

PART THREE: PRIORITY NATURAL HAZARDS

The following hazards have been named to be among the top three potential emergencies caused by natural disaster that could impact any area of Sibley County. Cited research has been compiled via the National Climatic Data Center and/or other noted sources.

WINTER STORMS

Definitions and Sibley County History

Sibley County experiences three basic types of winter storm: blizzards, heavy snow events, and ice storms. (Ice storms include freezing rain, freezing drizzle and sleet.)

Blizzard - Blizzards, the most violent of the winter storms, are characterized by low temperatures, usually below 20 degrees Fahrenheit. These temperatures are accompanied by strong winds in excess of 35 miles per hour with enough snow in the air to create visibilities of one-quarter mile or less for an extended period of time, usually at least three hours or more. While blizzards can occur in Sibley County from October through April, they are most common from November through the end of March. There have been three (3) blizzards reported in Sibley County in the past 50 years. Fortunately, these blizzards caused no injuries or deaths.

Heavy Snow or Snowstorm - In Minnesota, a heavy snow event is defined by 6 or more inches of snow in a 12-hour period and 8 or more inches of snow in a 24-hour period. Snow is considered heavy when visibilities drop below one-quarter mile regardless of wind speed. In Sibley County, there have been fifteen (15) occurrences of heavy snow or snowstorm over the last 50 years. Fortunately, these events did not result in any deaths or property damage.

Ice Storms - Freezing rain, probably the most serious of the ice storms, occurs during a precipitation event when warm air aloft exceeds 32 degrees while the surface remains below the freezing point. When precipitation originating as rain or drizzle comes into contact with physical structures ice can form; this creates problems for traffic, utility lines, and tree limbs. During the past 50 years there have been two (2) ice related (i.e. ice/glaze) storms which resulted in no deaths or property damage. A similar form of ice storm is sleet. Sleet forms when precipitation originating as rain falls through a rather large layer of atmosphere with below-freezing temperatures; the raindrops freeze before reaching the ground, forming an icy layer. Sleet storms are usually of a shorter duration than freezing rain and generally create fewer problems.

Sibley County Winter Storm Hazard Risk Assessment

Hazard:	Winter Storm Blizzard, Ice Storm, Heavy Snow, Extreme Cold
Location	Countywide
Historic Events	0-1 storms per year Often below freezing Extreme cold 1-3 days per year
Likely to happen now?	Yes
How often?	0-1 storms per year Often below freezing Extreme cold 1-3 days per year
Where would event occur?	Countywide
Severity of event?	Several days per storm, multiple storms in a single winter, limited visibility, high amounts of snow accumulated

When would hazard likely occur?	November-March
What other hazards could occur at the same time?	Damaging winds, traffic accidents, spring flooding due to heavy snow accumulation
Economic impacts	School/business closing, costs of staff and equipment for snow removal, loss of livestock/crops
Loss of life impacts	Could be trapped outside during storm, loss of utilities could endanger those in homes, traffic accidents
Risk Level VH – Very High H – High L – Limited M – Minimal	Citizens/People: M Animals/Livestock: L Housing: L Critical Structures: L Infrastructure: L Total: M/L
<u>Risk Assessment</u>	
Unlikely – 1 Occasional – 2 Likely – 3 Highly Likely – 4	<u>Frequency of Occurrence</u> 2.25
More than 12 hours – 1 6-12 hours – 2 3-6 hours – 3 Minimal-None – 4	<u>Warning Time</u> 1
Limited – 1 Minor – 2 Major – 3 Substantial – 4	<u>Potential Severity</u> 3
Minimal – 1 Limited – 2 High – 3 Very High – 4	<u>Risk Level</u> 1
(Total divided by 4) Very Low – 1 Low – 2 Moderate – 3 High – 4	<u>Overall Priority</u> 2 Low

Statewide History of Winter Storms

Sibley County generally experiences at least one of the types of winter storm discussed above each year, often having multiples of each. Two of the more memorable storms, not just in Sibley County history but also in Minnesota history were the Armistice Day Blizzard of 1940 and the Halloween Blizzard of 1991, each of which produced more than a foot and a half of snow in the area. These examples are included here as a reminder of the possibilities for severe winter storm events.



Armistice Day Blizzard, 1940

The weather was relatively benign the morning of November 11, 1940. Many people were outdoors, taking advantage of the mild holiday weather. The forecast predicted colder

temperatures and a few flurries.

The storm started with rain that quickly turned to snow. By the next day, the Twin Cities had received 16.7 inches of snow, Collegeville 26.6 inches, and 20-foot drifts were reported near Willmar. Forty-nine Minnesotans lost their lives in this storm, many of them hunters trapped by the sudden turn of events.

Halloween Blizzard, 1991

The Halloween Blizzard of 1991 was less tragic but equally fierce. Across much of eastern Minnesota, trick-or-treaters donned snowmobile suits as snow began to fall during the afternoon of October 31. After a three-day snowstorm, 28.4 inches of snow were dropped on the Twin Cities, setting a single storm record for the metropolitan area. Duluth received 36.9 inches, the largest single storm total in Minnesota history. Sibley County received between 16 and 20 inches of snowfall while other parts of Southern Minnesota, namely Austin and Albert Lea, experienced an ice storm. Extremely cold temperatures followed the storm and hindered highway snow removal and transportation.

Vulnerability to Winter Storms and Sibley County Concerns Regarding Winter Storms

The probability of receiving measurable snow (>.1 inch) on any given day is 98.9% in winter, 96.7% in spring, and 85.6% in autumn. Significant snowstorms (5-12 inches in 24 hours) can be expected to occur once annually, and most will result in travel advisories and school and/or road closures. Severe, hazardous snow conditions appear to occur at least once every 10-15 years.

Minor ice storms are expected annually in late winter and early spring. Severe ice storms may be expected to occur once every 25 years, according to historical data. Winds are expected during ice storms in this area as they usually carry the cold air and precipitation that cause the storm.

Cold temperatures are predicted to occur each year, as well, although the 100-year extreme appears to be -34° F. Persistent cold temperatures combined with low precipitation (leading to deep ground frost) appear to occur at least once every 5 years. During years when precipitation is light all winter water main breaks are expected in late winter and early spring as the depth of ground frost reaches beyond 6 feet, where water mains are laid. This tends to occur once every 10-15 years.

The Sibley County cities of Gibbon, Gaylord, Arlington, and Henderson have identified concerns regarding winter storms affecting their communities.

Potential Impacts and Cascading Effects

Winter storms have a wide variety of impacts. Poor driving conditions, frigid temperatures, and automobile accidents can lead to loss of life and injuries such as hypothermia and frostbite. Winter storms can also render power equipment inoperable, leading to power outages, and occasional property damage can also occur due to winter storms. In addition, winter storms can have an economic impact as well when businesses and governmental office close, transportation slows down or stops, and people take shelter in their homes.

Winter Storm Gaps and Deficiencies

- Many jurisdictions report that no public outreach is performed to educate citizens about winter weather conditions and health hazards such as frostbite and hypothermia.
- Local radio and television stations do provide warnings and updates of winter weather conditions, but are effective only if tuned to. Since these broadcasts are made nearly entirely in English, language barriers may exist for non-English speaking residents. This is of particular concern in Gaylord, which has indicated that it has approximately 300 Hispanic residents and that there is an existing language barrier at times.
- Many power lines within the county are above-ground and are thus subject to damaging effects from ice storms and winter-storm winds.

ACTIONABLE MITIGATION STEPS:

Actionable Mitigation Steps are more elaborately explained with project, timeframe, responsible jurisdictions/staff, possible funding sources, and priority level in the Action Plan section of this document.

1. Utilize City Ordinances to Discourage Placement of Trees Near Power Lines (Countywide) – City staff from all Sibley County cities would review and, when necessary, amend local ordinances to limit placement of trees near power lines, preventing problems that can occur should tree limbs break due to a winter-storm related event, such as high winds or an ice storm.
2. Encourage Public to Listen to Local News (Countywide) – County and city staff would provide reminders and encourage local residents through local media that winter storm conditions, warnings, and updates are made available through local radio and television stations.
3. Assure Availability of Information for Non-English Speaking Residents (Gaylord, Countywide) – County and city personnel may want to consider provisions for assuring that language barriers for winter storm events are minimized and that all residents are able to get up-to-date information, regardless of language.
4. Community Education and Drills (Gaylord, Gibbon, and New Auburn) – City staff (police and fire) would provide educational information to personnel and citizens with the assistance of county emergency management personnel. Information will be provided in 2007-2008 and reassessed annually. Assessment would be done by city staff and county-wide emergency task force. Department (police and fire) will also conduct drills during the year 2007-2008.
5. Educate Key Personnel (Gaylord, Gibbon, and New Auburn) – City staff (police and fire) would provide educational information to personnel and citizens with the assistance of county emergency management personnel. Information will be provided in 2007 and reassessed annually. Assessment would be done by city staff and county-wide emergency task force.

SUMMER STORMS

Sibley County experiences various forms of summer storms. The four main forms of summer storms, including thunderstorms, tornadoes, hailstorms, and windstorms have all occurred, sometimes frequently, within Sibley County and will continue to do so in the future.



Thunderstorms - Seventy of the historical summer storm hazard events reported in Sibley County (according to NCDC data) were due to thunderstorm winds. Severe thunderstorms are defined as having one or more of the following: winds in excess of 58 miles per hour, hail of at least 3/4 of an inch in diameter, or a tornado. Thunderstorms are the most common summer storm in Sibley County, occurring primarily during the months of May through August with the most severe storms most likely to occur from mid-May through mid-July.

There are four types of thunderstorms, each of which occur in Sibley County: Multicell Cluster Storms, Multicell Line Storms, Supercells, and Lightning Storms. One of the reported lightening storms occurred in Winthrop on May 24, 1994. Unfortunately, two injuries occurred during this storm. Also, \$60,000 in property damage occurred in Arlington and \$40,000 in Henderson on August 16, 2002.

Tornadoes - Tornadoes are the most violent of all storms. The tornado is essentially a rapidly rotating column of air that is spawned by a cumulonimbus cloud. When it drops to the ground it can create significant damage and loss of life. Tornadoes always occur in association with thunderstorms. While somewhat more common in Southern Minnesota they have occurred in all counties in the state.

Tornadoes are most likely to occur during warm humid spells during the months of May, June, July and August, but have occurred as early as March and as late as November in Minnesota. Most Tornadoes occur during the warm part of the day – late afternoon or early evening; over 80 percent of Tornadoes occur between noon and midnight. There have been 25 confirmed Tornadoes reported in Sibley County between 1950 and 2006.

These events resulted in a total of \$51.35 million dollars worth of damages, 75 injuries, and one fatality. Most recently, on June 24th of 2003, a series of Tornadoes touched down nearby Gibbon, and one of them damaged two farmsteads and destroyed all of their outbuildings and sheds. A tornado event in 1965 was responsible for all of the 75 reported injuries, the one fatality, and \$50 million of the reported damages. This event was actually a pair of Tornadoes which ranged in the F2-F3 range.



Hailstorms - Hail is a product of a severe thunderstorm. It is formed when strong updrafts within a cumulonimbus cloud carry water droplets above the freezing level. The water droplets freeze as strong updraft winds toss them back up into colder regions of the cloud. More droplets

attach and freeze as they are tossed around. This process continues until the hailstones become too heavy to be supported by the updrafts and fall to the ground as hail.

Most hail in Minnesota ranges from pea-size to golf-ball size. Larger hailstones have been reported but occur much less frequently. Almost all areas of Southern Minnesota can expect some hail during the summer months, although most hail is not large enough to cause significant crop or property damage.

In Sibley County, there were 51 hail storms reported in the past between the years of 1950 and 2006, which fortunately caused no fatalities, injuries, or property damage. One of these reported hail storms in the County had hailstones of approximately 3.0 inches, during a hail event on June 17th, 1986.

Windstorms - Windstorms can and do occur in all months of the year; however, the most severe windstorms usually occur during severe thunderstorms in the warm months. There have been eight high winds reported in Sibley County over the past 50 years that range from 40 – 70 miles per hour. These can inflict damage to buildings and in some cases overturn high profile vehicles.

Winds of up to 130 miles per hour have been reported in the strongest thunderstorms. Those 14 storms reported in Sibley County range from 60 – 80 miles per hour. Downburst winds can cause as much damage as a small tornado and the two are frequently confused. As downburst winds spread out they are often referred to as straight-line winds and they can cause major structural and tree damage over a relatively large area.

Sibley County Summer Storm Hazard Risk Assessment

Hazard:	Summer Weather Thunderstorm, Lightning, Hail, Wind (excluding tornado)	Tornado
Location	Countywide	Countywide
Historic Events	51 hail events between 1950-2006. Events in 1986 produced 3 inch hailstones.	F2-F3 Tornadoes in 1965 were responsible for one fatality, 75 injuries, and \$50 million in damages.
Likely to happen now?	Yes	Possible
How often?	94% chance of thunderstorm, 56% chance of hail yearly, extreme heat several days per year	Once every 3-4 years according to current records
Where would event occur?	Countywide	Countywide
Severity of event?	Lightning, damaging winds, extreme heat can be harmful if precautions are not observed	County has already had an F3 tornado event, could happen again.
When would hazard likely occur?	Spring-Fall	Spring-Fall
What other hazards could occur at the same time?	Flooding, traffic accidents, wild and structural fires sparked by lightning	Damage/failure of utilities/infrastructure, fire, exposure to hazardous materials

Economic impacts	Loss of crops/livestock, property damage	Property loss or damage, loss/damage of community infrastructure
Loss of life impacts	Lightning strike, heat stroke/exhaustion, being struck by hailstone or wind-driven object (rare in most cases)	Can be extremely dangerous, particularly stronger Tornadoes that can devastate houses down to the foundation where people are taking shelter. Would be especially dangerous in more densely populated areas.
Risk Level VH – Very High H – High L – Limited M – Minimal	Citizens/People: H Animals/Livestock: L Housing: H Critical Structures: L Infrastructure: H Total: L/H	Citizens/People: VH Animals/Livestock: H Housing: VH Critical Structures: L Infrastructure: H Total: H/VH
Risk Assessment		
Unlikely – 1 Occasional – 2 Likely – 3 Highly Likely – 4	<u>Frequency of Occurrence</u> 4	<u>Frequency of Occurrence</u> 2
More than 12 hours – 1 6-12 hours – 2 3-6 hours – 3 Minimal-None – 4	<u>Warning Time</u> 3	<u>Warning Time</u> 3
Limited – 1 Minor – 2 Major – 3 Substantial – 4	<u>Potential Severity</u> 3	<u>Potential Severity</u> 4
Minimal – 1 Limited – 2 High – 3 Very High – 4	<u>Risk Level</u> 2	<u>Risk Level</u> 3
(Total divided by 4) Very Low – 1 Low – 2 Moderate – 3 High – 4	<u>Overall Priority</u> 3 Moderate	<u>Overall Priority</u> 3 Moderate

Vulnerability and History of Summer Storms

Sibley County had 70 thunderstorm events, 51 hail events and 25 tornado touchdowns reported between 1950 and 2006. Often these events were produced by the same violent storm event. With 70, 51 and 25 occurrences over 56 years, the likelihood of a thunderstorm, hail event or tornado hitting somewhere in the county in any given year is high. Assuming a storm event affects one square mile, and there are 588.65 square miles in Sibley County, it is likely that various areas of the county will experience various summer storm events, most notably thunderstorms, every year.

Multiple tornadoes occurred in Sibley County on June 24th of 2001. The first moved in from Renville County at 5:55PM and then dissipated. A few trees were leveled and there was minor property damage. The second tornado touched down briefly in Sibley County before crossing into Renville County at 6:31PM. The third hit Sibley County and moved north, occasionally stalling in place for minutes at a time. It heavily damaged two farmsteads, destroying all

outbuildings and sheds and damaged the homes significantly. The last tornado entered Renville County at 6:45pm and caused significant damage in the City of Buffalo Lake. In Sibley County, there were 25 Tornadoes reported in the past 50 years, which caused \$50.35 million in property damage, 75 personal injuries and 1 death on May 6, 1965. Most of the reports identified Sibley County; however, the City of Gibbon reported \$1 million of property damage caused by a tornado.

A severe thunderstorm in May of 1996 leveled several local properties. A barn was destroyed three miles northwest of Gibbon and hail destroyed portions of Hitterite Colony. Debris was strewn 2.5 miles downstream. Eight barns went down in New Auburn, Green Isle and Arlington along with a church steeple in Green Isle. Estimated wind speed: 70 knots. Two years earlier, in May of 1994, golf ball-sized hail was dropped in Gaylord and a canopy was torn from a local inn; debris was blown onto several homes. Two people were injured and three homes were damaged (although these reports were not acknowledged in the National Climatic Data Center database).

Summer Storm Concerns

The table below indicates Sibley County communities and their noted concerns with summer storm events, as defined by their responses to the surveys administered to city personnel as part of this hazard mitigation planning process.

JURISDICTION	ASSESSED RISK (PROBABILITY)	ASSESSED IMPACT	TOP PRIORITY?
Arlington	Medium	High	Yes
Gaylord	Medium	High	Yes
Gibbon	Low	High	Yes
Green Isle	Concern	Unreported	No
New Auburn	Medium	Medium	Yes
Winthrop	Medium	High	Yes
SIBLEY COUNTY	LOW TO MEDIUM	MEDIUM TO HIGH	YES

Probability: High – Annually to 2yrs, Medium - 5yrs, Low – 10yrs

Impact: High – Loss of life and \$500,000 plus property damage, Medium – bodily injuries and \$250,000 property damage, and Low – bodily discomfort and less than \$100,000 in property damage

Potential Impacts and Cascading Effects

Potential impacts of summer storms can be extremely varied. The most significant potential impacts include the loss of life or physical injuries sustained, varying degrees of property and infrastructure damage (ranging from mild damage to total loss), interruptions of city services, and utility failures such as interruption of communications and power outages which can range from several hours to many days. The economic impact of summer storm damage is also very significant, as lost or damaged businesses are forced to shut down while repairs are made, and some may never open again due to the financial hardships caused by the storm damages. This lost business is in turn felt throughout the local economy. Storm repair efforts can also strain city resources, including staff and equipment. Economic impacts can also occur through damage or loss of agricultural crops or livestock. Additionally, lightning strikes may ignite both structural and wildfires.

Summer Storm Gaps and Deficiencies

- Some rural Sibley County residents may be outside the effective range of city severe weather warning system sirens.
- Local television and radio stations provide summer storm warning information and updates, but are effective only if tuned and paid attention to. Since broadcasts are nearly entirely in English, language barriers may also exist for non-English speaking residents, as may be the case in Gaylord, which has a Hispanic population of at least several hundred residents.
- The City of Gaylord has indicated that they have a large elderly population that may require assistance in getting to a safe area in the event of a serious summer storm.
- The City of Arlington has noted that there is not a nearby shelter available to residents of one mobile-home park in the community.
- There has also been considerable discussion of the need to add wind-resistance regulations to existing building codes in the City of Gaylord and the City of New Auburn.

ACTIONABLE MITIGATION STEPS:

Actionable Mitigation Steps are more elaborately explained with project, timeframe, responsible jurisdictions/staff, possible funding sources, and priority level in the Action Plan section of this document.

1. Designate or Create Storm Shelters Where Needed (Winthrop, Arlington) - Make sure storm shelters are available, especially in trailer courts. City police and fire personnel will work with trailer court managers to assess and address proper storm shelters. Where shelter may lie in unincorporated areas county personnel will on such issues. City administration will work with fire, police, and public works staff, and external partners if necessary, to identify or create appropriate and safe shelter space.
2. Guarantee Early Warning Systems Are Installed And Maintained (Winthrop, New Auburn, Arlington, Henderson, Gibbon) – City public works and administration will document and regulated testing of warning systems.
3. Assure Availability of Information for Non-English Speaking Residents (Countywide, particularly Gaylord) – County and city personnel may want to consider provisions for assuring that language barriers for winter storm events are minimized and that all residents are able to get up-to-date information, regardless of language.
4. Make Assistance Available for Elderly Residents (Gaylord) - City staff and local agencies that focus on elderly residents should identify ways to provide rapid

assistance to elderly people in the event of a serious storm threat, to ensure that they are aware of the threat and able to get to a safe location.

5. Specify the Need for Wind-Resistant Structures in Building Codes (Gaylord, New Auburn) – City planners and engineers will work with building inspectors and planning commissions to incorporate appropriate language within codes. Other communities may wish to consider this project as well.
6. Encourage Residents to Listen to Local News (Countywide) – County and city staff would provide reminders and encourage local residents through local media that winter storm conditions, warnings, and updates are made available through local radio and television stations
7. Provide Public Outreach and Drills (Winthrop, Gaylord, New Auburn, Arlington, Gibbon and County) – Police and fire personnel will work together with county personnel to coordinate drills. In addition, city personnel working with schools will provide education information to students. Information will be provided in 2007-2008 and reassessed annually. Assessment would be done by city staff and county-wide emergency task force.