FEMA Federal Disaster Declaration 4 times:

- 1998 – Severe storms
- 2001 – Flooding
- 2004 – Severe storms / flooding
- 2010 – Severe storms / flooding

Tornadoes

Even though Wisconsin averages about 23 tornadoes per year, Trempealeau County has only had 20 tornadoes since 1950, averaging about one tornado every 3 years. 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:

- July 22, 2013 (EF0)
- Aug.18, 2005 (F0)
- May 26, 2002 (F0)
- Aug.18, 2001 (F0)
- May 30, 1991 (F0)
- Sept.9, 1990 (F1)
- July 3, 1983 (F0)
- May 17, 1982 (F1)
- Apr.7, 1980 (F0)
- June 16, 1979 (F1)
- July 5, 1978 (F1)
- June 2, 1973 (F1)

It has been quite a few years since a sizeable tornado has hit Trempealeau County. In May 1953, a violent (F4) tornado tracked northeast across the county and hit nearly a hundred farms. In August 1924 a large tornado hit near Osseo, WI and killed a boy who was trying to get to a shelter. In more recent years very brief touchdowns have been more common. The terrain may limit some tornadoes from forming but brief touchdowns and tracks can still occur even through the bluffs and valleys.

Strongest tornadoes: (1850-2016)

- Oct. 3, 1903 (F4) – 45 inj, 9 dead
- Aug. 7, 1924 (F4) – 20 inj, 4 dead
- May 10, 1953 (F4) – 10 inj, 0 dead
- May 18, 1898 (F3) – 15 inj, 1 dead
- May 1, 1930 (F2) – 13 inj, 0 dead

Trempealeau County Tornado Facts:

- No F5 or EF5* tornadoes
- Three F4 tornadoes and one F3
- 14 deaths and 121 injuries since 1850
- Tornadoes have occurred March – October
- Most have occurred in May (9)

Tornado Watches		Tornado Warnings	
Year		Year	
2016	0	2016	1
2015	0	2015	0
2014	1	2014	0
2013	3	2013	2
2012	2	2012	0
2011	3	2011	0
2010	3	2010	0
2009	3	2009	0
2008	8	2008	0
2007	5	2007	1
2006	4	2006	0
2005	8	2005	2

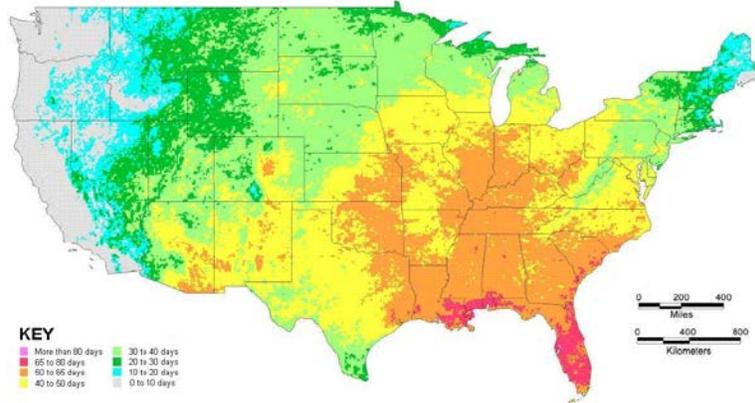
Enhanced Fujita (EF) Scale	
EF0	65-85 mph
EF1	86-110 mph
EF2	111-135 mph
EF3	136-165 mph
EF4	166-200 mph
EF5	>200 mph

Severe Thunderstorms / Lightning

Trempealeau 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, 1 inch diameter hail or larger, or a tornado.

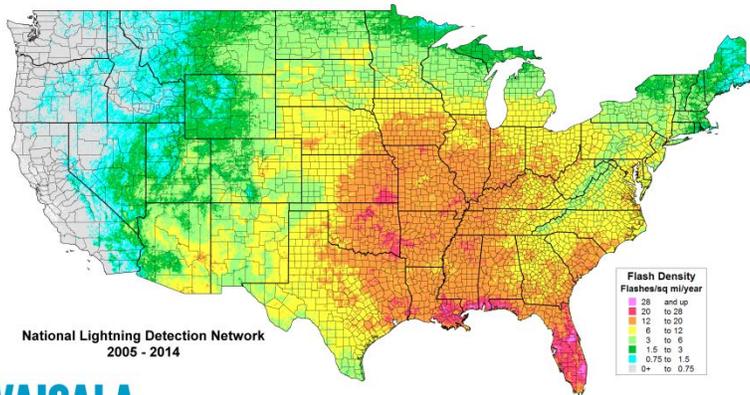
Downdraft winds from a severe thunderstorm can produce local or widespread damage, even tornado-like damage if strong enough. Most severe thunderstorm winds occur in June or July and between the hours of 4 and 8 p.m., but can occur at other times. Most damage involves blown down trees, power lines, and damage to weaker structures (i.e. barns, outbuildings, garages) with occasional related injuries. In 1998, a large squall line moved through the region with wind gusts in excess of 100 mph knocking down hundreds of trees and damaging buildings. Power was also out in many communities. Winds gusted to an estimated 75 mph around Osseo (plus 2" hail) near a tornadic thunderstorm in July 2010. There have been about 134 damaging wind reports since 1982 in the county.

Average Number of Thunderstorm Days per Year



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. There have been 131 large hail ($\geq 3/4$ ") reports in the county since 1982.

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 in 2007, 2008, 2011, and 2016. There was a fatality near Blair, WI in October 2006 when a man outside surveying land was struck and killed around midday.



Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2016	5	2016	8
2015	5	2015	8
2014	5	2014	12
2013	10	2013	19
2012	10	2012	11
2011	14	2011	10
2010	14	2010	14
2009	4	2009	4
2008	8	2008	7
2007	18	2007	10

Flooding and Hydrologic Concerns

On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms (“training”) can bring excessive rainfall leading to flash flooding in Trempealeau 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.

There have been several flash floods in recent years, including August 2005 when Arcadia and Blair, WI were hit. Another flash flood occurred from 2-3 inches of rain in September 2005 across southern parts of the county. In September 2010, Arcadia was evacuated due to heavy rain and drainage from nearby creeks. This flood led to the highest levels ever observed on the Trempealeau River. And in September 2015 heavy rain flooded parts of Osseo, Eleva, and Strum causing extensive damage.

Flash Flood Warnings	
Year	
2016	7
2015	3
2014	1
2013	1
2012	0
2011	0
2010	1
2009	3
2008	0
2007	0
2006	0

Three main rivers can impact Trempealeau County – the Mississippi River, the Black River, and the Trempealeau River. There are many other creeks and smaller rivers as well. 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.

Trempealeau River @ Dodge Top 5 Crests (FS: 9 feet)	
Date	Crest
9/25/2010	12.75'
6/29/1998	12.29'
3/15/2007	11.56'
8/14/2016	11.55'
9/18/1992	11.44'

Flooding along the Trempealeau River through the center and western parts of the county, and the Black River through the southern parts, can be a bit more frequent, usually stemming from heavy rain patterns as opposed to snowmelt. Both rivers tend to rise and fall relatively quickly with rare property damage concerns.
(Image to right: Trempealeau River @ Dodge, WI)



The US Army Corps of Engineers maintains a Lock and Dam (#6) at Trempealeau, WI that is used to manage navigational water levels, not for flood control.

Mississippi River @ Trempealeau Top 5 Crests (FS: 647 feet)	
Year	Crest
1965	653.02'
2001	651.43'
1997	651.40'
1969	650.80'
1952	649.98'



Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Trempealeau County. Since 1982, an average of 3-4 winter storms impact the area each season. The terrain in the county does limit the number of true blizzards (only 2 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 Blair, WI is 39.9 inches, but nearby ridge tops are typically 3-5° F cooler and can average closer to 50 inches. There are occasions where milder daytime temperatures in valleys produce rain when a wintry mix or snow is falling on ridges. Blowing snow is more common on ridge tops as well. The all-time record one-day snowfall at Blair was 20 inches set on December 7, 1927. 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.

On February 23-25, 2007, a major winter storm impacted Trempealeau County. Heavy snow, including lightning, brought nearly a foot of snow the first night. Winds later increased and created major blowing and drifting. Some sleet and freezing rain fell next, followed by another round of heavy snow and blizzard conditions the next night. When the storm finally moved out, 28.0 inches of snow had fallen in southern parts of the county (at Trempealeau, WI), ranking as the second largest multi-day snow storm on record. In January 1952, a multi-day storm dropped 32 inches of snow in parts of the county.

Top 5 Seasonal Snowfalls at Blair, WI	
Years	Snowfall
1950-51	98.5"
1951-52	93.7"
1928-29	87.0"
1934-35	76.1"
1942-43	70.4"

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 18 inches of wet snow in Trempealeau County on March 13-14th.

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 7 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 28 times a winter (Note: Milder temperatures along the Mississippi River limit sub-zero readings to an average of 22). 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 Blair, WI is -49°F set in 1912.

Coldest Lows at Blair, WI	
Low	Date
-49°F	1/7/1912
-46°F	1/12/1912
-45°F	2/3/1996
-45°F	2/16/1936
-43°F	1/30/1951



In 1996, Trempealeau County went nearly 6 consecutive days with temperatures below zero degrees (F) following a blizzard about a week earlier. Low temperatures of -40°F, -39°F, -38°F, -45°F, -41°F, and -37°F were set on 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.

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 Blair, WI is 109°F which was set on July 15, 1936.

Since 1982, there have been 121 fatalities directly related to heat waves and another 95 indirectly, in Wisconsin. In Trempealeau County, there have been 16 heat waves since 1982 and two related fatalities.

One of the longest heat waves on record occurred in July 1936 when Trempealeau County hit 90°F or higher for 14 consecutive days, including 9 days at or above 100°F and an all-time record of high of 109°F as noted above. In more recent years, heat waves with high temperatures in the 90s to lower 100s hit in July and August of 2001. In July 1995, a 4-day heat wave included high temperatures of 100°F and 105°F.

Warmest Highs at Blair, WI	
High	Date
109°F	7/15/1936
108°F	7/14/1936
107°F	7/13/1936
107°F	6/1/1934
105°F	7/14/1995



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.

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 and field fires in Trempealeau County. April is the peak threat month and there have been cases where long-lasting fires can travel for miles in the longer north-south valleys. 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 Trempealeau County area. Data is valid for Blair, 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	3.3	14.3	0.89"	9.8"
FEB	30.7	7.8	19.3	1.04"	7.2"
MAR	42.1	20.1	31.1	1.83"	8.2"
APR	57.4	32.4	44.9	3.24"	1.6"
MAY	68.9	43.7	56.3	3.99"	0.0"
JUN	78.2	53.5	65.8	4.44"	0.0"
JUL	82.4	57.5	70.0	4.26"	0.0"
AUG	80.0	55.8	67.9	4.47"	0.0"
SEP	71.7	46.4	59.1	4.28"	0.0"
OCT	59.1	34.1	46.6	2.45"	0.2"
NOV	42.5	23.0	32.8	2.11"	3.9"
DEC	29.0	8.7	18.8	1.10"	9.2"
Year	55.6	32.3	44.0	34.32"	39.9"

Miscellaneous facts:

- Warmest year on record – 1998 (47.5°F)
- Warmest month on record – July 1955 (76.5°F)
- Warmest day on record – July 15, 1936 (109°F)
- Greatest number of days with 90°F or warmer – 1930 (38 times)

- Coldest year on record – 1979 (40.7°F)
- Coldest month on record – January 1912 (-4.8°F)
- Coldest day on record – January 7, 1912 (-49°F)
- Greatest number of days at 0°F or colder – 1978 (71 times)

- Wettest year on record – 1954 (49.90")
- Wettest month on record – May 2004 (12.09")
- Wettest day on record – August 23, 1975 (6.08")
- Driest year on record – 1976 (19.10")
- Driest month on record – January 1981 & November 1976 (0.02")

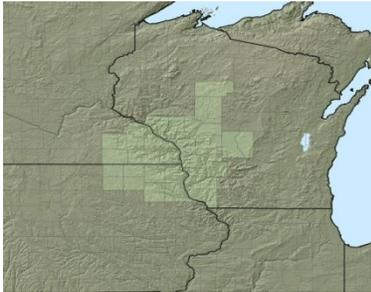
- Highest seasonal snowfall on record – 1950/51 (98.5")
- Highest monthly snowfall on record – January 1929 (45.5")
- Highest one-day snowfall on record – December 7, 1927 (20.0")
- Least seasonal snowfall on record – 1967/68 (9.1")



NOAA/National Weather Service Support and Weather Monitoring



NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Trempealeau 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.

NOAA Weather Radio coverage in Trempealeau County includes:

- WXJ86 (La Crosse) on 162.550 MHz
- KGG95 (Winona) on 162.425 MHz
- WNG564 (Black River Falls) on 162.500 MHz
- WXJ88 (Eau Claire) on 162.400 MHz

Storm spotter groups consist mainly of fire departments, amateur radio operators, and the general public. Spotter training is held about every other year with an average attendance in the past 5 years of 48.

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

Automated weather station(s):

- None

River Gauge(s):

- Mississippi River Lock & Dam #6 @ Trempealeau, WI
- Trempealeau River @ Arcadia, WI (manual gage)
- Trempealeau River @ Dodge, WI
- Black River @ Galesville, WI

Cooperative Observers

- Dodge
- Galesville 1S
- Strum 4S
- Trempealeau Lock & Dam 6



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.noaa.gov/new/SVRclimo/climo.php?parm=anySvr
-	http://www.spc.noaa.gov/climo/online/rda/ARX.html

Contact information:

Todd Shea
Warning Coordination Meteorologist
NWS La Crosse
todd.shea@noaa.gov

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