Sherburne County 2026 Hazard Mitigation Plan

SHERBURNE COUNTY







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Department of Public Safety | Division of Homeland Security and Emergency Management

Sherburne County Minnesota

2026 Hazard Mitigation Plan

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Section 1 – Introduction

Hazard mitigation planning is any sustained action to reduce or eliminate long-term risk to human life and property from future natural disasters. In the National Preparedness Goal, the Federal Emergency Management Agency (FEMA) describes five mission areas—prevention, protection, mitigation, response and recovery. (FEMA, 2015/2025). Hazard mitigation planning contributes to the mitigation mission by identifying risks, establishing core capabilities, and building long-term local resilience across the whole community to lessen disaster losses (FEMA, 2015/2025).

The Disaster Mitigation Act of 2000 requires local communities to develop and update a FEMA-approved hazard mitigation plan (HMP) every five years to remain eligible for federal pre- and post-disaster funding (Disaster Mitigation Act of 2000). To be eligible for future federal mitigation funds, counties and local jurisdictions must have an active, officially adopted HMP.

Natural disasters are increasing in frequency. Since 1980, damages from natural disasters in the U.S. have exceeded $3.2 trillion, and $1.5 trillion of that has been in the last ten years (Climate Central, 2026b). 2023 saw a record 28 separate billion-dollar weather and climate disaster events in the United States; 2024 saw 27 billion-dollar disaster events, and 2025 had 23, the 2nd and 3rd highest numbers recorded, respectively (NCEI, 2024). Minnesota alone has experienced 70 separate billion-dollar disasters since 1980, with a total estimated cost of $20–50 billion (Climate Central, 2026a).

Natural disasters are costly, but mitigation provides real economic value, and action taken before disasters happen significantly lessens their financial impacts (*Controlling the Rising Cost of Federal Responses to Disaster*, 2016). Researchers at the National Institute of Building Sciences looked at the results of 23 years of federally funded mitigation grants provided by FEMA, the U.S. Economic Development Administration (EDA), and the U.S. Department of Housing and Urban Development (HUD). Their findings revealed that for every $1 spent on hazard mitigation funding in the nation, $6 is saved in future disaster costs (Multi-Hazard Mitigation Council, 2019).

1.1 Hazard Mitigation Planning in Minnesota

Sherburne County is vulnerable to a variety of natural hazards that threaten the loss of life and property. Hazards such as tornadoes, flooding, wildfires, blizzards, straight-line winds, and droughts can potentially inflict vast economic loss and personal hardship.

This planning document is accompanied by a website that allows for easy stakeholder and community engagement, as well as interactive maps, dashboards, and infographics.

Sherburne County HMP Website

A broad overview of this companion website's features is as follows:

- Homepage (featuring Declared Disasters dashboard, feedback forms, links to Sherburne County Emergency Management website, etc.)
- County Profile
- Risk Assessment & Natural Hazard Profiles
- Goals & Implementation
- Climate Change

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1.1.1 Scope

U-Spatial, University of Minnesota, was contracted by Minnesota Homeland Security and Emergency Management using FEMA Building Resilient Infrastructure and Communities (BRIC) grant funds to work with Sherburne County Emergency Management to facilitate an update to the 2020 Sherburne County HMP. U-Spatial brings extensive geographic data analysis skills and hazard risk assessment expertise to the process. U-Spatial also employed the services of Hundrieser Consulting LLC for county and stakeholder outreach as well as mitigation action development related to this plan.

This HMP evaluates and prioritizes the major natural hazards affecting Sherburne County as determined by frequency of event, economic impact, deaths, and injuries. Mitigation recommendations are based on input from state and local agencies, the public, and national best practices.

This is a multi-jurisdictional plan that covers Sherburne County, including the cities of Baldwin, Becker, Big Lake, Clear Lake, Elk River, Princeton (partly in Mille Lacs County), St. Cloud (partly in Stearns & Benton), and Zimmerman. The Sherburne County mitigation activities identified in this plan also incorporate the concerns and needs of townships, school districts, and other participating entities.

Members from each of these jurisdictions actively participated in the planning process by assisting with public outreach, attending planning team meetings, providing local information, identifying mitigation actions, and reviewing the plan document (see Appendix C). The information in these forms was used to help identify mitigation actions for local implementation (see also Section 2.2). Each jurisdiction will adopt the plan by resolution after the plan is approved by FEMA. County and local city resolutions will be added by Sherburne County after final approval by FEMA (see Appendix B).

Sherburne County has specified the following goals for this plan update:

- Include more recent data documenting the critical infrastructure and hazards faced by Sherburne County.
- Reformat and reorganize the plan to reflect definitions of hazards as expressed in the 2024 Minnesota State Hazard Mitigation Plan.
- Reflect current hazard mitigation priorities in Sherburne County.
- Encourage recipients and sub-recipients of hazard mitigation grants to consider climate change adaptation, resiliency, and equity in their planning efforts.

1.1.2 Hazard Mitigation Definition

Hazard mitigation may be defined as any action taken to eliminate or reduce the long-term risk to human life and property from natural hazards. The benefits of hazard mitigation planning include the following:

- Saving lives, protecting the health of the public, and reducing injuries.
- Preventing or reducing property damage.
- Reducing economic losses.
- Minimizing social dislocation and stress.
- Reducing agricultural losses.

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- Maintaining critical facilities in functioning order.
- Protecting infrastructure from damage.
- Protecting mental health.
- Reducing legal liability of government and public officials.

1.2 State Administration of Mitigation Grants

FEMA currently has two mitigation grant programs that the State of Minnesota administers: the Hazard Mitigation Grant Program (HMGP) and the Flood Mitigation Assistance (FMA) program. The HMGP and FMA programs are administered through the Minnesota Department of Public Safety Homeland Security Emergency Management (HSEM) Division. All applicants must have or be covered under an approved hazard mitigation plan. Eligible applicants include state and local governments, certain private non-profit organizations or institutions, and tribal communities.

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Section 2 – Public Planning Process

2.1 Planning Team Information

The Sherburne County HMP planning team is led by the Sherburne County emergency manager. Planning team members include representatives from public and governmental sectors. Table 1 identifies the individuals who participated in virtual planning team meetings during the plan update process and the positions they held/organizations they represented at the time of participation.

Note: Table 1 is not an exhaustive list of stakeholder participation in the Sherburne County HMP update. Additional participation by jurisdictional and other agency representatives is documented in Table 3 of this section, as well as in Section 3.4, Appendix C, and Appendix G. The meeting summaries in Appendix F provide a comprehensive overview of each session. This includes a complete list of invited planning team stakeholders and information on other significant opportunities for engagement during the plan update.

Find the planning team members on the Sherburne County HMP website

Table 1. Hazard Mitigation Planning (HMP) Team

Name	Agency/Organization	Participant Title
Derek Baas	Sherburne County Emergency Management	Emergency Management Director
Kyle Breffle	Sherburne County Emergency Management	Deputy Director of Emergency Management
Dan Andren	Sherburne County Sheriff's Office	Captain
Drew Nelson	Sherburne County	Director of IT
Loraine Rupp	Sherburne County	Auditor/Treasurer
Dan Weber	Sherburne County	Assistant County Administrator
Marc Schneider	Sherburne County	Planning and Zoning, Zoning Administrator
David Unze	Sherburne County Sheriff's Office	Communications Media Specialist
Tanner Anderson	Sherburne County	Hwy Maintenance Superintendent
Andrew Witter	Sherburne County Public Works	Public Works Director and County Engineer
Kara Zoller	Sherburne County Health & Human Services	Public Health Supervisor
Gary Gray	Sherburne County Board of Commissioners	County Commissioner
Gregg Felber	Sherburne County Board of Commissioners	County Commissioner
Raeanne Danielowski	Sherburne County Board of Commissioners	County Commissioner
Nicole Ruhoff	Sherburne County	Public Health Manager
Lynn Waytashek	Sherburne County Planning & Zoning	Planning & Zoning Administrator
Scott Case	City of Baldwin Fire Department	Fire Chief

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Name	Agency/Organization	Participant Title
Robin Fischer	City of Baldwin Fire Department	Fire Chief
Chris Lisson	City of Becker	Public Works and Parks Assistant Director
Greg Lerud	City of Becker	City Administrator
Sam Olson	City of Big Lake Police Dept.	Chief of Police
Thomas Kucala	City of Big Lake Police Dept.	Captain
John Kreuser	City of Elk River	Fire Chief & Director of Emergency Management
Justin Femrite	City of Elk River	Public Works Director
Joe Hale	City of Elk River	Environmental Services and Projects Specialist
Tom Geiser	City of Elk River Utilities	Operations Director
Todd Frederick	City of Princeton Police Dept.	Chief of Police / Assistant Emergency Manager
Steven Zumberge	City of Princeton Fire Dept.	Fire Chief
Lisa Lovering	City of Princeton	Emergency Manager
Bob Gerold	City of Princeton	Deputy Emergency Manager/Public Works Director
Luke Langner	City of St. Cloud	Public Services Director
Peter Kedrowski	City of St. Cloud Fire Department	Deputy Fire Chief
Tony Lorenz	City of St. Cloud Fire Department	Deputy Fire Chief
Randy Piasecki	City of Zimmerman, MN	City Administrator
Ryan Maloney	City of Zimmerman/Livonia Fire District	Fire Chief / Emergency manager
Lucinda Messman	Becker Township	Clerk
Brenda Maas	Town of Big Lake	Clerk
Bruce Aubol	Town of Big Lake	Chair
Bud Stimmler	Clear Lake Township	Board Chairman
Steve Demeules	Palmer Township	Township Supervisor
Terrance VanderEyk	Clear Lake Township	Town Engineer
Jeremy Schmidt	Becker Public Schools	Superintendent
Nicole Stottlemyre	ISD 728	Coordinator of Prevention and Safety
Jon Dotterer	HSEM	Regional Program Coordinator
Michael Palmer	MN DNR	Regional Firewise Specialist
Edgardo Castro-Garcia	Fairview HealthCare	Manager - Security & Emergency Management
Bill Peterson	US Fish and Wildlife Service at Sherburne National Wildlife Refuge	Project Leader
James Bedell	MN DNR	Area Hydrologist
Michelle Schmitz	Xcel Energy	Manager, Community Relations
Francine Larson	Sherburne SWCD	District Manager
Clinton Maxson	Isanti County Emergency Management	Emergency Management Director

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2.2 Review of Existing Plans, Capabilities & Vulnerabilities

Sherburne County and its local communities utilized a variety of planning documents to direct plan development. These documents included a Comprehensive/Master Plan, Emergency Operations Plan, Transportation Plan, etc. (see Section 5.1.4 and Appendix D). The planning process also incorporated the existing natural hazard mitigation elements from previous planning efforts. In addition, the 2024 Minnesota All-Hazard Mitigation Plan was consulted.

In the development of the Sherburne County HMP, U-Spatial consultants reviewed and incorporated a variety of planning documents that direct community development and influence land use decisions for the county and its jurisdictions. In addition, U-Spatial consultants worked closely with the Sherburne County emergency management director and other key county staff and local city officials to collect feedback on local mitigation capabilities and vulnerabilities that either support or hinder the ability to mitigate against natural hazards countywide and at the local level.

Building codes offer a way to incorporate geographically relevant and best available building science with policies and programs. Sherburne County adopts and enforces the Minnesota State Building Code for the unincorporated areas under its jurisdiction. The Planning & Zoning Department is the primary authority for building safety and code compliance. All cities participating in this Update—Baldwin, Becker, Big Lake, Clear Lake, Elk River, Princeton, St. Cloud, and Zimmerman—also adopt and enforce the State Building Code. For more information, see Appendix C, Question 7: Building Codes.

The following is a summary of the assessment tools used to gather information on local capabilities and vulnerabilities during the planning process:

Capabilities Assessment (*hazard-specific*): In this assessment, detailed information was collected from Sherburne County on current plans and programs in place (i.e., existing programs, plans, or policies) as well as program gaps or deficiencies that currently exist to mitigate against damages caused by each natural hazard addressed in the plan. Section 4 identifies current gaps and deficiencies for mitigation, and Section 5.1 describes the capabilities that Sherburne County has to support mitigation.

Local Mitigation Surveys: As part of Sherburne County's 2026 HMP update, participating jurisdictions, key county personnel, and additional agency stakeholders were asked to fill out a Local Mitigation Survey (LMS) form. Questions in the LMS form addressed the following:

- Hazard Identification, Risk Assessment & Vulnerability Analysis
- Local Mitigation Capabilities Assessment
- Local Mitigation Projects
- Survey Participants

The purpose of the survey was to gather jurisdictionally specific information needed to support the update of the plan and to help inform development of local-level mitigation actions for the next five-year planning cycle (for the full Sherburne County LMS report, see Appendix C).

2.3 Planning Process Timeline and Steps

To update the 2020 Sherburne County HMP, U-Spatial consultants worked in coordination with Sherburne County Emergency Management and members of the planning team. The updated plan

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includes new data documenting the types of hazards faced by Sherburne County residents and emergency planning officials as well as new thinking on how to address these hazards.

2.3.1 Stakeholder Coordination and Public Outreach

Two planning team meetings took place via Zoom video conference hosted by U-Spatial. Meeting participants included representatives from Sherburne County, city and township governments, neighboring jurisdictions, and other key stakeholders. Appendix F provides documentation of stakeholder outreach and participation in the plan update.

Survey forms to acquire mitigation ideas and feedback remain available on the HMP website

To provide the opportunity for public input, Sherburne County issued two news releases announcing the plan update and inviting public review and feedback on the draft plan. The news release provided information on where to view the plan and submit comments. The Sherburne County HMP website, hosted by U-Spatial, and the feedback and mitigation action ideas survey will remain available through the five-year planning period to foster public engagement. Table 2 documents dates of Hazard Mitigation update meetings and public outreach. Appendix G provides documentation of the public outreach for feedback on the draft plan by Sherburne County and jurisdictions.

Table 2. Sherburne County hazard mitigation update meetings and public outreach

Event	Date	Appendix
Kickoff Webinar	01/27/2026	Appendix F, Planning Team Meetings
News Release #1	02/03/2026	Appendix G, Public Outreach & Engagement Documentation
Planning Team Meeting #1	04/02/2026	Appendix F, Planning Team Meetings
Planning Team Meeting #2	09/30/2026	Appendix F, Planning Team Meetings
News Release #2	11/02/2026	Appendix G, Public Outreach & Engagement Documentation
Public Review Start	11/02/2026	Appendix G, Public Outreach & Engagement Documentation
Public Review End	11/15/2026	Appendix G, Public Outreach & Engagement Documentation

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At the close of the public outreach period, the U-Spatial consultants worked with the Sherburne County Emergency Manager and planning team to incorporate public feedback into the HMP.

For more information on the planning process, see Sections 5 and 6.

2.3.2 Overview of Jurisdictional Participation

Throughout the planning process, Sherburne County and the U-Spatial team worked to engage representatives from the county and each city in the update of the plan. Key activities for jurisdictions included assisting with public outreach, participating in planning team meetings, providing local-level information, and reviewing and providing feedback to the plan update.

U-Spatial and Sherburne County actively used the following methods to engage jurisdictions in the HMP plan update process:

- **Zoom Video Conferencing**: Planning team meetings were conducted via Zoom video conferencing hosted by U-Spatial. Virtual meetings proved to be a beneficial addition to the planning process, resulting in a high turnout from jurisdictional representatives and other stakeholders, as well as providing the ability for presenters to collect, respond to, and document feedback from participants through Zoom functions such as surveys, chat, and Q&A.
- **Email Correspondence**: Email was a primary tool used to communicate with representatives from Sherburne County, municipal governments, and other stakeholders. Emails were used to distribute news releases for public outreach, to invite participation in meetings and to share meeting summaries, as well as to request local information and final review of the draft plan. Email proved to be an effective tool that resulted in increased jurisdictional participation and collection of locally specific information.
- **Surveys, forms, and polls:** Input tools such as surveys, forms, and tools were used throughout the process to efficiently collect information in a format that could directly be fed into the written hazard mitigation plan. Polls were used to elicit feedback during the planning team meetings. The Local Mitigation Survey (LMS) was used to ensure feedback from every jurisdiction for critical input such as building code use, NFIP adoption, and changes in vulnerabilities. Feedback forms were posted on the website for easy access during the plan review.
- **Phone Calls**: Phone calls were frequently used to conduct direct outreach or follow-up to jurisdictions to ensure participation or to collect information via one-on-one interviews. Phone calls proved to be an effective tool that resulted in increased jurisdictional participation and collection of quality information. Phone calls were especially useful in engaging very small communities that had limited staff or technological capabilities.

Cities participating in Sherburne County HMP update varied by population and associated government resources to participate in the planning process (e.g., personnel, time, and technology). Rural communities with smaller populations (under 500) typically had part-time elected officials, limited-to-no city staff, and reduced city hall hours in which to conduct business. Sherburne County and U-Spatial were sensitive to these local challenges and worked to help these local governments to participate using the methods that worked best to accommodate them, such as phone interviews to complete local mitigation survey forms (see Appendix C).

Table 3 provides an overview of each city's participation in the Sherburne County HMP update planning process and a reference to supporting documentation.

Table 3. Jurisdictional participation in the planning process

Jurisdiction (2025 Est. Population, Esri)	News Release #1	Planning Team Mtg #1	Local Mitigation Survey	Mitigation Action Charts	Planning Team Mtg.#2	News Release #2 & Plan Review
Supporting Documentation	App. G	App. F	App. C	Sec. 5.3 App. H	App. F	App. G
Sherburne County (100,756)	X	X	X			
City of Baldwin (7,027)	X	X	X			
City of Becker (5,117)	X	X	X			
City of Big Lake (12,437)	X	X	X			
City of Clear Lake (656)	X		X			

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Jurisdiction (2025 Est. Population, Esri)	News Release #1	Planning Team Mtg #1	Local Mitigation Survey	Mitigation Action Charts	Planning Team Mtg.#2	News Release #2 & Plan Review
Supporting Documentation	App. G	App. F	App. C	Sec. 5.3 App. H	App. F	App. G
City of Elk River (27,143)	X	X	X			
City of Princeton (5,134)*	X	X	X			
City of Saint Cloud (70,612)*	X	X	X			
City of Zimmerman (6,834)	X	X	X			
Anoka County (Neighboring jurisdiction)						
Benton County (Neighboring jurisdiction)						
Hennepin County (Neighboring jurisdiction)						
Isanti County (Neighboring jurisdiction)						
Mille Lacs County (Neighboring jurisdiction)						
Stearns County (Neighboring jurisdiction)						
Wright County (Neighboring jurisdiction)						

*Population estimate includes area that is not within the county.

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Section 3 – Risk Assessment and Vulnerability Analysis

The goal of mitigation is to reduce or eliminate the future impacts of a hazard, including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation practices must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.

The risk assessments in this plan are based on widely accepted tools and databases, consultation with hazard mitigation planning expertise at FEMA and HSEM, and technical guidance from the MN DNR State Climatology Office. Geographic Information System (GIS) tools are used throughout to demonstrate geographically based risk and vulnerabilities.

3.1 Natural Hazard Identification

This assessment identifies the characteristics of natural hazard events, the severity of the risk, the likelihood of these events occurring, and the vulnerability of each jurisdiction's population and assets.

The cornerstone of risk assessment is identifying the hazards that affect jurisdictions. Listed below are the natural hazards addressed in the 2024 Minnesota State Hazard Mitigation Plan:

Flooding
Dam/Levee Failure
Wildfires
Windstorms
Tornadoes
Hail
Lightning
Winter Storms
Landslides (Erosion and Mudslides)
Land Subsidence (Sinkholes and Karst)
Drought
Extreme Heat
Extreme Cold
Earthquakes
Coastal Erosion & Flooding

3.1.1 Hazard Prioritization

As part of the plan update process, the planning team reviewed, updated, and prioritized the hazards faced by residents of Sherburne County, updated the existing mitigation actions published in the 2020 HMP, and proposed new mitigation actions.

The team examined the hazards identified in the 2020 Sherburne County HMP and adjusted them to reflect the definitions of natural hazards used in the 2024 Minnesota State Hazard Mitigation Plan.

While this HMP focuses on natural hazards, planning took place with the understanding that many non-natural hazards could occur due to natural disasters (e.g., disruption in electrical service due to downed powerlines from heavy snow, ice storms, or high wind events).

The prioritization of hazards for the Sherburne County HMP Update (Table 4) was based upon group review and discussion of the natural hazards that pose risk to the county during the HMP Planning Team Meeting #1. In the review of each hazard, the group was asked to consider if the risk to severe natural hazards had increased or decreased since the last plan, and if this affected their priority level to mitigate against that hazard. Appendix F provides the discussion notes from the meeting.

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Table 4. Prioritization of hazards for 2026 Sherburne County HMP Update

Natural Hazards Addressed in the Last Plan	Current Priority
Windstorms	High
Tornadoes	High
Flooding	High
Winter Storms	High
Hail/Hailstorms	High
Extreme Cold	Moderate
Extreme Heat	Moderate
Drought	Moderate
Wildfire	Moderate
Lightning	Moderate
Land Subsidence	Low
Landslides	Low
Dam/Levee Failure	Low

3.1.2 FEMA- and Minnesota-Declared Disasters and Assistance

Another historical perspective is derived from FEMA-declared disasters and emergencies. The Stafford Act provides for two types of disaster declarations: emergency declarations and major disaster declarations (Robert T. Stafford Disaster Relief and Emergency Assistance Act, 1974). Between 1957 and August 2026, Sherburne County was included in ten federal disaster declarations; see details on the Sherburne County HMP website.

Minnesota Statutes Chapter 12A established a framework for state agencies to help communities recover from disaster. In 2014, Governor Mark Dayton signed legislation establishing the state's Disaster Assistance Contingency Account to assist local communities after a natural disaster when federal aid is not available. Damage required to declare a disaster is half the threshold of the federal/FEMA public assistance (only) program threshold (MN HSEM, 2019). Sherburne County has not been included in any State Disaster Declarations.

The Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) program, and the former Building Resilient Infrastructure and Communities (BRIC) program are FEMA-administered hazard mitigation assistance programs that provide funding for eligible mitigation planning and projects that reduce disaster losses and protect life and property from future disaster damages (FEMA, 2021). Table 5 lists the projects in the county funded by a hazard mitigation assistance program.

Table 5. Historical hazard mitigation funding awarded in Sherburne County

DR#	Fiscal Year	Subrecipient	Project Type	Project Cost	Federal Share
N/A	2017	MN HSEM	91.5: Local Multijurisdictional Multihazard Mitigation Plan - UPDATE	$378,000	$283,500
N/A	2011	Sherburne County	91.1: Local Multihazard Mitigation Plan	$109,900	N/A
1921	2010	Sherburne County	91.1: Local Multihazard Mitigation Plan	$57,999	$43,499

Source: (FEMA, 2026)

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3.2 Community Vulnerability

The degree to which a person is vulnerable to the impacts of a hazard depends on how well they can react before, during, and after a hazardous event. The Centers for Disease Control and Prevention (CDC) Agency for Toxic Substances & Disease Registry (ATSDR) defines social vulnerability as "…the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks" (ATSDR, 2020). Exacerbating these stressors are the increasing number of extreme weather events attributed to Minnesota's changing climate (MPCA, 2018).

The ATSDR created the CDC Social Vulnerability Index (SVI) to help identify vulnerable communities that need support in preparing for hazards or recovering from disaster. The CDC SVI is created at the census tract level using American Community Survey (ACS) five-year data.

The SVI is included in the FEMA National Risk Index (NRI) and presented in the Risk and Vulnerability dashboard on the webpage for each hazard. Additionally, summaries of at-risk populations in each jurisdiction are available on the county profile page. Vulnerable attributes of a population are addressed with each natural hazard.

The Risk and Vulnerability dashboard for each hazard also includes the FEMA Community Resilience Challenges Index (CRCI). The CRCI is a composite index of 22 community resilience indicators, including population and household characteristics, housing, healthcare, economic factors, and connection to community. The index value provides a relative composite value by census tract and is designed for emergency managers to target outreach strategies and understand the resilience challenges community members face (FEMA, 2024a).

Explore population vulnerability on the Sherburne County HMP Website

3.3 Climate Change

Minnesota's climate change summary is informed primarily by the Midwest Chapter of the Fifth National Climate Assessment (NCA5) dated November 2023 and with interpretations from the MN DNR State Climatology Office (Wilson et al., 2023).

Rising global temperatures and the resulting increases in atmospheric moisture from evaporation of ocean waters have allowed Minnesota to become warmer, wetter, and more humid during the past several decades. The ten combined warmest and wettest years between 1895 and 2022 all occurred since 1998. Nights have warmed faster than days since 1970, and winter has warmed several times faster than summer. Even with the drought conditions of the early 2020s in Minnesota, heavy precipitation continues to show long-term increases, with damaging rain and snowfall events reported somewhere in the state each year of the decade through 2023. Despite no increase in the highest temperatures of summer, maximum annual heat index values (one measure of how hot it feels) have been rising across the state because of increased humidity during heat waves.

Even though periods of intense growing-season drought have defined the climate of the early 2020s in much of Minnesota, long-term increases in annual precipitation have continued because of heavy and even record-setting precipitation during the cold season. For instance, record-dry conditions

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during May through mid-August of 2021 led to parts of northwestern and northern Minnesota reaching "Exceptional Drought"—the worst category on the US Drought Monitor. A shift to a stormy pattern during the following winter and spring, however, produced unprecedented precipitation between December in May in the exact same areas, with historic flooding along the Rainy River.

The observed changes in our climate have altered growing seasons, damaged forests, challenged natural resource management, limited recreational opportunities, destroyed infrastructure, and affected the conditions of lakes, rivers, wetlands, and groundwater aquifers that provide water for drinking and agriculture. Climate models project that temperature and precipitation increases will continue in Minnesota through the 21st century, with hotter summers and increased drought severity during dry periods as well.

To help the public understand how the changing climate has affected and is expected to affect the behavior of common weather hazards in Minnesota, the MN DNR State Climatology Office developed graphical summaries of the scientific confidence associated with each hazard's relationship to climate change (Table 6 and Table 7). Climate change in Minnesota has by far the strongest associations with (1) sharp declines in the frequency and severity of extreme cold outbreaks, tied to a persistent warming of winters, and (2) sharp increases in the frequency and intensity of extreme precipitation events. For instance, from 1970 through 2023, Minnesota's winters warmed at a rate of almost one degree F per decade, and approximately three-four times faster than summer. During that same period, the coldest night of the year has warmed almost twice as fast as winter as a whole—up to two degrees F per decade (or 20 degrees F per century).

Despite major losses to cold extremes, the warming climate and increased abundance of atmospheric moisture has led to an uptick in many heavy snowfall metrics across Minnesota, leading to moderately high confidence that the changing climate is increasing heavy snowfall events—even as other winter characteristics decline. The intensity and frequency of tornadoes and severe convective storms are weakly connected at best to recent climate changes, and since the 1950s, despite superior detection and verification capabilities, the number of damaging tornadoes rated at least F-2 or EF-2 in Minnesota has shown no increases. Dramatic changes in the seasonal and geographical ranges of severe convective weather have, on the other hand, already affected Minnesota. In 2021, a damaging tornado crossed the Boundary Waters into Canada, becoming the latest on record so far north in the state. Then, on December 15th, an outbreak of destructive thunderstorm winds and over 20 tornadoes struck the southeastern parts of the state, producing the latest tornadoes on record by 29 days.

The climatic picture is expected to change further beyond the 2020s and especially as Minnesota approaches the middle of the 21st century (Table 7). Dramatic losses in extreme cold and additional increases in heavy and extreme precipitation are expected to remain the state's leading climate change symptoms. Although Minnesota has not yet observed increases in the frequency, severity, or duration of summertime high temperatures or drought (through 2023), climate model projections summarized in NCA5 indicate that heat waves are all but certain to increase by mid-century. A 2018 study conducted by NOAA scientists indicates that by the 2050s, heat waves in Minnesota will be more attributable to climate change than to natural variability (Lopez et al., 2018).

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Table 6. Confidence that climate change has already impacted common Minnesota weather/climate hazards

Confidence	Hazard	Recent & Current Observations
Highest	Extreme cold	Rapid decline in severity & frequency
	Extreme rainfall and heavy snowfall	Becoming larger and more frequent
Moderately High	Humid heat waves	Some increase in maximum dew point and Heat Index values since 1980
Moderately Low	Tornadoes, hail, thunderstorm winds	Intensity and frequency unchanged, but seasons expanding aggressively
Low	Drought and dry spells	Intense & major episodes in early 2020s but no long-term trend
Lowest	Summer high temperature extremes	Highest temperatures still well within historical ranges, and number of hot days increasing only slightly in isolated locations

Source: (Blumenfeld, K. Minnesota State Climatology Office, personal communication, December 21, 2023)

Table 7. Confidence that climate change will impact common Minnesota weather/climate hazards through 2070

Confidence	Hazard	Expectations through 2070
Highest	Extreme cold	Continued rapid decrease in severity and frequency
	Extreme rainfall	Unprecedented events more common
High	Heat waves	Summer high temperatures, maximum dew point and heat index values all projected to increase
Moderately High	Drought	Increased severity likely as summer heat increases; frequency and duration projections unclear
Moderately Low	Heavy snowfall	Greater extremes, but events less frequent as winter rain increases
	Tornadoes, hail, thunderstorm winds	Intensity and frequency unclear but continued seasonal expansion and larger “outbreaks” possible

Source: (Blumenfeld, K. Minnesota State Climatology Office, personal communication, December 21, 2023)

3.3.1 Climate Change Impacts and Resilience Planning

The NCA5 states that even if the world decarbonizes rapidly, the Nation will continue to face climate impacts and risks. Adequately and equitably addressing these risks involves longer-term inclusive planning, investments in transformative adaptation, and mitigation approaches that consider equity and justice. In the Midwest, rising temperatures, extreme precipitation, drought, and other climate-

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related events are impacting agriculture, ecosystems, cultural practices, health, infrastructure, and waterways. Communities, Indigenous Peoples, governments, and businesses are embracing adaptation approaches that include climate-smart agriculture, improved landscape management, innovative green infrastructure financing, and collaborative decision-making.

NCA5 includes these key messages for the Midwest region (Chapter 24: Midwest):

- Changes in precipitation extremes, timing of snowmelt, and early-spring rainfall are expected to pose greater challenges for crop and animal agriculture, including increased pest and disease transmission, muddier pastures, and further degradation of water quality. Climate-smart agriculture and other adaptation techniques provide a potential path toward environmental and economic sustainability.
- Increasing incidence of flooding and drought is expected to further alter aquatic ecosystems, while terrestrial ecosystems are being reshaped by rising temperatures and decreasing snow and ice cover. In response, communities are adapting their cultural practices and the ways they manage the landscape, preserving and protecting ecosystems and the services they provide.
- Climate change has wide-ranging effects on lives and livelihoods. Mitigation and adaptation strategies, such as expanded use of green infrastructure, heat-health early warning systems, and improved stormwater management systems, when developed in collaboration with affected communities, have the potential to improve individual and community health.
- Increases in temperatures and extreme precipitation events are already challenging aging infrastructure and are expected to impair surface transportation, water navigation, and the electrical grid. Shifts in the timing and intensity of rainfall are expected to disrupt transportation along major rivers and increase chronic flooding. Green infrastructure and public and private investments may mitigate losses, provide relief from heat, and offer other ways to adapt the built environment to a changing climate.
- Climate-related changes to water quantity and quality are increasing the risks to ecosystem health, adequate food production, surface water and groundwater uses, and recreation (high confidence). Projected increases in droughts, floods, and runoff events across the Mississippi River basin and the Great Lakes will adversely impact ecosystems through increased erosion, harmful algal blooms, and expansion of invasive species.

Key messages from the NCA5 are indicated in green throughout this document.

3.3.2 Health Impacts of Climate Change in Minnesota

Climate change already impacts our health, and these impacts are expected to worsen in the years ahead. The risks are especially high for Minnesotans who are less able to cope due to their age, income, housing insecurity, preexisting health conditions, and more.

Heat, air pollution (including wildfire smoke and allergens like pollen), extreme precipitation, floods, droughts, and ecosystem changes are all “climate hazards” that impact our health. Some of these climate hazards have a direct effect, like a heat-related illness from a heatwave, while some have an indirect impact, like exacerbation of asthma from mold growth in a flooded basement.

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Heat

Minnesotans will experience a wide range of impacts from the increased frequency and severity of extreme heat events. Higher heat, increased humidity, and longer and more frequent extreme heat events can lead to direct health impacts of dehydration and heatstroke. Untreated heat stroke can lead to death. Heat-related illness directly accounted for 75 deaths in Minnesota from 2000–2022.

Heat can also worsen existing health conditions, such as respiratory and cardiovascular diseases. The people most at risk include those who are more exposed and those who may be more susceptible due to physiological reasons. People more likely to be exposed to heat include outdoor workers in agriculture and construction, student athletes, people who live in cities (due to the heat island effect), people without air conditioning, and unhoused persons.

People at higher risk because of physiological reasons include those with underlying medical conditions, pregnant people, older adults, infants, and young children.

Just as one example of the devastating effects of heat, in the summer of 2011, Minnesota had six days when the heat index was 105 degrees F or higher—and that same summer there were 1,302 emergency department visits and 3 deaths due to heat. What makes these numbers tragic is that heat-related illnesses are preventable.

Air Pollution

In general, we breathe clean air in Minnesota, according to federal standards. But on some days and in some locations, air is unhealthy due to ozone or fine particulate matter. Greenhouse gas emissions can increase air pollution, and rising temperatures can also affect the formation and release of pollutants. Unhealthy air days are expected to become more frequent, and more intense due to climate change.

Climate change is likely to increase three main air contaminants in Minnesota: ozone, particulate matter (including wildfire smoke), and allergens. These air pollutants can cause or exacerbate cardiovascular and respiratory diseases, chronic obstructive pulmonary disease (COPD), allergies, and asthma.

Pollen is intensifying with climate change, and can trigger allergies, asthma attacks, and affect other respiratory conditions. In Minnesota, asthma affects one in 16 children (6.4%) and one in 13 adults (7.4%). People with asthma need to be especially aware of pollen sources and seasons to prevent an allergy-related asthma attack.

There are three pollen seasons in Minnesota: trees, grasses, and weeds. Trees are the first to release pollen, typically starting in early April, grasses usually ramp up pollen release in early June, and weeds typically begin releasing pollen in mid-June and continue until the first hard frost. Research shows that the growing season for ragweed pollen, which is highly allergenic, has increased by 15 to 25 days in and around Minnesota. The lengthening pollen season is strongly related to climate change characteristics, such as lengthening of the frost-free season and later timing of the first fall frost.

Indirect health effects from air pollution can include reduced visibility on a high smog day, reduced productivity at work or school due to allergies or asthma, and reduced productivity and degradation of crops and water sources, which can lead to economic burdens.

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Those most at risk include:

- Children, because they have developing lungs, are outside more, and they play vigorously and inhale more air per pound of body weight compared to adults.
- Adults over 60, because their bodies are aging.
- People with chronic respiratory or cardiovascular disease because they are more susceptible to air pollution.
- Individuals living near other sources of air pollution (such as roadways, freeways, and heavy industry), because they are chronically exposed to air pollution.
- People of color, because they are more likely to be exposed to more air pollution and have a disproportionate burden of heart and lung diseases, which may increase susceptibility.

Extreme Precipitation, Floods, Drought

Rain is falling more frequently in extreme, heavy, localized events, leading to some parts of our state experiencing flooding while other areas experience drought.

Increased frequency and severity of heavy rainfalls can lead to flooding, which results in both direct and indirect health impacts like:

- Injury or even death from drowning.
- Illnesses from being exposed to contaminated drinking water or recreational sources.
- Mental health stress from experiencing the trauma of the event or later from being displaced or dealing with damaged homes and business.
- Respiratory ailments from exposure to mold from flooded basements.
- Carbon monoxide poisoning from exposure to carbon monoxide when using secondary power sources, like generators.
- Flooding can also disrupt economic and social networks and put a strain on essential services.

The people most at risk are Minnesotans who are more likely to be exposed to flood waters, like those who live in a flood plain or near water bodies, or people who cannot easily evacuate or recover from flooding destruction, such as people who do not have reliable transportation, people who can't use the stairs when elevators are out of service, people in wheelchairs, people with disabilities, older adults, and lower income people.

Heavy rain events can cause standing water in backyards or basements. Many homeowners have experienced wet basements, which is mentally and financially stressful, and if mold starts to grow that can become a health problem.

Localized flash flooding can also be a problem where our infrastructure is undersized, and people get caught off guard by flooded roads. This is an important public health safety concern as almost half of flash flood fatalities occur in vehicles. It takes as little as six inches of fast-moving water to knock over and carry away an adult, and as little as 12 inches can carry away a small car.

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Another public health concern with precipitation changes exacerbated by climate change is waterborne disease outbreaks. Heavy downpours can lead to a host of problems, including increased runoff and sewage overflows, which can cause outbreaks of waterborne diseases such as E. coli and Cryptosporidium. Runoff can carry viruses and other disease-causing agents into wells and recreational waters, contaminating them and causing health problems.

Zoonotic Diseases

Zoonotic diseases or zoonoses are caused by germs like viruses, bacteria, parasites, and fungi that spread between animals and people. Increases in temperatures and changes in rain patterns are changing our ecosystems, which can affect the spread of diseases carried by insects, ticks, rodents, birds, and other animals.

Diseases from ticks include Lyme disease, Anaplasmosis, and Babesiosis. As temperatures increase, disease-transmitting ticks will become active sooner and stay active longer, allowing more time to develop and feed on hosts. Ticks thrive in warm humid environments.

Additionally, there may be a decreased die off over the winter months if temperatures do not get very cold. An increase in winter temperatures can also lead to new tick species moving into and surviving in Minnesota, which can lead to the introduction of new diseases.

People more at risk for diseases carried by insects, ticks, and rodents are people who spend more time outdoors or are more exposed to these pests.

Harmful Algal Blooms

An increase in water temperatures can lead to blue-green algal blooms, which contain toxins that can pose harmful health risks. People or pets who drink or swim in water with dangerous levels of harmful algal bloom (HAB) contamination may experience stomach illness, skin irritation, allergic responses, and damage to the liver and nervous system. In extreme cases, dogs and other animals have died after drinking water containing these toxins.

Harmful algal blooms in Minnesota lakes result from several factors including runoff from fertilizers, discharges from waste treatment plants, warmer waters, and higher temperatures. While HABs can occur naturally, the frequency of outbreaks is increasing in part because human activities create favorable conditions for the blooms.

Zoonotic diseases and HABs can have an indirect health effect when they threaten the livelihoods of people who work in recreation-dependent economies that revolve around camping, fishing, and hunting.

Mental Health

Climate change threatens our mental health through direct exposure to a climate-related disaster (e.g., flooding); through the disruption to a major determinant of health, such as a loss of livelihood or a cultural tradition; and through awareness or uncertainty of climate change as an existential threat. These experiences may overlap and lead to compounded impacts on an individual or even an entire community, such as family farmers burdened with decadal drought who are more likely to commit suicide.

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Existing research has associated several mental health conditions with climate change, such as psychological distress, grief reactions, depression, post-traumatic stress disorder, interpersonal conflicts, drug or alcohol abuse, loss of identity, and suicidal ideation.

Vulnerable populations such as children, the elderly, communities of color, and other marginalized communities are most at risk of climate change-related mental health impacts.

3.3.3 Climate Change Adaptation

Climate change adaptation is important for increasing the resilience of communities and the environment. The shocks caused by more extreme weather events and the stressors of longer-term changes to the climate affect all natural systems. For human communities, these impacts challenge the surroundings in which they live, the critically important ecosystem services upon which they depend, public health, local facilities and infrastructure, the safety of their residences, and the viability of their livelihoods. Development trends can further exacerbate both climate impacts and population vulnerability. Communities are only as resilient as the most vulnerable within them.

3.3.4 Climate Change Data and Tools in Minnesota

The Minnesota Climate Adaptation Partnership (MCAP), a program affiliated with both University of Minnesota Extension and the College of Food, Agricultural and Natural Resource Sciences, brings together federal and state agencies, organizations, and individuals statewide with an interest in climate adaptation. MCAP received funding after the 2021 legislative session to develop high-resolution (2.6 mile/4km grid) dynamically downscaled climate projections utilizing the University of Minnesota's Supercomputing Institute. This data is being made publicly accessible via the new Minnesota CliMAT—Climate Mapping and Analysis Tool. This interactive online tool provides highly localized climate projections for Minnesota. MN CliMAT is based on data from the latest generation of global climate models, called CMIP6. With the dynamically downscaled climate projection data, users can visualize even how small cities will likely be impacted in the coming decades (Liess, S. et al., 2023).

More resources are available on the climate change page of the Sherburne County website

3.4 Jurisdictional Change in Risk or Vulnerability Assessment

Jurisdictions in Sherburne County have varying vulnerabilities to and concerns about impacts to their communities. Interviews with jurisdictional representatives in addition to the Local Mitigation Survey resulted in some specific concerns (see Appendix C). Participants were asked to provide feedback on how their community's vulnerability to natural hazards had either increased (due to changes such as development) or decreased (due to local mitigation efforts) over the past five years.

At the local jurisdictional level, several communities did note an increase in development over the last five years as a factor for an increase in vulnerability to severe weather or disaster events.

3.4.1 Jurisdictional Responses

As part of the Local Mitigation Survey form, Sherburne County Emergency Management and each city jurisdiction were asked to provide a vulnerability assessment that described what structures,

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systems, populations, or other community assets were susceptible to damage and loss from specific hazard events. This information was used to help tie local vulnerability back to the exposure of people, buildings, infrastructure, and the environment to the natural hazards listed in Table 4 and to assist local governments in development of related local mitigation actions to reduce risk.

The following is a compilation of common responses taken directly from jurisdictional representatives as preserved in Appendix C: Question 2 – Local Vulnerabilities. Responses here are edited only for clarity.

Sherburne County

Windstorms, Winter Storms: Overhead powerlines across the county are vulnerable to physical failure when exposed to straight-line severe winds, heavy snow, and ice storms.

Windstorms, Tornadoes: There are areas throughout Sherburne County without viable storm shelters or tornado safe rooms where there are populations vulnerable to high wind and storm events, such as mobile home parks and campgrounds. A coordinated approach is needed to identify where storm shelters or tornado safe rooms are needed and to evaluate whether new construction or a retrofit of facilities is possible. Finding funding for the implementation of such construction projects is a barrier.

Wildfire: Sherburne County is experiencing notable residential growth that directly expands its Wildland-Urban Interface (WUI)—the transition zone where housing developments meet undeveloped wildland and forest vegetation.

City of Baldwin

Wildfire: Baldwin faces a distinct vulnerability to spring and autumn wildfires. Because many homes are built directly into wooded areas or border large prairie plots, structural vulnerability is high if defensible space is not maintained. Development in these Wildland-Urban Interface areas is an ongoing risk as brush or woodland fires can quickly spread to homes and outbuildings.

Windstorms, Ice Storms: The city of Baldwin is regularly exposed to high-velocity straight-line winds and severe summer thunderstorms as well as heavy ice storms in winter that jeopardize local overhead power lines.

City of Becker

Windstorms, Tornadoes: We have an outdated warning siren. The city is transitioning from the outdated county-operated outdoor warning sirens to a more modern alert system.

City of Big Lake

High Winds, Tornadoes: We have one mobile home park and there is a small shelter. We also have a larger development that was built without basements.

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City of Clear Lake

Windstorms, Ice Storms: The city of Clear Lake is regularly exposed to high-velocity straight-line winds and severe summer thunderstorms as well as heavy ice storms in winter that jeopardize local overhead power lines.

Wildfire: Clear Lake is surrounded by agricultural plots and pockets of dry brush. During periods of seasonal drought, high prairie winds can drive rapid brush fires that threaten outer property lines and outbuildings.

Flooding: Localized flash-flooding downpours can temporarily overwhelm municipal culverts and storm sewers.

City of Elk River

Flooding: The city of Elk River's primary flood vulnerability stems from its positioning near the confluence of the Elk River and the Mississippi River. Neighborhoods adjacent to the riverbanks and low-lying zones near the Bailey Point Nature Reserve face recurring threats during heavy spring snowmelts and severe rainfall. Major rising-water events have required localized sandbagging, property evacuations, and defensive barriers to protect dozens of high-risk homes located directly on the floodplains. Around 13% of localized properties maintain active flood vulnerability.

Windstorms: The city has experienced downed powerlines and damaged trees due to severe thunderstorm and windstorm events.

Wildfire: The city has substantial tracts of oak savanna, pine groupings, and flammable brushland interwoven with suburban housing. Development in these Wildland-Urban Interface areas is an ongoing risk as brush or woodland fires can quickly spread to homes and outbuildings.

City of Princeton

Flooding: The city's Waste Water Treatment Plant is susceptible to flooding during high water events

City of St. Cloud

All Hazards: We have a growing population of non-English speaking residents. This poses a challenge when issuing emergency notifications. Not all residents are signed up for the emergency notification systems provided by Stearns, Benton, or Sherburne counties.

Extreme Heat/Cold: We do not have a designated facility or plan in place for emergency sheltering in the event of extreme heat or cold temperatures.

City of Zimmerman

Severe Winter and Summer Storms: Our City Hall does not have backup power; it needs a generator.

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3.4.2 Future Development

Because Sherburne County is vulnerable to a variety of natural hazards, the county government—in partnership with the state government—must make a commitment to prepare for the management of these events. Sherburne County is committed to ensuring that county elected and appointed officials become informed leaders regarding community hazards so that they are better prepared to set and direct policies for emergency management and county response.

As part of the vulnerability assessment conducted for the Sherburne County HMP update, jurisdictions were asked to describe if there were any factors related to population growth, zoning, or development they felt have increased their community's vulnerability to future severe weather or disaster events. The following is a compilation of responses taken directly from jurisdictional representatives as preserved in Appendix C: Question 4 – Increase in Vulnerability. Responses here are edited only for clarity.

Sherburne County

Sherburne County's population has grown approximately 7% since 2019. Sherburne County is experiencing notable residential growth that directly expands into the Wildland-Urban Interface (WUI), thereby increasing the wildfire risk to new properties. As one of the fastest-growing counties in Minnesota, the convergence of housing demand, outward suburban expansion, and proximity to major natural areas—such as the Sherburne National Wildlife Refuge and extensive pine stands—has accelerated this intersection.

City of Baldwin

The city of Baldwin has not had any new development or increase in vulnerability.

City of Becker

The city of Becker's population growth rate in the past five years has been around 1.1%. We are expected to grow at 2% from 2025 to 2030. Since 2019, the city has seen 213 new units of housing come into the community. This includes 109 new single-family dwellings (including twin homes, 4-plexs, and 6-plexs) and 104 multi-family dwelling units. From a planning and zoning perspective, we shifted to a unified development ordinance that was completed in 2025 that resulted in some reduced lot sizing leading to an increase in allowed density.

City of Big Lake

The city of Big Lake has held a steady 1% growth per year since 2019. We have experienced both commercial/industrial growth as well as residential. This has not increased the vulnerability of the city to natural hazards.

City of Clear Lake

Between 2019 and today the city of Clear Lake had a development project where over 60 new homes were constructed in the city, which has increased our population and potential for damage to new structures. Many homes have been built slab-on-grade, so residents do not have a basement for safety during high wind or tornado events. With an increase in population and construction of more homes, we have also witnessed more stormwater discharging to our stormwater system.

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City of Elk River

The city of Elk River's 2020 census population was 23,835 and the state demographer estimates the population in 2025 was 27,000. We have not changed zoning to a degree that impacts our vulnerability and our newer developments over the past five years are not near flood zones, waterways or hazardous/dangerous industry.

City of Princeton

The city of Princeton had a new high-density housing built within the last five years located south of 1st Street on the west side of the city with more planned. We also have a senior housing facility and multi-family dwellings planned on the west side of the city for 2027.

City of St. Cloud

The city of St. Cloud has not had any increase in vulnerability to natural hazards due to any new development or population growth in the last 5 years.

City of Zimmerman

The city of Zimmerman has approved 2 new residential developments that will include up to 80 slab construction dwellings, which will be susceptible to wind/tornado events. Fortunately, both are located within ½ mile of an existing outdoor warning siren, but sheltering remains a concern when no basements are provided.

In the development of local mitigation actions, all jurisdictions were encouraged to consider hazard mitigation strategies that would reduce risk in relation to future development, such as the update of local comprehensive plans, enforcement of ordinances, and incorporation of infrastructure improvements to reduce local vulnerabilities (see Appendix H).

The Sherburne County emergency management director will work to keep the jurisdictions covered by the HMP engaged and informed during the plan's cycle. By keeping jurisdictional leaders involved in the monitoring, evaluation, and update of the HMP, they will keep their local governments aware of the hazards that face their communities and how to mitigate those hazards through planning and project implementation.

Section 6 of this plan further outlines the process by which Sherburne County will address the maintenance of this plan, including monitoring, evaluation, and update of the plan, as well as implementation and continued public involvement.

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Section 4 – Hazards

As part of the risk assessment, each natural hazard that poses risk to the county was independently reviewed for its past hazard history, relationship to future trends, and jurisdictional vulnerability to future events. The county also conducted a capabilities assessment to review the plans and programs that are in place or lacking (program gaps or deficiencies) for implementing mitigation efforts, as related to each natural hazard. An assessment was also conducted for local jurisdictions to identify the plans, policies, programs, staff, and funding they have in place to incorporate mitigation into other planning mechanisms (see Section 5.1 and Appendix C).

Read more about natural hazard prioritization and view interactive information on all hazards

The following hazard profiles address hazards that the Sherburne County Planning Team deemed moderate to high risk. Hazards determined to be low risk or without substantive mitigation actions are not required to be included.

4.1 Flooding

Flooding is the most significant and costly natural hazard in Minnesota. Five of the ten federal disaster declarations in Sherburne County included flooding.

4.1.1 Probability of Occurrence

From 1997 through May 2026, the NCEI Storm Events Database has recorded six flood and flash flood events. Sherburne County has experienced one flash flood event once every 2.4 years and one riverine flood event every 4.9 years on average during this period.

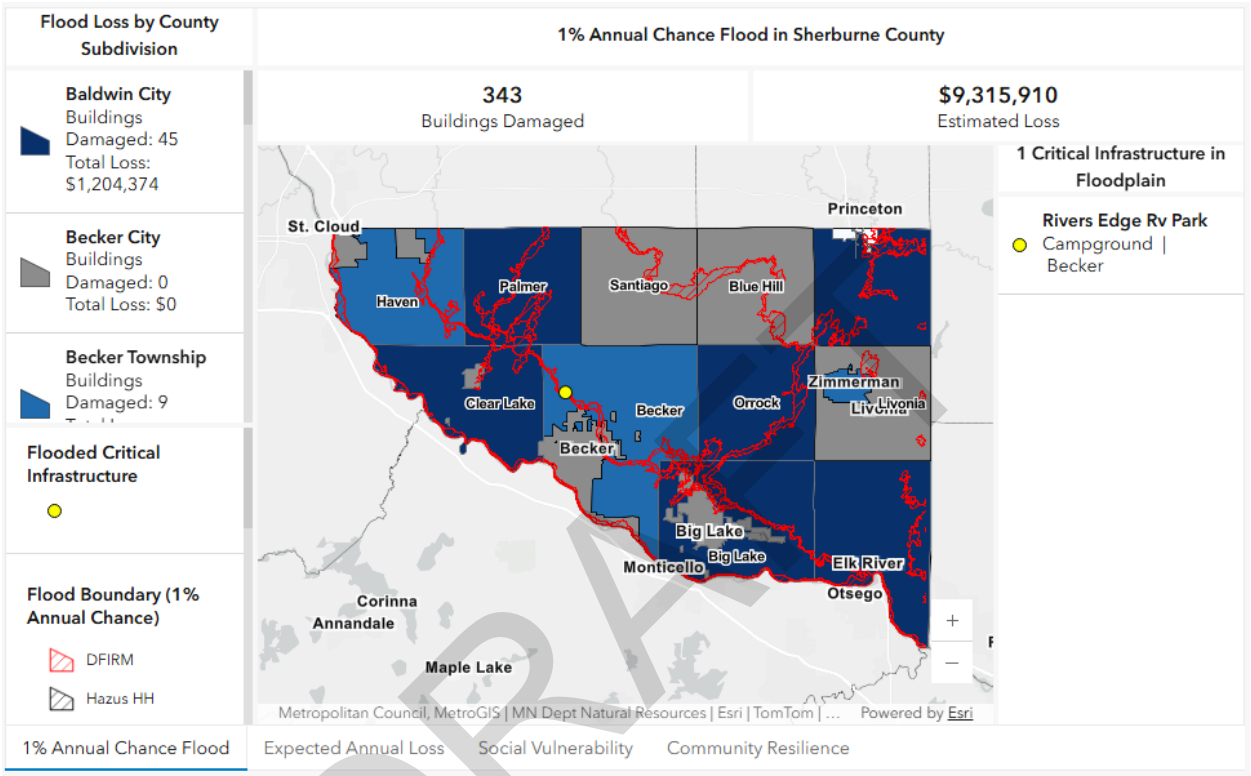
View interactive maps and see information about flooding history, risk, and vulnerability

Minnesota HSEM has encouraged a potential risk and economic loss analysis for a 1% annual chance flood using the FEMA tool, Hazus for ArcGIS. A potential risk and economic loss analysis for a 1% annual chance flood was conducted using Hazus, a nationally standardized risk modeling methodology. Digital Flood Insurance Rate Map (DFIRM) data was used to define the 1% annual chance flood boundary. Water depths within the 1% annual chance flood boundary were calculated by taking the difference between the elevation of the water surface and the elevation of the ground. To calculate the water surface elevation a combination of datasets were used. Base flood elevation (BFE) data was first assigned to the areas within the flood boundary where it was available, the water surface elevation had to be calculated for the remaining areas of the flood boundary. The method of calculating the water surface elevation varied by the data available. For this analysis, water surface elevations were calculated by interpolating three different datasets: the regulatory water surface elevation values of cross section lines (primary data), the elevation values of base flood elevation lines (secondary data), and for the remaining areas, the elevation at the flood boundary line.

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The elevation values in the water surface elevation raster layer (10m resolution) were then subtracted by the elevation values in a digital elevation model raster layer (10m resolution) to derive depth values. The resulting Hazus 1% annual chance floodplain is shown in the Flood Vulnerability dashboard on the Sherburne County HMP website (Figure 1), where it is available in an interactive form.

Figure 1. 1% Annual chance flood in Sherburne County



4.1.2 Vulnerability

Potential economic loss estimates were based on county-specific building data. U-Spatial requested Sherburne County parcel tax and spatial databases to include building valuations, occupancy class, square footage, year built, foundation type, and number of stories. Best practices were employed to use local data if provided. Assumptions were made to populate any missing (but required) values for the Hazus flood model loss estimation.

View at-risk populations in Sherburne County

Hazus reports the percent damage of each building in the floodplain, defined by the centroid of each building footprint. After formatting the tax and spatial data, 50,987 points were input to Hazus to represent buildings with a total estimated building plus contents value of $88 million. Approximately 90% of the buildings (and 72% of the building value) are associated with residential housing.

The estimated loss by occupancy class for the entire county is shown in Table 8.

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Table 8. Summary of 1% annual chance flood loss estimation by occupancy class

General Occupancy	County Total Buildings	County Building and Contents Value	Floodplain Total Buildings	Floodplain Building + Contents Value	Buildings with damage	Building + Contents Loss
Residential	45,978	$13,646,674,622	391	$76,653,900	330	$6,459,362
Commercial	1,160	$2,169,194,370	3	$10,800	3	$1,056
Other	3,849	$3,141,193,426	17	$11,373,200	10	$2,855,492
Totals	50,987	$18,957,062,418	411	$88,037,900	343	$9,315,910

Source: (FEMA, 2026c)

The distinction between building attributes within a parcel was not known, so the maximum percent damage to a building in that parcel was used to calculate loss estimates for the entire parcel. The sum of all the losses in each census block were aggregated to visualize the loss (see flood risk map on the HMP website). Please note: It is possible for a building location to report no loss even if it is in the flood boundary. For example, if the water depth is minimal relative to 1st-floor height, there may be 0% damage.

Hazus Critical Infrastructure Loss Analysis

Critical facilities and infrastructure are vital to the public, and their incapacitation or destruction would have a significant negative impact on the community. These facilities and infrastructure were identified on the HMP website and verified by Sherburne County.

Buildings identified as essential facilities for the Hazus flood analysis include hospitals, police and fire stations, and schools (often used as shelters). Essential facilities are vulnerable to structural failure, extensive water damage, and loss of functionality during a flood, thereby negatively impacting the communities that rely on these facilities' services. Fortunately, none of Sherburne County's essential facilities included in the Hazus flood analysis are located within the 1% annual chance floodplain.

Extreme precipitation resulting in flooding may overwhelm water infrastructure, disrupt transportation, and cause other damage. Particularly where stormwater, sewage and water treatment infrastructure is aging or undersized for more intense rainstorms, extreme rain events may pose both health and ecological risks in addition to costly damage (USGCRP, 2018b).

It is important to identify other critical infrastructure within the 1% annual chance floodplain, given the higher risk of the facility or infrastructure being incapacitated or destroyed during a flood. Fortunately, none of Sherburne County's essential facilities included in the Hazus flood analysis are located within the 1% annual chance floodplain. This flood analysis did not evaluate flooding bridges, roads, or other linear features.

Other important assets within the 1% annual chance flood boundary are worth further flood risk review. Buildings considered include places where critical leaders' offices may be, historical resources, hazardous waste storage, and places where populations may be exposed, such as campgrounds or mobile home parks. The Rivers Edge RV Park campground in Becker is located within the 1% annual chance flood boundary. This vulnerability is mapped on the HMP website and should be reviewed in more detail.

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Community Vulnerability

Potential economic losses were estimated by Census Minor Civil Division. The Cities of Baldwin and Elk River would suffer significant estimated losses in the 1% annual chance flood. Clear Lake Township and Palmer Townships also have significant estimated losses. All jurisdictions with buildings identified in the 1% annual chance flood zone can also be viewed on the Sherburne County HMP website.

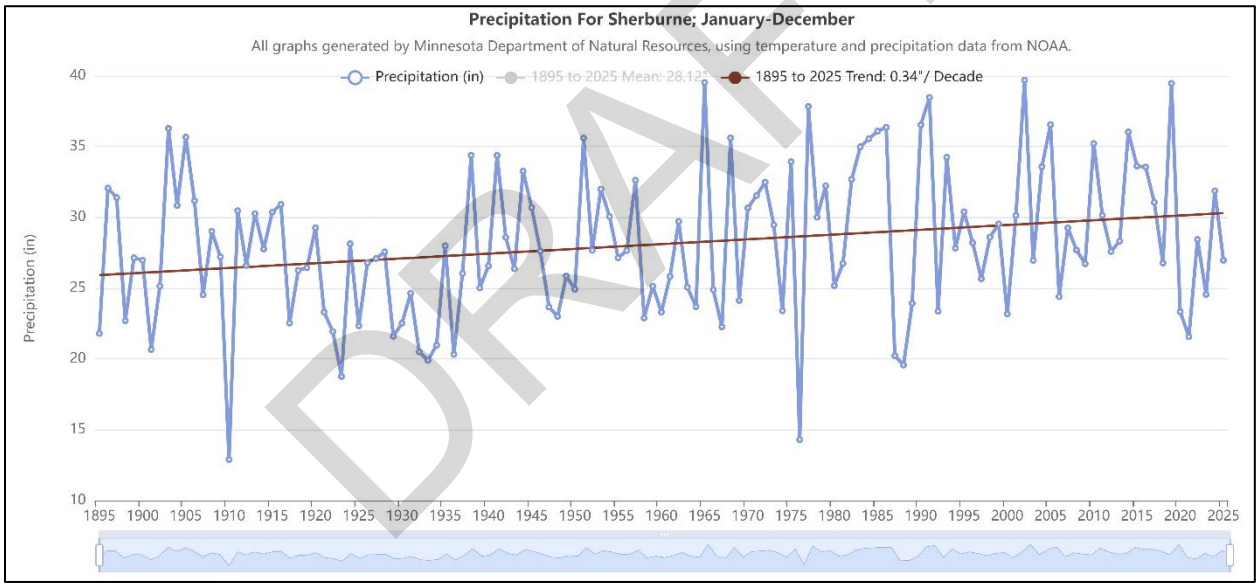
The status of jurisdictional participation in the National Flood Insurance Program and any repetitive loss properties are detailed in Section 5.1.1. National Flood Insurance Program (NFIP).

Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

4.1.3 Flooding and Climate Change

Higher temperatures globally have evaporated more surface and ocean water into the atmosphere, which, in turn, has provided more potential moisture for precipitating weather systems. In Sherburne County, the result has been increased precipitation, with annual totals increasing at an average rate of .35 inch per decade since 1895 (see Figure 2).

Figure 2. Annual precipitation, 1895–2025



Source:(MN DNR, 2026b)

Key Message #1 in the Water Chapter of the NCA5 states that climate change will continue to cause profound changes in the water cycle.

Snow cover will decrease and melt earlier and heavier rainfall is leading to increasing flooding (Payton et al., 2023). Additional increases in heavy and extreme precipitation are expected to remain the state's leading climate change symptoms. Heavy rains are now more common in Minnesota and more intense than at any time on record. Long-term observation sites have seen dramatic increases in one-inch rains, three-inch rains, and the size of the heaviest rainfall of the year. Since 2000, Minnesota has seen a significant uptick in devastating, large-area extreme rainstorms as well. Rains that historically would have been in the 98th percentile annually (the largest 2%) have become more common (MN DNR, 2024).

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This precipitation increase is found in all seasons, but spring and summer are becoming wetter at faster rates than fall and winter. Whereas temperature increases have been greatest in the northern parts of the state, precipitation increases have been well distributed geographically, and have somewhat favored southern Minnesota, which has better access to moisture from the Gulf of Mexico and is more frequently near the "low-level jet" airflow (a relatively fast-moving zone of winds in the lower atmosphere) that influences precipitation production.

4.1.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified existing program gaps and deficiencies that make its residents more vulnerable to flooding. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Road Infrastructure: Flood mitigation for county and township roads (i.e., culvert replacements, road repair) is an ongoing need. The county and many of our townships have limited funding for road infrastructure. Sherburne County continues to provide assistance on road infrastructure mitigation projects to reduce the impacts of localized flooding.

Funding: The county needs funding assistance to improve roads and culverts that experience repetitive flooding. Significant State and Federal funding is needed to construct infrastructure projects to prevent, reduce, and mitigate the impacts of high rain events and flooding.

4.2 Wildfire

Wildfire is an uncontrolled fire spreading through vegetative fuels, posing danger and destruction to property. Each year between January 1992 and July 2025, Minnesota experienced an average of 427 wildfires that burned at least five acres (MN DNR, 2025). Wildfires occur throughout the spring, summer, and fall; however, most wildfires in Minnesota take place in March, April, and May. The history of wildfire in Sherburne County is shown in Figure 3; an interactive map is available on the Sherburne County HMP website. The number of wildfires by type, acres, and cause includes aggregated data for Sherburne County.

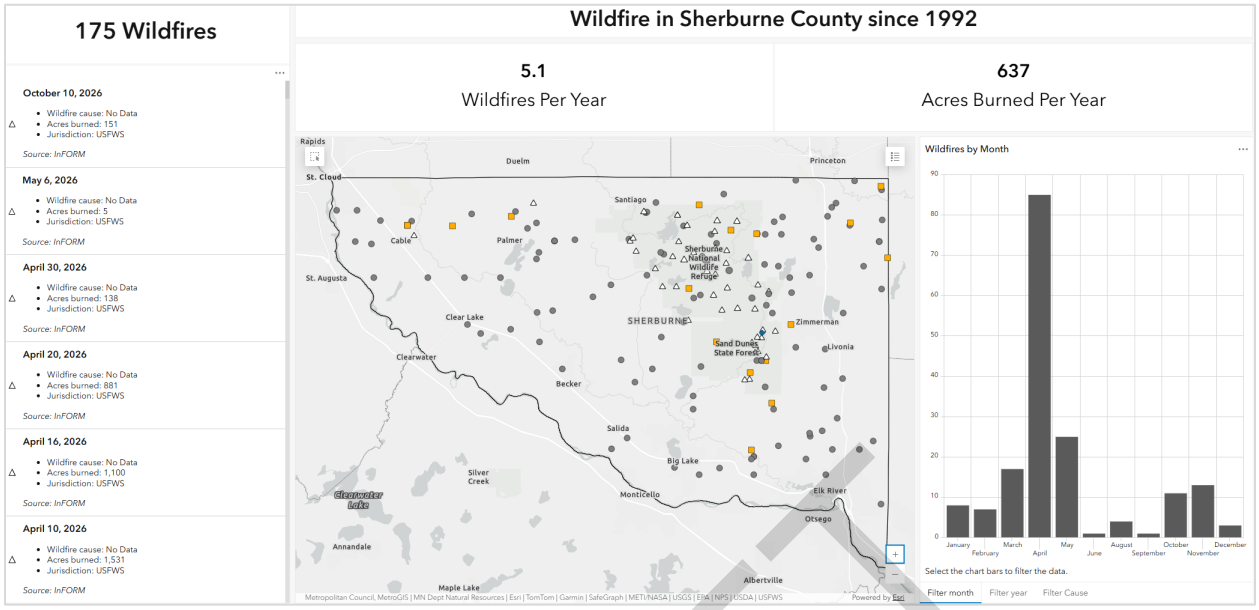
View interactive maps and see information about wildfire history, risk, and vulnerability

4.2.1 Probability of Occurrence

To determine the probability of future wildfires, Minnesota DNR and National Interagency Fire Center records of previous wildfire events in Sherburne County were summed and divided by the dataset's period of record, resulting in an annual relative frequency of wildfires for that period. From January 1992 to April 11, 2025, the relative frequency of wildfire events in the county is 5.1 per year (MN DNR, 2025; National Interagency Fire Center, 2025). This relative frequency can be used to infer the probability of these events occurring in the future.

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Figure 3. History of wildfire in Sherburne County



4.2.2 Vulnerability

Wildfires jeopardize the built environment, health, and wellbeing of individuals living near its fuel source. Some residents are more vulnerable to air quality conditions of wildfire, including children, older adults, and those with respiratory issues (AirNow, 2021).

Structures located in areas near undeveloped wildland are vulnerable to wildfires. The SILVIS Lab at University of Wisconsin–Madison created a dataset documenting the changes of the wildland–urban interface (WUI) in the United States from 1990 to 2020. Radeloff et al. (2018) define WUI as the area where structures and other human development meet or intermingle with wildland vegetation. With the increase of development in metropolitan fringes and rural areas, the WUI is growing. The expansion of the WUI in recent decades has significant implications for wildfire management and impact as it creates an environment in which fire can readily move between structural and vegetation fuels. Its expansion has increased the likelihood that wildfires will threaten structures and people (Radeloff et al., 2018).

There are two main types of WUI: intermix and interface. Intermix WUI are areas where housing and wildland vegetation intermingle; interface WUI are areas where housing are adjacent to wildland vegetation (Radeloff et al., 2018). Table 9 shows the change of total WUI (intermix and interface) in the county from 2000 to 2020, and the percentage of the county's land, housing, and population in the WUI area.

Table 9. Wildland-Urban Interface (WUI), Sherburne County, 2000–2020

	Total WUI 2000	Total WUI 2010	Total WUI 2020	% Change (2000–2020)
Land Area	20.3%	25.8%	27.1%	33.7%
Housing	29.0%	31.2%	32.3%	11.1%

Source: (Radeloff, Mockrin, et al., 2023)

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Communities with higher proportions of WUI areas are more vulnerable to wildfires. The percentage of WUI within individual jurisdictions in Sherburne County is shown in Table 10.

Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

Table 10. Percentage of land area classified as WUI per jurisdiction in Sherburne County

Township/City	Percent WUI
Zimmerman	75.0
Livonia	53.5
Big Lake Township	43.9
Princeton	38.7
Becker Township	37.4
Baldwin	35.7
Orrock	31.5
Elk River	31.4
Santiago	27.7
Blue Hill	18.6
Palmer	13.6
Big Lake	9.8
Haven	6.1
Becker	6.0
Saint Cloud	2.4
Clear Lake Township	0.8
Clear Lake	0.0

Source: (Radeloff, Helmers, et al., 2023)

4.2.3 Wildfire and Climate Change

The changing climate poses a complex web of issues for wildfire in Minnesota. Climate change likely is affecting the frequency and intensity of Canadian wildfires, similar to its effect on wildfires in the western U.S. and Alaska (Wehner, 2017). Small particulate pollution from smoke plumes has numerous health impacts as described above, and if severe enough can result in spikes of demand for emergency services. Based even on intermediate (RCP4.5) future climate projections, many Midwest counties will experience increased exposure to wildfire smoke (Mills et al., 2018).

According to the NCA5, Key Message #3 in the Midwest Chapter, Climate Adaptation will require innovative collaborations between public health and other sectors such as emergency management (Wilson et al., 2023).

Changes in Minnesota's climate also may be influencing the frequency, severity, and areal coverage of wildfires. For example, warmer winters with inconsistent snow cover, the arrival of wet conditions prior to the growing season, plus early and more frequent thaws, all combine to prolong the exposure of susceptible vegetation to dry conditions, potentially extending the peak wildfire season.

Minnesota's changing climate also may affect fire-damaged areas. For instance, heavy rains in burned areas can lead to erosion and mudslides. Documented and projected increases in the frequency and intensity of heavy and extreme rainfall suggest that Minnesota is becoming and will become more prone to post-fire landscape hazards. Climate change also is having an impact on the

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pests that damage the health and composition of Minnesota forests, although the ultimate consequences for wildfire are complex and uncertain. Shorter winters are allowing two reproductive cycles of the Eastern Larch Beetle, which has now killed off at least 143,000 acres of mature tamarack forest in Minnesota since 2001 and affected about 535,000 acres to some degree during that period. The decline in severity and frequency of extreme cold may allow more rapid establishment of Emerald Ash Borer to latitudes further north than without climate change. Minnesota forests are home to an estimated 1 billion ash trees. Many of these trees are in nearly pure stands of black ash growing in wet areas. So while the deaths of these lowland species will increase fuel loading, their decreased transpiration will increase water on the ground. The ultimate contribution to wildfire will depend on the interplay between increased precipitation, warming temperatures, extreme heat, and periods of drought as our climate continues to change.

Temperatures are predicted to rise in the state, which could lead to more extreme heat events and associated wildfire risks. As Minnesota's climate changes, weather fluctuations between drought and extreme rain events and increasing temperatures will result in changes to forest composition and/or distribution. These fluctuations can lead to dry conditions that may cause increased fire risk in both grassland and forest environments.

The varied impacts of climate change are complicated by how these changes also interact with and reinforce one another. Drought and heat may both contribute to wildfires, which may in turn lead to changes in plant and animal populations and other ecological shifts. Increasing events of extreme heat and drought can increase the number of wildfires (Blumenfeld, K. Minnesota State Climatology Office, personal communication, January 9, 2019).

4.2.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified existing program gaps and deficiencies that make its residents more vulnerable to wildfire. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Community Wildfire Protection Plan (CWPP): Sherburne County does not have a CWPP in place. Significant outside grant funding would be necessary to successfully develop a new CWPP in coordination with local governments.

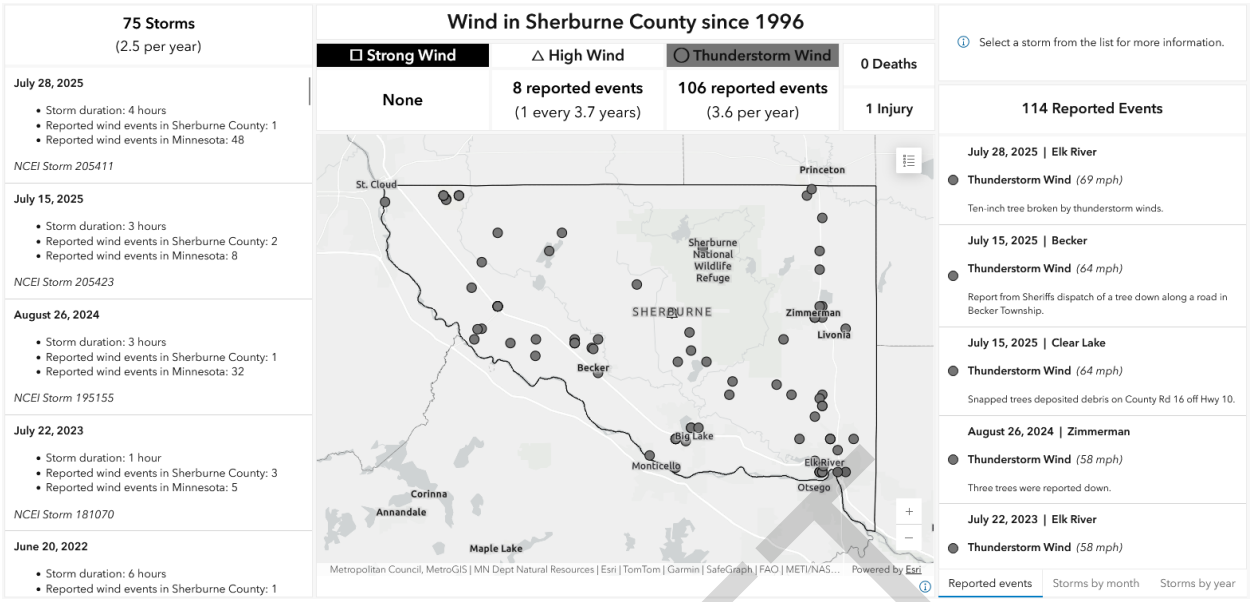
4.3 Windstorms

A windstorm is a wind strong enough to cause damage to trees and buildings and typically exceeding 34 mph (Pielke, 2012). Windstorm events encompass a variety of types of damaging wind. The history of windstorms in Sherburne County is shown in Figure 4; an interactive version of this map can be found on the Sherburne County HMP website.

View interactive maps and see information about windstorm history, risk, and vulnerability

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Figure 4. History of windstorms in Sherburne County



4.3.1 Probability of Occurrence

To determine the probability of future wind-related events in Sherburne County, records of previous storms that produced hail events were examined since 1996. The relative frequency of storms that produce hail events from January 1996 to May 2026 is 2.6 per year. Each storm may include one or more recorded events. These relative frequencies can be used to infer the probability of these storms occurring in the future.

4.3.2 Vulnerability

The likelihood of a windstorm event does not vary geographically within the county, but the vulnerability of its residents is not constant. Vulnerability to injury from all kinds of windstorms decreases with adequate warnings, warning time, and sheltering in a reinforced structure. Therefore, residents living in rural areas, living alone or with limited mobility, or living in a manufactured home may be more vulnerable. Also at a higher risk to windstorms are those who work outdoors or do not have permanent housing.

Structural vulnerability depends in part upon the construction of a building and its infrastructure. Residents of mobile homes are more vulnerable to fatality or injury from windstorms because mobile homes are not able to withstand high winds as well as other structural dwellings, with 50 mph (43.4 knots) being the lower limit of wind speeds capable of damaging mobile homes (AMS, 2004). Steps to mitigate these vulnerabilities have been taken by the state, requiring all mobile home parks to provide an evacuation plan, and parks with at least 10 homes licensed after March 1, 1988 to provide a storm shelter (MDH, 2020). However, mobile home parks often do not provide the required storm shelters (Sepic, 2017). Building codes have also changed to improve the strength of new mobile home construction but there are still many older mobile homes in use that do not meet these new standards.

Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

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4.3.3 Windstorms and Climate Change

Lack of high-quality long-term data sets makes assessment of changes in wind speeds very difficult (Kunkel et al., 2013). In general, one analysis found no evidence of significant changes in wind speed distribution. Other trends in severe storms, including the number of hurricanes and the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds, are uncertain. Since the impact of more frequent or intense storms can be larger than the impact of average temperature, climate scientists are actively researching the connections between climate change and severe storms (USGCRP, 2018a).

According to the NCA5 Key Message #5 in the Climate Trends chapter, extreme events are becoming more frequent.

4.3.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified program gaps and deficiencies that make its residents more vulnerable to summer storms, including windstorms. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Above-Ground Power Lines: Most powerlines throughout Sherburne County are above ground, exposing them to potential damage from high wind events. The county and local jurisdictions continue to work with electric utility providers to convert overhead powerlines to underground or to implement other measures to reduce risk of power failure.

Public Education: Ongoing public education is needed during tornado season to inform the public about what a tornado watch/warning is and what to do when outdoor warning sirens are activated. Sherburne County and local jurisdictions also need to continue to encourage residents to be aware of and ready for severe storm events that can lead to long-term power outages.

Storm Shelters and Tornado Safe Rooms: There are areas throughout Sherburne County without viable storm shelters or tornado safe rooms where there are populations vulnerable to high wind and storm events, such as mobile home parks and campgrounds. A coordinated approach is needed to identify where storm shelters or tornado safe rooms are needed and to evaluate whether new construction or a retrofit of facilities is possible. Finding funding for the implementation of such construction projects is also a barrier.

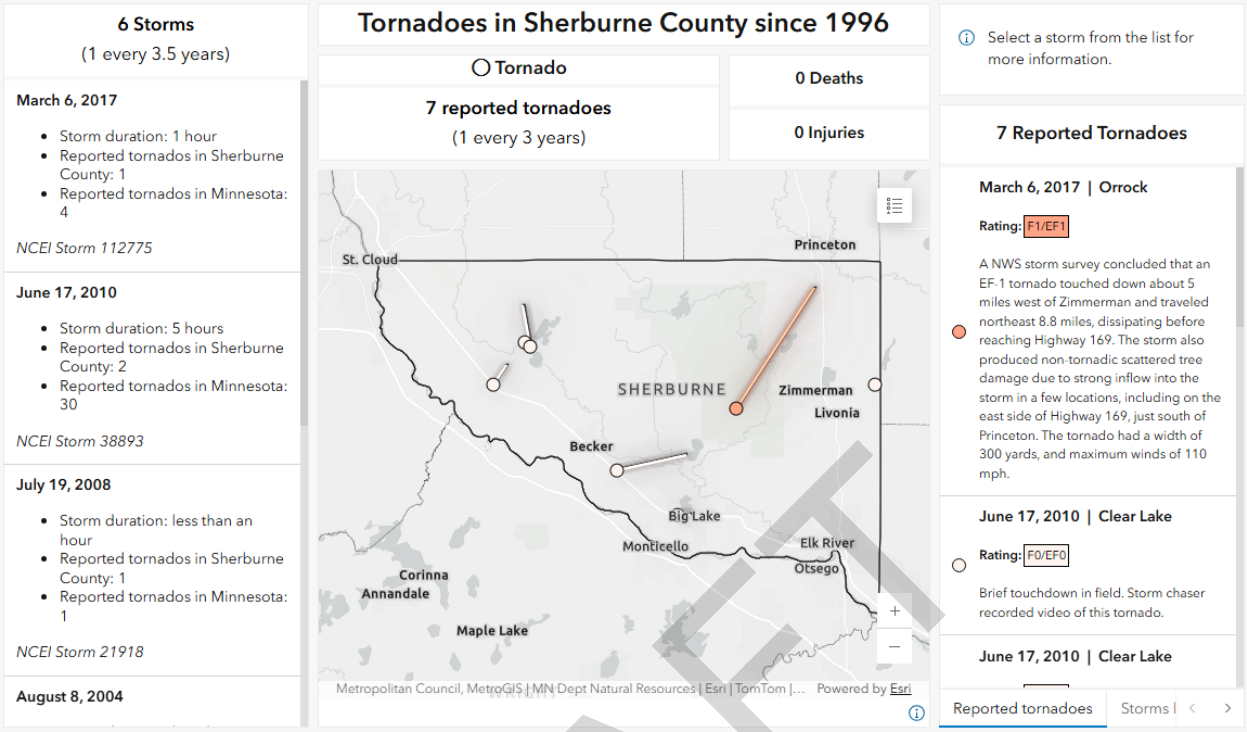
4.4 Tornadoes

With wind speeds reaching up to 300 mph, tornadoes are one of nature's most violent storms (Hogeback, 2020). The history of tornadoes in Sherburne County is shown in Figure 5; an interactive version of this map can be found on the Sherburne County HMP website.

View interactive maps and see information about tornado history, risk, and vulnerability

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Figure 5. History of tornadoes in Sherburne County



4.4.1 Probability of Occurrence

Estimating the probability of future tornadoes in Sherburne County was done using two methods. The first method summed the total number of tornadoes that either touched down in or traveled through the county. This sum was divided by the number of years tornado data was recorded, resulting in the annual relative frequency of tornado occurrences in the county. Based on records in the NCEI Storm Events Database from January 1996 through May 2026, there has been one tornado every 3.5 years in Sherburne County. Tornado-producing storms occurred in four of the 31 years on record.

Because tornadoes often cross county lines and tornadic frequency may be better understood using events from a larger area, a second method was used to describe the frequency of tornadic events within a 50-mile radius of any location within the county. A grid of 900 square-meter cells was used to cover Minnesota and 50 miles beyond its border. From the center of each cell, the number of tornadoes that intersected a 50-mile radius was counted. Each cell was assigned a total tornado line count, which was then divided by the tornado dataset's period of record, resulting in the annual relative frequency of tornadoes occurring within 50 miles of the respective cell.

For any location in Sherburne County, there was an annual frequency of 2–4 tornadoes within a 50-mile radius. The historical frequency was slightly higher in the southeastern tip than in the rest of the county. These relative frequencies can be used to infer the probability of these events occurring in the future.

4.4.2 Vulnerability

The likelihood of a tornado does not vary significantly across geography within Sherburne County; however, certain populations may be more vulnerable and less resilient to the impacts of a tornado.

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In general, tornado casualties decrease when people receive adequate warnings with sufficient time to seek shelter in a reinforced structure. Because communication is critical before a tornadic event, certain residents may be more negatively impacted by a tornado, including those living in rural areas, individuals with limited mobility, people who do not live near an outdoor warning siren, or those who do not use social media. Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

View at-risk populations in Sherburne County

People living in mobile homes are particularly vulnerable to tornadoes because they cannot withstand the strong winds produced by a tornado. An analysis by the Associated Press of NOAA storm data found that since 1996, 53% of tornado fatalities in the United States were people who remained within or attempted to flee from mobile homes (Borestein et al., 2023). While Minnesota law requires most mobile home parks to have storm shelters, many do not (Raiche, 2022).

4.4.3 Tornadoes and Climate Change

Minnesota's climate is undergoing distinct changes, but as reported by the MN DNR State Climatology Office, these changes are only weakly connected to increases in tornadoes or severe convective storms. Minnesota, like all parts of the U.S., has seen increases in the weakest class of tornadoes (rated F-0 or EF-0), but these increases are known to be linked to improved spotting, detection, and verification procedures within the National Weather Service.

When examining tornadoes that cause significant structural damage and are rated EF-2 or above, Minnesota has seen no recent trends towards increasing frequencies—whether measured as raw counts, or as days with one or more of these tornadoes (MN DNR, 2019).

The tornado trends in Minnesota match those found nationally. NCA5 states that while the average annual number of tornadoes appears to have remained relatively constant, there is evidence that tornado outbreaks have become more frequent, tornado seasons are extending into later in the fall, and that tornado strength has increased (Marvel et al., 2023). An October 10, 2021 tornado in the Boundary Waters Canoe Area Wilderness became the latest on record so far north in the state. Then, on December 15, 2021, an outbreak of destructive thunderstorm winds and over 20 tornadoes struck the southeastern parts of the state, producing the latest tornadoes on record by 29 days (Blumenfeld, K. Minnesota State Climatology Office, personal communication, December 21, 2023).

According to the NCA5 Key Message #5 in the Climate Trends chapter, extreme events are becoming more frequent.

However, climate scientists are unclear about whether the recent statistical behavior of these severe convective storm events has any relationship with the changing climate. This uncertainty results from the fact that tornadoes and their parent thunderstorms operate on smaller scales and more localized processes than the global climate. There has been some indication that, on a national basis, tornadoes are being clustered into fewer days, suggesting a greater tendency towards outbreaks. Scientific modelling studies indicate that the meteorological conditions supportive of severe thunderstorms should increase in the future, but it is unclear whether the specific conditions required for the formation of tornadoes, and particularly significant tornadoes, will increase (Kossin, 2017). Until more studies are completed, the Minnesota State Climatology Office recommends

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assuming that tornadoes will remain an important and dangerous part of Minnesota's climate, even if they do not increase in frequency or severity in response to changing climatic conditions.

4.4.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified program gaps and deficiencies that make its residents more vulnerable to summer storms, including tornadoes. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Above-Ground Power Lines: Most powerlines throughout Sherburne County are above ground, exposing them to potential damage from high wind events. The county and local jurisdictions continue to work with electric utility providers to convert overhead powerlines to underground or to implement other measures to reduce risk of power failure.

Public Education: Ongoing public education is needed during tornado season to inform the public about what a tornado watch/warning is and what to do when outdoor warning sirens are activated. Sherburne County and local jurisdictions also need to continue to encourage residents to be aware of and ready for severe storm events that can lead to long-term power outages.

Storm Shelters and Tornado Safe Rooms: There are areas throughout Sherburne County without viable storm shelters or tornado safe rooms where there are populations vulnerable to high wind and storm events, such as mobile home parks and campgrounds. A coordinated approach is needed to identify where storm shelters or tornado safe rooms are needed and to evaluate whether new construction or a retrofit of facilities is possible. Finding funding for the implementation of such construction projects is also a barrier.

4.5 Hail

Hailstorms occur throughout the year though are most frequent between May and August (NWS, 2020). Although hailstorms rarely cause injury or loss of life, they have cost Minnesota over $1.5 billion (ADJ 2024) in property and crop damage since 1960 (CEMHS, 2026). In 2017, 44% of properties in Minnesota were affected by damaging hail events (Samanta & Wu, 2017). The history of hail in Sherburne County is shown in Figure 6; an interactive version of this map can be found on the Sherburne County HMP website.

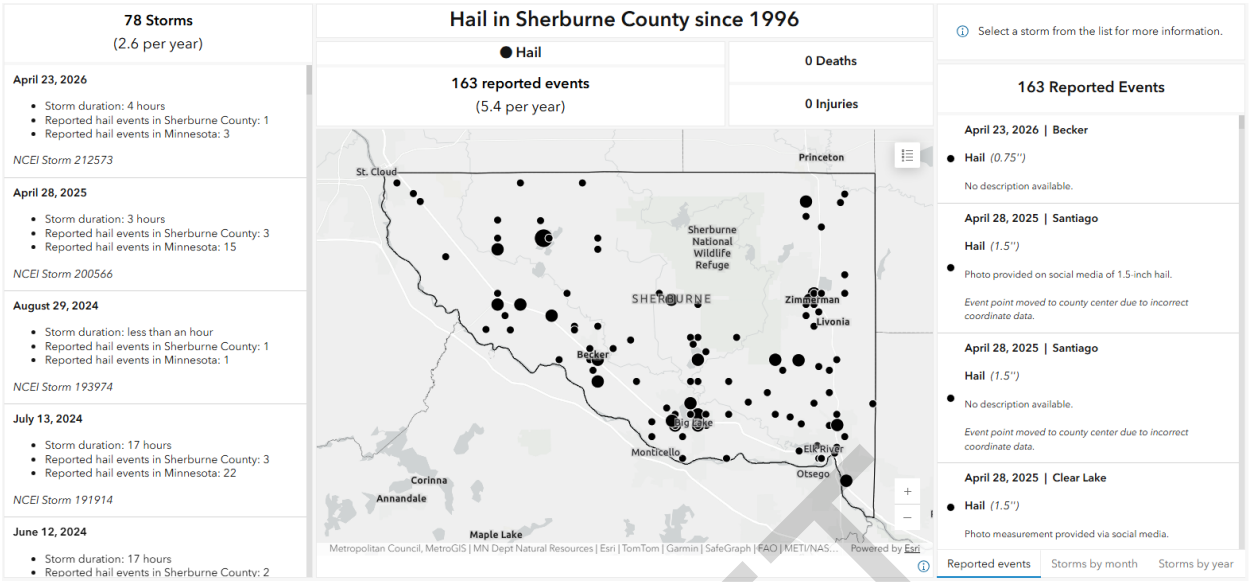
View interactive maps and see information about hail history, risk, and vulnerability

4.5.1 Probability of Occurrence

To determine the probability of future hailstorms in Sherburne County, records of previous hail events in the county were examined for the period of record. From January 1955 through May 2026, the relative frequency of hail events was 5.4 per year. This relative frequency can be used to infer the probability of hail events occurring in the future. Please note that public reports of hail are often secondary to those of thunderstorm winds or tornadoes because if either damaging winds or tornadoes occur, the damaging wind and/or tornado are more important to the reporter and may result in underreporting of hail events.

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Figure 6. History of hail in Sherburne County



4.5.2 Vulnerability

Sherburne County's agricultural lands and structures are vulnerable to hail damage and its residents to injury and possibly death. Data from the Spatial Hazard Events and Losses Database for the United States (SHELDUS) was examined to identify the county's monetary losses due to hail damage to crops, property, injury, and death. From 1960 through 2024, Sherburne County reported $(ADJ 2024) in hail damages, ranking 78th among Minnesota counties in total hail damages. Sherburne County's losses are primarily due to property damage reported at $42,586,354 (ADJ 2024), followed by $642,971.34 in crop damages. Crop indemnity payments due to hail totaled $552,850 (ADJ 2024) for the period of record spanning 1989–2024 (CEMHS, 2026).

Within Sherburne County, the vulnerability of jurisdictions to hailstorms does not vary geographically. As with all summer storms, those who work outdoors or do not have permanent housing are at greater risk during hailstorms.

Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

4.5.3 Hail and Climate Change

Trends in severe storms, including the numbers of hail and damaging thunderstorm winds are uncertain. Since the impact of more frequent or intense storms can be larger than the impact of average temperature, climate scientists are actively researching the connections between climate change and severe storms (Marvel et al., 2023). The NCA reports that in Minnesota's neighboring Great Plains region, hail size, frequency of large hail, and length of hail season are projected to increase through the rest of this century (Knapp et al., 2023). The occurrence of very heavy precipitation has increased in Minnesota in recent decades, and future projections also indicate this will continue (Blumenfeld, K. Minnesota State Climatology Office, personal communication, December 21, 2023).

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According to the NCA5 Key Message #5 in the Climate Trends chapter, extreme events are becoming more frequent.

4.5.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified program gaps and deficiencies that make its residents more vulnerable to summer storms, including hailstorms. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Above-Ground Power Lines: Most powerlines throughout Sherburne County are above ground, exposing them to potential damage from high wind events. The county and local jurisdictions continue to work with electric utility providers to convert overhead powerlines to underground or to implement other measures to reduce risk of power failure.

Public Education: Ongoing public education is needed during tornado season to inform the public about what a tornado watch/warning is and what to do when outdoor warning sirens are activated. Sherburne County and local jurisdictions also need to continue to encourage residents to be aware of and ready for severe storm events that can lead to long-term power outages.

Storm Shelters and Tornado Safe Rooms: There are areas throughout Sherburne County without viable storm shelters or tornado safe rooms where there are populations vulnerable to high wind and storm events, such as mobile home parks and campgrounds. A coordinated approach is needed to identify where storm shelters or tornado safe rooms are needed and to evaluate whether new construction or a retrofit of facilities is possible. Finding funding for the implementation of such construction projects is also a barrier.

4.6 Lightning

Lightning is a common weather phenomenon that typically occurs as a by-product of a thunderstorm. The potential hazard posed by lightning is significant. Each year in the United States lightning kills an average of 49 people and injures hundreds more (NWS, 2021b). It is impossible to predict where individual lightning strikes will occur due to the nature of lightning being widespread, frequent, and random. People can be struck by lightning through numerous ways, including a direct strike; a side flash (lightning strikes a taller object and a portion of the current strikes a nearby person); a ground current (energy from a lightning strike travels outward along the ground surface); and through conduction (lightning strike traveling through wires, pipes, or other metal surfaces) (NWS, 2021a).

View interactive maps and see information about lightning history, risk, and vulnerability

While many lightning casualties happen at the beginning of an approaching storm, more than half of lightning deaths occur after a thunderstorm has passed. Lightning can strike more than 10 miles from the storm in an area with clear sky above (NWS, 2017). There is little an individual can do to substantially reduce risk outdoors in a thunderstorm. The safest action is to get inside a building or vehicle.

From 1950 to June 30, 2026, one damaging lightning event has been recorded in the NCEI Storm Events Database for Sherburne County. On September 21, 2005, lightning struck an home Elk River, destroying a garage and two bedrooms (NCEI, 2026). Please note damage from lightning may be

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underreported in the Storm Events database, because there is no formal public alerting program for lightning (alone) and little to no tracking of lightning damage except through infrequent media reporting. Lightning events are only logged when they cause a fatality, injury, or significant property/crop damage, and lightning on its own (i.e., without accompanying thunder, hail, high winds, etc.) does not trigger automatic entry into the database (NWS, 2026).

4.6.1 Probability of Occurrence

The odds of an individual in the U.S. being killed or injured by lightning during a given year is 1 in 1.2 million (NWS, 2018). For more local statistics on hazardous lightning events the NCEI Storm Events Database was examined for events that occurred in Sherburne County. Based on the number of previously reported events, the relative frequency of lightning events in the county is less than one per year. This relative frequency can be used to infer the probability of hazardous lightning events occurring in the future is very low (NCEI, 2026). 4.6.2 Vulnerability

All humans and structures in the state are vulnerable to lightning. The risks are greatest during the summer when outdoor recreational activities are most common. Minnesota lakes, boats, parks, and trails place clusters and concentrations of people at risk to afternoon and evening thunderstorms, especially on weekends and during the major summer holidays. As with all summer storms, those who work outdoors or do not have permanent housing are more at risk. Within the county, the vulnerability of jurisdictions to lightning does not vary geographically.

Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

4.6.3 Lightning and Climate Change

The conditions associated with lightning are uncertain. These conditions—tornadoes, large hail, and damaging thunderstorms—are difficult to compare historically but may become more concentrated on fewer days or multiple events may occur at one time. These events could happen without necessarily increasing overall numbers or severity (ICAT, 2017). Severe rain events are certain to be more common and may include an additional risk of lightning. Vaisala documents the unusual severe weather of 2021 in December, which caused thunderstorms and lightning in southern Minnesota (Vaisala, 2021). Climate change may influence the seasonality of hazards such as lightning.

4.6.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified program gaps and deficiencies that make its residents more vulnerable to summer storms, including lightning. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Above-Ground Power Lines: Most powerlines throughout Sherburne County are above ground, exposing them to potential damage from high wind events. The county and local jurisdictions continue to work with electric utility providers to convert overhead powerlines to underground or to implement other measures to reduce risk of power failure.

Public Education: Ongoing public education is needed during tornado season to inform the public about what a tornado watch/warning is and what to do when outdoor warning sirens are activated.

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Sherburne County and local jurisdictions also need to continue to encourage residents to be aware of and ready for severe storm events that can lead to long-term power outages.

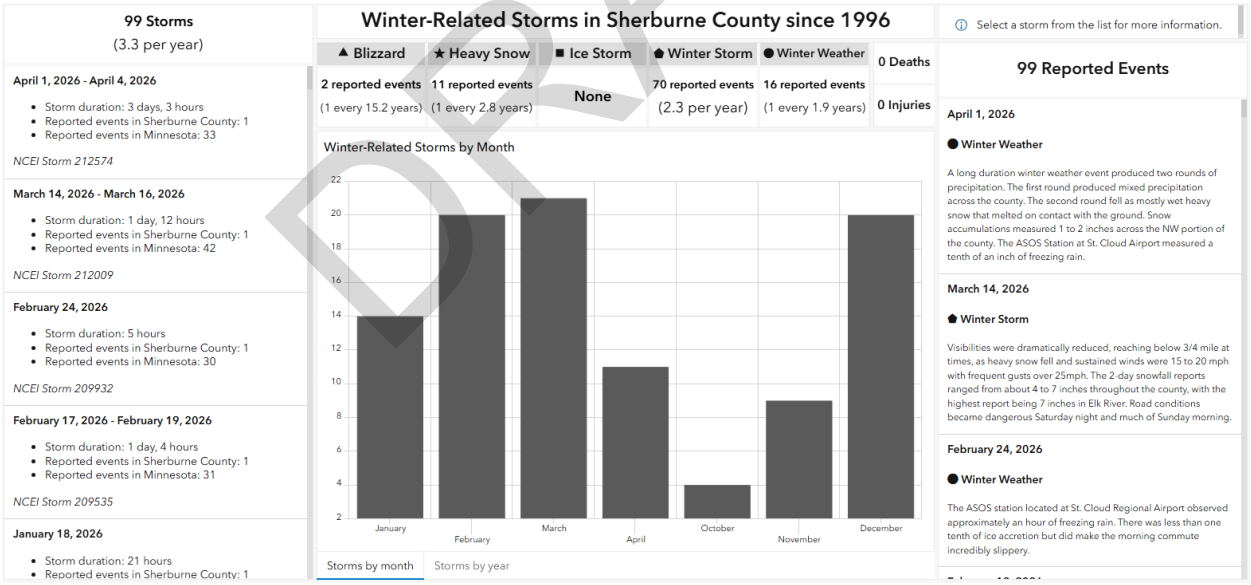
Storm Shelters and Tornado Safe Rooms: There are areas throughout Sherburne County without viable storm shelters or tornado safe rooms where there are populations vulnerable to high wind and storm events, such as mobile home parks and campgrounds. A coordinated approach is needed to identify where storm shelters or tornado safe rooms are needed and to evaluate whether new construction or a retrofit of facilities is possible. Finding funding for the implementation of such construction projects is also a barrier.

4.7 Winter Storms

Winter storms encompass a number of winter weather events which the National Weather Service (NWS) organizes into the following categories: blizzard, heavy snow, ice storm, winter storm, and winter weather. Winter weather events are common in Minnesota and can be costly. According to the Spatial Hazard Events and Losses Database (SHELDUS), winter weather events in Minnesota have cost more than $1.2 billion in damages since 1960 (CEMHS, 2026). The history of winter storms in Sherburne County is shown in Figure 7; an interactive version of this map can be found on the Sherburne County HMP website.

View interactive maps and see information about winter storm history, risk, and vulnerability

Figure 7. History of winter storms in Sherburne County



4.7.1 Probability of Occurrence

To determine the probability of future winter-related storms in Sherburne County, records of winter weather (blizzards, heavy snows, ice storms, winter storms, and winter weather) producing storms were summed and divided by the dataset's period of record, resulting in the annual relative frequency of winter-related storms. Based on records in the NCEI Storm Events Database through May 2026, the relative frequency of winter-related storms in Sherburne County is 3.3 per year. Each

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storm could produce one or more winter-related events. This relative frequency can infer the probability of these storms occurring in the future.

4.7.2 Vulnerability

Transportation systems, electrical distribution systems, and structures are vulnerable to winter storms throughout the county. These events do not vary geographically within the county; all jurisdictions are equally vulnerable. While it is highly likely these events will continue occurring annually, the amount of snow and ice and number of winter-related storm events to occur each year are unpredictable. People residing in climates such as these must always be prepared for situations that put their lives or property at risk. It is important that extra consideration be given to the vulnerable populations discussed in Section 3.2. Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

4.7.3 Winter Storms and Climate Change

Historically, winter storms have had a large impact on public safety in Minnesota. If the frequency of snowstorms and annual total snowfalls increase, as anticipated effects of Climate Change, the effects on public safety will also increase. Pressures on energy use, reduced reliability of services, potential outages, and potential rise in household energy costs are major climate change risks to public health that can occur from winter weather.

Table 7 in Section 3.3 discusses confidence that climate change will impact common Minnesota weather/climate hazards beyond 2025, there is some weak evidence that warming winters may make heavy snowfall events less frequent as winter warms.

4.7.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified several program gaps and deficiencies that make its residents more vulnerable to severe winter storms. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Above-Ground Power Lines: Most powerlines throughout Sherburne County are above ground, exposing them to impacts/damage from winter high wind and ice events, potentially leading to localized or extensive power outages.

Public Education: Ongoing public education is needed to encourage residents to be ready for long-term power outages or to be snowed in during dangerous winter events such as ice storms and blizzards.

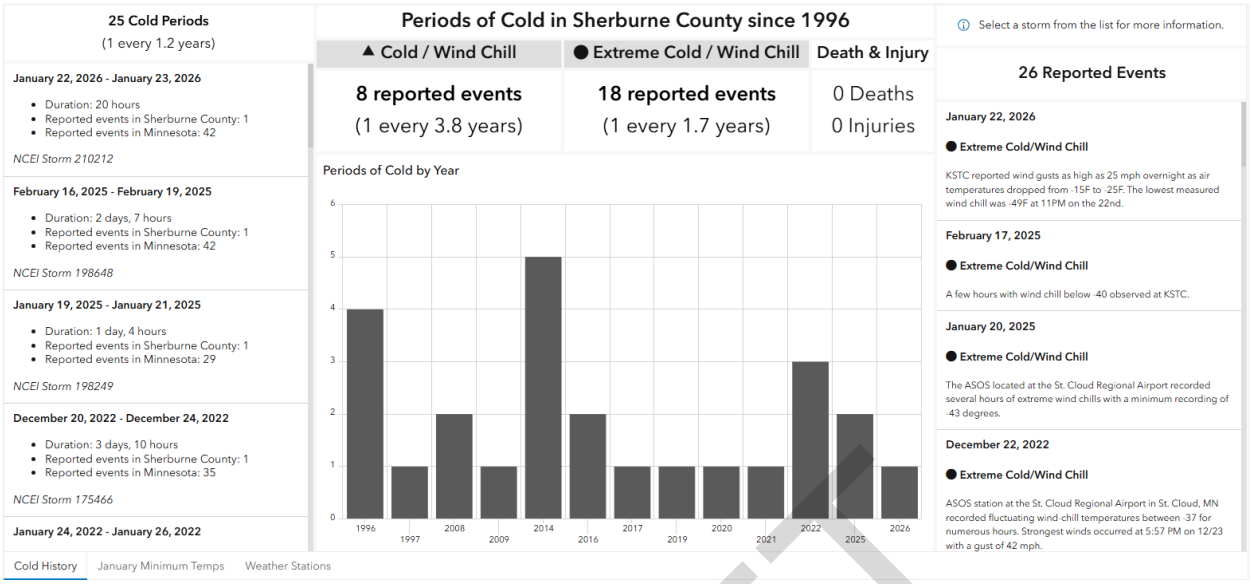
4.8 Extreme Cold

Due to Minnesota's position in the middle of the continent and subsequent climate, the state may experience extremely frigid temperatures in winter. Winter in Sherburne County can be especially dangerous when low temperatures and wind create arctic-like wind chills. The history of extreme cold in Sherburne County is shown in Figure 8; an interactive version of this dashboard can be found on the Sherburne County HMP website.

View interactive maps and see information about extreme cold history, risk, and vulnerability

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Figure 8. History of extreme cold in Sherburne County



4.8.1 Probability of Occurrence

To determine the probability of future cold-related events in Sherburne County, records of previous cold/wind chill and extreme cold/wind chill events were summed and divided by the dataset's period of record, resulting in the annual relative frequency. Based on records in the NCEI Storm Events Database through May 2026, the relative frequency of extreme cold/wind chill events in Sherburne County is one every 1.7 years. (NCEI, 2026). This relative frequency can be used to infer the probability of these events occurring in the future.

4.8.2 Vulnerability

The risk of extreme cold does not vary geographically within the county. Citizens living in climates such as these must always be prepared for situations that put their lives or property at risk. The youngest and more elderly residents, homeless persons, individuals with chronic medical conditions, and those who are working or recreating outdoors are most at risk for frostbite and hypothermia (MDH, 2021).

View at-risk populations in Sherburne County

It is not always the depth of the cold that poses a threat but rather unpreparedness for the cold, such as an individual with a vehicle breakdown who lacks a personal winter safety kit in the vehicle. The cost of propane can make rural residents more vulnerable to issues with extreme cold. A propane shortage and resulting crisis, such as that which occurred in 2014, may increase the cost of heating homes and farms to a prohibitive amount (Eaton, 2014). The Minnesota Department of Commerce presents options and suggestions for homeowners who use propane on their website.

The CDC publication "Extreme Cold: A Prevention Guide to Promote Your Personal Health and Safety" outlines preparation measures that individuals can take to reduce their vulnerability to extreme cold. Highlights in this document include advice about travel preparations, securing your home water supply, and safety during recreation (CDC, 2021).

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Section 3.4 provides jurisdictional responses to localized vulnerabilities to extreme cold.

4.8.3 Extreme Cold and Climate Change

Although climate research indicates that Minnesota's average winter lows are rising rapidly, and our coldest days of winter are now warmer than we have ever recorded, cold temperatures have always been a part of Minnesota's climate, and extreme cold events will continue.

As the climate changes, an increase in extreme precipitation or storm events could lead to a higher risk of residents being exposed to cold temperatures during power outages or other storm-related hazards. Extreme and changing temperatures are already challenging aging infrastructure and are expected to impair surface transportation and the electrical grid.

Key Message #4 in NCA5 in the Midwest Chapter states that green infrastructure and public and private investments may mitigate losses, provide relief from heat, and offer other ways to adapt the built environment to a changing climate.

4.8.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified several program gaps and deficiencies that make its residents more vulnerable to extreme cold. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Generators for Backup Power to Critical Facilities & Shelters: Not all healthcare facilities utilized for the care of residents & visitors, including designated severe weather/emergency shelters (schools, churches, etc.) have backup power to run heating systems in the event of a power outage.

Public Education: Ongoing public outreach and education is needed across jurisdictions to encourage residents to be aware of and prepared for periods of extreme cold, including risks of exposure, how to avoid frozen pipes, and the dangers of using alternate heating sources indoors during power outages.

4.9 Extreme Heat

Extreme heat describes weather that is much hotter and/or humid than typical for a place and time of year. In the United States, extreme heat is the deadliest weather-related hazard and causes more deaths than flooding, tornadoes, and hurricanes combined. While heat waves are infrequent in a northern state like Minnesota, they can have severe consequences for residents who are not acclimatized to their effects (Runkle et al., 2022).

The National Weather Service (NWS) issues extreme heat watches, heat advisories, and extreme heat warnings based on the heat index, which is a combination of air temperature and relative humidity that determines how hot it feels. The heat index threshold differs based on locality, since people in colder climates are less prepared for heat events than people who live in warmer climates (NWS, 2025b).

More recently, the NWS has developed the HeatRisk tool to issue a forecast of heat-related impacts to occur over a 24-hour period. It is intended to provide risk guidance to decision makers and heat-sensitive populations. Historical data from the HeatRisk tool, available back to 2015, provide a more comprehensive look at extreme heat events beyond those reported as Extreme Heat Events in the Storm Events Database. The HeatRisk tool takes into consideration:

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- How unusual the heat is for the time of year
- The duration of the heat, including both daytime and nighttime temperatures
- If those temperatures pose an elevated risk of heat-related impacts based on data from the Centers for Disease Control and Prevention (NWS, 2025a).

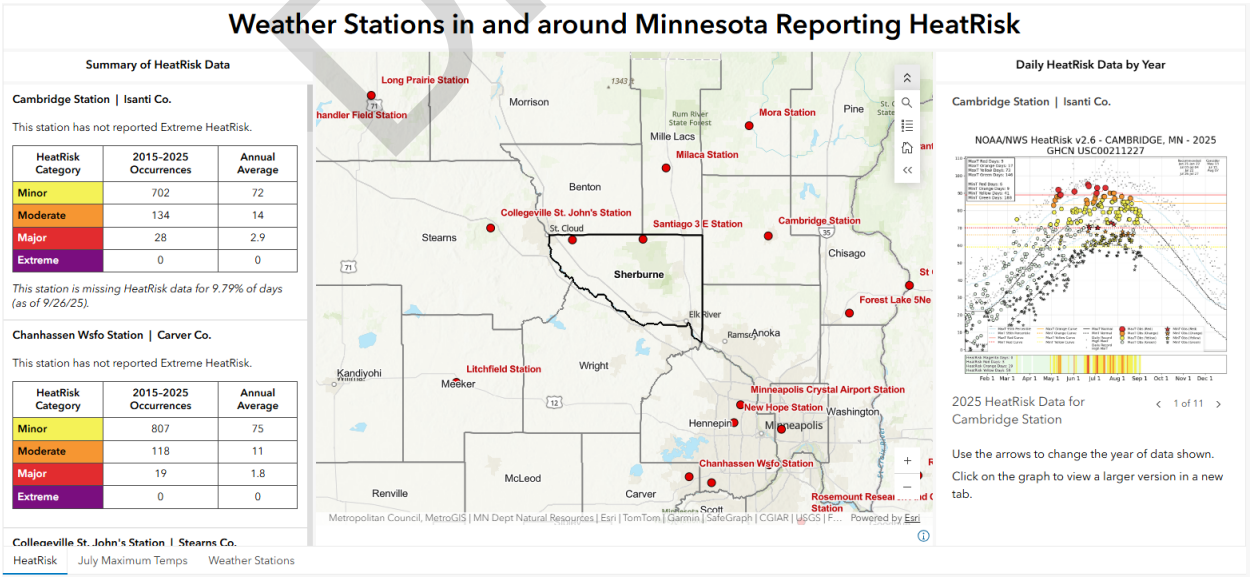
Impacts of extreme heat are far-reaching and can be severe. Some impacts include infrastructure failures, such as roads buckling and power outages; strain on essential services, such as increased demand for emergency medical services and law enforcement (Guo, 2017; Williams et al., 2020); and disruptions to important social and economic networks, such as school and event cancellations, which reduce access to education, physical activity, and community support.

View interactive maps and see information about extreme heat history, risk, and vulnerability

Residents can suffer from increased heat-related illnesses, exacerbation of pre-existing chronic conditions, and even death (Moss, 2017). In the United States, heat is estimated to result in $100 billion in economic losses annually, primarily due to lost productivity, and it accounts for $1 billion in direct healthcare costs each year (American Public Health Association, 2025). In 2023, extreme heat led to 834 emergency department visits, 98 hospitalizations, and two deaths in Minnesota. From 2020–2024, extreme heat was responsible for 73 emergency department visits and eight hospitalizations in Sherburne County (MDH, 2026).

Extreme heat exacerbates poor air quality conditions because the stagnant air during a heat wave increases ozone and particulate pollution (Center for Science Education, 2025). Air pollution is particularly harmful for people over the age of 65, children under the age of five, outdoor workers, and people with respiratory or cardiovascular conditions. The Minnesota Extreme Heat Toolkit further details the health effects of poor air quality.

Figure 9. History of HeatRisk in Sherburne County



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The history of extreme heat in Sherburne County is shown in Figure 9; an interactive version of this chart can be found on the Sherburne County HMP website. This dashboard summarizes the occurrences of days when each HeatRisk category threshold was met for each year from 2015–2025. For the purposes of hazard mitigation planning, we have considered days in the Major (Red) Category (a level of heat affects anyone without effective cooling and/or adequate hydration. Impacts are likely in some health systems, heat-sensitive industries, and infrastructure) and the Extreme (Magenta) Category (level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts are likely in most health systems, heat-sensitive industries, and infrastructure) as extreme heat-related events.

4.9.1 Probability of Occurrence

To determine the probability of future heat-related events in Sherburne County, the average number of days exceeding the major or extreme HeatRisk categories is used to reflect heat events in the county. The St. Cloud Regional Airport Weather Station experiences major or extreme HeatRisk days an average of three days per year based on the 12 years of record. This relative frequency can infer the probability of these events occurring in the future.

Based on records in the Midwestern Regional Climate Center (MRCC) that date back to 1991, the average daily maximum temperature for July in Sherburne County has historically been in the 80–83.9 °F range (MRCC, 2021), which is below the 90 °F for 2–3 days criteria for "extreme" heat events (FEMA, 2024b). However, the St. Cloud Regional Airport Weather Station has reported daily maximum temperatures of at least 90 °F a total of 240 times, an average of eight days per year. This historical average can be used to infer future events, although climate change projections show an increase in the number of days that exceed 90 °F by mid-century (see Section 4.9.3).

4.9.2 Vulnerability

The Minnesota Department of Health updated the Minnesota Extreme Heat Toolkit in 2025 to help local governments prepare for extreme heat events. In their toolkit, they note extreme heat events are often dubbed "silent killers" because deaths and illnesses from these events are often misunderstood and underreported. In fact, extreme heat kills more people in the United States than all extreme weather events combined (Adams-Fuller, 2023). Minnesota does not have a mandated reporting system to report deaths and illnesses linked to extreme heat (MDH, 2025), but is important to not underestimate the danger of extreme heat events within the state.

High temperatures can be exacerbated by the urban heat island effect in developed areas, an effect that amplifies temperatures in areas with a higher concentration of impervious and paved surfaces. These types of surfaces absorb more heat and hold it for longer than vegetation cover (EPA, 2019). Impervious surfaces are not spread evenly throughout the county, and attention should be given to cities or areas within the county where this type of surface cover is most dense. The city with the highest concentration of impervious surfaces is St. Cloud (also in Stearns and Benton counties) at 21.19% (MDH & University of Minnesota, 2019). The distribution of heat-trapping surfaces and their proximity to tree canopy are more important than their total area.

The distribution of impervious surfaces can be viewed in the Extreme Heat Risk & Vulnerability dashboard in the Exposure tab. The metro counties have an additional layer that demonstrates tree

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canopy, an effective mitigation of extreme heat: urban tree canopy of at least 40% can result in as much as 7–9 °F cooler temperatures (Ziter et al., 2019). The Metropolitan Council Growing Shade Tool provides data and resources to inform tree planting and canopy preservation for the Twin Cities region to realize benefits, such as cooler temperatures, improved air quality, cleaner stormwater, improved mental health, and enhanced biodiversity.

Rural areas have higher rates of heat-related emergency department visits compared with urban areas (MDH, 2024), and Americans living in rural areas are twice as likely as those in urban areas to have pre-existing health conditions that make them more vulnerable to extreme heat (Pohl, 2025). Rural agricultural regions can have higher rates of humidity due to moisture-producing crops like corn (Minnesota Supercomputing Institute, 2016), which produces evapotranspiration, or "corn sweat," that can add as much as 5–10 °F to the dew point temperature (Steil, 2016).

Key Message #3 in the Midwest Chapter of the NCA5 lists strategies, such as expanded use of green infrastructure and heat-health early warning systems, have the potential to improve both individual and community health (Wilson et al., 2023).

Everyone is susceptible to extreme heat, but certain individuals are at a higher risk of developing heat-related illnesses. According to the Centers for Disease Control and Prevention (CDC), population groups more vulnerable to extreme heat include:

- Older adults (≥65 years old). The elderly cannot easily adjust to sudden changes in temperature and are more likely to have a chronic medical condition or take medication affecting their body's ability to control its temperature.
- Infants and children. Young children and infants have limited control of their surroundings and rely on others to keep them cool and hydrated.
- Individuals with chronic health conditions. These individuals are less likely to respond to changes in temperature, may be taking a medication that exacerbates the effects of extreme heat, or have a condition that is a risk factor for heat-related illness (e.g., heart disease, mental illness, poor blood circulation, and obesity).
- People with low income. These individuals may not be able to afford to properly cool their home and may face transportation challenges when trying to access cooling shelters.
- Athletes and people working outdoors. Both groups are likely to exert energy while being exposed to the heat (CDC, 2020).

Table 11 shows characteristics that MDH has determined make individuals more at risk to adverse health effects from extreme heat, including how that vulnerability ranks among Minnesota counties. Sociodemographic and socioeconomic data were obtained from the American Community Survey five-year estimates, 2020-2024, Health data come from the U.S. Centers for Disease Control and Prevention's PLACES, 2024 and 2025 releases. Data on electricity-dependent Medicare beneficiaries come from the U.S. Department of Health & Human Services' emPOWER Map. For links to these data, please reference "Data" link in the footer of the Heat and Health Interactive Map on the Sherburne County Extreme Heat website. The indicator's percentile rank within Minnesota determines the vulnerability level of Sherburne County for that indicator (e.g., the 81st–100th percentile is associated with the highest vulnerability compared to other Minnesota counties). For more information on what makes individuals and communities more vulnerable, see the Minnesota Extreme Heat Toolkit.

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Table 11. Populations vulnerable to extreme heat in Sherburne County

Vulnerability Indicator	Percentage of Population	Percentile Rank within Minnesota	Vulnerability Level
Adults with COPD	5.2%	12th	Lowest
Adults with a self-care disability	2.8%	6th	Lowest
Adults with coronary heart disease	5.5%	2nd	Lowest
Adults with diabetes	9.1%	5th	Lowest
Families at less than 200% of poverty level	11.4%	6th	Lowest
Households where a person age 65 or over lives alone	9.2%	3rd	Lowest
Households with no computing device	4.3%	12th	Lowest
Households with no vehicle available	4.2%	24th	Low
Households with rent over 50% of income	3.0%	29th	Low
Medicare beneficiaries who are electricity-dependent	3.7%	16th	Lowest
Medicare–Medicaid-enrolled beneficiaries	1.8%	5th	Lowest
People age 5 or over with limited English	1.9%	53rd	Moderate
People age 65 or over	12.0%	0	Lowest
People over age 16 who work outdoors	8.6%	50th	Moderate
People under age 5	6.5%	85th	Highest
People who are experiencing homelessness	0.1%	70th	High
People who are uninsured	3.7%	13th	Lowest
People who do not identify as “White alone, not Hispanic or Latino”	13.3%	57th	Moderate

Facilities where vulnerable populations may be concentrated, such as prisons, group homes, and childcare centers, are considered to be at higher risk during heat events. Sherburne County’s prison does not have air conditioning.

View interactive information about at-risk populations in Sherburne County

Warming temperatures will continue to increase the risk of extreme heat, especially among these already vulnerable populations. Section 3.4 provides jurisdictional responses to localized vulnerabilities to extreme heat.

4.9.3 Extreme Heat and Climate Change

Minnesota’s annual average temperature has increased more than 3.4 °F since record-keeping began in 1895 (University of Minnesota Climate Adaptation Partnership, 2026), and nine of Minnesota’s hottest 16 years on record have occurred since the year 2000 (MN DNR, 2026a). In Sherburne County, the average temperature from July to September has increased 0.2 degrees Fahrenheit per decade since 1895 (MN DNR, 2026b).

Nights are warming at a much higher rate than days in Minnesota. In Sherburne County, nighttime minimum temperatures from July to September have increased at a rate of 0.3 degrees Fahrenheit per decade (MN DNR, 2026b).

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While 94% of Minnesota households have some form of air conditioning (including central air, room units, dehumidifiers, and ceiling fans), only 68% have the central air conditioning that can provide reliable whole-house cooling (U.S. Energy Information Administration, 2023). Furthermore, homes with air conditioning equipment may not use it; for example, low-income homes might not turn on their units due to the associated costs, and homes in areas with higher crime rates may be reluctant to use window units for security reasons (EPA, 2006).

The average number of days per year with temperatures over 90 °F under a very high carbon emissions (SSP 585), mid-century (2040–2059) scenario is illustrated in the Climate Dashboard on the Plan website.

Climate models project that temperature and precipitation increases will continue in Minnesota through the 21st century, with hotter summers and increased drought severity during dry periods as well. Already, the maximum annual heat index values have been rising across the state, because increased humidity during heat waves (Blumenfeld, K. Minnesota State Climatology Office, personal communication, December 21, 2023).

Table 12 compares historical temperature averages to projections under a high emissions (SSP 585) scenario, demonstrating how many more days will reach above 90 °F and nights where the minimum does not go below 75.2 °F. The data in the table is taken from Minnesota CliMAT, an interactive online tool that provides highly localized climate projections for Minnesota and visualize how even specific towns will likely be impacted in the coming decades (Liess, S. et al., 2023). While models differ on how many degrees of warming will be caused by climate change, all models agree that temperatures will continue to rise.

Table 12. Historical vs projected number of days reaching temperature thresholds in Sherburne County

	Historical (1995–2014)	Projected (2040–2059)	Change
Days Above 90	17.89	40.38	+22.49
Nighttime Minimum > 75.2	0.59	3.78	+3.20

Greenhouse gas concentrations will continue rising through the century, and the air's ability to trap heat from the Earth's surface will increase accordingly. Warming of the atmosphere will evaporate even more water into the air, further limiting the amount of cooling Minnesota will be able to achieve at night and during the winter. As warmer winters and warmer baseline conditions transition into summer, it will be much easier to attain extreme heat (MN DNR, 2026a).

4.9.4 Program Gaps and Deficiencies

Sherburne County Emergency Management identified several program gaps and deficiencies that make its residents more vulnerable to extreme heat. The following gaps and deficiencies should be addressed with new mitigation efforts to reduce that vulnerability:

Generators for Backup Power to Critical Facilities & Shelters: Not all healthcare and other critical facilities utilized for the care of residents & visitors, including designated severe weather/emergency shelters (schools, churches, etc.) have backup power to run cooling systems in the event of a power outage.

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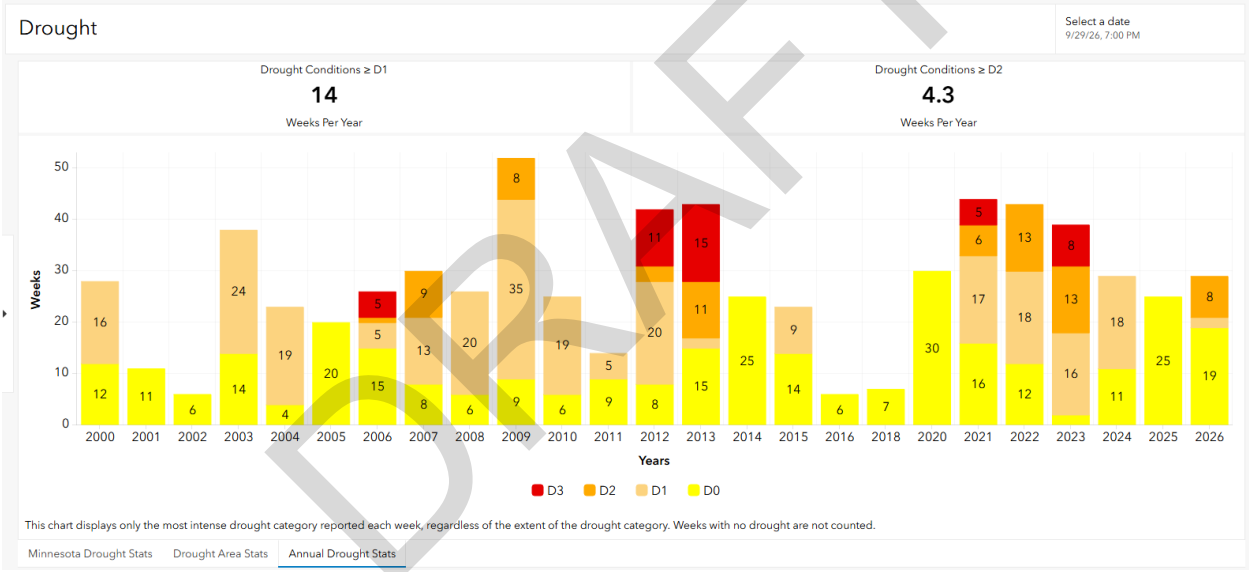
Public Education: Ongoing public outreach and education is needed across jurisdictions to encourage residents to be aware of and prepared for periods of extreme heat, including risks of exposure and preventative measures, especially for those who may be more vulnerable such as older adults, children, or those with chronic conditions.

4.10 Drought

There are numerous approaches to assessing drought conditions. The current gold standard for accurate drought conditions in the United States is the United States Drought Monitor (USDM). Annual drought statistics since 2000 can be seen in Figure 10; an interactive version of this dashboard can be found on the Sherburne County HMP website.

See interactive information about drought, including history and the USDM Dashboard, on the Sherburne County HMP website

Figure 10. Annual drought statistics in Sherburne County since 2000



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4.10.1 Probability of Occurrence

To determine the probability of future droughts in Sherburne County, records of previous droughts were summed and divided by the dataset's period of record, resulting in the annual relative frequency of droughts. The USDM database was examined from January 2000–September 29, 2026 for any occurrence of drought ≥ D1 in Sherburne County, regardless of the duration of the drought. According to the weekly reported data, the relative frequency of the county experiencing drought conditions ≥ D1 is 14 weeks per year, and the relative frequency of drought conditions ≥ D2 is 4.3 weeks per year (NDMC, 2025). The relative frequency of past droughts can be used to infer the probability of similar droughts occurring in the future.

4.10.2 Vulnerability

One way to identify county assets vulnerable to drought is by examining the impacts of previous droughts. Overseen by the National Drought Mitigation Center (NDMC), the Drought Impact Reporter (DIR) is a comprehensive database that gathers drought-related reports from a variety of sources and identifies the sector(s) impacted by each drought. The NDMC (NDMC, 2025) defines a drought impact as "[a]n observable loss or change that occurred at a specific place and time because of drought." A drought meeting this definition is categorized based on the sector(s) the drought impacts; therefore, a single drought affecting multiple sectors will be counted once for each respective sector it impacted.

DIR records show 31 reported drought incidents in Sherburne County from January 2005 to September 2026, impacting eight sectors with greatest impacts to the following sectors: relief, response & restrictions; agriculture; and water supply & quality. (NDMC, 2026). Since droughts are regional in nature, jurisdictions within Sherburne County do not vary in their vulnerability to drought; however, the impact from droughts are not equal.

Drought conditions may impact soil moisture reserves, groundwater supplies, lake levels, and stream flows. Water-dependent industries that experience the greatest impacts include: agriculture, public utilities, forestry, and tourism (MN DNR, 2021). In addition, droughts may negatively affect an individual's health by contributing to poor air quality caused by wildfire smoke and particulate matter, or a dusty environment. The 2021 drought resulted in elevated fire danger in roughly the northern two-thirds of the state, and record-high particulate readings across Minnesota due to the Canadian wildfires (Huttner, 2021). Populations vulnerable to these conditions include children, older adults, and those with respiratory issues.

According to the DIR, Sherburne County's agriculture sector has been impacted by drought more than once, and with 24% of Sherburne County's land devoted to cultivated crops, the county's agriculture community is also vulnerable to the economic impact a drought may have on crops. From 1989–2024, THE COUNTY received $23,749,442 (2024 ADJ) in crop indemnity payments due to drought, placing it as the 65th-highest-paid county in Minnesota (CEMHS, 2026).

Section 3.4 provides jurisdictional responses to localized vulnerabilities to specific hazards.

4.10.3 Drought and Climate Change

Droughts have been happening throughout Minnesota's history. While the degree at which climate change will impact future droughts is not certain, an increase in efforts and resources are being devoted to project these impacts. In 2023, the NCA5 was completed by the U.S. Global Change Research Program. It provided a comprehensive scientific review of how climate change is impacting the U.S. as well as providing climate change projections.

According to the report, a warming climate is contributing to oscillations between extreme droughts and floods, threatening the agriculture and livestock in the Midwest which produces more than 30% of the world's corn and soybeans (Wilson et al., 2023). Climate change is attributed to an estimated $31.9 billion (2022 USD adjusted) of US crop indemnity payments over the last 30 years, with the largest portion of payments going to farmers affected by drought (Wilson et al., 2023). In Minnesota, drought alone represents 25% of the total crop indemnity payments made in the state (CEMHS, 2026).

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Climate projections indicate an increase in annual precipitation of 0.2%–0.5% in the western Midwest and the increase in cumulative runoff is expected to continue through the midcentury (Wilson et al., 2023).

> Key Message #5 in the Midwest Chapter of the NCA5 states that managing extremes is necessary to minimize impacts on water quality and quantity. The extreme variability between wet and dry periods is expected to negatively impact the water quality and quantity of the Mississippi River System and adversely affect dependent ecosystems and commerce (Wilson et al., 2023).

4.10.4 Program Gaps and Deficiencies

Sherburne County Emergency Management did not identify any program gaps or deficiencies that make its citizens more vulnerable to drought.

4.11 Dam Failure

The MN DNR Dam Safety Program has the mission of protecting the life and safety of people by ensuring that dams are safe. Minnesota's Dam Safety Program sets minimum standards for dams and regulates the design, construction, operation, repair, and removal of both privately and publicly (non-federal) owned dams (MN DNR, 2020). The federal government is responsible for regulating and maintaining dam safety of federally owned dams. No single agency regulates all federally owned dams. 42% of federal dams are owned and managed by the U.S. Army Corp of Engineers (USACE) and the Bureau of Reclamation. The remaining federal dams are owned and managed by other federal agencies, including the Fish and Wildlife Service, Forest Service, the Department of Defense, and the Bureau of Indian Affairs, among others (Normand, 2019). The Federal Energy Regulatory Commission (FERC) Dam Safety Program is the largest dam safety program in the U.S. The Commission works with federal and state agencies to ensure and promote dam safety of over 3,000 dams across the U.S. The Commission inspects projects on an unscheduled basis to investigate potential dam safety problems; complaints about constructing and operating a project; safety concerns related to natural disasters; and issues concerning compliance with the term and conditions of a license (FERC, 2020).

Dam Inventory: The National Dam Inventory reports that there are 14 dams in Sherburne County. Dams are mapped on the MN State 2024 HMP website. Sherburne County has one dam classified as a High Hazard Dam. The two dams classified as Significant Hazard Dams are NSP-Bottom Ash and Sherco, both of which are earth tailings dams. There are 11 dams classified as Low Hazard Dams in Sherburne County. The Minnesota Dam Safety Program office was consulted to identify dam incidents and concerns.

Sherburne County's High Hazard dam is Elk River, a gravity recreation dam located on its namesake river. Elk River Dam has a height of 23 feet, a maximum storage of 2,800 acre-feet, a drainage area of 234 square miles, and a maximum discharge of 10,000 cubic feet per second. The current dam was built by CH2M Hill, Inc. in 1980 to replace the structure built in 1916. This area of the Elk River was originally dammed in 1851 to power a sawmill and feedmill (Lake Orono Improvement Association, 2018).

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Elk River Dam forms Lake Orono, a 300-acre reservoir that is entirely within the municipal boundary of the City of Elk River. The reservoir was dredged in 2021 and stocked with a variety of fish by the Minnesota Department of Natural Resources (City of Elk River, 2021). Lake Orono is a popular location for fishing, swimming, and boating. The 28-acre Orono Park is located on the lake's western shore and features a variety of recreational amenities as well as civic ones, such as City Hall, a library, and a YMCA. Lake Orono is surrounded by residential areas and there are several adjacent businesses.

Several residential streets run south of Main St NW and terminate near the northern banks of the Elk River segment that is downstream of the dam. In the event the Elk River Dam fails, homes at the ends of the streets could be at risk. The last inspection date of the dam was 5/23/2024 and the Emergency Action Plan is current as of 1/7/2019.

4.11.1 Probability of Occurrence

Extreme precipitation is only one factor contributing to dam failure, and the possibility of failure is dam-specific, relating to both environmental and structural conditions. There are no noted dam incidents in Sherburne County. A high hazard dam has some risk of failure. Total dam failures are extremely unlikely if the dam is maintained in compliance with Minnesota's Dam Safety Program. The likelihood of failure in Sherburne County is low.

4.11.2 Vulnerability

Although dam regulatory authorities differ between various federal and state agencies, all authorities attempt to classify dams according to the potential impacts from a dam failure or mis-operation. In response to the numerous classification systems, FEMA's Interagency Committee on Dam Safety created a downstream hazard potential classification system that is adaptable to any agency's current system. Table 13 provides an overview of the main criteria agencies consider when determining a dam's downstream hazard potential. This classification system does not imply that the dam is unsafe, but rather categorizes dams based on the probable loss of human life and the impacts on economic, environmental, and lifeline interests (FEMA, 2004).

Table 13. Downstream hazard potential classification criteria

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Class III (Low)	None expected	Low and generally limited to owner
Class II (Significant)	None expected	Yes
Class I (High)	Probable - one or more expected.	Yes (but not necessary for this classification)

Source: (USACE, 2008)

Dams for which a hazard potential has not been designated, or is not provided, are classified as "Undetermined."

An Emergency Action Plan (EAP) is a document that identifies potential emergency conditions at a dam and specifies preplanned actions to be followed during a dam failure to minimize property damage or loss of life. An EAP is required for Class I dams and strongly recommended for Class II dams (MN DNR, 2020).

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4.11.3 Dam Failure and Climate Change

Dams are designed based on assumptions about a river's annual flow behavior that will determine the volume of water behind the dam and flowing through the dam at any one time. Changes in weather patterns due to climate change may change the hydrograph or expected flow pattern. Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events are mechanisms that also result in increased discharges downstream. It is conceivable that bigger rainfalls at earlier times in the year could threaten a dam's designed margin of safety, causing dam operators to release greater volumes of water earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream.

Climate change may increase the probability of design failures. Some spillways may not be large enough to convey the increased flow pattern. An undersized spillway could lead to dam overtopping and failure.

The partial failure of the Rapidan Dam in Blue Earth County in June of 2024 highlighted the growing threat climate change poses to the country's aging infrastructure as extreme weather becomes more common and severe. The Rapidan Dam is a Significant Hazard Dam in "poor" condition. About 20% of Minnesota's Significant and High Hazard Potential Dams are in "fair" or "poor" condition, with a few in "undefined" condition, and about 70% of these dams were built before 1970 (USACE, 2024). These older dams are growing increasingly taxed by extreme weather, especially in the Midwest (Harrison, 2024). Climate change is adding a new level of uncertainty that needs to be considered with respect to assumptions made during the dam construction.

While the Rapidan Dam partial failure did not result in mass inundation, it sent an estimated 11.6 million cubic yards of sediment downstream. The sediment was high in phosphorus and nitrogen because of nearby agricultural runoff. The impacts to the fish habitat and ecology of the stream may not be known for years (MPR News, 2024). The sediment loading behind older dams adds another compounding threat of dam failure to the stream and structures below.

4.11.4 Program Gaps and Deficiencies

Sherburne County Emergency Management did not identify any program gaps or deficiencies that make its citizens more vulnerable to dam failure.

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Section 5 – Mitigation Strategy

The goal of mitigation is to protect lives and reduce the impacts of future hazard events, including property damage, disruption to local and regional economies, the amount of public and private funds spent on recovery, and to build disaster-resistant communities. Mitigation actions and projects should be based on a well-constructed risk assessment as provided in Section 3 of this plan and on the HMP website. Mitigation should be an ongoing process, adapting over time to accommodate a community's needs.

5.1 Community Capability Assessments

The capability assessment identifies current activities and existing planning tools used to mitigate hazards. The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to reducing disaster damages. The assessment also evaluates these capabilities to determine whether the activities can be improved to more effectively reduce the impact of future hazard events. The following sections identify existing plans and mitigation capabilities within all of the communities:

- Appendix D: Lists the plans and programs in place in Sherburne County as related to hazard mitigation.
- Appendix C: As part of the Sherburne County HMP update, the county and city governments were asked to participate in filling out a "Local Mitigation Survey" (LMS) form to report on their current mitigation capabilities and program gaps. Appendix C provides the LMS reports gathered for Sherburne County.

Information from the capability assessments was used to support development of local mitigation actions for implementation over the next five years (see bullet point *Comments on Implementation & Integration).*

5.1.1 National Flood Insurance Program (NFIP)

The NFIP is a federal program created by Congress to mitigate future flood losses nationwide through sound, community-enforced building and zoning ordinances and to provide access to affordable, federally backed flood insurance protection for property owners. The NFIP is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government that states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHAs), the federal government will make flood insurance available within the community as financial protection against flood losses.

Jurisdictional participation in the National Flood Insurance Program (NFIP) is outlined below (G. Bennett MN DNR, personal communication, September 18, 2026).

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Sherburne County

- Status: Participating
- Entry Date: 5/16/1974 (Emergency Entry); 5/19/1981 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: 343
- Adoption of Current Floodplain Ordinance: 6/04/2024 (adopted); 6/15/2024 (effective)
- Adoption of latest DFIRM Map: 10/04/2011 (and in 6/04/2024 ordinance)
- Floodplain Administrator: Marc Schneider, Planning & Zoning Administrator (zoning@co.sherburne.mn.us)

Baldwin (formerly Baldwin Township)

- Status: Participating
- Entry Date: 10/09/2023 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: 45
- Adoption of Current Floodplain Ordinance: 4/18/2022 (adopted); 5/01/2022 (effective)
- Adoption of latest DFIRM Map: 4/18/2022
- Floodplain Administrator: Daniel Licht, Zoning Administrator (ddl@planningco.com)

Becker

- Status: Participating
- Entry Date: 6/12/2000 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: None
- Adoption of Current Floodplain Ordinance: 9/06/2011 (adopted); 9/24/2011 (effective)
- Adoption of latest DFIRM Map: 9/06/2011
- Floodplain Administrator: Jacob Sanders, Community Development Director (jsanders@ci.becker.mn.us)

Becker Township

- Status: Participating
- Entry Date: 6/07/2012 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: 9
- Adoption of Current Floodplain Ordinance: 12/10/2024 (adopted); 12/14/2024 (effective)
- Adoption of latest DFIRM Map: 4/24/2012 (and in 12/10/2024 ordinance)
- Floodplain Administrator: Daniel Licht, Zoning Administrator (ddl@planningco.com)

Big Lake

- Status: Participating
- Entry Date: 2/17/1976 (Emergency Entry); 12/26/1978 (Regular Entry)

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- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: None
- Adoption of Current Floodplain Ordinance: 9/14/2011 (adopted); 9/17/2011 (effective)
- Adoption of latest DFIRM Map: 9/14/2011
- Floodplain Administrator: Hanna Klimmek, City Administrator (hklimmek@biglakemn.org)

Clear Lake

- Status: Participating
- Entry Date: 10/14/2011 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: 0
- Adoption of Current Floodplain Ordinance: 7/06/2011 (adopted); 8/13/2011 (effective)
- Adoption of latest DFIRM Map: 7/06/2011
- Floodplain Administrator: Doug Rosenau, Building Inspector consultant through MetroWest Inspections (Dr@mwimn.com or cityoffice@cityofclearlakemn.gov)

Elk River

- Status: Participating
- Entry Date: 2/19/1974 (Emergency Entry); 5/02/1977 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: 38
- Adoption of Current Floodplain Ordinance: 12/04/2023 (adopted); 12/09/2023 (effective)
- Adoption of latest DFIRM Map: 10/17/2011 (and in 12/04/2023 ordinance)
- Floodplain Administrator: Zack Carlton, Community Development Director (zcarlton@elkrivermn.gov)

Princeton (partly in Mille Lacs County)

- Status: Participating
- Entry Date: 7/02/1974 (Emergency Entry); 6/15/1981 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Dates: 11/16/2011 (Sherburne Co.); 3/04/2013 (Mille Lacs Co.)
- Potential Buildings Damaged in Floodplain: 7
- Adoption of Current Floodplain Ordinance: 1/10/2013 (adopted); 1/17/2013 (effective)
- Adoption of latest DFIRM Maps: 9/08/2011 (Sherburne Co.); 1/10/2013 (Mille Lacs Co. – but also includes Sherburne Co.)
- Floodplain Administrator: Stacy Marquardt, Community Development Planner (smarquardt@princetonmn.org)

St. Cloud (partly in Stearns and Benton counties)

- Status: Participating
- Entry Date: 3/31/1972 (Emergency Entry); 4/01/1977 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas

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- Current Effective Map Dates: 8/16/2011 (Benton Co.); 11/16/2011 (Sherburne Co.); 2/16/2012 (Stearns Co.)
- Potential Buildings Damaged in Floodplain: 0
- Adoption of Current Floodplain Ordinance: 10/10/2011
- Adoption of latest DFIRM Maps: 7/11/2011 (Benton & Sherburne Cos.); 10/10/2011 (Stearns Co. – but also includes Benton & Sherburne Cos.)
- Floodplain Administrator: Matt Glaesman, Community Development Director (matt.glaesman@ci.stcloud.mn.us)

Zimmerman

- Status: Participating
- Entry Date: 5/06/2000 (Regular Entry)
- FEMA Map: FEMA Mapped High Risk Areas
- Current Effective Map Date: 11/16/2011
- Potential Buildings Damaged in Floodplain: 22
- Adoption of Current Floodplain Ordinance: 11/07/2011 (adopted); 11/12/2011 (effective)
- Adoption of latest DFIRM Map: 11/07/2011
- Floodplain Administrator: Keith Koehler, Public Works Director (zimmermanPWD@cityofzimmerman.com)

Following a damaging flood event, any impacted jurisdiction would work with the MN DNR to use a form to track cumulative improvements and repetitive losses in the floodplain. The affected jurisdiction would also review the Minnesota Post-Flood Substantial Damage Playbook for Local Officials.

5.1.2 Repetitive Loss Properties

Repetitive loss properties are defined as properties with two or more flood insurance claims of $1,000 or more in any rolling 10-year period. Property owners are asked to consider mitigation activities such as acquisition, relocation, or elevation, among other options. FEMA's Repetitive Loss (RL) properties strategy is to eliminate or reduce the damage to property and the disruption to life caused by repeated flooding of the same properties. Property owners are notified of their status by FEMA.

A Severe Repetitive Loss (SRL) property is defined as a residential property that is covered under an NFIP flood insurance policy and:

a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
c) For both (a) and (b) above, at least two of the referenced claims must have occurred within any 10-year period and must be greater than 10 days apart.

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Sherburne County has five RL properties and no SRL properties (Ceil Strauss, MN Floodplain Manager, personal communication, August 28, 2026). The RL properties have 13 combined losses with net payments totaling $$178,879.

Sherburne County has six RL properties and no SRL properties For more on the areas that flood repeatedly in Sherburne County, see the Sherburne County Flooding page.

5.1.3 Previous Integration of Hazard Mitigation into Planning Mechanisms

Sherburne County and its incorporated communities are encouraged to integrate relevant information from this mitigation plan into their other planning mechanisms. This demonstrates local progress in mitigation efforts and strengthens the overall mitigation planning process. As part of this plan update, communities were asked to report whether and how information from the 2020 plan was incorporated into their existing plans, policies, programs, partnerships, or other documents. The following provides an overview of their responses.

Sherburne County

Sherburne County actively integrated the 2020 Sherburne County Hazard Mitigation Plan across departmental efforts to reduce risk to natural hazards, including through public outreach, planning, policies, and projects. Sherburne County Emergency Management conducted active promotion of the county's new emergency notification system (HyperReach). Sherburne County Emergency Management utilized the Sherburne County Sheriff's Office Facebook page and Sherburne County website to provide information and communicate with the public on emergency preparedness, severe weather, and other hazard conditions throughout the year. The NWS Severe Weather Awareness Week and Winter Hazard Awareness Week were promoted annually. To address wildfire risk, Sherburne County Planning and Zoning continued to enforce Zoning Ordinance, Section 17 – General Development Regulations, Subdivision 12: Building in Fire Prone Areas which establishes requirements for developers building in fire prone areas. The Planning and Zoning Department also continued to enforce the county's floodplain ordinance and reviewed all proposed building permits in the floodplain and/or shoreland district to ensure projects complied with minimum elevation requirements prior to issuance. The Sherburne County Public Works Department continued to conduct winter road maintenance and vegetation management along county roads to reduce the risk of downed trees or branches resulting from severe windstorm events. The Public Works Department maintained ditches along county-owned roads and worked with private property owners with ditches within the right of way to keep them clear of debris. The Sherburne County Parks, Trails and Open Space Plan was adopted by the Sherburne County Board of Commissioners on June 21, 2005. This plan is used as a guideline for the development of Sherburne County's parks, trails, and open spaces and includes mitigation considerations for severe weather and wildfire management.

City of Baldwin

The city of Baldwin integrated the Sherburne County 2020 HMP in several ways. The city has continued to regulate land use and new development in flood-risk areas through Chapter 92, Floodplain Overlay District of the Baldwin City Code. The city of Baldwin has continued to maintain shared coordination networks with surrounding municipal fire districts (such as Princeton and Elk River) to ensure rapid, heavy-response containment before localized brush

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fires can spread into populated subdivisions. The city also maintains and tests our outdoor warning sirens to ensure they are functional to warn residents of high wind and tornado events.

City of Becker

The city of Becker integrated the Sherburne County 2020 HMP through our implementation of city projects that address risk reduction to flooding and severe storms. The city installed additional generation when we did a City Hall addition renovation. We have ensured that all of the city's water and wastewater infrastructure is connected to Supervisory Control and Data Acquisition (SCADA), and either has an existing standby generation at each of the facilities, or receptacles to connect a generator. The city has also been transitioning from the outdated county-operated outdoor warning sirens to a more modern alert system. The city of Becker has continued to address flood mitigation for new development through policy. The city enforces its Unified Development Ordinance (UDO) in 2025, which includes regulations for floodplain management, a shoreland management overlay district, and subdivision standards. The Community Development Department administers and enforces these regulations through its plan review process, with the Community Development Director serving as the Zoning Administrator.

City of Big Lake

The city of Big Lake integrated the Sherburne County 2020 HMP through out local stormwater improvements to handle high rain events and policy enforcement. The city has been working to update every lift station with new electric panels that operate the station. The city of Big Lake actively adopts and enforces a floodplain ordinance to regulate local development and land use in flood-prone zones. The rules are legally established under City Code Section 1004.02 (Floodplain Overlay District). It serves as a supplemental overlay that places strict restrictions on top of standard base zoning rules. The city is also currently updating its Emergency Operations Plan. We actively use the Big Lake Fire Department Facebook page to share information with local residents about severe weather or fire danger during dry periods.

City of Clear Lake

The city of Clear Lake integrated the Sherburne County 2020 HMP by working implement mitigation for flooding through infrastructure improvements, policy enforcement, and public outreach. The city updated lift stations and added a new lift station with a backup generator. The city also continues to enforce shoreland management protections through zoning restrictions and establishing bluff impact zones. The city enforces protective buffer zones extending landward from the Ordinary High-Water Level (OHWL). Grading, clear-cutting vegetation, and building footprints are heavily restricted or outright banned along natural slopes that drain directly into local waters to prevent severe erosion and flash runoff. The city is in the process of a building a new website to better disseminate information to residents about severe weather events.

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City of Elk River

The city of Elk River integrated the Sherburne County 2020 HMP by focusing on three specific initiatives over the last 5-years. Our emerald ash borer tree removal program has eliminated around 750 potentially high hazard trees from public spaces. Secondly, we have been actively monitoring and maintaining our emergency overflows at all critical drainage locations. And finally, the 169 Redefine Project included stormwater drainage conveyance that now provides an emergency outlet for a previously isolated drainage basin within the city. In addition, the city of Elk River has continued to actively enforce a comprehensive floodplain ordinance. Flood management is integrated directly into Chapter 30, Article VI, Division 11 (Floodplain Management) of the Elk River City Zoning Code. The city has also maintained update of an Emergency Action Plans for all departments as well as schools and nursing homes within the city.

City of Princeton

The city of Princeton integrated the Sherburne County 2020 HMP by continuing to address local flood mitigation. The city has worked to implement stream bank stabilization projects along the West Branch of the Rum River and on the main line of the Rum River (six total projects). The city of Princeton also has continued to enforce a zoning code which incorporates state floodplain and shoreland standards. For overall all-hazards preparedness we have continued to update our city's Emergency Management Plan.

City of St. Cloud

The city of St. Cloud integrated the Sherburne County 2020 HMP through our emergency management program, which includes active outreach to residents to encourage sign up for emergency notifications and sharing information on severe weather and personal preparedness. The city participates annually in the National Weather Service's spring and winter severe weather awareness weeks as well as National Preparedness Month. Information is shared with the public through the city website, emails, radio spots, and social media. The city of St. Cloud has also addressed flood mitigation through ongoing enforcement of the city's floodplain ordinance to regulate local land development and minimize flood losses. Because St. Cloud is situated along the Mississippi River and the Sauk River, flood protections are legally integrated directly into Article 12, Section 12.1 (Floodplain Overlay District) of the St. Cloud Land Development Code.

City of Zimmerman

The city of Zimmerman integrated the Sherburne County 2020 HMP through several efforts to increase our preparedness for severe weather and flooding. The city upgraded three outdoor warning sirens within its boundary to deliver emergency warnings for high wind and tornado events. Backup generators were added to select high-priority lift stations to ensure pump function in power failure events. The city also has continued to enforce both Shoreland Management and Floodplain regulations to govern development along waterways, lake(s) and flood-prone areas. The Building Inspector and Planning staff review construction and development plans to ensure compliance and safety.

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5.1.4 Plans and Programs in Place to Address Natural Hazards

Sherburne County has numerous plans and programs in place to address natural hazards. Some of these programs are hazard-specific, and others address impacts and human safety for many types of events ("All Hazards"). To group related natural hazards, "Summer Storms" encompasses Tornadoes, Windstorms, Lightning, and Hail. The plans and programs in place by Sherburne County to support mitigation for the hazards addressed in this plan are described as follows:

All Hazards

Building Regulations: Sherburne County adopts and enforces the Minnesota State Building Code for the unincorporated areas under its jurisdiction. The Planning & Zoning Department is the primary authority for building safety and code compliance.

All Hazards Emergency Operations Plan: Sherburne County Emergency Management maintains an all-hazards Emergency Operations Plan (EOP) which lays out concepts and operating guidelines for all incident management and support functions that may be needed to ensure life safety, incident stabilization, and property preservation during an incident and the transition to recovery.

Emergency Notification System: Sherburne County maintains the Hyper-Reach Emergency Notification System which allows residents and visitors to sign up ("opt-in") to receive severe weather alerts targeted to their location, along with other local emergency alerts. A link to sign up for the system is located on the Sherburne County Emergency Management website page. Sherburne County also uses IPAWS (Integrated Public Alert Warning System), which allows for both targeted and county-wide emergency notifications to both residents and visitors (not an "opt-in" service).

Preparedness Outreach & Education: Sherburne County Emergency Management utilizes the Sherburne County Sheriff's Office Facebook page and Sherburne County website to provide information and communicate with the public on emergency preparedness, severe weather, and other hazard conditions throughout the year. The county receives all products/statements issued by the National Weather Service, and in turn shares or incorporates these into its community outreach and public education. Sherburne County Emergency Management provides special presentations or other planning assistance as requested to local governments, schools, or other local organizations and facilities within the county.

Mass Care Sheltering: In the event of a disaster where temporary sheltering is needed, Sherburne County Emergency Management works in coordination with Sherburne County Public Health, the American Red Cross, and local governments/Fire & EMS to provide mass care services as needed. The county EOP includes plans, procedures, and resources available for mass care sheltering.

Backup Power: Sherburne County works to ensure the continuity of operations of county government services and critical infrastructure in the event of an extended power outage. Local jurisdictions are responsible to assess where backup power is needed and to obtain emergency generators.

Schools Support: Sherburne County Emergency Management coordinates with local school districts as needed on related emergency planning and preparedness, including support for specific trainings,

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exercises, equipment, and relay of county-level emergency notifications. School districts have their own policies, decision-making protocols, and communications plans in place to determine the need to close school and to notify targeted audiences in the event of severe weather, extreme temperatures, or other events that pose risk to students and staff.

Regional Collaboration: Sherburne County Emergency Management participates in annual regional planning, training, and exercises with neighboring emergency managers. Sherburne County Emergency Management also participates in statewide emergency management training conferences.

Severe Winter Storms

Winter Weather Statements (Watch, Advisory, Warning, etc.): Sherburne County Emergency Management works to relay winter weather statements received from the NWS to help alert residents and visitors to hazardous conditions.

Winter Hazard Awareness Week: Sherburne County participates in the Winter Hazard Awareness Week campaign sponsored by MN HSEM and the National Weather Service each November. The week-long effort provides specific information each day covering the topics of winter weather, outdoor winter safety, indoor winter safety, and winter driving safety. Sherburne County Emergency Management promotes and shares information during the week via social media and area news media. Communities, schools, churches or other civic programs are encouraged to share locally.

Snow Removal & Ice Control: The Sherburne County Highway Department conducts winter road maintenance on county roads in accordance with the Sherburne County Snow and Ice Control Policy. Other road jurisdictions conduct winter road maintenance on their respective road systems in accordance with each of their established policy and/or practices.

Severe Summer Storms (Includes: Tornadoes, Windstorms, Lightning, and Hail)

Severe Weather Statements (Watch, Advisory, Warning, etc.): Sherburne County works to relay severe spring and summer weather statements (such as for thunderstorms, windstorms, or tornadoes) received from the NWS to help alert residents and visitors to hazardous conditions.

Outdoor Warning Sirens: Outdoor warning sirens are located throughout the county and are tested monthly by the Sherburne County Sheriff's Office.

Skywarn® Program: Sherburne County Emergency Management works with the National Weather Service to offer Storm Spotter training on an annual basis to local fire and law enforcement departments and area residents that wish to be trained as spotters. SkyWarn Storm Spotters help to keep their local communities safe by providing timely and accurate reports of severe weather to their local NWS office.

Severe Weather Awareness Week: Sherburne County participates in the Severe Weather Awareness Week campaign sponsored by MN HSEM and the NWS each April. The week-long effort provides

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specific information each day covering the topics of severe weather alerts and warnings, lightning, hail, floods, tornadoes (with statewide drills), and extreme heat. Each topic covered includes factsheets, checklists, data, and other resources. Sherburne County Emergency Management promotes and shares information during the week via social media with communities, schools, churches or other civic programs. Promotion of the use of NOAA weather radios occurs during the NWS Severe Weather Awareness Week as well as throughout the year.

Vegetation Management: The Sherburne County Highway Department conducts vegetation management along county roads to reduce the risk of downed trees or branches resulting from severe spring and summer storm events. Local road authorities and electric utility providers also work to manage vegetation near power lines to reduce the risk of downed lines and power outages.

Extreme Cold

Emergency Notifications: Sherburne County Emergency Management works to relay extreme cold temperature warnings issued by the National Weather Services to help alert residents and visitors to the risks of extreme cold conditions. The Sherburne County Emergency Management Office also encourages residents to follow local news or NWS weather applications to receive severe weather and extreme temperature notifications.

Extreme Cold Safety Awareness: Sherburne County Emergency Management and Sherburne County Public Health promote public awareness of personal safety measure to take during periods of extreme cold, such as sharing information via Facebook posts.

Emergency Sheltering: In the event of an extended power outage coupled with a period of extreme cold, Sherburne County Emergency Management will work with Sherburne County Public Health and local Fire or EMS agencies as needed to assist vulnerable residents such as the elderly who may need temporary sheltering.

Extreme Heat

Emergency Notifications: Sherburne County Emergency Management works to relay extreme heat temperature warnings issued by the National Weather Service to help alert residents and visitors to the risks of extreme heat conditions. The Sherburne County Emergency Management Office also encourages residents to follow local news or NWS weather applications to receive severe weather and extreme temperature notifications.

Public Education and Awareness: Sherburne County Emergency Management and Sherburne County Public Health to promote public awareness of personal safety measures to take during periods of extreme heat, such as sharing information via Facebook posts.

Emergency Sheltering: In the event of an extended power outage coupled with a period of extreme heat, Sherburne County Emergency Management will work with Sherburne County Public Health and local Fire or EMS agencies as needed to assist vulnerable residents such as the elderly who may need temporary sheltering.

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Drought

Public Awareness & Outreach: In the event of extreme drought conditions, Sherburne County works in concert with the NWS, MN DNR, and local communities to raise public awareness of drought conditions and recommended water use restrictions as per MN DNR guidance.

Precipitation Monitoring: The Sherburne County SWCD participates in the MNgage Minnesota Volunteer Precipitation Observing Program, which is administered by the DNR Minnesota State Climatology Office. Data collected by volunteers is entered into a database for various studies and weather prediction simulations, including the assessment of drought severity and impacts.

Flooding

Floodplain Management: Sherburne County Zoning Ordinance, Section 13 – Floodplain District establishes the floodplain district and zoning regulations and conditional uses permitted within the floodway, flood fringe, and general floodplain districts of Sherburne County. The Sherburne County Planning & Zoning Administrator serves as the county's designated Floodplain Management Administrator.

Shoreland Ordinance: Sherburne County Zoning Ordinance, Section 14 – Shoreland Overlay District establishes allowable uses and development standards in shoreland areas designated within the county.

Subdivision Ordinance: The Subdivision Ordinance of Sherburne County establishes regulations for the subdivision and platting of land within Sherburne County and outside the boundaries of municipalities, and provides for the installation of streets, roads, and other improvements.

Transportation Plan: The Sherburne County 2040 Transportation Plan focuses on projects between 2023 and 2040. The plan outlines the priorities and scheduling of road, bridge, and other projects that also benefit localized flood risk reduction.

Minnesota Buffer Law: The Sherburne County SWCD administers the state Buffer Law and provides technical assistance on buffer compliance by landowners. Buffers benefit bank stabilization and reduce erosion and sedimentation into ditches, streams, rivers, and lakes.

One-Watershed One Plan (1W1P): Sherburne County SWCD participates in the Mississippi River – St. Cloud 1W1P and the Rum River 1W1P. These plans address regional watershed planning which may also include measures related to flood mitigation.

Wildfire

Public Awareness & Emergency Notifications: In event of wildfire, Sherburne County Emergency Management works with local law enforcement, local fire departments, the NWS, and the MN DNR to get the word out on the risk of the level of fire danger and any burning restrictions to help keep the public informed and protected.

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Burning Restrictions/Permits: Burning restrictions are set by the MN DNR. Burning permits within Sherburne County are obtained through the MN DNR website or local office.

Wildland Fire Fighting: Local fire departments respond to woodland or grassland fires within their boundaries or in coordination with other fire departments as needed via mutual aid agreements.

Prescribed Burns: The Sherburne County Parks Department runs a burn program for county-owned lands like Oak Savanna Park to clear invasive species. This program is separate from the Sherburne National Wildlife Refuge prescribed burn program. The Sherburne County Sheriff's Office and local fire departments are notified ahead of time of the wildlife refuge burns so they can differentiate between the controlled burns and a real emergency when residents call in smoke sightings.

Subdivision Regulations: Sherburne County Zoning Ordinance, Section 17 – General Development Regulations, Subdivision 12: Building in Fire Prone Areas establishes the following requirements for developers building in fire prone areas: 1). The solid portion of a conifer stand shall be removed for a distance of thirty (30) feet around the perimeter of the building. Single, well-spaced trees may be left in this buffer area; 2). An alternate, passable driveway shall be installed. Two driveways will allow an escape route to inhabitants of the building should one become blocked by fire, and allow for entrance and movement of emergency equipment; and 3). Building construction materials shall conform to reflect the relative fire danger of the area. Roofs and exteriors of buildings should be of fire-resistant nature. The Sherburne County Subdivision Ordinance also establishes road and block requirements which enforce length limits on blocks and proper road spacing to ensure that local fire departments and emergency vehicles can safely enter and evacuate residential layouts.

5.2 Mitigation Goals

The goals and strategies for natural hazards in the 2024 Minnesota State Hazard Mitigation Plan were adopted for use in the Sherburne County Plan. This framework, as outlined below, will allow for integration of the mitigation actions that are listed by Sherburne County and its jurisdictions into the state plan. The state will then be able to develop a statewide strategy that will benefit all of Minnesota.

Flooding Goal: Reduce deaths, injuries, property loss and economic disruption due to all types of flooding (riverine, flash, coastal, dam/levee failure).

Wildfire Goal: Reduce deaths, injuries, property loss, natural resource and economic disruption due to wildfires (forest, prairie, grass, and peat bogs).

Windstorms Goal: Reduce deaths, injuries, property loss, and economic disruption due to windstorms.

Hail Goal: Reduce deaths, injuries, property damage, and economic disruption due to hailstorms.

Winter Storms Goal: Reduce deaths, injuries, property loss, and economic disruption due to winter storms (blizzard, ice, and ice storm).

Lightning Goal: Reduce deaths, injuries, property losses, loss of services, and economic disruption due to lightning.

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Tornado Goal: Reduce deaths, injuries, property loss, and economic disruption due to tornadoes.

Drought Goal: Reduce economic loss and environmental impacts due to drought.

Extreme Heat Goal: Reduce deaths, injuries, and economic disruption due to extreme heat.

Extreme Cold Goal: Reduce deaths, injuries, and economic disruption due to extreme cold.

Dam/Levee Failure Goal: Reduce deaths, injuries, property loss, natural resource and economic disruption due to dam/levee failure.

Erosion/Landslide/Mudslide Goal: Reduce deaths, injuries, property loss, and economic disruption due to hillside, coastal, bluff: caused primarily by oversaturation of soil.

5.3 Mitigation Action and Project Strategies

The mitigation actions in this plan are summarized into four main strategy types, as described in the FEMA publications *Local Mitigation Planning Handbook* (2013) and *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* (2013). Minnesota HSEM determined a fifth strategy type for use within the state: Mitigation Preparedness and Response. The strategies and example actions are listed in Table 14.

Table 14. Mitigation strategies and action types

Mitigation Strategy	Description	Example Mitigation Actions
Local Plans and Regulations	These actions include government authorities, policies, or codes, that influence the way land and buildings are developed and built.	• Comprehensive plans • Land use ordinances • Planning and zoning • Building codes and enforcement • Floodplain ordinances • NFIP Community Rating System • Capital improvement programs • Open space preservation • Shoreline codes • Stormwater management regulations and master plans
Structure and Infrastructure Projects	These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance program.	• Acquisitions and elevations of structures in flood-prone areas • Utility undergrounding • Structural retrofits • Floodwalls and retaining walls • Detention and retention structures • Culverts • Safe rooms

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Mitigation Strategy	Description	Example Mitigation Actions
Natural Systems Protection	These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.	• Sediment and erosion control • Stream corridor restoration • Forest management • Conservation easements • Wetland restoration and preservation
Education and Awareness Programs	These are actions to inform and educate residents, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady or Firewise Communities. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions.	• Radio or television spots • Websites with maps and information • Real estate disclosure • Presentations to school groups or neighborhood organizations • Mailings to residents in hazard-prone areas. • StormReady Certification • Firewise Communities
Mitigation Preparedness and Response	This is a State of Minnesota mitigation strategy with the intent of covering preparation and actions that protect life and property during a natural disaster.	• Emergency operations plan • Flood fight plans and preparedness • Dam emergency action plans • Warning • Backup power • Emergency capabilities

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Local leaders work together with the Sherburne County emergency management director to assure that the hazards and mitigation actions included in this plan are accurate and addressed in their jurisdictions. Development of mitigation actions for the county and each city was informed by a community's hazard and risk assessment; identification of local vulnerabilities, and review of capabilities in place to address mitigation. Planning team members, local elected officials and staff from Sherburne County and each city actively participated in the development and review of mitigation action charts for implementation through participation in planning team meetings (see Appendix F) and development of Local Mitigation Surveys (see Appendix C). Additional jurisdictional and public feedback was incorporated following news releases inviting public input to the planning process (see Appendix G).

The Sherburne County risks and mitigation activities identified also incorporate the concerns and needs of townships, school districts, and other entities participating in this plan. Appendix H contains the jurisdictional mitigation action charts for participating cities.

See Mitigation Actions for all jurisdictions and provide ongoing feedback on the HMP website

The following is an overview of the mitigation action charts and a description of each element of the chart.

Number (#)
Each mitigation action is identified by a number.

Hazard
Each mitigation action is identified by the natural hazard it relates to. Actions that fall under "All Hazards" relate to both natural and non-natural hazards. "Severe Winter Storms" includes blizzards, heavy snow, ice storms, winter storms, and winter weather. "Severe Summer Storms" includes windstorms, tornadoes, lightning, and hail.

Mitigation Strategy
Each mitigation action is identified by one of the following five mitigation strategies.

- Local Planning and Regulations
- Structure and Infrastructure Projects
- Natural Systems Protection
- Education and Awareness Programs
- Mitigation Preparedness and Response Support

See Table 14 for a description of each mitigation strategy and related types of actions.

Mitigation Action

Each mitigation action provides a concise, action-oriented description of the action or project to be undertaken that will help to reduce or eliminate future risk, including in areas with existing or new development.

Status
The status of each mitigation action is indicated by one of the following categories:

- New – New actions that have been identified since the last plan.
- Existing – Actions that are carried over from the last plan or have been updated.
- In Progress – Actions from the last plan that are currently being acted upon.

Mitigation actions that have been completed or deleted from the 2020 Sherburne County Hazard Mitigation Plan are identified and reported on in Appendix H. Completed and deleted mitigation actions are not carried over into the updated mitigation action chart.

Priority
In the review and discussion of selected mitigation strategies and actions, the planning team ranked mitigation actions by priority for implementation. Table 15 provides criteria that were taken into consideration in the process.

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Table 15. Criteria for Mitigation Action Priority Ranking

Ranking	Criteria
High Priority	• Methods for reducing risk from the hazard are technically reliable. • The jurisdiction has experience in implementing mitigation measures. • Mitigation measures are eligible under federal grant programs. • There are multiple mitigation measures for the hazard. • The mitigation measure(s) are known to be cost-effective. • The mitigation measures protect lives and property for a long period or are permanent risk reduction solutions.
Moderate Priority	• Mitigation methods are established. • The jurisdiction has limited experience with the types of measures that may be appropriate to mitigate the hazard. • Some mitigation measures are eligible for federal grants. • There is a limited range of effective mitigation measures for the hazard. • Mitigation measures are cost-effective only in limited circumstances. • Mitigation measures are effective for a reasonable period.
Low Priority	• Methods for reducing risk from the hazard are not well-established, are not proven reliable, or are experimental. • The jurisdiction has little or no experience in implementing mitigation measures, and/or no technical knowledge of them. • Mitigation measures are ineligible under federal grant programs. • There is a very limited range of mitigation measures for the hazard, usually only one feasible alternative. • The mitigation measure(s) have not been proven cost-effective and are likely to be very expensive compared to the magnitude of the hazard. • The long-term effectiveness of the measure is not known or is known to be relatively poor.

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Time frame

Each mitigation action identifies the anticipated timeframe for implementation within the next five-year planning cycle. If a mitigation action is considered an ongoing effort, the next five-year period in which the activity would occur is listed. If a mitigation activity has a defined period for implementation (i.e., a specific year), it will be noted.

Responsibility

Each mitigation action identifies what personnel, department, or agency will serve as lead for the administration or implementation of the action.

Comments on Implementation & Integration

Each mitigation action provides a description of how the jurisdiction will work to implement the mitigation action and incorporate the activity into other existing planning mechanisms. This can

include description of methods for public outreach, enforcement of policies, development of plans, and coordination of key staff and partnership efforts.

Possible Funding

Each mitigation action identifies potential funding sources to support implementation of the mitigation activity, such as existing county or city funding, or state or federal funding. Projects that may be eligible for future FEMA Hazard Mitigation Assistance grant funding are noted.

5.3.1 Sherburne County Mitigation Actions

To reduce natural hazard risks to our residents, infrastructure, and resources, Sherburne County has identified the following mitigation actions for implementation (2027–2032).

1. **All Hazards:** Conduct outreach to encourage residents to be aware of and sign up for Sherburne County's HyperReach emergency notification system.
   - **Strategy:** Education and Awareness Programs
   - **Status:** Existing
   - **Priority:** High
   - **Timeframe:** 2027–2032
   - **Responsibility:** Emergency Management Division
   - **Comments on Implementation and Integration:** Sherburne County Emergency Management continues to promote sign up for HyperReach. A link to sign up for the system is located on the Sherburne County Emergency Management website page
   - **Possible Funding:** All elements of the Sherburne County Emergency Management (EM) Division are funded under the Sherburne County Sheriff's Office Department general operating fund. The EM program may be supplementally funded externally by grant funding, such as the Emergency Management Performance Grant (EMPG). All further reference to funding that supports work done by the EM Division is "Sherburne County EM Program Funding" unless otherwise noted.

2. **All Hazards:** Update the Sherburne County Emergency Operations Plan (EOP) to ensure it adequately details the needed steps to respond to all potential hazards.
   - **Strategy:** Mitigation Preparedness and Response Support
   - **Status:** Existing
   - **Priority:** High
   - **Timeframe:** 2027–2032
   - **Responsibility:** Emergency Management Division
   - **Comments on Implementation and Integration:** The EOP is updated as needed and/or according to the Minnesota Homeland Security Emergency Management review cycle.
   - **Possible Funding:** Sherburne County EM Program Funding.

3. **All Hazards:** Work with local communities, Sherburne County Health & Human Services (HHS), and the American Red Cross to increase the amount of shelter facilities with Memorandums of Understanding in the county.
   - **Strategy:** Mitigation Preparedness and Response Support

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- **Status:** Existing
- **Priority:** Moderate
- **Timeframe:** 2027–2032
- **Responsibility:** Emergency Management Division, HHS
- **Comments on Implementation and Integration:** Addressed in EOP and in coordination with local jurisdictions and the American Red Cross. Sherburne County Emergency Management encourages all communities to have designated local facilities that are ready to provide temporary sheltering.
- **Possible Funding:** Sherburne County EM Program Funding

4. **Severe Winter and Summer Storms:** Provide education and awareness on severe winter, spring, and summer storms to residents and visitors and promote personal and family emergency preparedness.
   - **Strategy:** Education and Awareness Programs
   - **Status:** Existing
   - **Priority:** High
   - **Timeframe:** 2027–2032
   - **Responsibility:** Emergency Management Division
   - **Comments on Implementation and Integration:** Sherburne County Emergency Management participates annually in the National Weather Service's Severe Weather Awareness Week and Winter Hazards Awareness Week to actively share information on seasonal storm hazards with the public. Local jurisdictions are encouraged to share the information with their communities.
   - **Possible Funding:** Sherburne County EM Program Funding

5. **Severe Winter and Summer Storms:** Ensure Sherburne County critical facilities are supplied with backup power generator power where necessary.
   - **Strategy:** Mitigation Preparedness and Response Support
   - **Status:** Existing
   - **Priority:** High
   - **Timeframe:** 2027–2032
   - **Responsibility:** Emergency Management Division, County Administration
   - **Comments on Implementation and Integration:** Emergency Management continues to work with County Administration and other departments to identify what county-owned critical facilities (buildings or other infrastructure) should have backup generator power and install generators at these locations.
   - **Possible Funding:** Sherburne County EM Program Funding, FEMA grant program funding may be considered in the future if necessary for any large-scale generator projects.

6. **Severe Winter and Summer Storms:** Work with rural and municipal electrical coops to identify where it is feasible and cost-effective to bury or strengthen power lines to mitigate against power line failure and implement measures.
   - **Strategy:** Structure and Infrastructure Projects
   - **Status:** Existing

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- **Priority:** High
- **Timeframe:** 2027–2032
- **Responsibility:** Public Works Department in coordination with local governments and utility companies
- **Comments on Implementation and Integration:** Sherburne County Public Works will work in conjunction with our local municipalities and electric cooperatives to address powerline conversion projects as needed and as deemed feasible.
- **Possible Funding:** Electrical cooperative funding, local municipal funding. Possible FEMA Building Resilient Infrastructure and Communities (BRIC) grant funding.

7. **Severe Winter and Summer Storms:** Conduct tree trimming or removal of trees in the right of way of county roads to reduce risk of road blockages and downed power lines due to falling limbs.
   - **Strategy:** Natural Systems Protection
   - **Status:** Existing
   - **Priority:** High
   - **Timeframe:** 2027–2032
   - **Responsibility:** Public Works Department, local jurisdictions
   - **Comments on Implementation and Integration:** Sherburne County Public Works and city utilities routinely perform vegetation management along roads under their authority.
   - **Possible Funding:** Public Works and local road authority operating budgets

8. **Severe Summer Storms, Tornado:** Ensure that outdoor warning sirens throughout the county are maintained and updated as needed by local jurisdictions. Ensure that other jurisdictions are utilizing appropriate weather warning tools.
   - **Strategy:** Mitigation Preparedness and Response Support
   - **Status:** Existing
   - **Priority:** High
   - **Timeframe:** 2027–2032
   - **Responsibility:** Local Jurisdictions in coordination with the Sherburne County Emergency Management and Dispatch divisions.
   - **Comments on Implementation and Integration:** Outdoor warning sirens are tested monthly. Maintenance of sirens is the responsibility of the cities and townships where they are located. Sherburne County Dispatch will continue to test and sound the sirens. Local jurisdictions are encouraged to plan for and address purchase of new outdoor warning sirens as they deem necessary. Sherburne County Emergency Management and Dispatch divisions will serve in a supporting role as needed for new warning siren projects.
   - **Possible Funding:** Local governments fund maintenance of their sirens. Sherburne County funds the testing of warning sirens monthly. Funding for purchase of new sirens may be possible via FEMA hazard mitigation grant opportunities.

9. **Severe Summer Storms, Tornado:** Work to construct storm shelters or tornado safe rooms in areas where people are vulnerable during dangerous high wind events.
   - **Strategy:** Structure and Infrastructure Projects
   - **Status:** Existing

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- **Priority:** High
- **Timeframe:** 2027–2032
- **Responsibility:** Emergency Management Division in coordination with local governments and area school districts
- **Comments on Implementation and Integration:** Sherburne County Emergency Management continues to work in coordination with schools and local jurisdictions who may be seeking to construct a new tornado safe room and apply for possible future FEMA grant funding.
- **Possible Funding:** Projects would be funded locally, and local governments and schools may seek to apply for FEMA hazard mitigation grant opportunities with local cost-share funding.

10. **Extreme Heat/Cold:** Work with local jurisdictions to be prepared to open heating or cooling centers in the event of extreme temperature events.
    - **Strategy:** Mitigation Preparedness and Response Support
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Emergency Management Division
    - **Comments on Implementation and Integration:** This is an ongoing part of the Sherburne County Emergency Management program in coordination with local emergency managers. Local jurisdictions are responsible to ensure their designated facilities are equipped with backup power.
    - **Possible Funding:** Sherburne County EM Program Funding, local jurisdiction funding

11. **Flooding:** Administer and enforce the County's Floodplain Ordinance to regulate new development in mapped flood risk areas.
    - **Strategy:** Local Planning and Regulations
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Planning and Zoning Department
    - **Comments on Implementation and Integration:** Sherburne County Zoning Ordinance, Section 13 – Floodplain District establishes the floodplain district and zoning regulations and conditional uses permitted within the floodway, flood fringe, and general floodplain districts of Sherburne County. The Sherburne County Planning & Zoning Administrator serves as the county's designated Floodplain Management Administrator.
    - **Possible Funding:** Sherburne County general operating fund

12. **Flooding:** Provide information to the public on the flood insurance rate maps for Sherburne County to support property owner awareness and decision-making for existing homes or new construction.
    - **Strategy:** Education and Awareness Programs
    - **Status:** Existing
    - **Priority:** Moderate

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- **Timeframe:** 2027–2032
- **Responsibility:** Planning and Zoning Department
- **Comments on Implementation and Integration:** This is an ongoing service provided by the Sherburne County Planning and Zoning Department.
- **Possible Funding:** Sherburne County general operating fund

13. **Flooding:** Conduct public outreach in advance of and during heavy rain and flood events to educate residents on personal actions to take to reduce damages to property and protect life safety.
    - **Strategy:** Education and Awareness Programs
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Emergency Management and Dispatch divisions
    - **Comments on Implementation and Integration:** Sherburne County Emergency Management regularly incorporates public outreach and education on flooding during Severe Weather Awareness Week and during actual storm events during the year. This includes caution alerts not to drive through potential flood waters in low areas. Communication channels used include the Sheriff's Office social media, local media, and the Sherburne County website.
    - **Possible Funding:** Emergency Management program funding

14. **Flooding:** Implement improvement projects that reduce risk of flood damages to transportation infrastructure such as culverts, roads, and bridges.
    - **Strategy:** Structure and Infrastructure Projects
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Public Works Department
    - **Comments on Implementation and Integration:** The Sherburne County 2040 Transportation Plan focuses on projects between 2023 and 2040. The plan outlines the priorities and scheduling of road, bridge, and other projects that also benefit localized flood risk reduction.
    - **Possible Funding:** Sherburne County Capital Improvement Project budget for transportation projects

15. **Flooding:** Work to restore drainage ditches along county roads to carry surface water discharge and avoid over-the-road flooding.
    - **Strategy:** Natural Systems Protection
    - **Status:** Existing
    - **Priority:** Moderate
    - **Timeframe:** 2027–2032
    - **Responsibility:** Public Works Department

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- **Comments on Implementation and Integration:** Sherburne County Public Works Department maintains ditches along county-owned roads and works with private property owners with ditches within the right of way to keep them clear of debris.
- **Possible Funding:** Public Works Department general operating funds

16. **Flooding:** Repair, restore, and stabilize shorelines of streams, rivers, and lakes that experience damaging erosion from heavy rain and flood events.
    - **Strategy:** Natural Systems Protection
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Sherburne Soil and Water Conservation District (SWCD)
    - **Comments on Implementation and Integration:** The Sherburne SWCD continues to provide landowners with technical and financial assistance in preparation for natural occurring events.
    - **Possible Funding:** Sherburne SWCD Cost-Share program funding

17. **Wildfire:** Conduct Firewise public awareness & education campaigns on wildfire safety and actions for property owners to take, such as creation of defensible space to reduce wildfire risk to structures.
    - **Strategy:** Education and Awareness Programs
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Emergency Management Division in coordination with local fire departments and Minnesota Department of Natural Resources (MN DNR)
    - **Comments on Implementation and Integration:** Sherburne County Emergency Management continues to use existing public outreach channels such as the Sheriff's Office FB/X page, Sherburne County website and distribution of news releases to newspapers and radio stations. Outreach for wildfire awareness will particularly be done during extended dry periods, after storms that result in blowdown of trees, and during summer months when people have more campfires. Local fire departments also do their own outreach to residents to raise awareness of wildfire danger.
    - **Possible Funding:** Emergency Management program funding, local fire departments

18. **Wildfire:** Work with local fire departments to identify rural areas that are not served by a municipal water source and evaluate for needed dry hydrant or well access projects. Install infrastructure as feasible.
    - **Strategy:** Structure and Infrastructure Projects
    - **Status:** Existing
    - **Priority:** Moderate
    - **Timeframe:** 2027–2032
    - **Responsibility:** Emergency Management Division in coordination with local fire departments

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- **Comments on Implementation and Integration:** Sherburne County has a database with the locations of existing dry hydrants and well access points and will keep this updated with any new projects. The County will provide support to local fire departments and help provide support to local grant applications to support project implementation.
- **Possible Funding:** Community Wildfire Defense Grant, local government funding

19. **Wildfire:** Manage vegetation in Sherburne County Parks to reduce risk of wildland fire (e.g., controlled burns, removal of trees after blowdown events, and application of silvicultural prescriptions).
    - **Strategy:** Natural Systems Protection
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Parks and Trails Department
    - **Comments on Implementation and Integration:** The Sherburne County Parks Department runs a burn program for county-owned lands like Oak Savanna Park to clear invasive species. This program is separate from the Sherburne National Wildlife Refuge prescribed burn program. The Sherburne County Sheriff's Office and local fire departments are notified ahead of time of the wildlife refuge burns so they can differentiate between the controlled burns and a real emergency when residents call in smoke sightings.
    - **Possible Funding:** Parks and Trails Department program funding

20. **Wildfire, Drought:** Work to raise public awareness during periods of drought and the increased risk of wildfire.
    - **Strategy:** Education and Awareness Programs
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Emergency Management Division
    - **Comments on Implementation and Integration:** Sherburne County Emergency Management and local fire departments conduct outreach to residents to raise their awareness of high-risk wildfire periods through channels such as Facebook and local news media.
    - **Possible Funding:** Emergency Management program funding, local governments

21. **Wildfire:** Enforce regulations that reduce the risk of wildfire to areas of new residential development in high-risk Wildland-Interface Areas.
    - **Strategy:** Local Planning and Regulations
    - **Status:** Existing
    - **Priority:** High
    - **Timeframe:** 2027–2032
    - **Responsibility:** Planning and Zoning Department
    - **Comments on Implementation and Integration:** The Sherburne County Planning and Zoning Department enforces Zoning Ordinance, Section 17 – General Development Regulations, Subdivision 12: Building in Fire Prone Areas. This ordinance establishes the following

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requirements for developers building in fire prone areas: 1). The solid portion of a conifer stand shall be removed for a distance of thirty (30) feet around the perimeter of the building. Single, well-spaced trees may be left in this buffer area; 2). An alternate, passable driveway shall be installed. Two driveways will allow an escape route to inhabitants of the building should one become blocked by fire, and allow for entrance and movement of emergency equipment; and 3). Building construction materials shall conform to reflect the relative fire danger of the area. Roofs and exteriors of buildings should be of fire-resistant nature. The Sherburne County Subdivision Ordinance also establishes road and block requirements which enforce length limits on blocks and proper road spacing to ensure that local fire departments and emergency vehicles can safely enter and evacuate residential layouts.

- **Possible Funding:** Sherburne County general operating fund.

Appendix H provides the mitigation actions developed for each city participating in the 2026 HMP update. A report on the status of mitigation actions related to natural hazards included in the Sherburne County 2020 plan update can be found in Appendix E.

See Mitigation Actions for all jurisdictions and provide ongoing feedback on the HMP website

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Section 6 – Plan Maintenance

6.1 Monitoring, Evaluation, and Updating the Plan

The Sherburne County Hazard Mitigation Plan (HMP) should be considered a living document. The plan should be updated and approved by FEMA at least every five years. The guidance in this section will function as the primary tool when reviewing progress on the implementation of the Sherburne County HMP.

The Sherburne County emergency management director (EMD) is the individual responsible for leading all efforts to monitor, evaluate, and update the HMP within the five-year window. Throughout the five-year planning cycle, the Sherburne County EMD will work with an emergency managers group to help monitor, review, evaluate, and update the HMP. The group will include township representatives and designated city emergency managers from cities participating in the plan update, and include other city elected officials or staff as needed. Representatives from agencies or organizations that are involved with related mitigation work in the county as well as those that work with underserved communities or socially vulnerable populations will also be invited to participate in the group. The Sherburne County EMD will conduct quarterly outreach to and communicate with the group on emergency management matters regarding severe weather awareness, local preparedness, mitigation, and response & recovery as needed. Additional stakeholders will be added based on need or in response to severe weather events.

If necessary, the Sherburne County EMD will convene the group to meet more regularly to monitor plan implementation progress and reassess needs and opportunities. This could be done in response to funding cycles of programs that provide resources for hazard mitigation activities. If there is a need for a special meeting due to new developments or a declared disaster occurring in the county, the group will meet to update pertinent mitigation strategies. Depending on Sherburne County opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

The group will continue to review the HMP goals and objectives to determine their relevance to changing situations in Sherburne County. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The group will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

Updates or modifications to the HMP during the five-year planning process will require a public notice and a meeting prior to submitting revisions to the individual jurisdictions for approval. The plan will be updated via written changes, submissions as the group deems appropriate and necessary, and as approved by county commissioners.

During the five-year plan period, the EMD will require all relevant county departments and jurisdictions to report on the status of their mitigation actions using the worksheets provided in Appendix I. This information will be used to track progress for the next plan update. Additionally, the

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EMD will establish and implement an HMP maintenance schedule. Forms for these purposes are drawn from FEMA's 2023 Local Mitigation Planning Handbook and can be found in Appendix I (FEMA, 2023).

The EMD will also solicit feedback from the emergency managers group using the following prompts (also found in Appendix I):

- Are there any new representatives from jurisdictions, agencies, or organizations that you feel should be included in our stakeholder outreach?
- Do you feel your community has any new vulnerabilities that may be impacted by hazard events? (critical infrastructure, systems, or populations)
- Has your community identified any new mitigation activities that would help reduce risk to future hazard events?
- Are there any funding opportunities or other resources that may be available to help implement local mitigation activities?
- How is your community integrating information from the mitigation plan into other planning mechanisms (such as plans, policies, or partnerships)?

6.2 Implementation

Sherburne County and its included municipalities share a common HMP and work together closely to develop, revise, and implement it. This HMP provides a comprehensive chart of mitigation actions for Sherburne County and its jurisdictions (see Appendix H and Section 5.3). The cities participating in the HMP planning process identified the specific mitigation strategies that they would seek to implement in their communities during the five-year planning cycle. These mitigation actions are provided in Appendix H.

Several implementation tools are available to address hazards. The strategies to use will be part of an ongoing discussion as Sherburne County looks for opportunities for plan implementation. The following tools will be considered:

Education: In many cases, education of residents has been identified as one of the most effective mitigation strategies.

Capital Investments: Capital investments such as fire and ambulance equipment, sprinkler systems, and dry hydrants are tools that can limit risks and impacts of natural and manmade hazards.

Data Collection and Needs Assessments: Data collection and needs assessments can aid in gaining a better understanding of threats and allow planning for mitigation strategies accordingly. As resources are limited for this part of the planning process, additional data collection is likely to be an ongoing activity as resources become available.

Coordination: Responsibilities for mitigation strategies run across various county departments, local fire and ambulance departments, city and township governments, and a host of state and federal agencies. Ongoing coordination is an important tool to ensure resources are used efficiently. Coordination can also avoid duplication of efforts or prevent gaps that are created because of unclear roles and responsibilities. The mitigation plan review process can function as a tool to have an ongoing discussion of roles, responsibilities, and opportunities for coordination.

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Regional Cooperation: Counties and public safety services providers throughout the region often share similar challenges and concerns. In some cases, a regional approach may be warranted as a mitigation strategy in order to save resources. Mutual aid agreements are a tool already in use for a number of services. Needs assessments for fire and ambulance services and development of assistance for volunteer recruiting, training, and retention could benefit from a regional approach. Cooperation among counties could also help in lobbying for certain funding priorities that address concerns relating to challenges in service delivery in rural areas. Organizations such as FEMA Region 5 and the Minnesota Division of Homeland Security and Emergency Management (HSEM) through the Regional Program Director can offer tools and resources to assist in these cooperative efforts.

Regulation: Regulation is an important mitigation tool for Sherburne County. Regulation plays a vital role in land use, access to structures, and the protection of water resources and public health.

6.3 Continued Public Involvement

Continued public involvement is critical to the successful implementation of the Hazard Mitigation Plan. The Sherburne County Emergency Management Director and the emergency managers group will continue to engage new public stakeholders in planning discussions and project implementation during the five-year cycle of this plan.

The Sherburne County HMP website provides opportunities for continued public involvement and feedback

To seek continued public participation after the plan has been approved and during the five-year window of implementation for this plan, Sherburne County will take the following measures:

- The Sherburne County HMP website link will be posted on the Sherburne County Emergency Management website. The website provides a PDF of the plan for download and an interactive experience for the public to understand the planning process, where county-specific vulnerabilities lie, national best practices, as well as a chance to submit feedback. Collected feedback will be reviewed during the five-year plan cycle and will be noted for future update of the plan or addressed as necessary.
- Following any major storms or natural disasters, Sherburne County Emergency Management will seek to gather concerns and new ideas for mitigation from local residents to include in the next update of the plan. This may be done through public meetings, outreach via social media, or news releases via local media.
- Each community participating in the plan will be responsible for keeping their local government, schools, and community members updated and engaged in the implementation of their respective mitigation action charts (see Appendix H or the Sherburne County HMP website). Each respective jurisdiction will be required to report on the status of mitigation actions in their charts to the Sherburne County EMD.
- Sherburne County and its jurisdictions will use numerous means of public outreach to engage new public stakeholders in providing input on mitigation concerns, including those from underserved communities or socially vulnerable populations. Outreach methods may include presentations at city council or township board meetings, sharing information at special events, working with local schools and partner organizations, and posting information

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in areas that are used to communicate with the public (bulletin boards, websites, social media, and local media sources that communities use to inform and engage the public). As mitigation projects are implemented, jurisdictions will work to keep the public updated and engaged in those local efforts.

- To ensure an equitable outreach strategy continues after the plan is adopted, the planning team will continue to seek to engage with underserved and vulnerable populations during the next five years. This will vary across jurisdictions, as underserved or vulnerable populations will differ across the planning area. Methods of engagement will include those listed above, as well as working with partner agencies, local organizations, facilities, or community interest groups (e.g., schools, nursing homes, Rotary Club) to conduct more targeted outreach or presentations to share information on hazard mitigation and solicit for feedback on concerns and ideas.

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