

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 the entire county. Cited research has been compiled via the National Climatic Data Center and/or other noted sources.

WINTER STORMS

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

Definitions and Le Sueur County History

- 1. Blizzard.** Temperatures, usually below 20 degrees Fahrenheit, characterize blizzards, the most violent of the winter storms. 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 Le Sueur County from October through April, they are most common from November through the end of March. According to National Climatic Data Center records, there have been three (3) blizzards in Le Sueur County between 1950 and 2005.

- 2. Heavy Snow or Snowstorm.** In Minnesota, 6 or more inches of snow define a heavy snow event 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. According to National Climatic Data Center records, there have been thirty-one (31) occurrences of heavy snow or snowstorm in Le Sueur County between the years of 1950 and 2005. One death has been attributed to a snowstorm that did affect Le Sueur County, in December of 1996, when a woman left her car in a heavy snowstorm, became disoriented, and succumbed to hypothermia before she could be rescued. Although the death did not occur directly in the county, it does demonstrate the dangers of such a snowstorm event.

- 3. 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 surface ice can form; this creates problems for traffic, utility lines, and tree limbs. According to National Climatic Data Center records, there have been six (6) ice-related (i.e. ice/glaze) events between the years of 1950 and 2005, which have not resulted in any deaths, injuries, or property damage.

Sleet is also a form of ice storm that may impact Le Sueur County. Sleet forms when precipitation originating as rain falls through a rather large layer of atmosphere with below-freezing temperatures and the raindrops freeze before reaching the ground. Sleet storms are usually of shorter duration than freezing rain and generally create fewer problems.

Le Sueur 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
<i>Risk Assessment</i>	
Unlikely – 1 Occasional – 2 Likely – 3 Highly Likely – 4	<u>Frequency of Occurrence</u> 3
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

Vulnerability to Winter Storms and Specific Areas of Concern

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. There have been thirteen (13) winter storms in Le Sueur County in the past 50 years that caused at least two deaths in the years 1994 and 1996.

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 -38° 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.

It is possible and likely that winter storms will affect any area within Le Sueur County. When winter storms do occur, they tend to affect very large areas at once, so they may impact many different communities within Le Sueur County at the same time, albeit it to varying degrees of impacts. The City of Kilkenny has indicated that they are concerned with secondary effects of winter storms, including power outages and problems with the sewer system. The cities of Cleveland, Kasota, and Montgomery have all also indicated some level of concern with the possibility of winter storm events.

Statewide History of Winter Storms

Le Sueur County usually experiences at least one occurrence of each type of winter storm annually, often the same type on more than one occasion. Two of the more memorable storms, not just in Le Sueur County history but in Minnesota history as well, 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 winter storms are included here due to their particularly vivid examples of the possible effects of such events on Le Sueur County.



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 that morning predicted colder temperatures and a few flurries.

The storm started with rain that quickly turned to snow. By the 12th, the Twin Cities had received 16.7 inches, 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.

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.
- While many jurisdictions report having ‘weather spotters’ capable of alerting police and other city personnel, it is important to see to it that communication and systems of early detection are cohesive throughout Le Sueur County.
- 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.
- Many power lines within the county are located above-ground and are thus subject to damaging effects from ice storms and winter-storm winds.
- Kilkenny has expressed concern regarding secondary effects due to winter storms, such as power outages and problems with their municipal sewer system.

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. Suggested areas of focus are denoted in parentheses.

1. Improve Resistance to Secondary Winter Storm Effects (Kilkenny) – City staff would consider necessary improvements to existing equipment or practices that could mitigate or eliminate threats due to cascading winter storm events such as power outages and sewer system problems.
2. Utilize City Ordinances to Discourage Placement of Trees Near Power Lines (Countywide) – City staff from all Le Sueur 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.
3. 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.
4. Community Education and Drills (Cleveland, Kasota, Kilkenny, Montgomery and County) – 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. City staff and countywide emergency task force would perform assessment. Department (police and fire) will also conduct drills during the year 2007.
5. Educate Key Personnel (Cleveland, Kasota, Kilkenny, Montgomery and County) – 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. City staff and countywide emergency task force would perform assessment.

SUMMER STORMS



1. Thunderstorms. . Forty- four (44) of the 176 hazard events reported in Le Sueur County 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 Le Sueur 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 Le Sueur County: Multicell Cluster Storms, Multicell Line Storms, Supercells, and Lightning Storms.

2. 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.

3. 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 or when ice pellets in the cloud collide with water droplets. The water droplets freeze as strong updraft winds toss the pellets and droplets back up into colder regions of the cloud. Both gravity and downdrafts in the cloud pull the pellets down, where they encounter more droplets that attach and freeze as they are tossed once again to higher levels in the cloud. This process continues until the hailstones become too heavy to be supported by the updrafts and fall to the ground as hail.

In Minnesota, most hailstones range from pea-size to golf-ball size. Larger hailstones have been reported but occur much less frequently. Area coverage of individual hailstorms is highly variable and spotty because of the changing nature of the cumulonimbus cloud. 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.

According to National Climatic Data Center records, in Le Sueur County, there were forty-four (44) hail events reported between 1950 and 2005. On May 15th, 1998, one hailstorm caused approximately \$20 million throughout Le Sueur County.

4. 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. These can inflict damage to buildings and in some cases overturn high profile vehicles. According to National Climatic Data Center records, there have been nine (9) high-wind events reported in Le Sueur County between 1950 and 2005 that range from 40 – 70 miles per hour. One of these high-wind events, which occurred in April of 2001, was powerful enough to rip the roof off of a barn near Cleveland, and was also responsible for other significant property damages in neighboring counties as well. Combined, these damages totaled more than \$8 million.

Winds of up to 130 miles per hour have been reported in the strongest thunderstorms. Thirteen (13) events of wind were reported in Le Sueur County that range from 60 – 80 miles per hour over the past 50 years. 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.

Strong winds combined with saturated soils can lead to widespread loss of trees. This becomes a problem in communities when downed trees injure people, damage property, knock out power lines or impede traffic. Downed power lines are a concern because of power outages as well presenting a risk of electrocution or fire. Risks associated with storms toppling trees can be managed through proper tree selection and proper maintenance programs. Some communities desire the look and feel of tree-shaded roads. This desire may lead the community to encourage the planting of trees that are too large for the narrow green strip between the street and sidewalk.

Le Sueur County Summer Storm Hazard Risk Assessment

Hazard:	Summer Weather Thunderstorm, Lightning, Hail, Wind (excluding tornado), extreme heat	Tornado
Location	Countywide	Countywide
Historic Events	44 hail events between 1950-2005. One event in 1998 caused \$20 million in damages across the county	Le Center, Ottawa 1998 Cleveland 1999, various tornado sites in 2006, particularly Kasota. 17 total tornadoes between 1950 and 2006
Likely to happen now?	Yes	Unlikely
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	F3 tornado reported near Ottawa (158-206 mph wind speeds)
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 which can devastate houses down to the foundation where people are taking shelter
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> 1
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> 4
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> 4
(Total divided by 4) Very Low – 1 Low – 2 Moderate – 3 High – 4	<u>Overall Priority</u> 3 Moderate	<u>Overall Priority</u> 3.25 Moderate

Vulnerability to Summer Storms

According to National Climatic Data Center records, Le Sueur County had 44 thunderstorm events, 28 hail events and 16 tornado touchdowns reported between 1950 and 2000. Often these events were produced by the same violent storm event. With 47, 28 and 16 occurrences over this 50 year span, the likelihood of a thunderstorm, hail event or tornado hitting somewhere in the county is 94%, 56% and 32% respectively in any given year. Assuming a storm event affects one square mile, and there are 448 square miles in Le Sueur County, the odds of a thunderstorm, hail event, or tornado touching down on any one particular square mile is 1 in 476, 1 in 800 and 1 in 1,400, respectively, each year. New Prague is particularly concerned with thunderstorms and/or tornados, due to their location near the river valley. Le Center is concerned with the

occurrence of tornadoes, since they have experienced this natural hazard event before and are located in an area that has a history of tornados. The City of Kilkenny is concerned with summer storm events as well, because they indicated that they have many homes without basements and businesses that would have no place to go for shelter.

History of Summer Storms

National Climatic Data Center information displays that in Le Sueur County, there were 17 tornadoes reported which occurred between 1950 and 2006, which caused \$44.35 million in property damage, 55 personal injuries and one deaths. Most of the reports identified Le Sueur County as the sources for those tornadoes. These tornadoes ranged from the classification of F0 to F3 on the Fujita Scale. An F0 tornado has wind speeds of 40-72 mph, while an F3 tornado has wind speeds of 158-206 mph. While most of the tornadoes that have occurred (and will possibly occur again) in Le Sueur County have been F0, F1, or F2 classification, there were two F3 tornados, which occurred south of Ottawa in March of 1998 and near Kasota in August of 2006. The Kasota-area tornado of 2006 was responsible for \$20 million in property damage, \$4 million in crop damage, 30 injuries, and one death.

The most memorable summer storm event in recent history was a tornado that tore through portions of the county in August of 2006. This was an F3-level storm that started in Nicollet County and tracked into Le Sueur County in the early evening hours of August 24th. There were over 100 homes damaged, and three homes were completely destroyed. Hundreds of farm animals were killed, including 200 dairy cows at a large dairy farm. Many injuries were reported, as well as the unfortunate death of one man when a tree crashed through the roof of his home.

Another memorable tornado occurred on the evening of March 29, 1998, as a part of the same storm system described above which produced the F3 tornado near Ottawa. The tornado tracked north of Cleveland, through Le Center, and into adjoining rural areas. Most of the businesses in the southern part of Le Center were damaged and many county fairground buildings were destroyed. Fifteen mobiles homes at a Le Center trailer park were demolished, with another twenty-six suffering major damage. Over one hundred farm buildings were destroyed.

On August 9th, 1999, a tornado destroyed a dairy barn and machine shop three miles northwest of Cleveland. Four miles east, a machine shed, a garage, and two cattle barns were flattened on a family farm. Many acres of corn along the twister's path were lost. There are no estimates on livestock lost, although several heads of cattle were reportedly killed.

Although tornadoes cause significant destruction, damage is also caused by high winds and hail. Trees, roofs, power lines and crops are affected nearly every summer. On July 24th and 25th, 1995, thunderstorms caused a large number of mature trees to be snapped and uprooted. Farm buildings and severe crop damage was reported six miles southeast of Montgomery.

Summer Storm Concerns

Most of the cities within Le Sueur County have indicated concern with the possibility of summer storm events. The cities of Cleveland, Kilkenny, and New Prague have all indicated a high level of concern. The cities of Heidelberg, Kasota, Le Center, Le Sueur, and Montgomery all indicated a medium level of concern. This is likely due to the extensive history of severe summer storm events within the county.

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 (as was the case in Le Center after the severe storms of 1999), 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 impact can also occur through damage or loss of agricultural crops or livestock, such as occurred near Montgomery in 1995 and near Cleveland in 1999. Lightning strikes may ignite both structural and wildfires.

Summer Storm Gaps and Deficiencies

- Power outages are a concern for some Le Sueur County communities. The leading cause of power failures is weather-related events ranging from seasonal flooding, tornadoes to winter storms and wildfires. Power grids, generating plants, transformer stations, power poles and even buried cable are vulnerable. Fewer instances of power failures are due to system failures, human error, accidents and sabotage. Extreme heat or extreme cold and lack of power can be a dangerous mix, particularly for elderly people, young children, and those with medical challenges.
- Kilkenny has indicated that they have many homes without basements and businesses without facilities that would provide for adequate shelter in a severe summer storm event.
- Some rural Le Sueur County residents may be outside the effective range of city severe weather warning system sirens. Additionally, not all communities have 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.