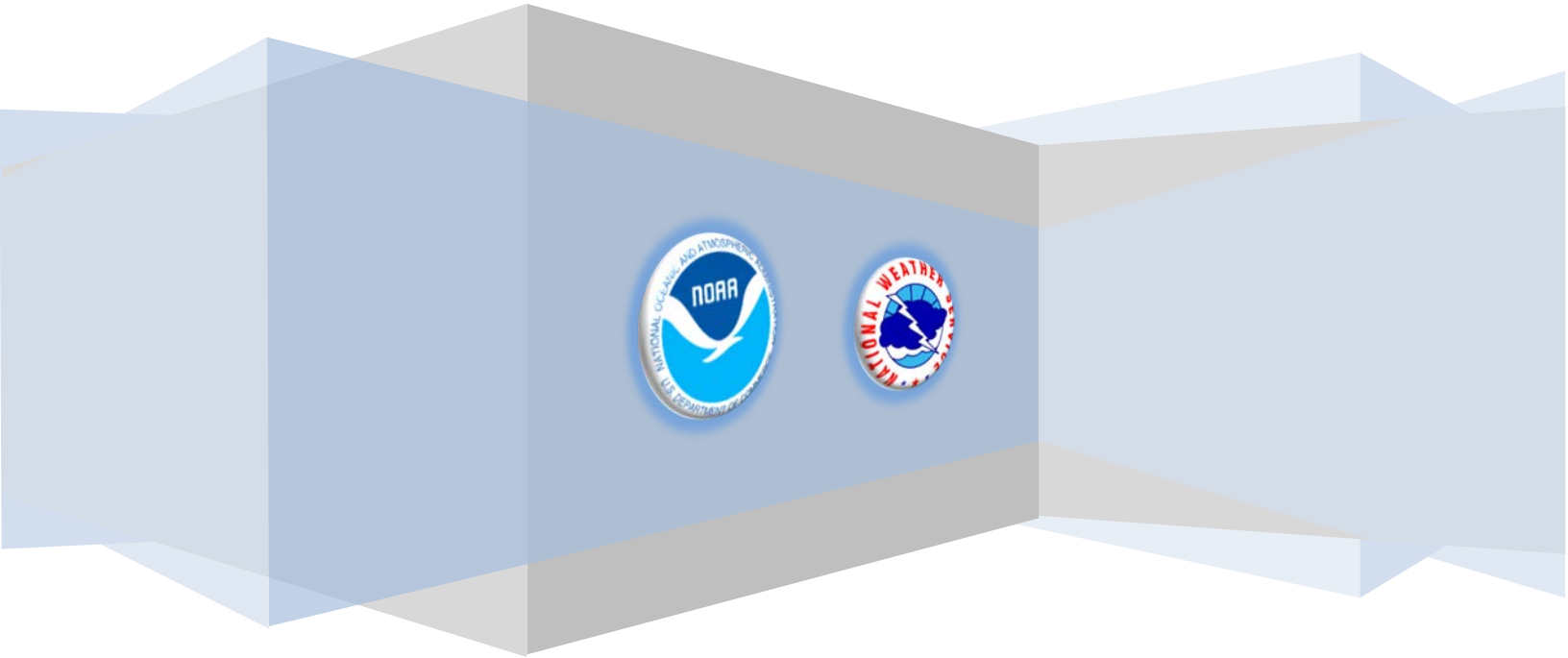
Natural Hazards Assessment

Crawford County, WI

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



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for
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Prepared by NOAA / National Weather Service – La Crosse
Last Update: October 2016

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Overview

Crawford 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 west and the Wisconsin River to the south.

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

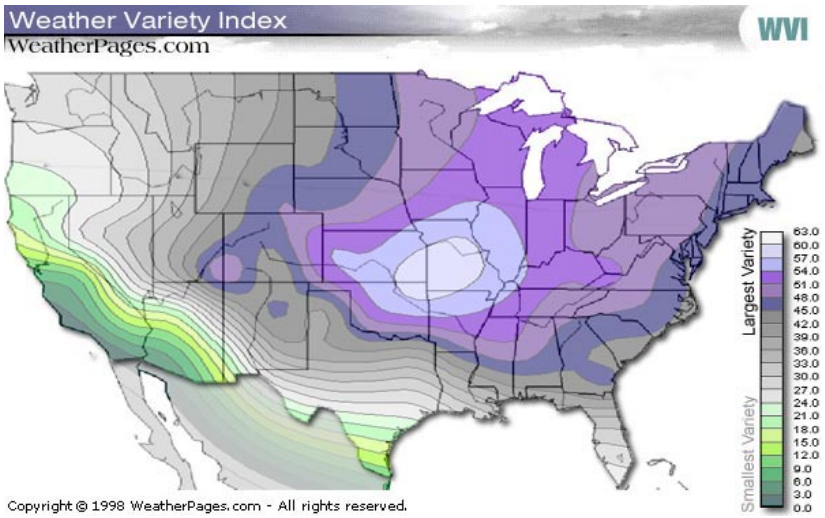
Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 3 to 4 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

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 and Madison, WI ranked 8th highest in variability out of 277 cities.

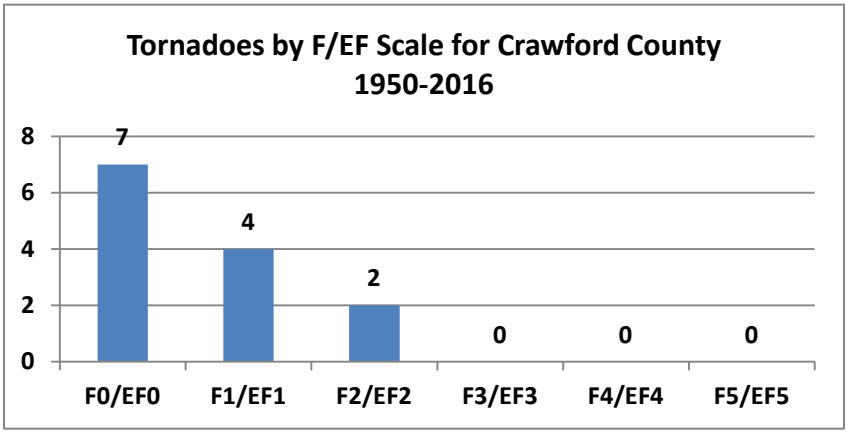


Since 1998, Crawford County has been included in a FEMA Federal Disaster Declaration 8 times:

1998 – Severe storms
2000 – Severe storms / flooding
2001 - Flooding
2004 – Severe storms / flooding
2007 – Severe storms / flooding
2008 – Severe storms / flooding
2013 – Severe storms / flooding
2016 – Severe storms / flooding

Tornadoes

Even though Wisconsin averages about 21 tornadoes per year, Crawford County has only had 13 tornadoes since 1950, averaging about one tornado every 6-7 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:

- June 22, 2016 (EF0)
- June 22, 2016 (EF0)
- June 23, 2010 (EF0)
- July 27, 2009 (EF1)
- June 17, 1987 (F0)
- July 3, 1979 (F0)
- July 3, 1979 (F0)
- June 24, 1971 (F1)
- Aug.6, 1968 (F0)
- May 18, 1967 (F1)
- Apr.11, 1965 (F2)
- May 4, 1964 (F2)

In May 1964, a tornado (F2) formed in extreme northeast Iowa and moved into the county injuring 3 people during a 21-mile track. An even larger tornado (F4) struck back in June 1915 when it crossed the Mississippi River 2 miles south of Ferryville, WI and ended near Soldiers Grove. This tornado killed several people near a railroad station along the Mississippi River, damaged 60 buildings and 8 homes.

Strongest tornadoes: (1850-2016)

- June 12, 1915 (F4) – 50 inj, 9 dead
- Nov.25, 1883 (F3) – 2 inj, 1 dead
- Oct.10, 1913 (F2) – 0 inj, 0 dead
- Aug.22, 1884 (F2) – 6 inj, 0 dead
- June 24, 1971 (F1) – 4 inj, 0 dead

Crawford County Tornado Facts:

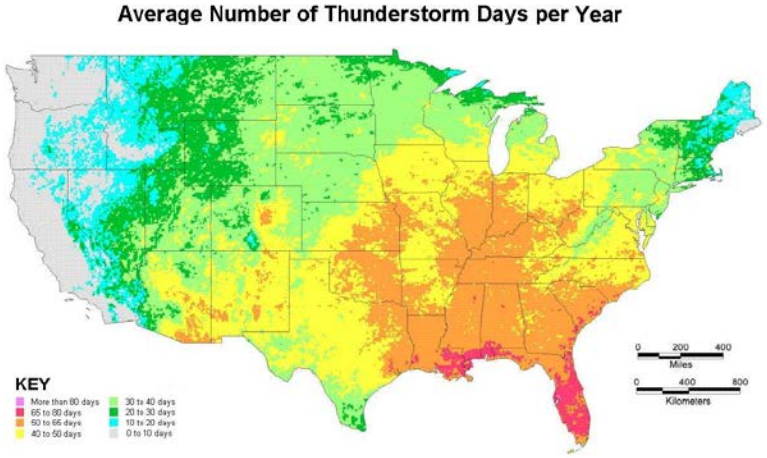
- No F5 or EF5 tornadoes
- Only one F4 tornado - 1915
- 10 deaths and 68 injuries since 1850
- Tornadoes have occurred April – November
- Most have occurred in May & June (3)

Tornado Watches		Tornado Warnings	
Year		Year	
2016	0	2016	0
2015	1	2015	0
2014	1	2014	0
2013	3	2013	1
2012	0	2012	0
2011	3	2011	0
2010	6	2010	0
2009	4	2009	2
2008	8	2008	2
2007	7	2007	0
2006	2	2006	0
2005	6	2005	0
2004	12	2004	0
2003	6	2003	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

Crawford 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, several large squall lines moved through the region with wind gusts in excess of 85 knocking down hundreds of trees and damaging buildings. Power was also out in many communities. There have been 101 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. In May 1989, two days of hail fell in the county, up to 2” in diameter at times. There have been 81 large hail (≥ 3/4”) reports in the county since 1982, including several golf ball size hail reports on June 8, 2011.

Non-severe thunderstorms still pose a lightning risk. According to the Vaisala Group, an average 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, 2010, and 2016. In Crawford County, there are no reported lightning fatalities or injuries since 1982.

Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2016	9	2016	6
2015	5	2015	5
2014	12	2014	7
2013	7	2013	10
2012	6	2012	6
2011	9	2011	5
2010	12	2010	8
2009	6	2009	8
2008	12	2008	5
2007	11	2007	10
2006	23	2006	5

Flooding and Hydrologic Concerns

Crawford County has an extensive flood history. On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms ("training") can bring excessive rainfall leading to flash flooding. The hilly terrain promotes rapid run-off and enhances the threat. Mud and landslides can occur in extreme cases, especially along the Mississippi River.

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 1982-2011, there were 11 deaths from flooding in Wisconsin.

Flash Flood Warnings	
Year	
2016	9
2015	1
2014	6
2013	6
2012	2
2011	2
2010	2
2009	4
2008	2
2007	2
2006	0
2005	0

In August 2007, widespread rainfall of 3 to 7 inches fell in one evening leading to significant flash flooding and property damage. Damage to property and infrastructure was extreme with numerous evacuations. In May 2004, 3-5 inches of rain fell over a few hours in the northwest part of the county and led to quick flash flooding, closures of Highway 35, and even one fatality in neighboring Vernon County.

In June 2008, more heavy rain fell leading to widespread flash flooding and eventually river flooding in the area. Numerous rainfall records were set and river levels on the Kickapoo River reached all-time record high crest values, impacting communities like Soldiers Grove and Gays Mills, WI hard. A second federal disaster declaration in 10 months was issued and damaged approached $10 million. In August and September 2016 record rainfall caused widespread flash flooding and significant damage.

Kickapoo River @ Steuben Top 5 Crests (FS: 12 feet)	
Date	Crest
6/10/2008	19.16'
7/3/1978	18.00'
8/20/2007	16.84'
9/18/1992	14.38'
6/24/2013	14.13'

There are numerous watersheds and drainage basins in the county. Main rivers include the Mississippi, Wisconsin, and the Kickapoo, but there are numerous creeks with rapid runoff behavior. Flood risk along the Mississippi River is highest in the spring with snowmelt, but the Wisconsin and Kickapoo Rivers can see flooding from snowmelt and warm season heavy rain patterns. Many of the other drainage areas can experience local ice jam issues with snowmelt, but more commonly can become dangerous from heavy rain spawned flash flooding.

Mississippi River @ Lynxville Top 5 Crests (FS: 625 feet)	
Date	Crest
4/24/1965	633.16'
4/21/2001	631.22'
4/14/1997	631.05'
4/22/1969	629.42'
6/30/1993	629.08'

The US Army Corps of Engineers maintains a Lock and Dam (#9) at Lynxville, WI (below left) that is used to manage navigational water levels, not for flood control.

Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Crawford County. Since 1982, an average of 3 winter storms impact the area each season. The terrain in the county does limit the number of true blizzards (only 4 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 Prairie du Chien, WI is 37.6 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 in Prairie du Chien was 16.0 inches set on 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.

On February 23-25, 2007, a major winter storm impacted Crawford County. Heavy snow, including lightning, brought over a foot of snow (15.9") over a two day period at Gays Mills. Winds also increased and created major blowing and drifting. Some sleet and freezing rain fell during the middle of the storm, followed by another round of heavy snow and blizzard conditions.

Top 5 Seasonal Snowfalls in Prairie du Chien, WI

Years	Snowfall
1950-51	72.8"
1978-79	68.0"
1985-86	62.0"
1961-62	60.8"
2007-08	60.7"

December 2008 was also a very snowy month with nearly 30" of snow falling (29.6") making it the 3rd snowiest month on record at Prairie du Chien, WI. A blizzard December 8-9, 2009 dropped nearly 14 inches of snow near Steuben.

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 two day storm brought 12.0" of snow to the area.

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 8 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 22 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 -20°F most days. The all-time record low at Prairie du Chien, WI is -37°F set on January 30, 1951 and January 15, 1963.

Coldest Lows at Prairie du Chien, WI

Low	Date
-37°F	1/15/1963
-37°F	1/30/1951
-36°F	2/3/1996
-34°F	1/24/1936
-34°F	1/13/1912

In 1996, the Prairie du Chien area went 8 consecutive days with low temperatures at or below -12°F following a blizzard about a week earlier. Low temperatures from late January to early February of -29°F, -36°F, and -31°F were set during that stretch. In January 1936, sub-zero readings were observed on 12 of 13 days, including lows of -30°F, -28°F, -34°F, and -32°F.

Since 1982 there have been 38 fatalities in Wisconsin from cold weather and 54 direct injuries.

On January 15, 2009 a wind chill of -40°F was observed in Prairie du Chien.

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 Prairie du Chien, WI is 110°F set in July 1901.

Warmest Highs at Prairie du Chien, WI	
High	Date
110°F	7/22/1901
109°F	7/14/1936
109°F	5/31/1934
109°F	7/25/1901
108°F	7/13/1936

Since 1986, there have been 135 fatalities directly related to heat waves and another 99 indirectly, in Wisconsin. In Crawford County, there have been 18 heat waves since 1982 with one fatality recorded in July 2011.

One of the longest heat waves on record occurred in July 1901 when the Prairie du Chien area hit 98°F or higher on 18 of 19 days, including an all-time record of high of 110°F as noted. In July 1936, high temperatures hit 100°F or higher on 11 of 13 consecutive days, including highs of 108°F and 109°F during that stretch. In more recent years, heat waves have hit in 1995, 1999, 2001, 2011, 2012, and 2013.

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, southern Wisconsin was given a Drought Disaster Designation.

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 Crawford 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 Crawford County area. Data is valid for Prairie du Chien, WI based on normals from a 30-year period (1981-2010).

Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	28.5	10.6	19.6	1.04"	11.0"
FEB	33.9	15.1	24.5	1.20"	8.5"
MAR	46.1	25.6	35.9	1.87"	4.1"
APR	60.7	37.5	49.1	3.82"	1.1"
MAY	71.5	48.0	59.8	4.21"	0.0"
JUN	80.6	57.9	69.2	4.72"	0.0"
JUL	84.4	62.5	73.5	3.95"	0.0"
AUG	82.4	60.9	71.6	4.39"	0.0"
SEP	74.9	51.8	63.4	3.19"	0.0"
OCT	62.5	40.2	51.4	2.43"	0.1"
NOV	46.5	28.8	37.6	2.29"	2.4"
DEC	32.0	15.5	23.7	1.52"	10.9"
Year	58.7	37.9	48.3	34.62"	37.6"

Note: Climate information began at Prairie du Chien, WI in 1893.

Miscellaneous facts:

- Warmest year on record – 1931 (53.6°F)
- Warmest month on record – July 1901 (82.4°F)
- Warmest day on record – July 22, 1901 (110°F)
- Greatest number of days with 90°F or warmer – 1894 (74 times)

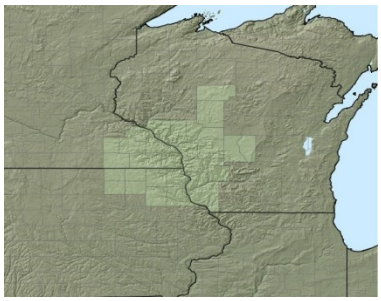
- Coldest year on record – 1917 (43.7°F)
- Coldest month on record – January 1912 (-0.8°F)
- Coldest day(s) on record – January 15, 1963 and January 30, 1951 (-37°F)
- Greatest number of days at 0°F or colder – 1893 (49 times)

- Wettest year on record – 2007 (52.23")
- Wettest month on record – June 2013 (13.93")
- Wettest day on record – July 18, 2007 (6.52")
- Driest year on record – 1895 (18.45")
- Driest month on record – Numerous (0.00")

- Highest seasonal snowfall on record – 1950/51 (72.8")
- Highest monthly snowfall on record – January 1979 (39.0")
- Highest one-day snowfall on record – March 6, 1959 (16.0")
- Least seasonal snowfall on record – 1967/68 (8.1")

NOAA/National Weather Service Support and Weather Monitoring

NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Crawford 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 Crawford County includes:
- WWG86 (Prairie du Chien) on 162.500 MHz
- WWG89 (Richland Center) on 162.475 MHz
- WXJ86 (La Crosse) on 162.550 MHz

Storm spotter groups consist of fire department personnel, amateur radio operators, and the general public, with some involvement from law enforcement. Spotter training is held nearly every year with an average attendance in the past 5 years of 39.

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

Automated weather station(s):
- Prairie du Chien, WI (KPDC)
- Boscobel, WI (KOVS)

River Gauge(s):
- Mississippi River @ Lansing, IA
- Mississippi River @ Lynxville (Lock & Dam 9)
- Mississippi River @ McGregor, IA
- Kickapoo River @ Soldiers Grove
- Kickapoo River @ Gays Mills
- Kickapoo River @ Steuben

Cooperative Observers
- Gays Mills
- Lynxville
- Prairie du Chien
- Soldiers Grove
- Steuben 4SE

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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