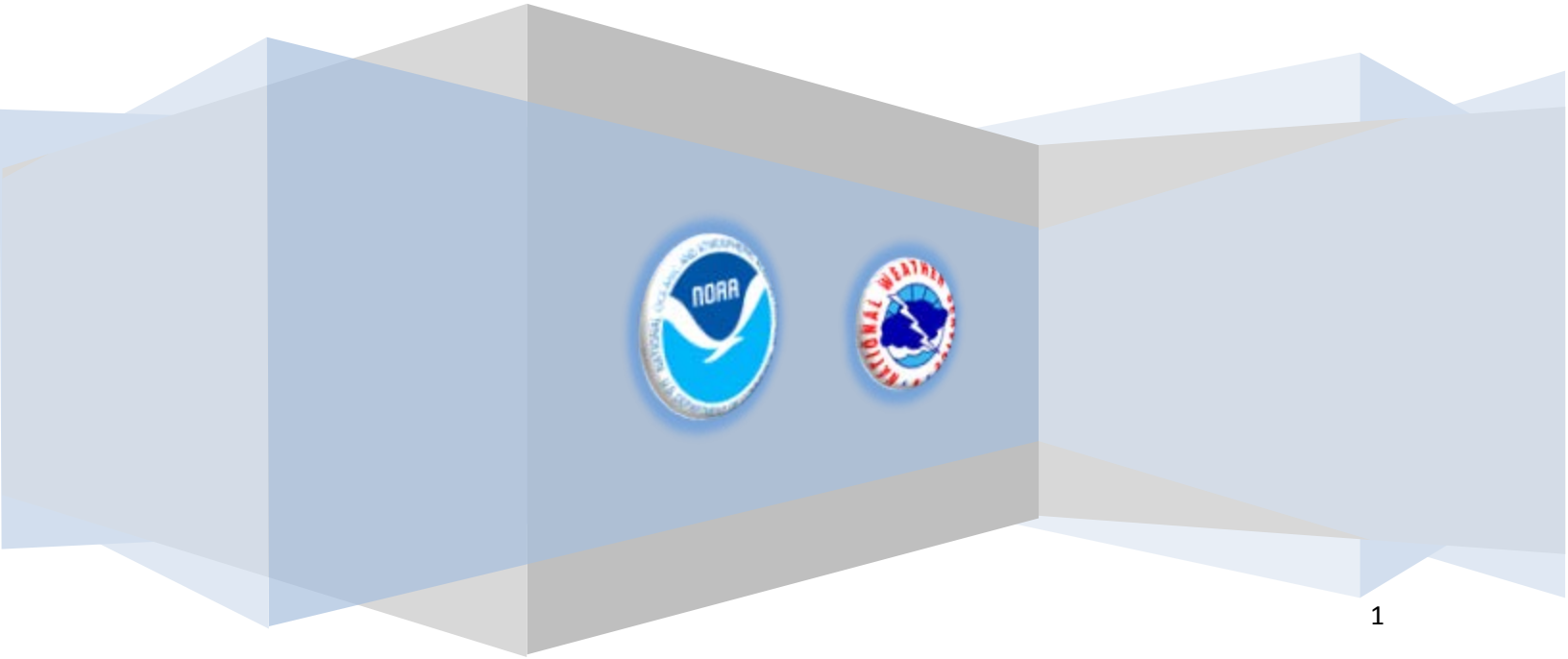
Natural Hazards Assessment

Winneshiek County, IA

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: November 2016

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Overview

Winneshiek County, IA is in the Upper Mississippi River Valley of the Midwest with a mix of terrain ranging from relatively flat farm land to hilly terrain with bluffs.

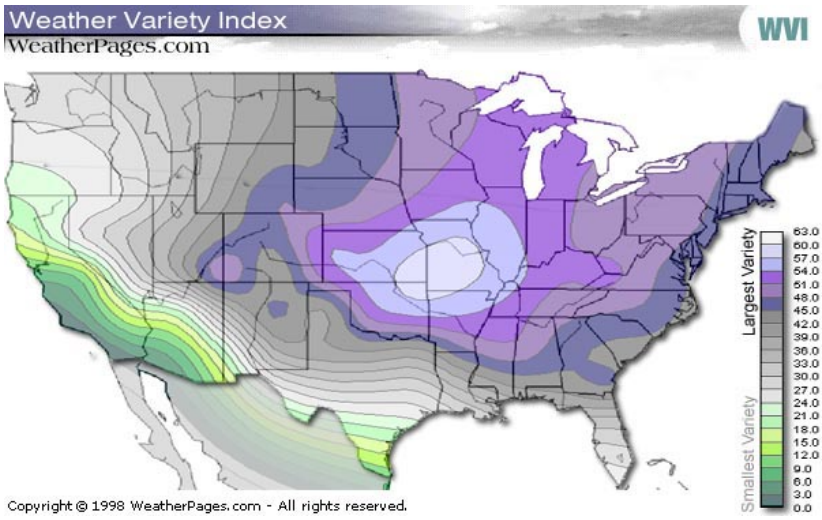
The area experiences a temperate climate with both warm and cold season extremes.

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 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, 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. Waterloo, IA ranked 10th and Dubuque, IA ranked 29th highest in variability out of 277 cities.

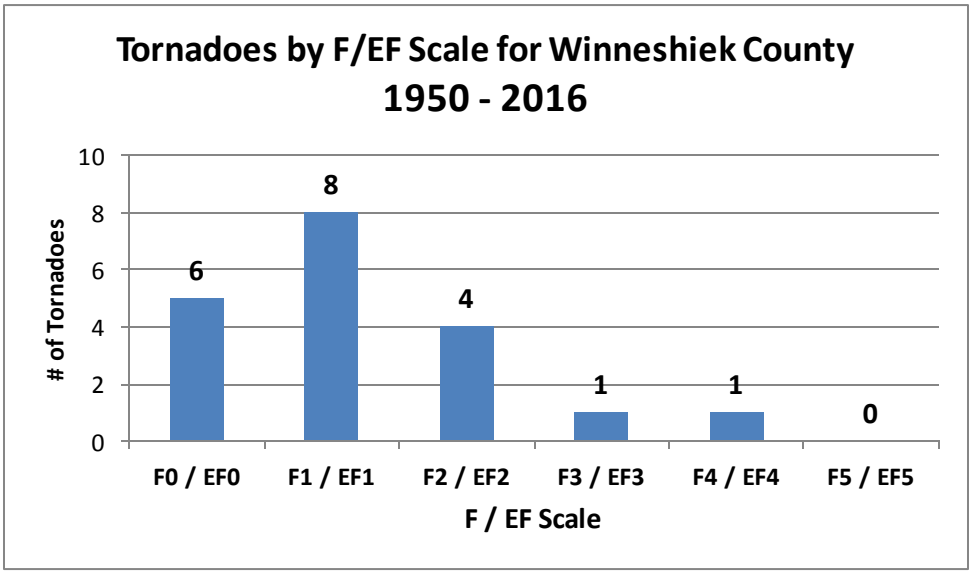


Since 1998, Winneshiek County has been included in a FEMA Federal Disaster Declaration 9 times:

1998 – Severe storms / flooding
2002 – Severe storms / flooding
2004 – Severe storms / flooding
2007 – Severe storms / flooding
2008 – Severe storms / flooding
2013 – Severe storms / flooding
2014 – Severe storms / flooding
2015 – Severe storms / flooding
2016 – Severe storms / flooding

Tornadoes

Even though Iowa averages about 47 tornadoes per year, Winneshiek County has only had 20 documented 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:

- Aug. 19, 2009 (EF0)
- June 26, 2002 (F0)
- July 19, 1994 (F0)
- July 19, 1994 (F3)
- June 12, 1990 (F1)
- June 12, 1990 (F0)
- May 24, 1989 (F1)
- Mar.24, 1988 (F2)
- July 29, 1987 (F2)
- July 10, 1984 (F1)
- Aug. 4, 1979 (F1)

One of the strongest tornadoes to ever hit Winneshiek County was in May 1918 when a large tornado (F4) tracked through Chickasaw County and moved east-northeast into southern Winneshiek County. Calmar, IA was hit hard when the tornado was reportedly a mile wide. There were at least two deaths near Calmar and numerous buildings destroyed. More recently a strong tornado (F3) hit Howard and Winneshiek Counties in July 1994 with reports of debris in Decorah. Two people were injured from high winds associated with the storm.

Strongest tornadoes: (1850-2016)

- May 9, 1918 (F4) – 15 inj, 7 dead
- May 5, 1965 (F4) – 17 inj, 0 dead
- June 6, 1906 (F3) – 3 inj, 0 dead
- July 19, 1994 (F3) – 0 inj, 0 dead
- Aug.25, 1965 (F2) – 1 inj, 0 dead

Winneshiek County Tornado Facts:

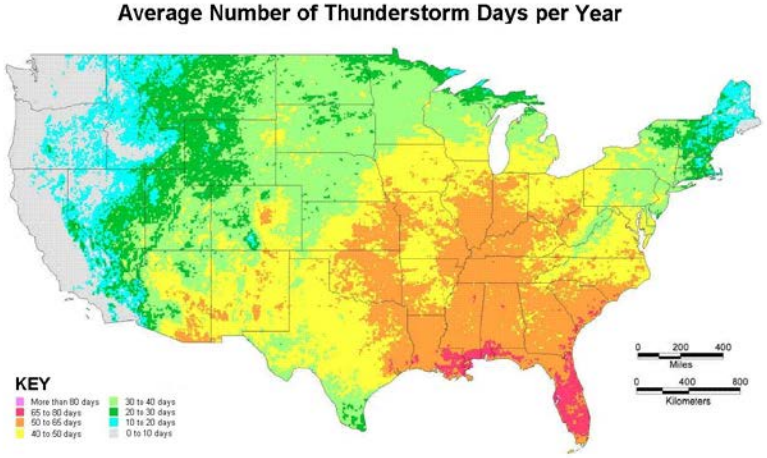
- No F5 or EF5 tornadoes
- Two F4 and two F3 tornadoes
- 7 deaths and 37 injuries since 1850
- Tornadoes have occurred March – August
- Most have occurred in June (8)

Tornado Watches		Tornado Warnings	
Year		Year	
2016	0	2016	0
2015	0	2015	0
2014	1	2014	0
2013	4	2013	1
2012	1	2012	1
2011	3	2011	0
2010	6	2010	0
2009	4	2009	1
2008	8	2008	0
2007	6	2007	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

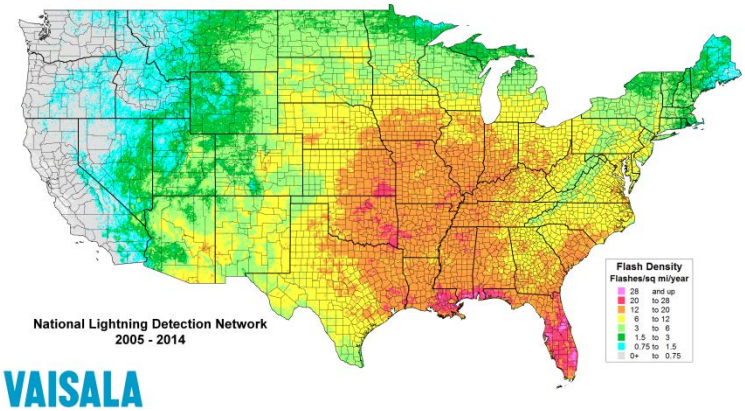
Winneshiek County averages 42 thunderstorm days per year. The National Weather Service (NWS) considers a thunderstorm severe when it produces wind gusts of 58 mph (50 knots) or higher, 1 inch diameter hail or larger, or a tornado.



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 June 1998, several damaging squall lines moved through the county leading to several injuries and many damaging buildings. In July 2006, wind gusts up to 70 mph demolished outbuildings near Ossian, IA and knocked down numerous trees in the county. There have been 96 damaging wind reports since 1982.

Large hail can also occur in a severe thunderstorm. May and June are the peak months 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. Larger than baseball sized hail was reported from a storm back in August 1965. In July 2009, two hail storms in the same day dropped hail up to soft ball size near Calmar and Ossian causing extensive crop damage. There have been 145 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 674,486 cloud-to-ground strikes hit Iowa each year based on data from 2006 to 2015. Nationally, Iowa ranks 29th in lightning related fatalities with 3 deaths reported between 2006 and 2015. Two people were killed in Iowa in 2015 from lightning.



Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2016	8	2016	3
2015	3	2015	1
2014	11	2014	14
2013	7	2013	9
2012	7	2012	14
2011	9	2011	6
2010	12	2010	8
2009	8	2009	7
2008	12	2008	8
2004	16	2004	9

Flooding and Hydrologic Concerns

On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms ("training") can bring excessive rainfall leading to flash flooding in Winneshiek County. The hilly terrain promotes rapid run-off and enhances the threat. Mudslides can and do occur in extreme cases.

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 1995, there have been 9 deaths from flooding in Iowa.

Flash Flood Warnings	
Year	
2016	10
2015	1
2014	5
2013	9
2012	1
2011	1
2010	3
2009	2
2008	2
2007	2
2006	0

Two main rivers can impact Winneshiek County – the Upper Iowa River and the Turkey River. While flooding can occur from snowmelt or ice jams, it usually stems from heavy rain patterns and rises or falls relatively quickly compared to other larger rivers in the state.

In June 2008, widespread 5-8" rainfall totals over a two day period led to significant flash flooding and eventual river flooding. Numerous roads were closed from mudslides or erosion. In Fort Atkinson, IA supports to a train bridge gave way along Highway 24 and there were numerous evacuations in the county. Many roads were closed and water approached the Law Enforcement Center in Decorah. Property damage was well over $5 million and crop damage was nearly $3 million. A record crest was set on the Upper Iowa River at Decorah and on the Turkey River at Bluffton, IA.

Upper Iowa River @ Decorah, IA Top 5 Crests (FS: 12 feet)	
Date	Crest
6/9/2008	17.90'
5/29/1941	15.20'
8/17/1993	14.35'
8/24/2016	13.68'
3/27/1961	13.08'

Flash flooding also hit parts of the county in 2016, 2013, 2010, 2009, 2007, 2004, 2002, and 1993.

Photos below are courtesy of Luther College (Decorah, IA) and Iowafloodhelp.org showing flooding along the Upper Iowa River.

Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Winneshiek County. Since 1982, an average of 4 winter storms impacts the area each season. The terrain in the county does limit the number of true blizzards (only 3 since 1982) but heavy snow, blowing snow, ice, and sleet all occur. There have been a total of 13 documented deaths and 25 injuries as a direct result from winter storms in Iowa since 1993.

The 30-year average seasonal snowfall at Decorah, IA is 40.0 inches. The highest one-day snowfall is 14.5 inches set on December 1, 1985. 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 northeast Iowa. 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, 18" of snow had fallen in northeast Winneshiek County.

Top 5 Seasonal Snowfalls at Decorah, IA	
Years	Snowfall
1961-62	69.2"
1950-51	68.1"
1958-59	64.4"
1996-97	62.8"
1992-93	61.2"

In late January 1996, a large and prolonged winter storm dropped about 23" of snow over a five day period in the Decorah, IA area, leading to one of the snowiest weeks on record.

March can often be a snowy month. Even though snowfall may be less frequent, heavy wet snow can form from large spring storms.

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 7 occurrences since 1993.

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 26 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 -43°F set in 1951.

Coldest Lows at Decorah, IA	
Low	Date
-43°F	1/30/1951
-41°F	2/3/1996
-39°F	1/15/1963
-38°F	2/2/1951
-37°F	1/31/1996

In late January and early February 1996, Decorah went 6 consecutive days with temperatures at or below zero degrees (F) following a large blizzard. Low temperatures of -37°F, -25°F, -34°F, -41°F, and -36°F were set on five straight mornings. In mid-January 1994, temperatures dropped to -17°F or colder for 7 mornings in a row.

Since 1993 there have been 5 fatalities in Iowa 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 wind chill values hit -30°F at Decorah, IA and in January 2009 values were even colder for a 3-day period.

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 Decorah, IA is 111°F set on July 14, 1936.

Warmest Highs at Decorah, IA	
High	Date
111°F	7/14/1936
109°F	7/13/1936
108°F	7/2/1911
107°F	7/11/1936
107°F	7/24/1901

In Winneshiek County there have 7 heat waves since 1993. During that same time period, there were 5 fatalities directly related to heat waves in Iowa.

A prolonged heat wave hit the upper Midwest in July 1936. At Decorah, the high temperature hit 100°F or warmer for 14 consecutive days, setting many daily and all-time records. In 1988 the high temperature hit 100°F or higher a total of seven times, but 1901, 1910, and 1911 also were very warm years with highs above 100°F ten times or more each year. In more recent years, heat waves struck in 1995, 1999, and 2001.

In mid-July 2011, the heat index hit 105 or higher for 3 straight days (July 17-19) with readings of 105, 111, and 114. Dew points were 81 deg F.

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.

The last drought in Winneshiek County was 2012, which included a drought disaster declaration by the USDA. Other more recent droughts hit parts of Iowa in 1999, 2000, 2001, 2003, 2005, and 2006.

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 or cropland field fires in Winneshiek 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 Winneshiek County area. Data is valid for Decorah, IA based on normals from a 30-year period (1981-2010).

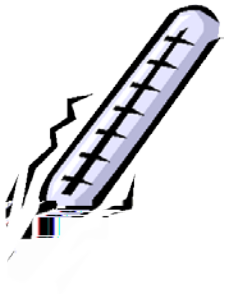
Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	26.8	8.8	17.8	0.91"	10.9"
FEB	32.0	13.3	22.6	0.85"	8.5"
MAR	44.9	24.8	34.9	1.76"	5.3"
APR	60.6	36.5	48.5	3.62"	1.3"
MAY	71.4	47.0	59.2	4.18"	0.0"
JUN	80.2	56.6	68.4	5.16"	0.0"
JUL	83.8	61.3	72.6	4.28"	0.0"
AUG	81.8	59.5	70.7	4.74"	0.0"
SEP	74.6	50.5	62.6	3.38"	0.0"
OCT	61.9	38.9	50.4	2.36"	0.1"
NOV	44.9	27.0	36.0	2.11"	3.7"
DEC	29.9	13.5	21.7	1.16"	11.0"
Year	57.8	36.4	47.1	34.53"	40.0"

Note: Climate records for Decorah, IA began in 1893.

Miscellaneous facts:

- Warmest year on record – 2012 (51.5°F) although 2016 may end up warmest
- Warmest month on record – July 1901 (80.4°F)
- Warmest day on record – July 14, 1936 (111°F)
- Year with greatest number of days with 90°F or warmer – 1910 (58 times)

- Coldest year on record – 1917 (40.9°F)
- Coldest month on record – January 1912 (-2.3°F)
- Coldest day(s) on record – January 30, 1951 (-43°F)
- Year with greatest number of days at 0°F or colder – 1917 (54 times)

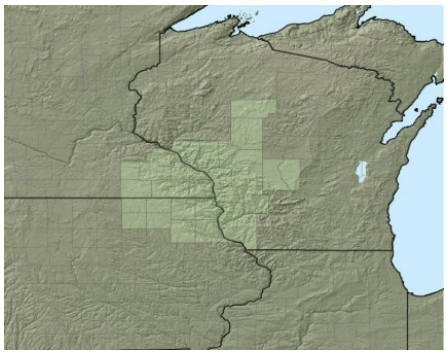


- Wettest year on record – 2016 (53.96")
- Wettest month on record – August 2007 (15.11")
- Wettest day on record – June 8, 2008 (6.60")
- Driest year on record – 1910 (18.54")
- Driest month on record – March 1999 (0.00")

- Highest seasonal snowfall on record – 1961/62 (69.2")
- Highest monthly snowfall on record – January 1996 (34.7")
- Highest one-day snowfall on record – December 1, 1985 (14.5")
- Least seasonal snowfall on record – 1967/68 (11.3")

NOAA/National Weather Service Support and Weather Monitoring

NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Winneshiek 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 Winneshiek County includes one station:

- KXI60 (Decorah) on 162.525 MHz

Storm spotters are primarily community fire department volunteers, with some additional help from amateur radio operators, law enforcement, and the general public. Spotter training is held about every other year with an average attendance of 43 over the past five years.

There are a variety of weather monitoring sources in or near Winneshiek County, including:

Automated weather station(s):

- Decorah (KDEC)

River Gauge(s):

- Upper Iowa River @ Kendallville
- Upper Iowa River @ Decorah
- Upper Iowa River @ Bluffton
- Turkey River @ Spillville

Cooperative Observers

- Calmar
- Decorah

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 La Crosse Severe Weather Climatology	www.weather.gov/arx/svr_climate
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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