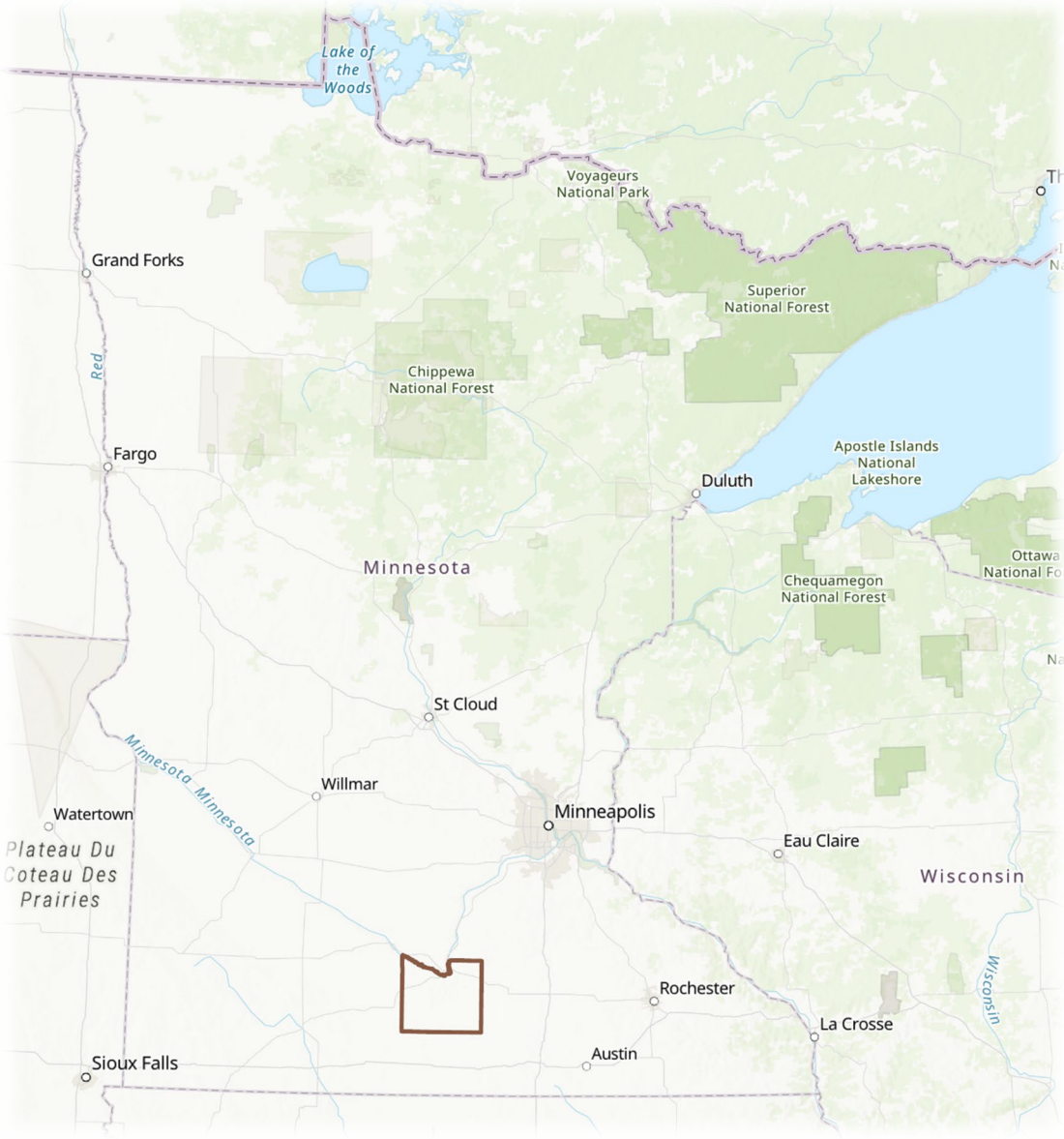
# Multi-Hazard Mitigation Plan

## Blue Earth County, Minnesota, 2020




BLUE EARTH COUNTY

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# Multi-Hazard Mitigation Plan
## Blue Earth County, Minnesota

## 2020

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# Section 1 – Introduction

## 1.1 Introduction

Hazard mitigation is defined as any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) has made reducing hazards one of its primary goals; hazard mitigation planning and the subsequent implementation of resulting projects, measures, and policies is a primary mechanism in achieving FEMA's goal.

From 1980-2018, the cost of damages due to natural disasters in the U.S. has exceeded $1.6 trillion. 2017 was a record year with $306 billion in damage (NOAA, n.d.). While the costliest disasters may occur in the coastal states, in 2018, wildfires, hailstorms, drought, and tornadoes caused many billion-dollar disasters across the nation.

Hazard mitigation planning and preparedness will be the most effective instrument to diminish losses by reducing the impact of disasters upon people and property. Although mitigation efforts will not eliminate all disasters, each county shall endeavor to be as prepared as possible for a disaster.

The Multi-Hazard Mitigation Plan (MHMP) is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000). The development of a local government plan is required to maintain eligibility for federal hazard mitigation grant funding programs. For communities to be eligible for future mitigation funds, they must adopt an MHMP.

Researchers at the National Institute of Building Sciences looked at the results of 23 years of federally funded mitigation grants provided by the Federal Emergency Management Agency (FEMA), U.S. Economic Development Administration (EDA) and U.S. Department of Housing and Urban Development (HUD) and found mitigation funding can save the nation $6 in future disaster costs, for every $1 spent on hazard mitigation (National Institute of Building Sciences, 2017).

Blue Earth County is vulnerable to a variety of potential natural disasters, which threaten the loss of life and property in the county. Hazards such as tornadoes, flooding, wildfires, blizzards, straight-line winds, ice storms and droughts have the potential for inflicting vast economic loss and personal hardship. In 2013, Minnesota had some of the highest weather-related disaster claims in the country (MN Environmental Quality Board, 2014).

This Multi-Hazard Mitigation Plan represents the efforts of Blue Earth County and its local governments to fulfill the responsibility for hazard mitigation planning. The intent of the plan is to reduce the actual threat of specific hazards by limiting the impact of damages and losses.

### *1.1.1 Scope*

The Blue Earth County Emergency Management Director and U-Spatial@UMD have combined efforts to update the 2013 Blue Earth County Multi-Hazard Mitigation Plan. U-Spatial@UMD contracted with Hundrieser Consulting LLC for additional emergency management planning expertise and facilitation.

This Multi-Hazard Mitigation Plan evaluates and ranks the major natural hazards affecting Blue Earth County as determined by frequency of event, economic impact, deaths and injuries. Mitigation recommendations are based on input from state and local agencies, public input and national best practices.

U-Spatial@UMD performed the hazard risk assessment for 1% annual chance floods using the FEMA Hazus GIS tool. The Minnesota Homeland Security and Emergency Management (HSEM) office has determined that Hazus should play a critical role in Minnesota's risk assessments.

This is a multi-jurisdictional plan that covers Blue Earth County, including the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, St. Clair, Skyline and Vernon Center. The Blue Earth County risks and mitigation activities identified in this plan also incorporate the concerns and needs of townships, school districts and other entities participating in this plan.

Members from each of these jurisdictions actively participated in the planning process by attending workgroup meetings, providing information, suggesting mitigation strategies and reviewing the plan document. *Appendix K – Local Mitigation Survey Report* includes jurisdictionally-specific input. 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 approval by FEMA. County and local city resolutions will be added by Blue Earth County after final approval by FEMA, in Appendix D in the back of the plan.

Blue Earth County has specified the following goals for this Multi-Hazard Mitigation Plan update:

- Include more recent data documenting the critical infrastructure and hazards faced by Blue Earth County.
- Reformat and reorganize the plan to reflect definitions of hazards as expressed in the 2014 State of Minnesota Multi-Hazard Identification and Risk Assessment Plan.
- Reflect current hazard mitigation priorities in Blue Earth County.

### *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. Following are examples of hazard mitigation measures that fall within one of five types of mitigation strategies:

- *Planning* – Development of mitigation standards, regulations, policies, and programs.
- *Structure and Infrastructure Projects* – Structural retrofits, property acquisition, local flood reduction projects, and safe room construction.
- *Natural Systems Protection* – Sediment and erosion control, stream corridor restoration, forest and vegetative management, floodplain and stream restoration.
- *Education and Awareness Programs* – Outreach programs, hazard awareness campaigns, real estate disclosure, and promotion of family/personal emergency preparedness.

- *Mitigation Preparedness & Response Support* – Emergency planning and services such as warning siren systems, CodeRED, and installing generators for critical facilities.

### 1.1.3 *Benefits of Mitigation Planning*

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
- 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 three mitigation grant programs that are administered by the State of Minnesota: The Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation program (PDM), and the Flood Mitigation Assistance (FMA) program. The HMGP, PDM and FMA programs are administered through the state of Minnesota Department of Public Safety, Division of Homeland Security and Emergency Management. 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.

# Section 2 – Public Planning Process

## 2.1 Steering Committee Information

The Blue Earth County multi-hazard mitigation plan steering committee is headed by the Blue Earth County Emergency Management Director, who is the primary point of contact. Members of the Blue Earth County MHMP steering committee include representatives from the public and governmental sectors. Table 1 identifies the steering committee individuals and the organizations they represent.

*Table 1. Multi-Hazard Mitigation Steering Committee*

| Name | Agency/Organization | Participant Title |
|---|---|---|
| Mike Maurer | Blue Earth County | Chief Deputy/EM |
| Brenda Olmscheid | Blue Earth County | Asst. Emergency Mgmt. Coordinator |
| Paul Barta | Blue Earth County | Captain |
| Dan Davidson | Blue Earth County | Lieutenant |
| Catherine Seys | City of St. Clair | City Clerk-Treasurer |
| Gloria Mack | Shelby Township | Clerk |
| Maria Bartsch | Rapidan Township | Clerk-Treasurer |
| Ava Adams-Morris | Jamestown Township | Clerk |
| Jonathan Graves | Blue Earth County | Appraiser/GIS Coordinator |
| Mark Piepho | Blue Earth County | Commissioner |
| Daniel Bunde | Madison Lake | Chief of Police |
| Ray Cornelius | Rapidan Township | Chairman |
| Patty Woodruff | City of Mapleton | City Administrator |
| Darla Ward | City of Pemberton | City Clerk-Treasurer |
| Charles Fredrickson | Decoria Township | Supervisor |
| Trisha Duncan | Xcel Energy | Area Manager |
| Jeff Johnson | City of Mankato | Director of Public Works |
| Paul Baer | LeRay Township | Chairman |
| Ryan Thilges | Blue Earth County | Public Works Director |
| Kevin Winkelman | Eagle Creek Rapidan Dam | Regional Manager |
| Tom Bruels | St. Clair Public School | Superintendent |
| Amy Vokal | Mankato Dept of Public Safety | Director |
| Justin Neumann | Mankato Dept of Public Safety | Sergeant |
| Jeff Bengtson | Mankato Dept of Public Safety | Associate Director |
| Pamela Hermanson | City of Mankato | Emergency Management Director |
| Julie Conrad | Blue Earth Co Environmental Services | Planner |

| Name | Agency/Organization | Participant Title |
|---|---|---|
| Scott Salsbury | Blue Earth Co Environmental Services | Planner |
| Tammy Pettersen | Lincoln Township | Clerk |
| Jennifer Bromeland | Eagle Lake | Administrator |
| Brian Goettl | Eagle Lake | Public Works Department |
| Diane Roelofs | Vernon Center | Clerk-Treasurer |
| Bradley Flatin | USDA - Farm Service Agency | County Executive Director |
| Taylor Gronau | Lake Crystal | Administrator |
| Jessie Anderson | Blue Earth County | Administrative Specialist |
| Aaron Stubbs | Blue Earth County | Land Use Planner |
| Kelley Haeder | Blue Earth County | Public Health |
| George Leary | Blue Earth County | County Zoning Administrator |
| Reginald Liddell | USDA - NRCS | District Conservationist |
| Erin Berle | Garden City Township | Chair |

Jurisdictional representatives participating on the steering committee were contacted throughout the plan update process to provide feedback on the hazards of concern to their community and the mitigation actions which they would seek to implement upon plan adoption.

## 2.2 Review of Existing Plans, Capabilities & Vulnerabilities

Blue Earth County and its local communities utilized a variety of planning documents to direct community development. These documents include a Comprehensive/Master Plan, Emergency Operations Plan, Continuity of Operations Plan, Stormwater Management Plan, Transportation Plan, etc. (see Appendix J for a full listing of plans and programs in place in Blue Earth County). The planning process also incorporated the existing natural hazard mitigation elements from previous planning efforts. In addition, the 2019 Minnesota All-Hazard Mitigation Plan was consulted.

In the development of the Blue Earth County Multi-Hazard Mitigation Plan, UMD 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, UMD consultants worked closely with the Blue Earth County Emergency Management Director, other key county staff, and local city officials to collect specific feedback on local mitigation capabilities and vulnerabilities that either support or hinder the ability to mitigate against natural hazards at the county and local level. 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 on current *Plans and Programs in Place* and *Program Gaps or Deficiencies* that currently exist to mitigate

destruction caused by each natural hazard addressed in the plan. This information was used to inform where there were current mechanisms in place to incorporate or implement mitigation measures (i.e., existing programs, plans or policies) and where there were areas that needed to be addressed. *Section 4.3 Hazard Profiles* identifies current gaps and deficiencies for mitigation and *Section 5.1.3 Plans and Programs in Place to Address Natural Hazards* describes the mitigation capabilities that are in place to support mitigation.

***Local Mitigation Surveys*** – As part of Blue Earth County's 2019 Multi-Hazard Mitigation Plan update, participating jurisdictions and key county personnel were asked to fill out a two-part "Local Mitigation Survey" (LMS) form. *Part A: "Past Events & Vulnerability Assessment"* collected detailed information from each jurisdiction on the following: 1) Severe weather or disaster events & impacts that have occurred within the last five years; 2) Actions taken within the last five years that have helped reduce local vulnerabilities to future disaster events; 3) Any changes within the last five years that have increased local vulnerabilities to future disaster events; and 4) Any concerns or specific ideas for mitigation projects to help reduce or eliminate risk resulting from future severe weather or disaster events. *Part B: "Local Mitigation Capabilities Assessment"* collected detailed information on each jurisdiction's capabilities in place to help support mitigation in the community, including: 1) Plans, authorities, or policies; 2) Staff (organizational capacity); 3) Programs; and 4) Funding or other resources. Information was further collected on what program gaps or deficiencies exist that are a barrier to accomplishing mitigation in the community.

Information from the LMS forms were used to inform Section 4, Risk Assessment and the development of local-level mitigation actions (see *Appendix G: Mitigation Actions by Jurisdiction*).

## 2.3 Planning Process Timeline and Steps

To update the 2013 Blue Earth County Multi-Hazard Mitigation Plan, UMD consultants worked in coordination with the Blue Earth County Emergency Management Director, and members of the steering committee. The updated plan includes not only new data documenting the types of hazards faced by Blue Earth County residents and emergency planning officials, but also new thinking about how to best address these hazards.

### *2.3.1 Blue Earth County Stakeholder Coordination*

On January 3, 2019, U-Spatial@UMD hosted a kickoff meeting online that was attended by the Blue Earth County Emergency Management Director. The webinar included a project overview, U-Spatial@UMD background, the roles and responsibilities of the Emergency Management Director, contents of the Multi-Hazard Mitigation Plan, planning process and projected timeline (see Appendix E for webinar slides).

On January 3, 2019, Blue Earth County issued a news release inviting public feedback and participation for the Blue Earth County MHMP update (for complete documentation, see *Appendix F: Public Outreach & Engagement Documentation*).

A steering committee meeting took place on April 24, 2019, at the Blue Earth County Justice Center in Mankato, which included the Blue Earth County MHMP steering committee and the UMD planning team. The steering committee was provided with an overview of the purpose, process and timeline for the Blue Earth County Multi-Hazard Mitigation Plan update, as well as the role and responsibilities of steering committee members. Appendix E provides documentation of steering committee meeting summaries, including participant sign-in sheets and presentation slides.

Steering committee members were engaged in providing feedback on plans and programs in place as they relate to hazards facing the county, and they discussed potential mitigation actions to be added to the plan. This information was used to inform the development of mitigation strategies in the updated plan.

On August 14, 2019, Blue Earth County Emergency Management convened a meeting with the city clerks from each participating city to discuss review and development of their respective draft mitigation action charts (MAC). See Appendix E for a meeting summary and Section 5.3.2 for the Jurisdictional MAC participation log.

On December 5, 2019, members of the steering committee convened again with the UMD planning team to conduct a review of the risk assessment presented in the plan and discussion of the draft mitigation action charts developed for Blue Earth County and each of the city jurisdictions participating in the plan. See Appendix E for a full meeting summary.

To provide opportunity for public input, Blue Earth County issued a second new release on January 9. 2020 inviting public review and feedback on the draft plan. The news release provided information on where the plan could be viewed, and comments submitted. U-Spatial@UMD hosted a webpage to post the full draft Blue Earth County MHMP, including excerpts of the Blue Earth County Master Mitigation Action Chart, each of the jurisdictional mitigation action charts, and an electronic feedback form.

Appendix F provides documentation of the public outreach for feedback on the draft plan by Blue Earth County and jurisdictions. The public feedback period for the draft plan was open from January 9, 2020 to January 24, 2020, for a total of 16 days.

*Table 2. Blue Earth County Hazard Mitigation Update Meetings and Public Outreach*

| Meeting Type | Date | Location |
|---|---|---|
| Public Outreach | 1/3/2019 | News release inviting public feedback and participation. |
| Kickoff Webinar | 1/3/2019 | Hosted online by U-Spatial@UMD in Duluth |
| Steering Committee | 4/24/2019 | Blue Earth County Justice Center, Mankato, MN |
| Steering Committee | 12/5/2019 | Blue Earth County Justice Center, Mankato, MN |
| Public Outreach | 1/9/2020 – 1/24/2020 | Public review period for draft plan |

At the close of the public outreach period, the UMD consultants worked with the Blue Earth County Emergency Management Director and members of the steering committee to incorporate comments from the public into the Multi-Hazard Mitigation Plan.

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

### 2.3.2 *Overview of Jurisdictional Participation*

Throughout the planning process, Blue Earth County requested the participation of city representatives for the provision of local-level information, review and feedback to the plan update. Table 3 provides an overview of the participation of each city that took part in the Blue Earth County MHMP update planning process, with reference to the location of supporting documentation.

*Table 3. Jurisdictional Participation in Planning Process*

| Jurisdiction | Local Mitigation Survey, (Appendix K) | 4-24-19 Planning Team Mtg. #1 (Appendix E) | Local Mitigation Action Chart Review (Section 5.3.2) | 12-5-19 Planning Team Mtg. #2 (Appendix E) | Draft MHMP Review (Appendix F) |
|---|---|---|---|---|---|
| Blue Earth County | X | X | X | X | X |
| City of Amboy | X | X | X | X | X |
| City of Eagle Lake | X | X | X | X | X |
| City of Good Thunder | X | X | X | | X |
| City of Lake Crystal | X | X | X | X | X |
| City of Madison Lake | X | X | X | X | X |
| City of Mankato | X | X | X | | X |
| City of Mapleton | X | X | X | X | X |
| City of Pemberton | X | X | X | | X |
| City of Skyline | X | X | X | | |
| City of St. Clair | X | X | X | X | X |
| City of Vernon Center | X | X | X | X | X |

# Section 3 – Blue Earth County Profile

This section offers a general overview of Blue Earth County to provide a basic understanding of the characteristics of the community, such as the physical environment, population, and the location and distribution of services.

## 3.1 General County Description

Blue Earth County is located approximately 70 miles southwest of the Twin Cities, and its population at the 2010 census was 64,013. It is bounded on the north by Le Sueur County and Nicollet County (sharing the Minnesota River as a natural border), on the west by Brown and Watonwan Counties, on the south by Martin and Faribault Counties, and by Waseca County to the east. Blue Earth County encompasses 764 square miles of several lakes, rivers, streams and rich agricultural land.

The 11 cities in Blue Earth County are Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, St. Clair, Skyline and Vernon Center. The 23 townships are Beauford, Butternut Valley, Cambria, Ceresco, Danville, Decoria, Garden City, Jamestown, Judson, Le Ray, Lime, Lincoln, Lyra, McPherson, Mankato, Mapleton, Medo, Pleasant Mound, Rapidan, Shelby, South Bend, Sterling and Vernon City.

## 3.2 Environmental Characteristics

The topography and physical characteristics of Blue Earth County has extensive variety. The majority of the county is an elevated plain, draining northward through tributaries of the Minnesota River that converge toward the city of Mankato. There they break the continuity of the plain with sharp, deep valleys, of which the valleys of the Blue Earth and Le Sueur Rivers are typical. Most of the plain lies between 1,000 and 1,110 feet above sea level.

Except for the major valleys, the surface is flat to gently rolling and marked by numerous broad, shallow depressions with poorly drained marshes. The larger streams are characterized by a series of terraces. At Mankato and northward, for example, the quarry district is loaded on such a terrace, while the city of Mankato itself lies on a low alluvial terrace.

When examining a topographic map of Blue Earth County, the presences of two main physiographic zones become obvious:

- The floodplain is located primarily along the Minnesota River, where it forms the northern boundary of the county. In addition, extensive floodplains also exist in the Mankato vicinity. Although there are many rivers and streams within the county, their associated valleys are quite narrow with steep bluffs and consequently very little floodplain.
- The upland plain occupies the major portion of the county and is composed of the surface mantle. The plain is dissected by numerous streams and rivers but is comprised of flat to gently rolling topography. This is due to the relative immaturity of the rivers while there is a relatively

good supply of water in the mantle, the very large supplies are found in the strata below the surface layer.

## 3.3 Geology

The Geologic Atlas of Blue Earth County was updated in 2016 by the Minnesota Department of Natural Resources and Minnesota Geological Survey. According to the Atlas,

> *The origin of the topography and surficial deposits can be traced back to late-glacial events…as ice retreated from the county and a proglacial lake formed. Layers of silt and clay that settled out of the glacial lake form the level surface that covers much of the county. The glacial lake was bounded on the east and south by a slightly higher arc of more rolling terrain that formed as debris-covered ice stagnated at the margin of a glacier. The lake sediment overlies layers of fine-grained glacial sediment (till). Areas of sand and gravel are generally thin (0 to 20 feet) and are located north of the Watonwan River and south of Lake Crystal where meltwater streams entered the lake from the west, depositing a sandy delta. As ice receded north, the sudden drainage of a much larger glacial lake (glacial Lake Agassiz) created the 200-foot-deep, mile-wide, glacial River Warren valley now occupied by the Minnesota River. The incision of this valley caused all tributary streams to begin adjusting their gradients to this new local base level by downcutting, a process that is ongoing. The sediment delivered by the tributaries forms fans at the tributary mouths and partly fills their lower reaches near the confluences with the Minnesota River. Locally thick sand and gravel (up to 80 feet) is found in the Minnesota River valley and the lower reaches of the Watonwan, Blue Earth, and Le Sueur rivers…A water-table aquifer occurs where a surficial sand layer is saturated. The water table may periodically drop below the base of the sand layer during dry periods, as is the case with a relatively thin sand layer north of the Watonwan River and south of Lake Crystal.*

## 3.4 Hydrography

More than 99% of the county lies within the Minnesota River Basin. The majority of the county is within four main watersheds: Blue Earth, Le Sueur, Watonwan and Middle Minnesota. The confluences of each of these four rivers are in Blue Earth County. Approximately 75% of the county is drained by the Blue Earth River and its tributaries (Blue Earth County, 2018).

Impaired waters are an increasing problem as Blue Earth County has many rivers, lakes and creeks that are on the Minnesota Pollution Control Agency Impaired Waters lists, including the Minnesota River, Maple River, Blue Earth River, Cobb River, Little Cobb River, Le Sueur River, Watonwan River, Madison Lake, Lura Lake, Loon Lake, Rice Creek, Perch Creek, and Minneopa Creek, among others (Minnesota Pollution Control Agency, 2018). Impaired waters have become a priority issue because they do not meet state water quality standards, they affect growth and health of communities and economies, and the Clean Water Act has a mandate requiring every state to address impairments. Impairments found in Blue Earth County waters include fecal coliform, turbidity, E. coli, PCB in fish tissue, PCB in water column, mercury in fish tissue, mercury in water column and dissolved oxygen.

Basic hydrography in Blue Earth County is mapped in Figure A-1 in Appendix A.

### 3.4.1 Groundwater

According to the Blue Earth County Land Use Plan (published December 2018), groundwater in the county is of high quality, and there is good availability from bedrock aquifers. In areas of the county, the groundwater used for drinking has become contaminated due to improperly handled hazardous materials and poorly planned land use practices. However, protecting groundwater via wellhead protection, well sealing and land use management is a high priority for the county, and is further addressed in the Blue Earth County Water Management Plan (Blue Earth County, 2018).

Groundwater sensitivity to pollution is measured by flow rate and soil permeability. For near surface materials, areas with a high sensitivity to pollution are areas where it takes hours to a week for a contaminant to reach the aquifer; areas with very low sensitivity to pollution are areas where it takes months to years for a contaminant to reach the aquifer. For the bedrock aquifers, areas with a high sensitivity to pollution are areas where it takes hours to months for a contaminant to reach the aquifer; areas with very low sensitivity to pollution are areas where it takes a century or more for a contaminant to reach the aquifer. The buried sand and gravel aquifer are relatively shallow and has many areas of moderate to high pollution sensitivity.

Figure A - 26 in Appendix A maps pollution sensitivity of near-surface materials from the transmission time of water through 3 feet of soil and 7 feet of surficial geology, to a depth of 10 feet from the land surface.

### 3.4.2 Lakes

Blue Earth County has approximately 19,000 acres of lake waters of varying depth, area and quality. The locations of these water bodies are generally concentrated in the eastern and northwestern quadrants of the county. The several lakes in the northeast section of the county are part of the extensive Prairie Lake Region of Southern Minnesota. Ballantyne, Duck, Madison, and Eagle Lakes are important water areas of northeastern Blue Earth County, while Lily, Crystal, and Loon Lakes are important water areas that are in the northwest. Rapidan Lake, located in the northcentral part of the county, is a man-made reservoir that was formed by the Rapidan Dam on the Blue Earth River. Lura and Minnesota Lakes are large bodies of water extending southward into Faribault County.

### 3.4.3 Rivers

The Blue Earth River and its tributaries flow in a northerly direction, forming a dendritic drainage pattern converging near the south bend of the Minnesota River, contributing an appreciable amount to its volume. The rivers and streams included in the drainage system include the Blue Earth River, Le Sueur River, Maple River, Cobb River, Little Cobb River, Watonwan River, Rice Creek, Willow Creek, Perch Creek, Minneopa Creek, Morgan Creek and Little Cottonwood River.

These waterways are significant topographic features of the county in that they form valleys with precipitous, tree-covered slopes, thus providing scenic beauty. The relief of several valleys is more than 100 feet and along the Minnesota River west of Mankato the bluffs average 200 feet above the riverbed.

High stream flows usually occur in the spring, which generally retreat within short periods of time. The extreme depth of the valleys prevents massive damage during flash floods caused by rapid runoff. Rapid runoff does contribute a great deal to the flood flows of the Minnesota River, however. Low flows occur during late summer, autumn and midwinter as the streams in the headwaters of the Minnesota River generally have very low or no flow at all. In the lower part of the watershed there is a continuous stream flow due to the groundwater recharge from springs which issue from the bluffs along the stream valleys.

### 3.4.4 Dam & Levee Inventory

Dams and levees are artificial barriers that have the ability to impound water, wastewater, or any liquid material for the purpose of storage or control and are an important part of Blue Earth County's infrastructure. Dams maintain lake levels and impound water for flood control, power production and water supply. A complete listing of dams in the county is provided in Table 4.

*Table 4. Dams in Blue Earth County*

| Name | Owner | Waterway | Primary Type | NID Height (ft) | Primary Purpose |
|---|---|---|---|---|---|
| Cottonwood Lake | MNDNR | Big Cobb River-TR | Gravity, Earth | 6' | Other |
| Eagle Lake | County of Blue Earth, MNDNR Wildlife | Le Sueur River-TR | Unknown | Unknown | Unknown |
| Gilfillin Lake Outlet | MNDNR | Gilfillin Lake | Unknown | Unknown | Unknown |
| Lost Marsh WMA | MNDNR-Wildlife | Little Cobb River-TR | Earth | 7' | Fish and Wildlife Pond |
| McPherson Twp. 25 | Gordon Rye Trust | Le Sueur River-TR | Earth | 10' | Fire Protection, Stock, or Small Fish Pond |
| North Eagle Lake | MNDNR-Wildlife | Le Sueur River-TR | Concrete, Earth | 7' | Fish and Wildlife Pond |
| Perch Lake | MNDNR-Fisheries | Cobb River-TR | Earth | 8' | Other |
| Rapidan | County of Blue Earth | Blue Earth River | Buttress | 73' | Hydroelectric |
| Rice Lake | MNDNR-Wildlife | County Ditch 88 | Earth | 7' | Fish and Wildlife Pond |
| Madison Lake | MNDNR | Madison Lake | Unknown | Unknown | Unknown |
| Warren St Detention | City of Mankato | Minnesota River-TR | Earth | 44' | Flood Control |

Levees are used to increase cultivation in agriculture and to protect population and structures from floods. There are three levees in Blue Earth County (Table 5).

*Table 5. Levees in Blue Earth County*

| Name | Location | Levee Miles | Leveed Area Sq. Miles |
|---|---|---|---|
| Minnesota River - Lehillier | Mankato | 1.4 | 0.2 |
| Minnesota River – Mankato | Mankato | 2.4 | 1.0 |
| Minnesota River – North Mankato | North Mankato | 2.0 | 1.4 |

### 3.4.5 Wetlands

Important benefits of wetlands include storage area for excess water during flooding; filtering of sediments and nutrients before they enter lakes, rivers and streams; and fish and wildlife habitat.

Most of the wetlands in the county have been lost due to conversion of the land to cities, towns and roads, in addition to farming and agriculture operations requiring the drainage of wetlands. According to the National Wetlands Inventory (NWI), there are 47,344 acres of wetlands in Blue Earth County (Figure A - 1). The Blue Earth County Water Management Plan includes a wetland management framework that was created to classify wetlands based on public values and the Blue Earth County Greenprint, a map of green infrastructure in the county (Blue Earth County, 2018).

Invasive plants have spread throughout many wetlands in Minnesota. These plants can take over entire native communities and threaten wetland ecosystems. Eurasian watermilfoil has been documented in Blue Earth County in the following lakes: Lura, Madison, Eagle (North and South) and Ballantyne (MN DNR, 2019).

## 3.5 Climate

The Blue Earth County area has one of the most favorable climates in the world for growing crops. The summers are quite warm, and the maximum rainfalls occur in the spring and early summer when the crops require it most. Late summer and autumn are generally dry, contributing to the maturation and easy harvesting of crops.

July is the hottest month on average in Blue Earth County, with an average monthly maximum temperature of 84°F (based on data from 1895-2018). The hottest month on record for the county was July 1936, with a month-long average maximum temperature of 95°F (MN DNR, n.d.).

January is the coldest month on average in Blue Earth County, with an average monthly minimum temperature of 4°F (based on data from 1895-2018). The coldest month on record for the county was January 1912, with a month-long average minimum temperature of -12°F (MN DNR, n.d.).

### *Future Trends*

Minnesota's climate is currently changing in ways that are pushing us to adapt to weather patterns and extreme events that pose major threats to our health, homes, environment and livelihoods. These events cost our state millions in property loss, damaged infrastructure, disrupted business, medical care and support services, and put residents and responders at risk. Understanding how our weather is changing now and into the future will help planners and decision-makers in emergency management

and supporting fields extend our progress in climate adaptation and lead to more resilient communities (Minnesota Department of Health, 2018).

The National Climate Assessment suggests that infrastructure planning (particularly water resources infrastructure) should "be improved by incorporating climate change as a factor in new design standards and asset management and rehabilitation of critical and aging facilities, emphasizing flexibility, redundancy, and resiliency" (Georgakakos, et al., 2014).

Federal, state, and tribal governments are increasingly integrating climate adaptation into existing decision-making, planning, or infrastructure-improvement processes (Georgakakos, et al., 2014). Definite predictions are difficult to make, as changes may vary depending on geographical location, even within Minnesota. Intense study of these topics is ongoing.

In August 2018, the Minnesota Department of Health Climate & Health Program published "Planning for Climate & Health Impacts in Southeast Minnesota: Emergency Management Considerations for HSEM Region 1." This report is one of a series of custom climate profile reports produced for each of the six HSEM regions in the state for reference to climate projection data, impacts, and considerations for emergency management and preparedness professionals in this HSEM region.

## Climate Data Trends

Over 50 years of storm data on record document that Minnesota has experienced an increase in the number and strength of weather-related natural disasters, particularly those related to rising temperatures and heavy downpours.

According to the 2015 Minnesota Weather Almanac,

> *During the three most recent decades, the Minnesota climate has shown some very significant trends, all of which have had many observable impacts…Among the detectable measured quantity changes are: (1) warmer temperatures, especially daily minimum temperatures, more weighted to winter than any other season; (2) increased frequency of high dew points, especially notable in mid- to late summer as they push the Heat Index values beyond 100°F; and (3) greater annual precipitation, with a profound increase in the contribution from intense thunderstorms* (Seeley M. , 2015).

Temperature and precipitation projections below are taken from the Minnesota Department of Health Region 1 profile. Appendix L provides the full MDH profile for Region 1, which includes Blue Earth County. The information in this report was used to help inform the updated risk assessments in *Section 4 – Risk Assessment* of this plan for natural hazards and their relationship to future trends.

## Temperature

> *The continued rise in winter temperatures will result in less snow pack, which will increase chances for grassland/wildfires as well as drought. The warmer winter temperatures will also have major consequences for our ecosystems, including native and invasive species, whose growth, migration, and reproduction are tied to climate cues. The increase in Lyme disease across Minnesota is also*

*likely influenced in part by the loss of our historical winters, due to a longer life-cycle period for ticks. Freeze-thaw cycles are likely to increase as well, damaging roads, power lines, and causing hazardous travel conditions. By mid-century our average summer highs will also see a substantial rise, coupled with an increase in more severe, prolonged heat waves that can contribute to drought and wildfires and pose a serious health threat, particularly to children and seniors* (Minnesota Department of Health, 2018).

### Precipitation

*There has been an increase in total average as well as heavy precipitation events, with longer periods of intervening dry spells. Our historical rainfall patterns have changed substantially, giving rise to larger, more frequent heavy downpours. Minnesota's high-density rain gauge network has captured a nearly four-fold increase in "mega-rain" events just since the year 2000, compared to the previous three decades. Extreme rainfall events increase the probability of disaster-level flooding. However, there is also an increased probability that by mid-century heavy downpours will be separated in time by longer dry spells, particularly during the late growing season. Over the past century, the Midwest hasn't experienced a significant change in drought duration. However, the average number of days without precipitation is projected to increase in the future, leading Minnesota climate experts to state with moderate-to-high confidence that drought severity, coverage, and duration are likely to increase in the state. Modeling future precipitation amounts and patterns is less straight-forward compared to temperature. Some climate models do a better job than others representing rainfall for the Midwest, and available data sources only provide average estimates on a monthly scale, masking the spikes in extremes that trigger flood and drought disasters* (Minnesota Department of Health, 2018).

## 3.6 Demographics

Mankato is the largest city in Blue Earth County (pop. 39,305) and the designated county seat. There are 11 cities and 23 townships within the county.

Table 6 summarizes the population by community according to the 2010 U.S. Census. Figure 1 shows Blue Earth County population density by census block.

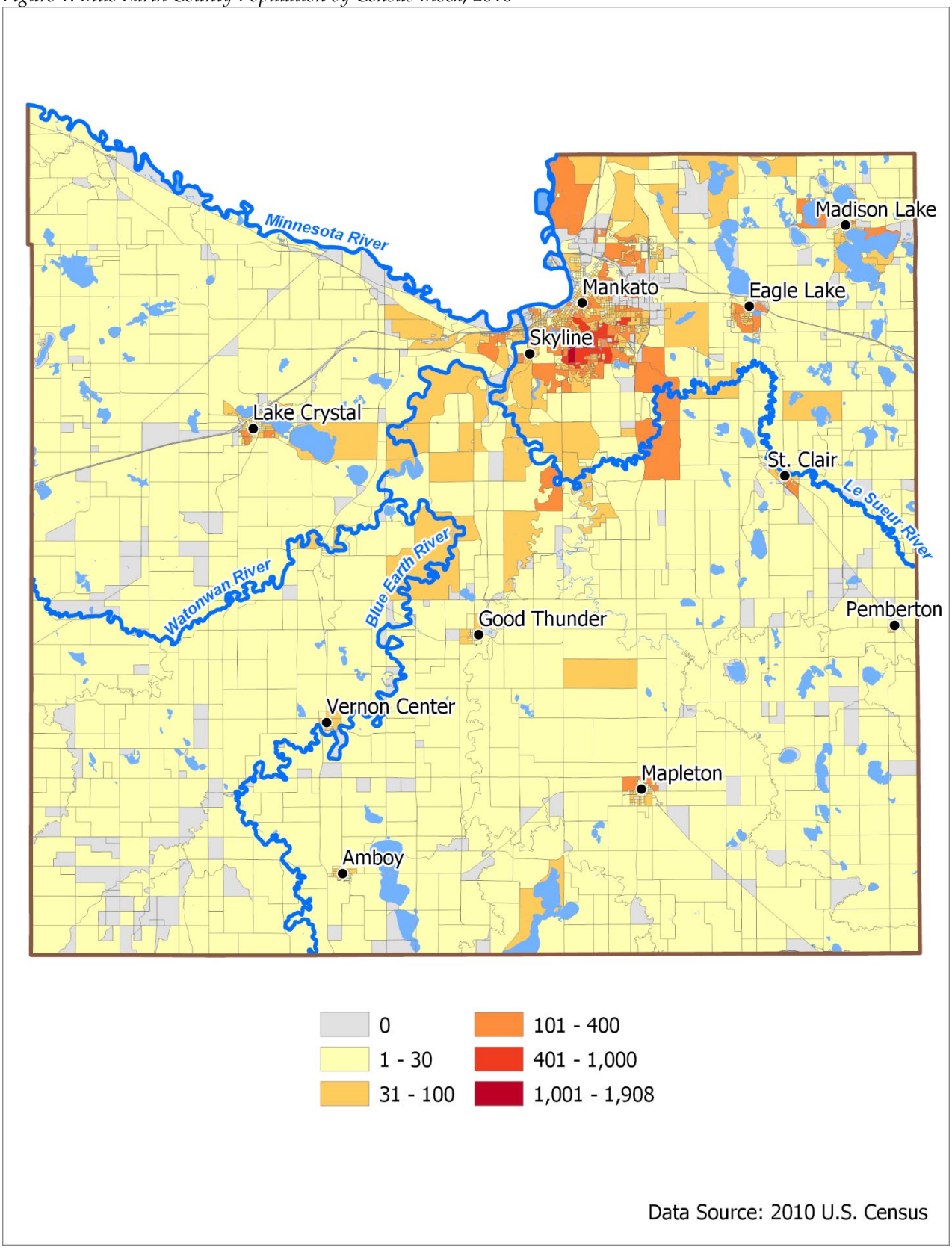
*Table 6. Blue Earth County Population by Community, 2010*

| Community | 2010 Population | % of County |
|---|---|---|
| Amboy | 534 | 0.8 |
| Beauford Township | 406 | 0.6 |
| Butternut Valley Township | 325 | 0.5 |
| Cambria Township | 260 | 0.4 |
| Ceresco Township | 239 | 0.4 |
| Danville Township | 240 | 0.4 |
| Decoria Township | 1,104 | 1.7 |
| Eagle Lake | 2,422 | 3.8 |
| Garden City Township | 689 | 1.1 |

| Community | 2010 Population | % of County |
|---|---|---|
| Good Thunder | 583 | 0.9 |
| Jamestown Township | 693 | 1.1 |
| Judson Township | 554 | 0.9 |
| Lake Crystal | 2,549 | 4.0 |
| Le Ray Township | 746 | 1.2 |
| Lime Township | 1,395 | 2.2 |
| Lincoln Township | 200 | 0.3 |
| Lyra Township | 327 | 0.5 |
| McPherson Township | 466 | 0.7 |
| Madison Lake | 1,017 | 1.6 |
| Mankato | 39,305 | 61.4 |
| Mankato Township | 1,969 | 3.1 |
| Mapleton | 1,756 | 2.7 |
| Mapleton Township | 310 | 0.5 |
| Medo Township | 364 | 0.6 |
| Minnesota Lake | 4 | 0.0 |
| Pemberton | 247 | 0.4 |
| Pleasant Mound Township | 214 | 0.3 |
| Rapidan Township | 1,101 | 1.7 |
| St. Clair | 868 | 1.4 |
| Shelby Township | 265 | 0.4 |
| Skyline | 289 | 0.5 |
| South Bend Township | 1,682 | 2.6 |
| Sterling Township | 296 | 0.5 |
| Vernon Center | 332 | 0.5 |
| Vernon Center Township | 262 | 0.4 |
| **Total:** | **64,013** | |

*Source: U.S. Census Bureau, 2010*

*Figure 1. Blue Earth County Population by Census Block, 2010*

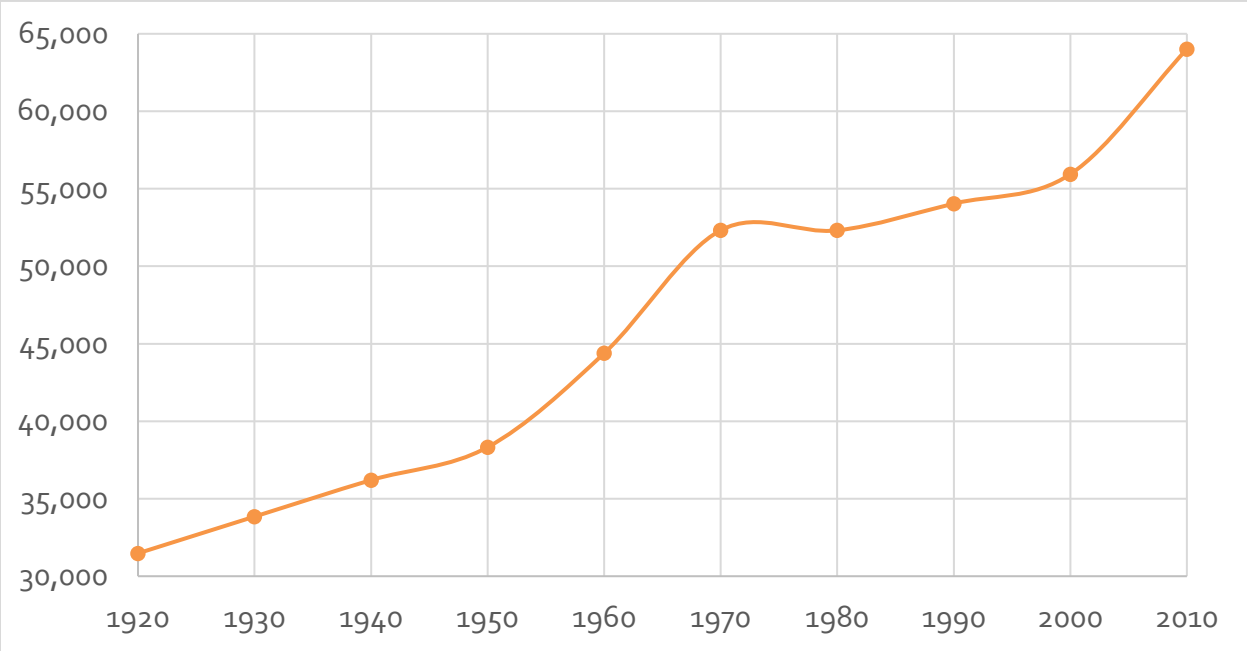


Population growth trends have an important influence on the needs and demands of a variety of services such as transportation, law enforcement and emergency response. An understanding of population trends and location of population concentrations is important for making projections regarding potential impacts in the event of a disaster.

In 2010, Blue Earth County had a population of 64,013, averaging 86 persons per square mile of land area. Mankato, the largest city in the county and the county seat, had a population of 39,305.

Blue Earth County's population is increasing, rising 14% from 2000 to 2010. Since 1920, the population has increased by 103%. Figure 2 below shows the population change in Blue Earth County between 1920 and 2010. Population change by township from 2000 to 2010 is mapped in Figure A - 3 in Appendix A.

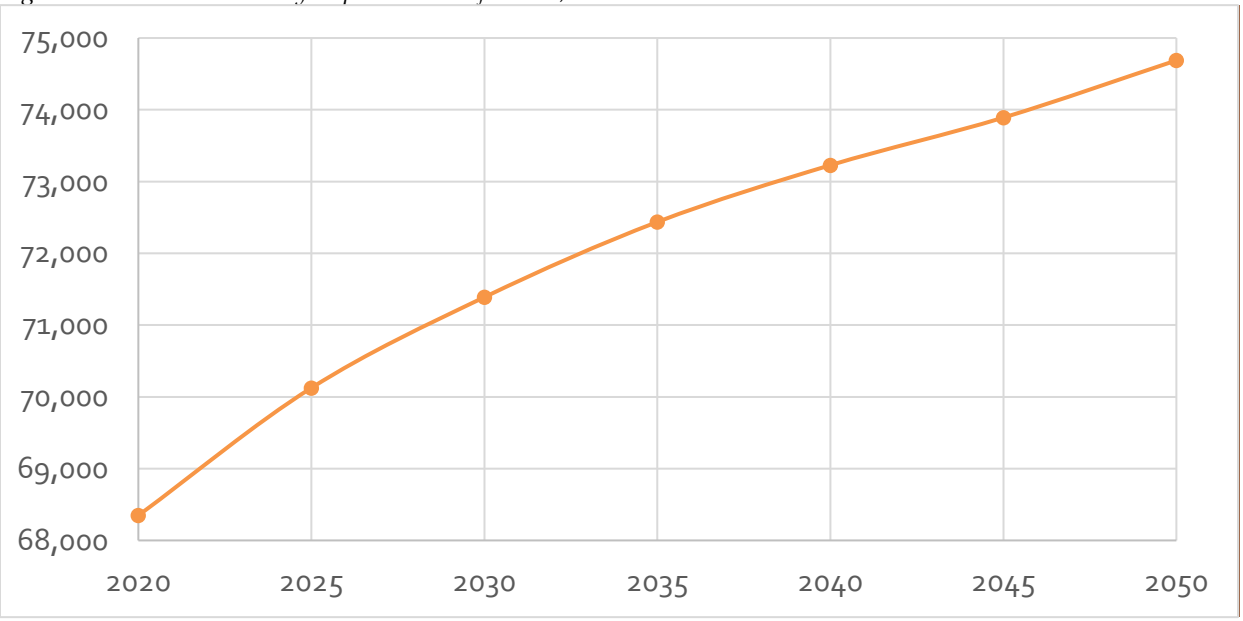
*Figure 2. Blue Earth County Population Change, 1920-2010*




*Source: U.S. Census Bureau*

Blue Earth County's population is projected to continue increasing, reaching a high of 74,688 in 2050 (Figure 3).

*Figure 3. Blue Earth County Population Projections, 2020-2050*




*Source: Minnesota State Demographic Center, Minnesota Planning, March 2017 release*

### *3.6.1 Population Vulnerability*

The degree to which a person is vulnerable to the impacts of a hazard depends on how well he/she 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" (2018).

Reducing social vulnerability can decrease both human suffering and economic loss. The ATSDR Social Vulnerability Index (SVI) uses U.S. Census variables at the tract-level to help local officials identify communities that may need support in preparing for hazards or recovering from disaster. Certain social conditions, such as high poverty, low percentage of vehicle access, or crowded households can increase a community's social vulnerability (ATSDR, 2018).

The percent of the county's population living below the poverty level is 18.1%, compared to a 10.5% average for the state of Minnesota. The ATSDR SVI ranks census tracts on 15 social factors which are grouped into four themes (Table 7).

*Table 7. SVI Variables*

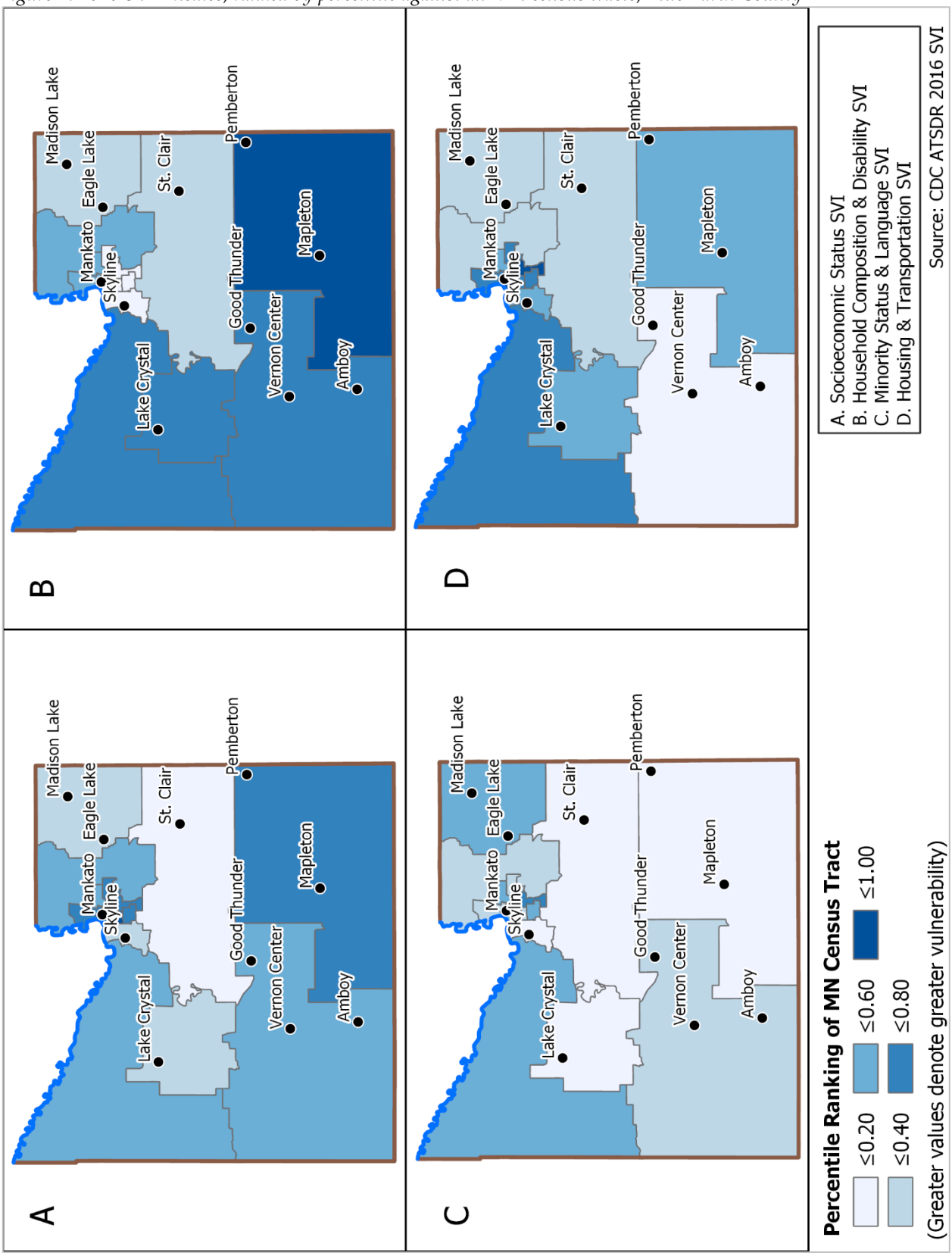
| Theme | Social Factors |
|---|---|
| Socioeconomic Status | • Proportion individuals below poverty level<br>• Proportion civilians unemployed 16+yrs<br>• Per capita income in 1999<br>• Proportion persons with no high school diploma 25+yrs |
| Household Composition & Disability | • Proportion persons 65 years or older<br>• Proportion persons 17 years or younger<br>• Proportion persons with disability 5+yrs<br>• Proportion single-parent HH with children under 18 yrs |
| Minority Status & Language | • Proportion minority<br>• Proportion persons 5+yrs who speak English less than 'well' |
| Housing & Transportation | • Proportion housing with 10+units<br>• Proportion mobile home<br>• Proportion HH with more people than rooms<br>• Proportion HH with no vehicle access<br>• Proportion of persons who are in institutional & non-institutional group quarters |

*Source:* (CDC, 2019)

Census tracts within Minnesota were ranked and given a percentile value from 0 to 1, with higher values indicating greater vulnerability. Theme-specific percentile rankings were generated by summing the percentiles of the variables comprising each theme and ordering the summed percentiles for each theme. For more information about the SVI methodology, visit https://svi.cdc.gov/.

Maps of each SVI theme for Blue Earth County are displayed in Figure 4.

*Figure 4. 2016 SVI Themes, ranked by percentile against all MN census tracts, Blue Earth County*



## 3.7 Economy

Blue Earth County is dominated by the education and health services sector, with 32% of jobs in the county. Trade, transportation and utilities are also major components of the county's economy.

The number of jobs in the county increased by over 8% between 2008 and 2018.

Table 8 provides an overview of the annual average employment by major industry sector in Blue Earth County.

*Table 8. Annual Average Employment by Major Industry Sector, Blue Earth County*

| Industry | Number of Jobs (2008) | Number of Jobs (2018) |
|---|---|---|
| Natural Resources and Mining | 469 | 479 |
| Construction | 2,008 | 1,986 |
| Manufacturing | 3,716 | 3,960 |
| Trade, Transportation and Utilities | 8,712 | 8,966 |
| Information | 1,139 | 903 |
| Financial Activities | 1,418 | 1,688 |
| Professional and Business Services | 2,543 | 2,227 |
| Education and Health Services | 10,822 | 12,709 |
| Leisure and Hospitality | 3,662 | 4,443 |
| Public Administration | 1,110 | 1,223 |
| Other Services | 1,344 | 1,415 |
| **Total Number of Jobs:** | **36,945** | **39,999** |

*Source: Minnesota Dept. of Employment and Economic Development. Note: data discrepancies between segment values and totals exist due to data suppression for confidentiality.*

According to the 2013-2017 American Community Survey five-year estimates, the median household income in Blue Earth County was $53,752, compared to a Minnesota average of $65,699. The median household income in Blue Earth County increased by 12% since the 2006-2010 estimates. The percent of the county's population living below the poverty level was 18.1%, compared to a 10.5% average for the state of Minnesota.

## 3.8 Critical Infrastructure

Critical infrastructures are among the most important assets of a community. While the purpose of these infrastructures differ in nature, their continued operations are integral to the health, safety, economic and cultural well-being of the residents of Blue Earth County.

Critical infrastructures have been identified based on FEMA guidelines (FEMA, 2013) as well as input from Blue Earth County. Critical infrastructures have been classified into the following groups: emergency and shelter facilities; infrastructure systems; high potential loss structures; and significant county assets. For the complete list of critical infrastructures in Blue Earth County, see Appendix B.

### *3.8.1 Emergency & Shelter Facilities*

Emergency and shelter facilities are vital to the health and welfare of entire populations, providing services and functions essential to communities, especially during and after a disaster (FEMA). Emergency and shelter facilities include: healthcare facilities, emergency services, evacuation centers/shelters, and schools (which are often used as evacuation centers/shelters).

Figure A - 4 displays the locations of the emergency and shelter facilities within Blue Earth County.

#### Healthcare Facilities

The Mayo Clinic Health System operates in Mankato, with a 24/7 emergency department, level II nursery, critical care medicine, advanced trauma care, inpatient behavioral health unit, cancer center, cardiac catheterization lab and advanced diagnostic imaging. They also operate a clinic in Lake Crystal.

#### Emergency Services

##### *Law Enforcement*

Police stations are located in the cities of Eagle Lake, Lake Crystal, Madison Lake and Mapleton.

The Sheriff's Office of Blue Earth County is located in Mankato and is an integral part of the county's justice system. As the chief law enforcement authority in the county, the sheriff is charged with the duty to "keep and preserve the peace of his county, for which purpose he may call to his aid such persons or power of his county as he deems necessary" (Blue Earth County, n.d.).

Both the Blue Earth County Emergency Operations Center and the City of Mankato Emergency Operations Center are located in Mankato.

##### *Fire & Rescue Services*

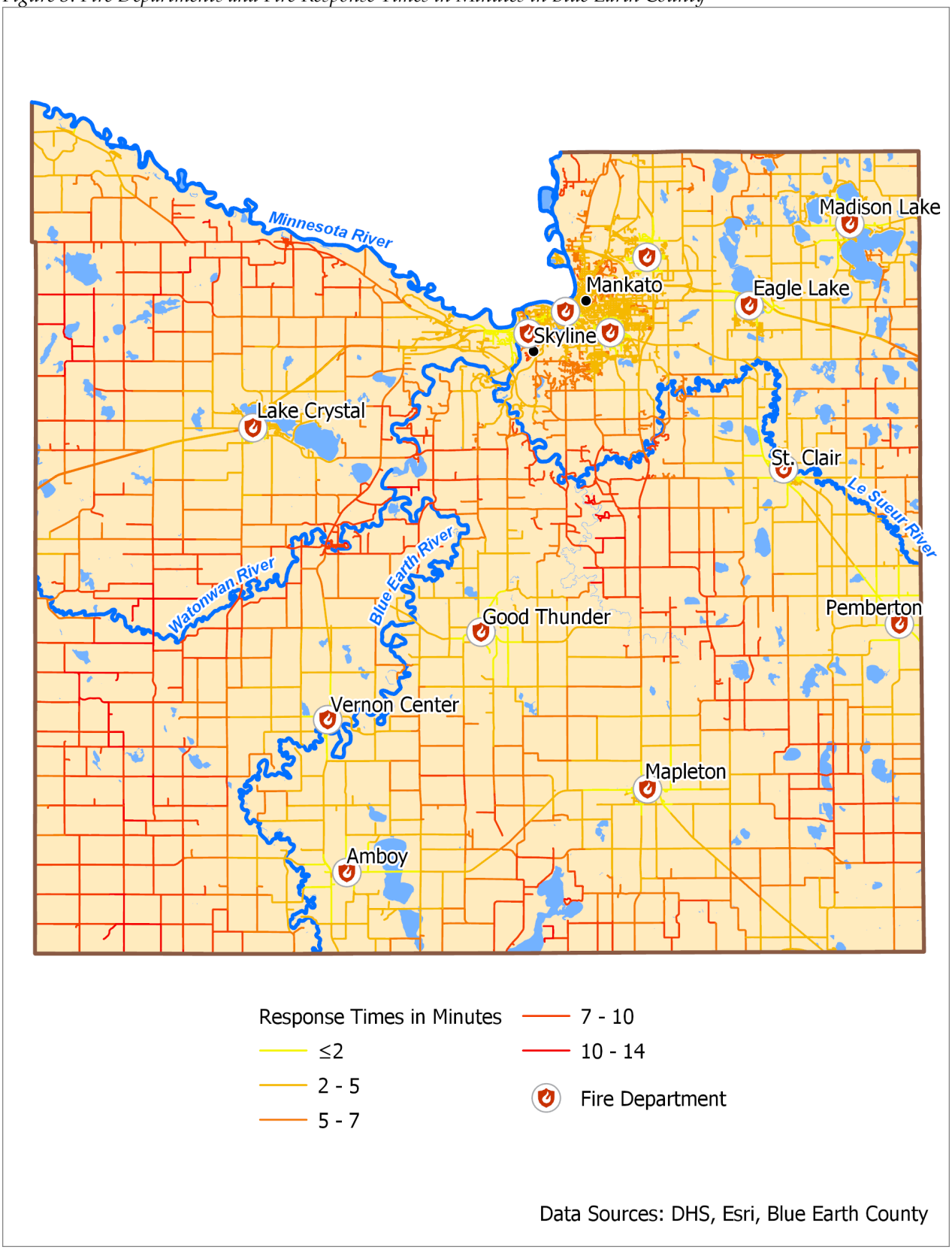
Fire departments are located in Good Thunder, Lake Crystal, Madison Lake, Mankato (three stations), and Mapleton. Volunteer fire departments are located in Amboy, Eagle Lake, Good Thunder, Mapleton, Pemberton, St. Clair, South Bend (Mankato) and Vernon Center.

Figure 5 shows fire departments and fire response times in Blue Earth County. These drive times were created using the ArcGIS Network Analyst extension and Esri's Business Analyst. The user may note discrepancies between MnDOT road data and the map in this document; Network Analyst requires a seamlessly-connected data source in order to perform the calculations for drive times, which Business Analyst provides but MnDOT does not. The Business Analyst data was used for this reason. According to this model, all communities in the county are within 14 minutes of a fire department.

#### Schools & Evacuation Centers/Shelters

There are 34 schools in Blue Earth County. According to Homeland Infrastructure Foundation Level Data, there are 25 shelters in Blue Earth County that are designated in the National Shelter System (Figure A - 4).

*Figure 5. Fire Departments and Fire Response Times in Minutes in Blue Earth County*



### *3.8.2 Infrastructure Systems*

Infrastructure systems include the transportation systems and utility systems which are fundamental to the functioning of communities. These systems allow for emergency facilities to operate and connect to residents; they are the lifelines for communities.

#### Transportation Systems

The infrastructure of transportation systems facilitates the movement of individuals, goods, and services. Figure A - 7 displays Blue Earth County's transportation systems.

##### *Roadways*

Within Blue Earth County there are 732 miles of county roads, 620 miles of township roads, and 165 miles of trunk highways (Blue Earth County).

##### *Railways*

Two railway companies operate in Blue Earth County: Union Pacific (UP) and Dakota, Minnesota and Eastern (DME) Railroad, a subsidiary of Canadian Pacific. According to data from the Minnesota Department of Transportation, there are 27 miles of UP tracks and 32 miles of DME tracks.

##### *Navigable Waterways*

This plan only references navigable waterways which are included in the U.S. Department of Transportation/Bureau of Transportation Statistics' National Transportation Atlas Database. A general definition of navigable waterways is defined by the US Army Corps of Engineers as, "...waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce..." (Code of Federal Regulations, n.d.). According to this definition, there are no navigable waters in Blue Earth County.

##### *Airports*

The Mankato Regional Airport is located five miles northeast of Mankato, with $11.5 million in annual economic stimulation and more than 160 jobs. There are two runways and the airport can accommodate aircraft up to a 757. Over 100 aircraft are based at the airport, ranging from single engine planes to large corporate jets (City of Mankato, n.d.).

#### Utility Systems

The infrastructure of utility system networks facilitates the process of moving utilities from their source to the consumer. A map of the utilities systems in Blue Earth County is displayed in Figure A - 6.

##### *Water & Sewer*

According to data from the Minnesota Pollution Control Agency, there are 43 wastewater treatment plants in the county.

##### *Energy*

There are 25 electrical substations in Blue Earth County, along with electric transmission lines operated by Alliant, Great River Energy and Xcel Energy, Inc.

Several pipelines cross the county, carrying natural gas, petroleum products and hydrocarbon gas.

There are 12 power plants in the county.

#### *Communication*

Established in 2004, the Allied Radio Matrix for Emergency Response (ARMER) Program, administered in coordination with the Minnesota Statewide Radio Board, manages the implementation of a 700/800 megahertz (MHz) shared digital trunked radio communication system capable of servicing the radio communication needs of every public safety entity operating in Minnesota (MN Department of Public Safety, n.d.).There are four ARMER towers in Blue Earth County (see Figure A - 6).

### *3.8.3 High Potential Loss Structures*

High potential loss structures are structures which would have a high loss or negative impact on the community if they were damaged or destroyed (FEMA). These structures include dams, levees and facilities storing hazardous materials.

#### Dams & Levees

There are 11 dams and three levees in Blue Earth County (see section 3.4.4 for a complete inventory).

#### Hazardous Materials Facilities

Blue Earth County did not provide the location of any facilities with hazardous materials in the county.

### *3.8.4 Significant County Assets*

Significant county assets include larger employers which represent a primary economic sector of a community; buildings of government services deemed to be significant; and cultural or historic assets that are deemed important to a community. An inventory of Blue Earth County's significant county assets is listed in Appendix B.

#### Leading Employers

While every employer is an important asset to a community, the loss or disruption of certain employers, or the primary economic sector of a community, will have a large negative impact on the respective communities. The 10 largest employers in Blue Earth County are: Mayo Clinic Health System, Minnesota State University – Mankato, Blue Earth County, MRCI, E I Microcircuits, City of Mankato, Johnson Outdoors, Consolidated Communications, South Central College and Monarch Healthcare Management.

#### Government Buildings

Government buildings deemed to be significant is at the discretion of the communities, but often include: government service centers, the court house, jails and prisons. Previously mentioned government emergency services (police and fire) are not included in this list.

### Cultural Resources

Cultural resources are cultural or historic assets that are unique or irreplaceable, or any asset that is important to a community. Blue Earth County is home to a number of art galleries, museums, theatres, music companies and dance companies. See Appendix B for a complete listing.

## 3.9 Land Use and Ownership

Blue Earth County covers a total of 764 square miles (488,960 acres). The most predominant use of land in Blue Earth County today is devoted to agriculture, which is the key economic driver in the county (Blue Earth County, 2018).

In 2017, there were 983 farms in the county, covering 382,730 acres. Of this farming land, 93% is cropland, 2% is woodland, and the rest is classified as "other." The number of farms in the county decreased by 8% between 2012 and 2017, while the number of acres farmed increased by 2%. The average size of each farm is 389 acres (Census of Agriculture, 2017).

According to Minnesota DNR data, the number of feedlots in Blue Earth County is 420, and 46 of those have more than 1,000 animal units. Feedlots in Blue Earth County are mapped in Figure A - 24 (*Appendix A: Blue Earth County Maps*).

Land ownership categories from the 2008 U.S. Geological Survey GAP (Gap Analysis Program) are shown in Figure A - 9 (*Appendix A: Blue Earth County Maps*). Land cover is mapped in Figure A - 8.

### *3.9.1 Facility Replacement Costs*

Blue Earth County-specific building data was sourced from the parcel tax databases and parcel polygon data included building valuations and occupancy class. Structure values for each parcel were aggregated within each parcel and assigned to the parcel centroid point. Records were aggregated to the relevant census administrative boundaries for the flood hazard analysis. This process also provided total facility replacement costs and total building exposure by general occupancy class (defined by Hazus tools). The total estimated building exposure for Blue Earth County is shown in Table 9.

*Table 9. Blue Earth County Total Building Exposure*

| Category | Count of Structures | Value of Structures |
|---|---|---|
| Agriculture | 41 | $14,783,600 |
| Commercial | 1,779 | $1,204,378,100 |
| Education | 39 | $315,747,400 |
| Government | 15 | $10,089,300 |
| Industrial | 112 | $149,669,000 |
| Religious/Non-Profit | 89 | $115,720,500 |
| Residential | 20,301 | $3,834,478,000 |
| **Total:** | **22,376** | **$5,644,865,900** |

# Section 4 – Risk Assessment

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.

Basing risk assessments on the best information available is important in developing affective mitigation actions that benefit communities. Geographic Information System (GIS) tools are not only helpful in producing maps, but they also show structures at risk and may determine damage estimates for potential hazard scenarios. MN Homeland Security and Emergency Management (HSEM) mitigation staff encourages the use of GIS tools in risk assessments because they produce good information to use in the risk assessment process.

This assessment identifies the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of three components — hazard identification and prioritization, risk profile, and vulnerability profile.

## 4.1 Hazard Identification/Profile

### *4.1.1 Hazard Identification*

The cornerstone of the risk assessment is identification of the hazards that affect jurisdictions. To facilitate the planning process, several sources were employed to ensure that the natural hazards are identified prior to assessment.

Natural hazards are identified in the FEMA publication "Multi-Hazard Identification and Risk Assessment – A Cornerstone of the National Mitigation Strategy," also known as MHIRA. FEMA Region V developed a list based on state mitigation plans in the region. Table 10 lists the natural hazards included in the 2019 Minnesota State Hazard Mitigation Plan.

*Table 10. FEMA MHIRA Natural Hazards in the 2019 Minnesota State Hazard Mitigation Plan*

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

**Addressed in the State Mitigation Plan because Minnesota is a heavily forested state compared to other states in Region V.*

### 4.1.2 *Hazard Prioritization and Vulnerability Assessment by Jurisdiction*

#### Prioritization of Hazards

As part of the plan update process, the steering committee reviewed, updated, and prioritized the hazards faced by residents of Blue Earth County, updated the existing mitigation actions published in the 2013 Multi-Hazard Mitigation Plan, and proposed new mitigation actions.

To engage in this process, the committee drew on a number of data sources. First, the committee examined the hazards identified in the 2013 Multi Hazard Mitigation Plan (Table 11). The natural hazards that pose risk to Blue Earth County were discussed and adjusted to reflect the definitions of natural hazards used in the 2019 Minnesota State Hazard Mitigation Plan. This was done in order to assure that the risks faced by Blue Earth County were categorized the same way as the priority hazards established by the State of Minnesota.

*Table 11. Natural hazards identified in the 2013 Blue Earth County Multi-Hazard Mitigation Plan*

| Natural Hazards | | | |
|---|---|---|---|
| Severe Winter Weather | Earthquake | Drought | Fire |
| Severe Summer Weather | Tornado | Flood | Sinkholes/Land Subsidence |
| Riverine and Ravine Erosion and Landslides | | | |

While the focus of this MHMP is on natural hazards, planning took place with the understanding that many non-natural hazards could occur as a result of natural disasters (i.e. disruption in electrical service due to freezing rain causing problems for both utility corporations and vulnerable populations dependent on electricity for heat).

This plan draws on a variety of data sources including the State of Minnesota and Homeland Security Emergency Management Critical Infrastructure Strategy for the State of Minnesota (2010), FEMA's Local Mitigation Planning How-to Guide Integrating Manmade Hazards into Mitigation Planning (2003), and the State of Minnesota Multi Hazards Identification Risk Assessment.

The prioritization of hazards for the Blue Earth County MHMP Update (Table 12) was based upon group review and discussion of the natural hazards that pose risk to the county during the MHMP kick-off steering committee meeting on April 24, 2019. 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. The group agreed that since the 2013 plan the prioritization of flooding and erosion/landslides should be moved from moderate to high due to the increase in high rain/flood events since the last plan. Severe winter storms and severe summer storms continued to be high priority hazards to address as previously in 2013. Wildfire, drought and dam failure remained low. *Appendix E: Steering Committee Meetings* provides the planning team discussion notes from the April 24, 2019 meeting.

*Table 12. Prioritization of Hazards for Blue Earth County*

| Natural Hazards | Risk Severity |
|---|---|
| Severe Winter Storms (Blizzards, Heavy Snow, Ice Storms) | High |
| Severe Summer Storms (Thunderstorms, Lightning, Hailstorms, Windstorms, Tornadoes) | High |
| Flash Flooding & Riverine Flood | High |
| Erosion/Landslides | High |
| Extreme Heat/Extreme Cold | Moderate |
| Drought | Low |
| Dam Failure | Low |
| Wildfire | Low |

## Vulnerability Assessment by Jurisdiction

Jurisdictions in Blue Earth 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. Participants were asked to provide feedback on how they felt vulnerability to natural hazards had either increased (due to changes such as development) or decreased (due to local mitigation efforts) over the past 5 years. Following is an overview of responses related to noted local vulnerabilities (see Appendix K for the full Local Mitigation Survey Report). 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 11, and to assist local governments in development of related local mitigation actions.

Blue Earth County

Blue Earth County is seeing continued development in areas that are vulnerable to erosion, bluff failure and lake shore sluffing. Lake shore sluffing adds impervious surfaces that impact vulnerable areas. This is due to an increased number of torrential rain events as opposed to multi-day or soaking rains. Construction of the Walmart Distribution Center has also added a significant number of people in one area if a severe weather event were to strike that location. It also brings many trucks to the area, staged in the parking lot or alongside the roadway, that could be vulnerable to severe weather events.

City of Good Thunder

We constructed a concession stand at our ball park, with this, the city has a higher cost of loss during a storm.

City of Madison Lake

Increased rainfall and rapid spring thaw have been noticed in the last five years. This can increase the risk of flooding and rapid increases to lake levels.

City of Mankato

Expansion of the community would be the only increase in vulnerability. The City of Mankato continues to take steps to improve land usage and prevent damage from the typical (flooding river and high intensity rain events) disasters that we experience.

City of Mapleton

From 2013 until now the city had added 11 new homes in a city-owned subdivision. This would increase the cost of damage due to storms, tornadoes, wind and/or hail.

City of St. Clair

While the City recognizes that there has been a change in weather patterns, bringing more frequent heavy rains and storms, which has increased our vulnerability to flooding, we feel the major factor is the change in farming practices … sloughs and holding areas have been eliminated, much larger tile is being utilized and there is less space between tile lines. The outlets (tile, culverts, etc.) carrying the water to the river are much larger and are running at capacity after a rain event.

### *4.1.3 Hazard Profiling Concept of Planning*

The risk assessments identify the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of three components – hazard identification, risk profile and vulnerability profile.

### *4.1.4 GIS and Risk Assessment*

The risk analysis step in this assessment quantifies the risk to the population, infrastructure and economy of the community. Hazards that can be geographically identified (wildfires, windstorms, tornadoes, hail, floods) were mapped.

FEMA's Hazus tool in ArcGIS was used to estimate the damages incurred for a 1% annual chance flood and for general asset assessment. Hazus also generates aggregated loss estimates for the entire county due to a 1% annual chance flood. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across each census block. Therefore, it is possible that overestimates of damage will occur in some areas while underestimates will occur in other areas. With this in mind, total losses tend to be more reliable over larger geographic areas (groups of many blocks) than for individual census blocks. It is important to note that Hazus is not intended to be a substitute for detailed engineering studies.

### *4.1.5 National Centers for Environmental Information (NCEI) Records*

Historical storm event data was compiled from the National Centers for Environmental Information (NCEI). NCEI records are estimates of damage reported to the National Weather Service (NWS) from

various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events.

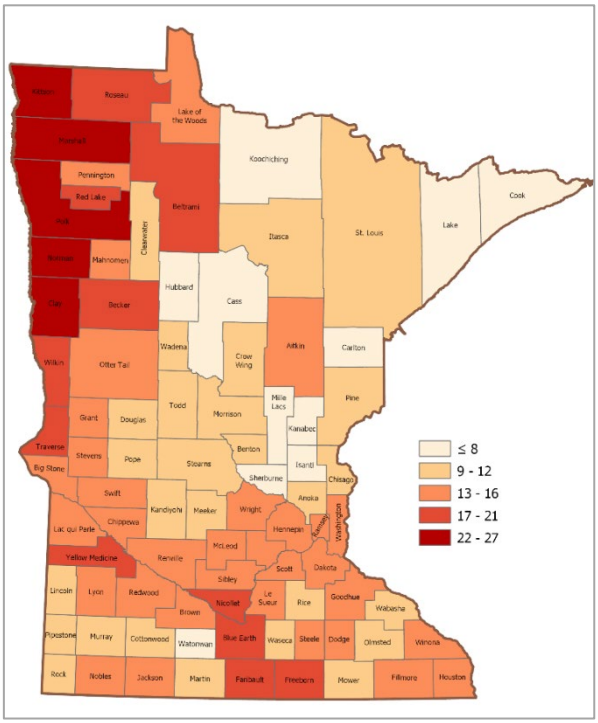
The NCEI data included 501 reported events in Blue Earth County between 1950 and April 2019. However, some weather event categories only had available data going back as recent as 1996. No records before 1950 were available. A summary table of events related to each hazard type is included in the hazard profile sections that follow. A full table listing all events, including additional details, is included in Appendix C. The full record of events can be found at the NCEI storm events data center: https://www.ncdc.noaa.gov/stormevents/. NCEI hazard categories used in this plan are listed in Table 13.

*Table 13. National Centers for Environmental Information Historical Hazards*

| Hazard | |
|---|---|
| Tornado | Hail |
| Thunderstorm Wind | Flood/Flash Flood |
| Winter Weather/ Winter Storm/Blizzard | Cold/Wind Chill |
| Excessive Heat/Heat | Lightning |

### 4.1.6 FEMA Declared Disasters

*Figure 6. FEMA Disaster Declarations by County*




Another historical perspective is derived from FEMA-declared disasters. Eighteen major disaster and three emergency declarations in Blue Earth County have been made between 1957 and June 2019 (Figure 6).

Table 14 and Table 15 show the details of the disasters including payments for Public Assistance (PA) and Individual Assistance (IA), listed under the flooding and severe storm profiles. No declarations were made for the other storms listed in the NCEI database. Reviewing the federal payments for damages from the declared disasters is a way of correlating the impact from the NCEI report.

*Table 14. FEMA-Declared Major Disasters in Blue Earth County (1957-June 2019)*

| Incident | Declaration Date and Disaster Number | Incident Period | Total PA Obligated by FEMA for Disaster in Minnesota | Total PA Obligated by FEMA for Disaster in Blue Earth County | Individual Assistance in Minnesota | Individual Assistance in Blue Earth County |
|---|---|---|---|---|---|---|
| Winter Storm, Straight-line winds, Flooding | 6/12/2019 DR-4442 | 3/12/2019-4/28/2019 | Yes, Amount Unknown | | | |
| Severe Storms, Tornadoes, Straight-line Winds, Flooding | 9/5/2018 DR-4390 | 6/15/2018 – 7/12/2018 | $13,018,824* | Yes, Amount Unknown | None | None |
| Severe Storms, Flooding | 11/2/2016 DR-4290 | 9/21/2016 – 9/24/2016 | $7,030,058* | Yes, Amount Unknown | None | Yes, Amount Unknown |
| Severe Storms, Straight-line Winds, Flooding, Landslides, Mudslides | 7/21/2014 DR-4182 | 6/11/2014 – 7/11/2014 | $40,844,210* | Yes, Amount Unknown | None | None |
| Severe Storms, Flooding | 5/10/2011 DR-1982 | 3/16/2011 – 5/25/2011 | $20,314,052* | Yes, Amount Unknown | None | None |
| Severe Storms, Flooding | 10/13/2010 DR-1941 | 9/22/2010 – 10/14/2010 | $25,610,976* | Yes, Amount Unknown | None | None |

| Incident | Declaration Date and Disaster Number | Incident Period | Total PA Obligated by FEMA for Disaster in Minnesota | Total PA Obligated by FEMA for Disaster in Blue Earth County | Individual Assistance in Minnesota | Individual Assistance in Blue Earth County |
|---|---|---|---|---|---|---|
| Severe Storms, Tornadoes, Flooding | 7/2/2010 DR-1921 | 6/17/2010 – 6/26/2010 | $13,066,488* | Yes, Amount Unknown | None | None |
| Flooding | 4/19/2010 DR-1900 | 3/1/2010 – 4/26/2010 | $12,721,044* | Yes, Amount Unknown | None | None |
| Severe Storms, Straight-line Winds, Tornadoes | 6/23/1998 DR-1225 | 5/15/1998 – 6/28/1998 | Yes, Amount Unknown | Yes, Amount Unknown | None | None |
| Tornadoes, Severe Storms | 4/1/1998 DR-1212 | 3/29/1998 | Yes, Amount Unknown | None | Yes, Amount Unknown | Yes, Amount Unknown |
| Severe Flooding, High Winds, Severe Storms | 4/8/1997 DR-1175 | 3/21/1997 – 5/24/1997 | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown |
| Severe Winter Storms | 1/16/1997 DR-1158 | 1/3/1997 – 2/3/1997 | Yes, Amount Unknown | Yes, Amount Unknown | None | None |
| Flooding, Severe Storms | 6/1/1996 DR-1116 | 3/14/1996 – 6/17/1996 | Yes, Amount Unknown | Yes, Amount Unknown | None | None |
| Severe Storms, Tornadoes, Flooding | 6/11/1993 DR-993 | 5/6/1993 – 8/25/1993 | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown |
| Ice Storm | 12/26/1991 DR-929 | 10/31/1991 – 11/29/1991 | Yes, Amount Unknown | Yes, Amount Unknown | None | None |
| Flooding | 4/18/1969 DR-255 | 4/18/1969 | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown |
| Heavy Rains, Flooding | 8/15/1968 DR-249 | 8/15/1968 | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown |
| Flooding | 4/11/1965 DR-188 | 4/11/1965 | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown | Yes, Amount Unknown |

*Source: Data downloaded from https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1 in 4/3/2019. Values are estimates collected at the time of the disaster. *According to https://www.fema.gov/disasters/state-tribal-government/0/MN as of 6/18/2019.*

*Table 15. FEMA-Declared Emergencies in Blue Earth County (1957-June 2019)*

| Incident | Declaration Date and Disaster Number | Incident Period | Individual Assistance in Minnesota | Public Assistance (all affected areas) |
|---|---|---|---|---|
| Flooding | 3/19/2010 EM-3310 | 3/1/2010 – 4/26/2010 | None | Yes, Amount Unknown |
| Hurricane Katrina Evacuation | 9/13/2005 EM-3242 | 9/29/2005 – 10/1/2005 | None | Yes, Amount Unknown |

| Incident | Declaration Date and Disaster Number | Incident Period | Individual Assistance in Minnesota | Public Assistance (all affected areas) |
|---|---|---|---|---|
| Drought | 6/17/1976 EM-3013 | 6/17/1976 | None | Yes, Amount Unknown |

** Data downloaded from https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1 in 4/3/2019. Values are estimates collected at the time of the disaster.*

Blue Earth County was also part of a State Disaster Declaration in 2016 (SD-006). A total of $479,956 was obligated to the county. The State Disaster Program was signed into state law in 2014. It is ½ the threshold of the federal/FEMA public assistance (only) program threshold.

Table 16 depicts the historical projects in Blue Earth County resulting from hazard mitigation funding.

*Table 16. Historical Hazard Mitigation Funding (HMGP and PDM) in Blue Earth County*

| Year | Project Description | Sub-Grantee | Funding Type | Federal Share |
|---|---|---|---|---|
| 2016 | Blue Earth County Landslide Acquisition/Demolition | Blue Earth County | HMGP | $296,438 |
| 2013 | Blue Earth County landslide-acquisition/demolition | Blue Earth County | HMGP | $332,538 |
| 2011 | City of Pemberton Warning Siren Installation | Pemberton | HMGP | $13,862 |
| 2010 | Blue Earth County - Property Acquisition | Blue Earth County | HMGP | $50,765 |
| 2009 | Blue Earth County Hazard Mitigation Plan Comprehensive Review | Blue Earth County | HMGP | $56,001 |
| 2002 | BENCO Electric -Line Replacement | Frost-Benco-Wells Electric Co | HMGP | $93,079 |
| 2001 | Region 9 RDC Mitigation Plan | Region 9 Regional Development Commission | HMGP | $68,404 |
| 1998 | Frost-Benco Wells Electric Cooperative Rebuild Project | Frost-Benco-Wells Electric Co | HMGP | $645,526 |
| 1997 | MNDOT - Living Snow Fence | Minnesota Department of Transportation-District-7 | HMGP | $247,952 |
| **Total HMGP/PDM Funding – Blue Earth County** | | | | **$1,804,565** |

** Data provided by MN HSEM in March 2019*

## 4.2 Future Development

Because Blue Earth 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. Blue Earth 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.

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 (see Section 4.1.2, *Vulnerability Assessment by Jurisdiction*).

The Blue Earth County Emergency Management Director will work to keep the jurisdictions covered by the Multi-Hazard Mitigation Plan engaged and informed during the plan's cycle. By keeping jurisdictional leaders involved in the monitoring, evaluation and update of the MHMP, 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. Each jurisdiction has identified mitigation strategies they will seek to implement in their communities (see *Appendix G: Mitigation Actions by Jurisdiction*). Jurisdictions will include considerations for hazard mitigation in relation to future development when updating local comprehensive plans or other plans that may influence development.

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

## 4.3 Hazard Profiles

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. A capabilities assessment was also conducted by the county to review the plans and programs that are in place or that are lacking (program gaps or deficiencies) for the implementation of 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 in order to incorporate mitigation into other planning mechanisms (see Section 5.1 Community Capability Assessments and *Appendix K: Local Mitigation Survey Report*).

Summer Storms, all given a risk severity of "high" by the planning team, are profiled separately as Tornadoes, Windstorms, Lighting and Hail in sections 4.3.1 through 4.3.4.

### *4.3.1 Tornadoes*

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms to the ground, with wind speeds between 40-300 mph. They develop under three scenarios: (1) along a squall line; (2) in connection with thunderstorm squall lines during hot, humid weather; and (3) in the outer portion of a tropical cyclone. Funnel clouds are rotating columns of air not in contact with the ground; however, the column of air can reach the ground very quickly and become a tornado.

Since 2007, tornado strength in the United States is ranked based on the Enhanced Fujita scale (EF scale), replacing the Fujita scale introduced in 1971. The EF scale uses similar principles to the Fujita scale, with six categories from zero to five, based on wind estimates and damage caused by the

tornado. The EF Scale is used extensively by the NWS in investigating tornadoes (all tornadoes are now assigned an EF Scale number), and by engineers in correlating damage to buildings and techniques with different wind speeds caused by tornadoes. To see a comparative table of F and EF scales, see http://www.spc.noaa.gov/faq/tornado/ef-scale.html.

In Minnesota, the peak months of tornado occurrence are June and July. The typical time of day for tornadoes in Minnesota ranges between 4:00 p.m. and 7:00 p.m. Most of these are minor tornadoes, with wind speeds under 125 miles per hour. A typical Minnesota tornado lasts approximately 10 minutes, has a path length of five to six miles, is nearly as wide as a football field, has a forward speed of about 35 miles an hour, and affects less than 0.1% of the county warned.

### Tornado History in Blue Earth County

According to the NCEI, 38 tornadoes were reported in Blue Earth County between 1950 and April 2019, causing one death, nine injuries, and over $8.5 million dollars in property damage. Tornado classification ranged from EF0/F0 to F4 on the Enhanced Fujita Scale/Fujita Scale.

The most recent tornado occurred in September 2018, when an EF0 tornado touched down north of Rapidan, before moving east for approximately one mile. Damage was confined to two homes and a field, with total losses estimated at $50,000. On that same day, another EF0 tornado touched down in a field near Garden City. It tracked northeast for 1.2 miles through a farmstead and fairground. Numerous trees were toppled, and corn fields flattened.

In July of 2017, an EF1 tornado occurred near Judson, where it knocked over a chimney, crushed two barns and downed a tree. It also damaged hundreds of acres of corn stalks along County Road 20 and County Road 11. Crop damage was estimated at $500,000.

On July 14, 2003, five tornadoes occurred in Blue Earth County (three were ranked as F1 and two were ranked as F2). One of the F2 tornadoes hit four farmsteads northeast of St. Clair, flattening barns, sheds and outbuildings. Property damage was estimated at $2 million. The other F2 occurred east of Lake Crystal, snapping a dozen trees and destroying a barn and sheds (estimated property damage of $100,000. The three F1 tornadoes occurred in Mankato and Rapidan, causing a total of $600,000 in property damage.

Figure 7 below shows tornado touchdown points and tracks in Blue Earth County. Historic tornado events in the county are listed in Table 17.

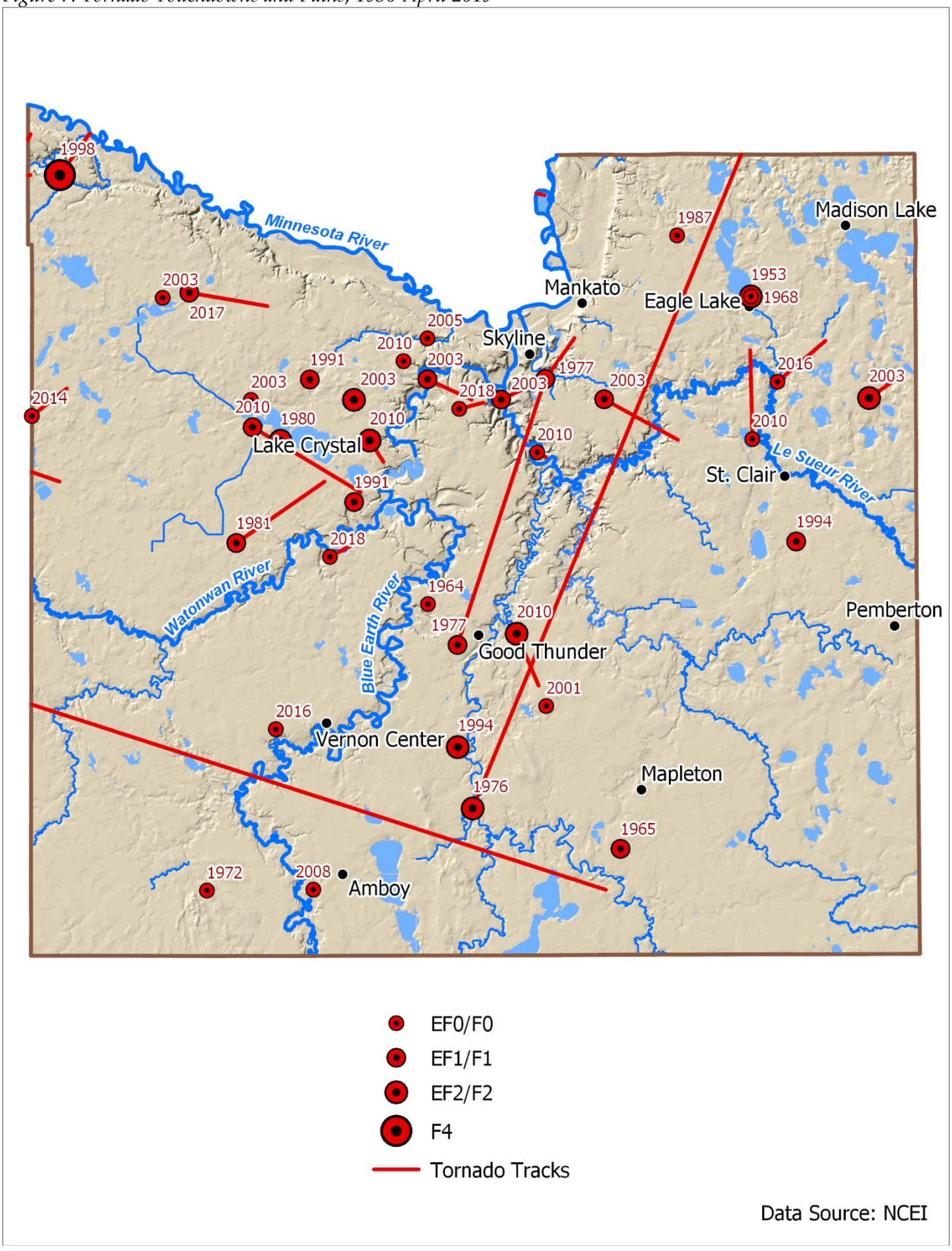
*Table 17. Historic Tornado Events in Blue Earth County, 1950-April 2019*

| Location or County | Date | Magnitude | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Rapidan | 9/20/2018 | EF0 | 0 | 0 | $50,000 |
| Garden City | 9/20/2018 | EF0 | 0 | 0 | *Unknown* |
| Judson | 7/9/2017 | EF1 | 0 | 0 | *Unknown* |
| Eagle Lake | 6/14/2016 | EF0 | 0 | 0 | *Unknown* |
| Vernon Center | 6/14/2016 | EF0 | 0 | 0 | *Unknown* |

| Location or County | Date | Magnitude | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Butternut | 5/8/2014 | EF0 | 0 | 0 | $1,000 |
| Rapidan | 8/13/2010 | EF0 | 0 | 0 | *Unknown* |
| Rapidan | 6/25/2010 | EF0 | 0 | 0 | *Unknown* |
| Good Thunder | 6/25/2010 | EF2 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/25/2010 | EF1 | 0 | 0 | *Unknown* |
| Rapidan | 6/25/2010 | EF2 | 0 | 0 | *Unknown* |
| St Clair | 6/17/2010 | EF0 | 0 | 0 | *Unknown* |
| Amboy | 7/17/2008 | EF0 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/29/2005 | F0 | 0 | 0 | *Unknown* |
| St Clair | 7/14/2003 | F2 | 0 | 0 | $2,000,000 |
| Mankato | 7/14/2003 | F1 | 0 | 0 | $100,000 |
| Rapidan | 7/14/2003 | F1 | 0 | 0 | $500,000 |
| Rapidan | 7/14/2003 | F1 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/14/2003 | F2 | 0 | 0 | $100,000 |
| Lake Crystal | 7/9/2003 | F0 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/9/2003 | F0 | 0 | 0 | *Unknown* |
| Mapleton | 5/1/2001 | F0 | 0 | 0 | *Unknown* |
| Cambria | 3/29/1998 | F4 | 0 | 0 | *Unknown* |
| Vernon Center | 8/7/1994 | F2 | 0 | 0 | $50,000 |
| St. Clair | 6/30/1994 | F1 | 0 | 1 | $500,000 |
| Blue Earth County | 4/29/1991 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 4/29/1991 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 7/14/1987 | F0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/14/1981 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 8/18/1980 | F2 | 0 | 1 | $2,500,000 |
| Blue Earth County | 5/28/1977 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 5/28/1977 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 6/14/1976 | F2 | 1 | 6 | $2,500,000 |
| Blue Earth County | 5/24/1972 | F0 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/20/1968 | F0 | 0 | 0 | *Unknown* |
| Blue Earth County | 8/2/1965 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 5/25/1964 | F0 | 0 | 0 | $25,000 |
| Blue Earth County | 7/25/1953 | F2 | 0 | 1 | $250,000 |

*Source: National Centers for Environmental Information*

*Figure 7. Tornado Touchdowns and Paths, 1950-April 2019*



The county has experienced tornadoes in 22 of the 68 full years on record, or in 32% of the years on record. To determine the probability of future tornadic events in Blue Earth County, we considered all past-observed tornadic events. Based on NCEI records through July of 2019, the relative frequency of tornado events in Blue Earth County is .55 events per year, which we infer to represent the probability of these events occurring in the future.

### Tornadoes and Future Trends

Tornadoes and other severe thunderstorm phenomena frequently cause as much annual property damage in the U.S. as do hurricanes, and often cause more deaths. Although recent research has yielded insights into the connections between global warming and the factors that cause tornados and severe thunderstorms, such as atmospheric instability and increases in wind speed with altitude (Del Genio, Yao, & Jonas, 2007), these relationships remain mostly unexplored, largely because of the challenges in observing thunderstorms and tornadoes and simulating them with computer models (National Climate Assessment Development Advisory Committee, 2013).

According to Harold Brooks of NOAA's National Severe Weather Laboratory, there is increasing variability in the "start" of tornado season. The number of days with more than 30 EF1 or greater tornadoes is increasing, while the number of days with at least 1 EF1 or greater tornadoes is decreasing. Thus, tornadoes are occurring on fewer days, but *more* are occurring on outbreak days.

The earliest reported tornado in Minnesota occurred on March 6, 2017, when two tornadoes touched down in southern Minnesota, which was 12 days earlier than the previous record. The Zimmerman tornado occurred 115 miles further north than the previous record from 1968. According to State Meteorologist Paul Huttner, "Those records fit seasonally and geographically with longer term climate trends pushing weather events earlier in the season and further northward" (Huttner, 2017).

The state of Wisconsin has recorded three tornadoes in January and six in December during the period of 1844-2013 (National Weather Service Weather Forecast Office, 2014), including a January tornado in 2008.

### Vulnerability

The likelihood of a tornado does not vary geographically in Blue Earth County. However, certain populations may be more vulnerable and less resilient to the impacts of a tornado. Because communication is so important before a tornadic event, citizens that are in living in rural areas, have limited mobility, do not live near an outdoor warning siren or do not use social media may be more affected. According to the Social Vulnerability Index results in Figure 4, citizens with social factors that make up the household composition and disability theme may be greatest in the southeast and northwest parts of Blue Earth County. As with all summer storms, those who work outdoors or do not have permanent housing are also at greater risk.

People living in mobile home parks are particularly vulnerable to tornadoes. While Minnesota law requires most mobile home parks to have storm shelters, many do not (Sepic, 2017). There are nine mobile home parks in Blue Earth County (see Figure A - 10).

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to tornadoes and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Warning Sirens* – There are no outdoor warning sirens in county parks. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

*Aboveground Power Lines* – A majority of the power lines in the county are aboveground and subject to damage from severe spring/summer storms that include high winds and may result in falling tree limbs. Power lines that are aboveground are susceptible to coming down during storms, resulting in power outages.

*Backup Power* – Not all county and local community facilities have backup power in the event of a severe spring or summer storm event that takes out power.

*Communications* – Not all Blue Earth County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Facebook page to receive important messages. Gaps in cell phone coverage exist in some parts of the county.

*Campground Shelters* – Blue Earth County has parks/campgrounds that are vulnerable to severe weather events such as high winds and damaging hail and thunderstorms. These parks/campgrounds do not have an official storm shelter or safe room. There are also campgrounds throughout Blue Earth County that do not have any sort of storm shelter due to their rustic nature.

*Storm Shelters / Community Safe Rooms* – Additional storm shelter areas would enhance public safety. Construction or retrofit of facilities to serve as community safe rooms for severe wind events should also be evaluated for areas where there are vulnerable populations, such as public campgrounds or the schools.

### *4.3.2 Windstorms*

FEMA defines winds in excess of 58 miles per hour, excluding tornadoes, as windstorms. Straight-line winds and windstorms are used interchangeably in the plan. This hazard is treated as a different category than tornadoes (which may also include high winds). Windstorms are among the nation's most severe natural hazards in terms of both lives lost and property damaged.

Severe winds can damage and destroy roofs, toss manufactured homes off their pier foundations, and tear light-framed homes apart. There are several different types of windstorms. A "downburst" is defined as a strong downdraft with an outrush of damaging winds on or near the earth's surface. Downbursts may have wind gusts up to 130 mph and are capable of the same damage as a medium-sized tornado. A "gust front" is the leading edge of the thunderstorm downdraft air. It is most prominent near the rain-free cloud base and on the leading edge of an approaching thunderstorm and is usually marked by gusty, cool winds and sometimes by blowing dust. The gust front often precedes the thunderstorm precipitation by several minutes. Straight-line winds, when associated with a

thunderstorm, are most frequently found with the gust front. These winds originate as downdraft air reaches the ground and rapidly spreads out, becoming strong horizontal flow.

When wind speeds are not able to be measured, they are estimated. Part of the process to determine wind speed is observing the damage. Table 18 lists the expected effects of increasing wind speeds.

*Table 18. Effects of Wind Speed*

| Wind Speed | Effects |
|---|---|
| 26-38 knots (30-44 mph) | Trees in motion. Lightweight loose objects (e.g., lawn furniture) tossed or toppled. |
| 39-49 knots (45-57 mph) | Large trees bend; twigs, small limbs break; and a few larger dead or weak branches may break. Old/weak structures (e.g., sheds, barns) may sustain minor damage (roof, doors). Buildings partially under construction may be damaged. A few loose shingles may be removed from houses. Carports may be uplifted; minor cosmetic damage may occur to mobile homes. |
| 50-64 knots (58-74 mph) | Large limbs break; shallow-rooted trees may be pushed over. Semi-trucks may be overturned. More significant damage to old/weak structures occurs. Shingles, awnings may be removed from houses; damage to chimneys and antennas occurs; mobile homes and carports incur minor structural damage. |
| 65-77 knots (75-89 mph) | Widespread damage to trees with trees broken/uprooted. Mobile homes may incur more significant structural damage; Roofs may be partially peeled off industrial/commercial/ warehouse buildings. Some minor roof damage may occur to homes. Weak structures (e.g., farm buildings, airplane hangars) may be severely damaged. |
| 78+ knots (90+ mph) | Many large trees broken and uprooted. Mobile homes may be severely damaged; moderate roof damage to homes may occur. Roofs may be partially peeled off homes and buildings. Moving automobiles may be pushed off dry roads. Barns and sheds may be demolished. |

*Source: (National Weather Service, 2018)*

### Windstorm History in Blue Earth County

Blue Earth County frequently experiences winds blowing at over 50 knots. According to NCEI records, there have been 160 thunderstorm/high wind events reported between 1950 and April 2019, with wind speeds of up to 87 knots. These winds can inflict damage to buildings and in some cases overturn high-profile vehicles.

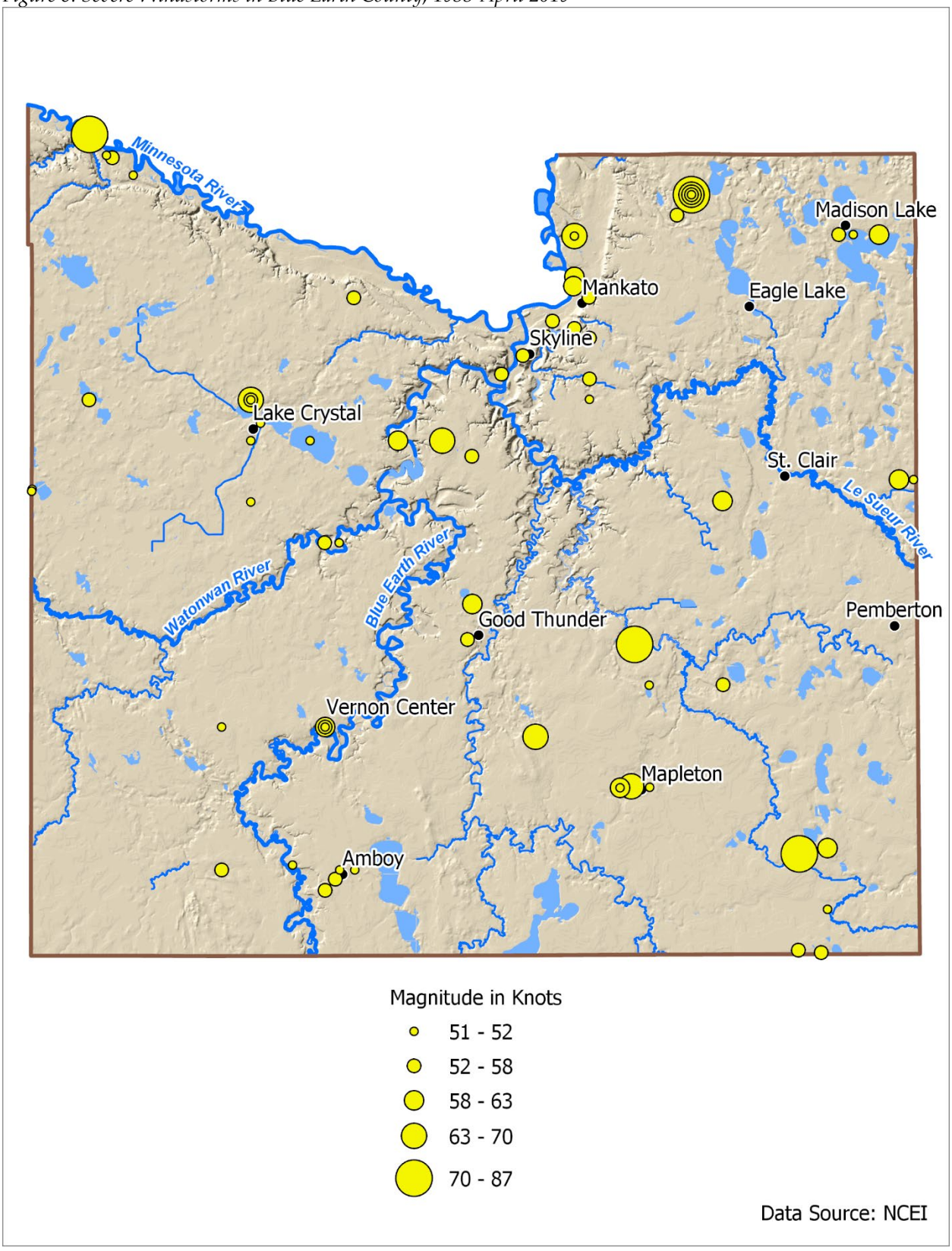
In August 2016 a thunderstorm moved across south-central Minnesota and Blue Earth County. Two grain bins and a machine shed near Mankato were damaged, resulting in an estimated $150,000 in property damage.

Another major windstorm occurred in June 2014, when two thunderstorms converged into one near Minnesota's southern border. Wind gusts reached 87 knots, which downed numerous large trees and caused power outages. Significant damage was also done to buildings and grain bins near Minnesota Lake, totaling $500,000 of property damage.

In May of 1998, a thunderstorm with gusts of up to 61 knots caused severe damage throughout the county. On Highway 14 a semitrailer was blown over, injuring one person. The property damage estimate for Blue Earth County was $20 million.

Severe windstorms (winds greater than 50 knots) in Blue Earth County are shown in Figure 8.

*Figure 8. Severe Windstorms in Blue Earth County, 1955-April 2019*



To determine the probability of future windstorm events in Blue Earth County we look at all past-observed windstorm events (thunderstorm wind, high wind, and strong wind). Based on NCEI records through July of 2019, the relative frequency of windstorm events in Blue Earth County is 2.5 events per year, which we infer to represent the probability of these events occurring in the future.

### Windstorms and Future Trends

Lack of high-quality long-term data sets make assessment of changes in wind speeds very difficult (Kunkel, et al., 2013). One analysis generally found no evidence of significant changes in wind speed distribution. Other trends in severe storms, including the numbers 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 and severe storms (National Climate Assessment Development Advisory Committee, 2013).

### Vulnerability

Vulnerability to injury from all kinds of windstorms decreases with adequate warnings, warning time, and sheltering in a reinforced structure. Vulnerability to structures depends upon construction of the building and 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. Wind in excess of 50 mph (43.4 knots) is the lower limit of wind speeds capable of damaging mobile homes (American Meteorological Society, 2004). Steps to mitigate these vulnerabilities have been taken but have not proven sufficient. For example, mobile home parks with 10 or more homes that received their primary license after March 1, 1998, are required to provide storm shelters that meet standards specified by the commissioner of administration (Minnesota Department of Health, 2018). However, mobile home parks often do not provide the required storm shelters. 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.

According to NOAA's Storm Prediction Center, from 1985-2002, 49% of tornado fatalities in the United States were people who remained within or attempted to flee from mobile homes (American Meteorological Society, 2004). Given the vulnerability of mobile home residents to windstorm events, it is important to have a general understanding of where mobile homes are located. Figure A - 10 displays the locations of the nine mobile home parks in Blue Earth County.

The likelihood of a windstorm event does not vary geographically in Blue Earth County. Because communication is so important before a windstorm event, citizens that are in living in rural areas, have limited mobility, do not live near an outdoor warning siren or do not use social media may be more affected. According to the Social Vulnerability Index results in Figure 4, citizens with social factors that make up the household composition and disability theme may be greatest in the southeast and northwest parts of Blue Earth County. As with all summer storms, those who work outdoors or do not have permanent housing are also at greater risk.

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to windstorms and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Warning Sirens* – There are no outdoor warning sirens in county parks. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

*Aboveground Power Lines* – A majority of the power lines in the county are aboveground and subject to damage from severe spring/summer storms that include high winds and may result in falling tree limbs. Power lines that are aboveground are susceptible to coming down during storms, resulting in power outages.

*Backup Power* – Not all county and local community facilities have backup power in the event of a severe spring or summer storm event that takes out power.

*Communications* – Not all Blue Earth County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Facebook page to receive important messages. Gaps in cell phone coverage exist in some parts of the county.

*Campground Shelters* – Blue Earth County has parks/campgrounds that are vulnerable to severe weather events such as high winds and damaging hail and thunderstorms. These parks/campgrounds do not have an official storm shelter or safe room. There are also campgrounds throughout Blue Earth County that do not have any sort of storm shelter due to their rustic nature.

*Storm Shelters / Community Safe Rooms* – Additional storm shelter areas would enhance public safety. Construction or retrofit of facilities to serve as community safe rooms for severe wind events should also be evaluated for areas where there are vulnerable populations, such as public campgrounds or the schools.

### *4.3.3 Lightning*

Lightning typically occurs as a by-product of a thunderstorm. In only a few millionths of a second, the air near a lightning strike is heated to 50,000°F, a temperature hotter than the surface of the sun. The hazard posed by lightning is significant. High winds, rainfall, and a darkening cloud cover are the warning signs for possible cloud-to-ground lightning strikes. 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.

Lightning strikes the ground approximately 25 million times each year in the U.S. According to the NWS, the chance of an individual in the U.S. being killed or injured by lightning during a given year is 1 in 240,000 (NOAA National Severe Storms Laboratory, n.d.).

Lightning is the most dangerous and frequently encountered weather hazard that most people in the United States experience annually. Lightning is the second most frequent killer in the U.S., behind floods and flash floods, with nearly 100 deaths and 500 injuries annually. The lightning current can

branch off to strike a person from a tree, fence, pole, or other tall object. In addition, an electrical current may be conducted through the ground to a person after lightning strikes a nearby tree, antenna, or another tall object. The current may also travel through power lines, telephone lines, or plumbing pipes to damage property or cause fires.

### Lightning History in Blue Earth County

The NCEI has recorded one lightning event in Blue Earth County between 1996 and April of 2019. In September 1996, a lightning strike occurred, causing an estimated $100,000 in property damage.

To determine the probability of future lightning events in Blue Earth County we look at past-observed events. Based on the NCEI period of record from 1996 through July of 2019, the relative frequency of lightning events in Blue Earth County resulting in a fatality, injury, and/or damage is .04 events per year, which we infer to represent the probability of these events occurring in the future.

### Lightning and Future Trends

The projected possible intensity and frequency of tornadoes, hail, and damaging thunderstorm winds, the conditions associated with lightning, are uncertain (National Climate Assessment Development Advisory Committee, 2013). Severe rain events are becoming more common and may include an additional risk of lightning.

### Vulnerability

The magnitude of summer storms with lightning each year is unpredictable and within Blue Earth County the vulnerability of populations or jurisdictions to lightning does not vary geographically. As with all summer storms, those who work outdoors or do not have permanent housing are most at risk.

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to lightning and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Warning Sirens* – There are no outdoor warning sirens in county parks. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

*Aboveground Power Lines* – A majority of the power lines in the county are aboveground and subject to damage from severe spring/summer storms that include high winds and may result in falling tree limbs. Power lines that are aboveground are susceptible to coming down during storms, resulting in power outages.

*Backup Power* – Not all county and local community facilities have backup power in the event of a severe spring or summer storm event that takes out power.

*Communications* – Not all Blue Earth County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Facebook page to receive important messages. Gaps in cell phone coverage exist in some parts of the county.

*Campground Shelters* – Blue Earth County has parks/campgrounds that are vulnerable to severe weather events such as high winds and damaging hail and thunderstorms. These parks/campgrounds do not have an official storm shelter or safe room. There are also campgrounds throughout Blue Earth County that do not have any sort of storm shelter due to their rustic nature.

*Storm Shelters / Community Safe Rooms* – Additional storm shelter areas would enhance public safety. Construction or retrofit of facilities to serve as community safe rooms for severe wind events should also be evaluated for areas where there are vulnerable populations, such as public campgrounds or the schools.

### *4.3.4 Hail*

Hailstorms are a product of severe thunderstorms. Hail forms when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger, until their weight can no longer be supported by the winds. Hailstones can vary in size, depending on the strength of the updraft. The NWS uses the following descriptions when estimating hail sizes: pea size is ¼-inch, marble size is ½-inch, dime size is ¾-inch, quarter size is 1-inch, golf ball size is 1 ¾-inches, and baseball size is 2 ¾-inches. Individuals who serve as volunteer "storm spotters" for the NWS are located throughout the state and are instructed to report hail dime size (¾-inch) or greater. Hailstorms can occur throughout the year; however, the months of maximum hailstorm frequency are typically between May and August. Although hailstorms rarely cause injury or loss of life, they can cause significant property damage.

#### Hail History in Blue Earth County

Hail is a particular concern in Blue Earth County due to the damage it can inflict on agriculture. According to the NCEI, only two hailstorms since 1955 resulted in property damage.

In June of 2010 in the southeastern corner of Blue Earth County, golf ball to soft ball sized hail fell, breaking the windshields of multiple vehicles. This storm caused approximately $250,000 in property damage. The only other hailstorm with property damage recorded by the NCEI occurred in June 1994, causing $500 in property damage. No deaths or injuries have been reported in the county due to hail.

Severe hailstorms (defined as those producing hail greater than 1") are mapped in Figure 9. Table 19 shows storms producing hail greater than 1-inch diameter in Blue Earth County.

To determine the probability of future hailstorm events in Blue Earth County we considered past-observed events. Based on NCEI records from 1955 through July of 2019, the relative frequency of hailstorm events in Blue Earth County is 2.2 events per year. The relative frequency of events producing hail of greater than 1-inch is .73, which we infer to represent the probability of these events occurring in the future.

*Figure 9. Severe Hailstorms in Blue Earth County, 1955-April 2019*

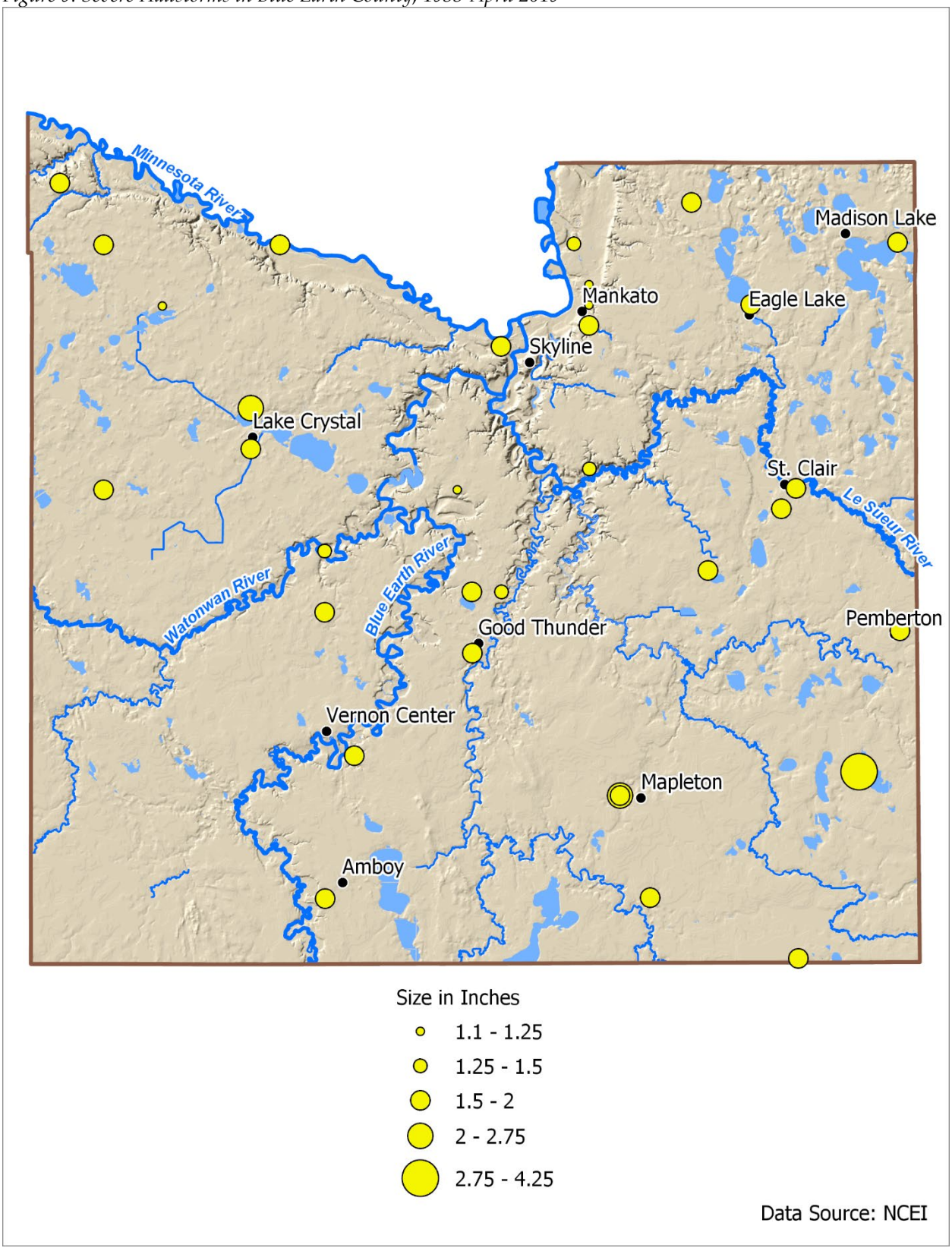


*Table 19. Storms producing hail greater than 1-inch diameter in Blue Earth County, 1955-April 2019*

| Date | Hail Size (inches) | Injuries | Date | Hail Size (inches) | Injuries | Date | Hail Size (inches) | Injuries |
|---|---|---|---|---|---|---|---|---|
| 9/20/2016 | 1.75 | 0 | 5/1/2001 | 1.75 | 0 | 6/19/1991 | 1.75 | 0 |
| 6/17/2014 | 1.5 | 0 | 5/1/2001 | 1.5 | 0 | 5/22/1990 | 1.75 | 0 |
| 6/17/2014 | 1.25 | 0 | 9/2/2000 | 1.75 | 0 | 6/30/1983 | 1.75 | 0 |
| 5/7/2014 | 1.75 | 0 | 7/25/2000 | 1.75 | 0 | 5/4/1982 | 1.75 | 0 |
| 5/7/2014 | 1.5 | 0 | 7/25/2000 | 1.5 | 0 | 7/22/1981 | 1.75 | 0 |
| 6/25/2010 | 4.25 | 0 | 5/17/2000 | 1.75 | 0 | 7/14/1981 | 1.75 | 0 |
| 6/25/2010 | 1.25 | 0 | 5/17/2000 | 1.75 | 0 | 6/27/1980 | 1.75 | 0 |
| 6/17/2010 | 1.75 | 0 | 5/18/1998 | 1.75 | 0 | 5/29/1980 | 1.75 | 0 |
| 4/12/2010 | 1.75 | 0 | 5/18/1998 | 1.75 | 0 | 7/15/1978 | 2.75 | 0 |
| 4/12/2010 | 1.75 | 0 | 5/18/1998 | 1.75 | 0 | 7/5/1975 | 1.75 | 0 |
| 4/12/2010 | 1.75 | 0 | 7/18/1997 | 1.75 | 0 | 5/28/1974 | 2.75 | 0 |
| 6/21/2007 | 1.75 | 0 | 7/18/1997 | 1.75 | 0 | 5/28/1974 | 1.75 | 0 |
| 7/19/2006 | 1.75 | 0 | 8/7/1994 | 1.75 | 0 | 7/23/1968 | 1.25 | 0 |
| 7/9/2003 | 1.25 | 0 | 8/7/1994 | 1.75 | 0 | 6/23/1962 | 1.5 | 0 |
| 5/8/2002 | 1.25 | 0 | 9/13/1993 | 1.75 | 0 | 8/29/1958 | 2 | 0 |
| 4/18/2002 | 1.75 | 0 | 6/19/1991 | 1.75 | 0 | | | |

*Source: National Centers for Environmental Information*

## Hail and Future Trends

According to the Federal Advisory Committee Draft National Climate Assessment (NCA), trends in severe storms, including the numbers 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 and severe storms (National Climate Assessment Development Advisory Committee, 2013).

The occurrence of very heavy precipitation has increased in Minnesota in recent decades and future projections also indicate this will continue (International Climate Adaptation Team, 2013). While it is unknown if this precipitation will occur during severe storms that produce hail, the possibility has not been ruled out.

## Vulnerability

Death, injury, crop, and property damage data from the Spatial Hazard Events and Losses Database for the United States (SHELDUS) was used to identify the monetary loss due to hailstorms that produced hail ≥ 1 inch (CEMHS, 2018). Blue Earth County ranked the highest among the Minnesota counties for damages from 1960 to 2017, primarily due to cumulative crop damages reported of over $80.4 million. The total damages of $88.9 million included $7.8 million in property damage and $600 thousand in FEMA's Willingness to Pay (WTP) values for injuries and fatalities combined.

As with all summer storms, those who work outdoors or do not have permanent housing are at greater risk during hailstorms

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to hailstorms and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Warning Sirens* – There are no outdoor warning sirens in county parks. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

*Aboveground Power Lines* – A majority of the power lines in the county are aboveground and subject to damage from severe spring/summer storms that include high winds and may result in falling tree limbs. Power lines that are aboveground are susceptible to coming down during storms, resulting in power outages.

*Backup Power* – Not all county and local community facilities have backup power in the event of a severe spring or summer storm event that takes out power.

*Communications* – Not all Blue Earth County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Facebook page to receive important messages. Gaps in cell phone coverage exist in some parts of the county.

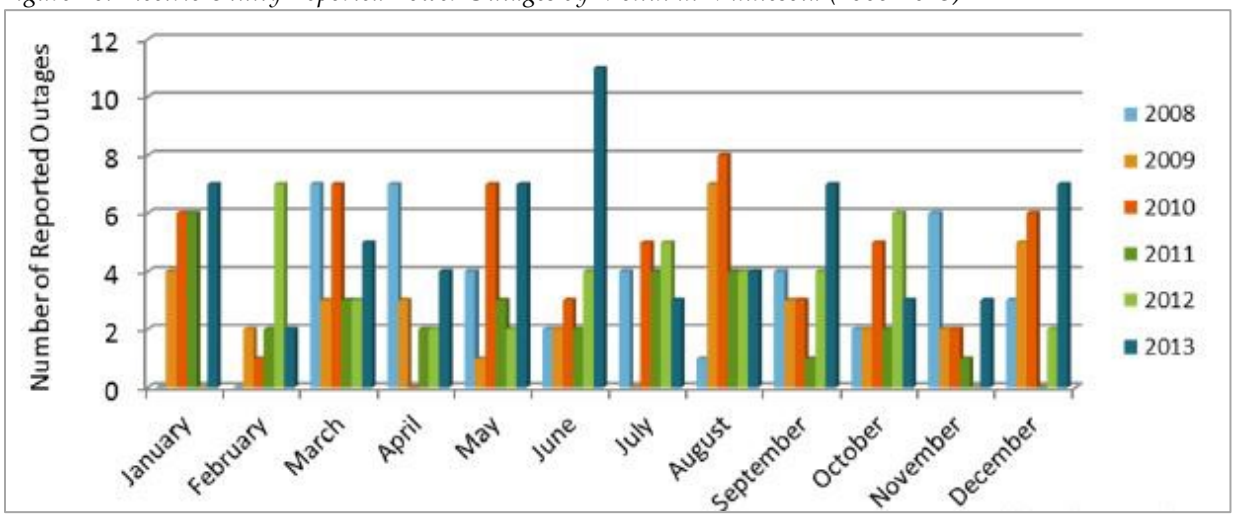
*Campground Shelters* – Blue Earth County has parks/campgrounds that are vulnerable to severe weather events such as high winds and damaging hail and thunderstorms. These parks/campgrounds do not have an official storm shelter or safe room. There are also campgrounds throughout Blue Earth County that do not have any sort of storm shelter due to their rustic nature.

*Storm Shelters / Community Safe Rooms* – Additional storm shelter areas would enhance public safety. Construction or retrofit of facilities to serve as community safe rooms for severe wind events should also be evaluated for areas where there are vulnerable populations, such as public campgrounds or the schools.

### Severe Summer Storms (Tornadoes, Windstorms, Lightning, Hailstorm) and Electrical Outages

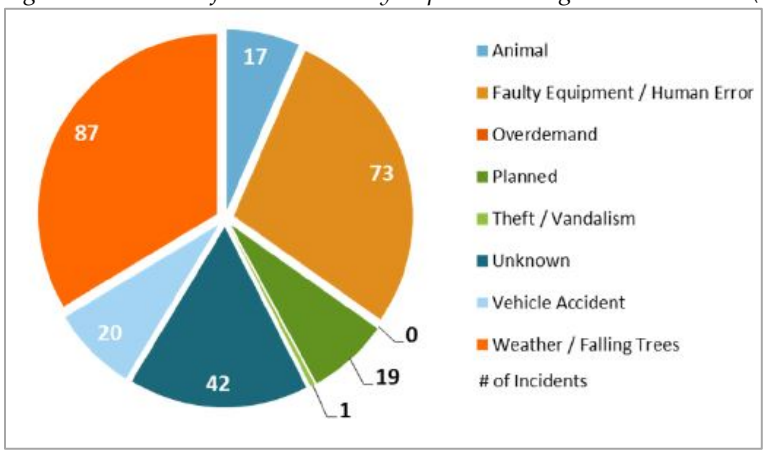
According to NOAA data, the natural hazards that caused the greatest overall property loss in Minnesota between 1996 and 2014 were thunderstorms and lightning, at $86.3 million per year. The state also experienced 23 electric transmission outages from 1992 to 2009, five of which were due to heat waves and thunderstorms. On average, the number of people affected annually by all electric outages during 2008 to 2013 in Minnesota was 449,995, with a high of 1,460,810 in 2011 (U.S. Department of Energy, 2015). Figure 10 below shows the seasonality of electric outages by month for the years 2008-2013, and Figure 11 shows the causes of outages in the state between 2008 and 2013, with the largest cause being weather/falling trees.

*Figure 10. Electric Utility Reported Power Outages by Month in Minnesota (2008-2013)*




*Source: U.S. Department of Energy, 2015*

*Figure 11. Causes of Electric-Utility Reported Outages in Minnesota (2008-2013)*




*Source: U.S. Department of Energy, 2015*

### *4.3.5 Flash Flood and Riverine Flood*

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Upstream floods, also called flash floods, occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe. Urban flooding is a type of upstream flood, which involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the

year in Minnesota, but they are most common in the spring and summer. Eighteen flash floods have been recorded in Blue Earth County since 1996.

Riverine floods refer to floods on large rivers at locations with large upstream catchments. Riverine floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and the flood peak is much longer for riverine floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage.

Nationwide, floods caused 4,586 deaths from 1959 to 2005 while property and crop damage averaged nearly $8 billion per year (in 2011 dollars) from 1981-2011 (Georgakakos, et al., 2014).

During the past several decades, agencies have used the "100-year floodplain" as the design standard for projects funded by the federal government. However, today floods of that magnitude are occurring far more often than once per century (Natural Resources Defence Council, 2015). In recognition of increasing risks, in January of 2015 the President issued an executive order that updates flood protection standards that guide federally-funded projects in or near floodplains or along coastlines. These new standards require federally-funded projects to either build two feet above the 100-year flood elevation for standard projects and three feet above for critical buildings like hospitals and evacuation centers; or build to the 500-year flood elevation (The White House, 2015).

### Flood History in Blue Earth County

Blue Earth County was part of FEMA Disaster Declaration DR-4442 due to severe winter storms, straight-line winds, and flooding. The incident period was 3/12/2019 – 4/28/2019, and the declaration was made 6/12/2019. The Preliminary Damage Assessment indicated $2,183,345 in damages in Blue Earth County. Severe flooding occurred due to ice dams on the Watonwan River, and residents in Garden City had to be rescued by boat. The county declared a state of emergency.

A flood occurred in March of 2019 in Cambria. Various roads were closed for several days due to the floodwaters that developed from snowmelt.

Flooding, severe storms, tornadoes and straight-line winds in June of 2018 resulted in Disaster Declaration 4390, which included Blue Earth County. Over $13 million of public assistance was obligated by FEMA to the state of Minnesota.

In September of 2016, Blue Earth County was part of Disaster Declaration 4290, due to severe storms and flooding. Over 6,000 homes and businesses were affected by floodwaters in southern Minnesota. Torrential rainfall in the county caused numerous road closures.

A line of thunderstorms in June of 2016 resulted in road closures between Skyline and County Road 90 along the Blue Earth River. Other road closures included 128 and 25 along Perch Creek and the Watonwan River. There was also severe flooding in Mankato, and mudslides along the Minnesota River.

Heavy rain in June of 2014 caused severe flooding in much of the state, including Blue Earth County. The Governor of Minnesota issued a State of Emergency for 35 counties. In Mankato, flooding resulted in the evacuation of approximately 70 people from an apartment complex. Multiple road closures occurred along the Minnesota River due to high water and debris. The estimated property damage total for the county was $2.3 million.

Extensive flooding occurred in the region in September of 2010, with various road closures occurring. Property damage in the county was reported at $2.1 million.

Table 20 below lists Blue Earth County's historical floods as recorded by the NCEI. No deaths or injuries were reported. The cumulative property damage estimate is $4.8 million dollars.

*Table 20. Blue Earth County Floods, 1996-October 2019*

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Cambria | 3/17/2019 | Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 9/22/2016 | Flood | 0 | 0 | *Unknown* |
| Cambria | 6/17/2016 | Flash Flood | 0 | 0 | *Unknown* |
| Amboy | 6/14/2016 | Flash Flood | 0 | 0 | *Unknown* |
| Lake Crystal | 6/14/2016 | Flash Flood | 0 | 0 | *Unknown* |
| Judson | 6/18/2014 | Flood | 0 | 0 | $2,300,000 |
| Eagle Lake | 6/17/2014 | Flash Flood | 0 | 0 | *Unknown* |
| Vernon Center | 6/16/2014 | Flash Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 6/21/2013 | Flash Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 3/21/2011 | Flood | 0 | 0 | *Unknown* |
| Amboy | 9/23/2010 | Flood | 0 | 0 | $2,100,000 |
| Minnesota Lake | 9/23/2010 | Flash Flood | 0 | 0 | *Unknown* |
| South Bend | 6/26/2010 | Flash Flood | 0 | 0 | *Unknown* |
| Mankato | 6/25/2010 | Flash Flood | 0 | 0 | *Unknown* |
| Pemberton | 3/17/2010 | Flood | 0 | 0 | $400,000 |
| Minnesota Lake | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Mapleton | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Pemberton | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Beauford | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Mankato | 8/19/2007 | Flash Flood | 0 | 0 | *Unknown* |
| Mapleton | 5/19/2007 | Flash Flood | 0 | 0 | *Unknown* |
| Eagle Lake | 6/16/2006 | Flash Flood | 0 | 0 | *Unknown* |
| Mankato | 6/9/2006 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 10/4/2005 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 8/18/2005 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 5/12/2005 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 6/9/2004 | Flood | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 6/9/2004 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 5/1/2001 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 4/1/2001 | Flood | 0 | 0 | *Unknown* |
| Mankato | 8/9/1999 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 5/1/1997 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 4/1/1997 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 3/15/1997 | Flood | 0 | 0 | *Unknown* |
| Mankato | 9/2/1996 | Flash Flood | 0 | 0 | *Unknown* |
| Mankato | 6/16/1996 | Flash Flood | 0 | 0 | *Unknown* |

The National Oceanic and Atmospheric Administration (NOAA) Advanced Hydrologic Prediction Service provides information from gauge locations at points along various rivers across the United States. There are five USGS gauging stations located in Blue Earth County. Table 21 below shows data on the highest-recorded gauge heights at each station.

*Table 21. Historical Flood Crests for USGS Gauging Stations in Blue Earth County*

**Historical Flood Crests for Minnesota River at Mankato**

| Date | Height (Feet) |
|---|---|
| 6/21/1993 | 30.11 |
| 4/10/1965 | 29.09 |
| 9/27/2010 | 28.25 |
| 4/10/1997 | 27.61 |
| 4/12/1969 | 27.07 |
| 4/16/2001 | 26.96 |
| 4/9/1951 | 26.20 |
| 6/23/2014 | 25.85 |
| 3/26/2011 | 25.51 |
| 4/14/1952 | 24.62 |

**Historical Flood Crests for Watonwan River near Garden City**

| Date | Height (Feet) |
|---|---|
| 4/9/1969 | 20.07 |
| 4/7/1965 | 18.89 |
| 6/9/1953 | 18.60 |
| 9/25/2010 | 18.01 |
| 6/20/1993 | 15.91 |
| 3/24/2011 | 13.64 |
| 4/14/2001 | 12.28 |
| 6/21/2014 | 10.02 |
| 3/21/1944 | 9.84 |
| 6/2/1980 | 9.80 |

**Historical Flood Crests for Blue Earth River near Rapidan**

| Date | Height (Feet) |
|---|---|
| 4/9/1965 | 21.36 |
| 9/26/2010 | 15.97 |
| 4/8/1951 | 14.97 |
| 4/10/1969 | 13.54 |
| 6/20/1993 | 13.32 |
| 6/9/1953 | 12.91 |
| 3/22/2011 | 12.70 |
| 4/14/2001 | 12.04 |
| 4/2/1962 | 11.53 |
| 5/24/1960 | 11.52 |

**Historical Flood Crests for Le Sueur River near Rapidan**

| Date | Height (Feet) |
|---|---|
| 5/22/1960 | 22.72 |
| 4/8/1965 | 22.10 |
| 9/26/2010 | 21.35 |
| 4/7/1951 | 19.73 |
| 4/2/1952 | 16.44 |
| 9/24/2016 | 16.43 |
| 4/1/1962 | 14.26 |
| 6/21/2014 | 14.06 |
| 3/29/1943 | 13.70 |
| 7/26/1968 | 13.54 |

**Historical Flood Crests for Little Cottonwood River near Courtland**

| Date | Height (Feet) |
|---|---|
| 6/17/2016 | 12.14 |
| 6/20/1993 | 10.45 |
| 4/5/2001 | 9.86 |
| 6/19/2014 | 9.42 |
| 3/19/2010 | 9.05 |
| 3/16/1985 | 8.96 |
| 3/22/1986 | 8.56 |
| 3/26/1979 | 8.29 |
| 6/17/1996 | 8.02 |
| 7/7/1983 | 7.80 |

*Source: USGS*

## Flooding and Future Trends

The quantity and character of precipitation is changing in Minnesota. Average precipitation has increased in the Midwest since 1900, with more increases in recent years. The Midwest has seen a 45% increase in very heavy precipitation (defined as the heaviest 1% of all daily events) from 1958 to 2011 (National Climate Assessment Development Advisory Committee, 2013). This precipitation change has led to amplified magnitudes of flooding. Increased precipitation may also show seasonal changes,

trending toward wetter springs and drier summers and falls. An example of a recent year with this character was 2012, when many MN counties were eligible for federal disaster assistance for drought, while others were eligible for flooding, and seven were eligible for both in the same year (Seeley M. , 2013). In 2007, 24 Minnesota counties received drought designation, while seven counties were declared flood disasters. In 2012, 55 Minnesota counties received federal drought designation at the same time 11 counties declared flood emergencies. In addition, the yearly frequency of the largest storms – those with three inches or more of rainfall in a single day – has more than doubled in just over 50 years. In the past decade, such dramatic rains have increased by more than 7% (MN Environmental Quality Board, 2014).

Southeastern Minnesota has experienced three 1000-year floods in the past decade: in September 2004, August 2007, and September 2010 (Meador, 2013). The 2004 flood occurred when parts of south-central Minnesota received over eight inches of precipitation. Faribault and Freeborn counties received over 10 inches in 36 hours. The deluge led to numerous reports of stream flooding, urban flooding, mudslides, and road closures (MN DNR, 2004). During the 2007 event, 15.10 inches fell in 24 hours in Houston County, the largest 24-hour rainfall total ever recorded by an official National Weather Service reporting location. The previous Minnesota record was 10.84 inches in 1972. The resulting flooding from the 2007 rainfall caused seven fatalities (MN DNR, 2007). In September 2010, a storm on the 22-23$^{rd}$ resulted in more than six inches of rain falling over 5,000 square miles in southern Minnesota. Rainfall totals of more than eight inches were reported in portions of 10 counties. The heavy rain, falling on soils already sodden from a wet summer, led to numerous reports of major rural and urban flooding. For many monitoring locations in southern Minnesota, stream discharge resulting from the deluge was the highest ever seen during an autumn flood (Minnesota Climatology Working Group, 2010).

June 2014 was the wettest month on record in Minnesota, with a state-averaged rainfall of 8.03 inches. This broke the previous record of 7.32 inches, which occurred in both July 1897 and June 1914. Rainfall totals for much of the state ranked above the 95$^{th}$ percentile when compared with the historical record; in some cases, the totals tripled that of the historical rainfall average for June. A presidential disaster declaration was declared due to the severe storms, winds, flooding, landslides, and mudslides (DR-4182), which included 37 Minnesota counties (including Blue Earth County) and three Indian Reservations.

### Vulnerability and Hazus Flood Risk Analysis

A potential risk and economic loss analysis for a 1% annual chance flood was performed using a FEMA tool, Hazus for ArcGIS. A Digital Flood Insurance Rate Map (DFIRM) defined the 1% annual chance flood boundary and a 10-meter Digital Elevation Model (DEM) was used to create a flood depth grid. The resulting Hazus 1% annual chance floodplain output is shown in Figure 12.

Losses were based on Blue Earth County-specific building data. Blue Earth County provided parcel tax and spatial databases that included building valuations, occupancy class, square footage, year built, and number of stories. The quality of the inventory is the limiting factor to a Hazus flood model loss estimation. Best practices were used to use local data and assumptions were made to populate missing (but required) values.

Hazus reports the percent damage of each building in the floodplain, defined by the centroid of each building footprint polygon derived using LiDAR data. After formatting the tax and spatial data, 22,376 points were input to Hazus to represent buildings with a total value of $5.6 billion and estimated building plus contents value of $9.5 billion. Approximately 91% of the buildings (and 68% of the building value) are associated with residential housing.

The distinction between the building attributes within a parcel was not known. The maximum damage to a building in that parcel was used to calculate loss estimates. The sum of all the losses in each census block were aggregated for the purposes of visualizing the loss. An overview of these results with the percent damage of buildings is shown in Figure 13. The estimated loss by occupancy class is shown in Table 22. It is possible for a point 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.

*Figure 12. 1% Annual Chance Floodplain in Blue Earth County*

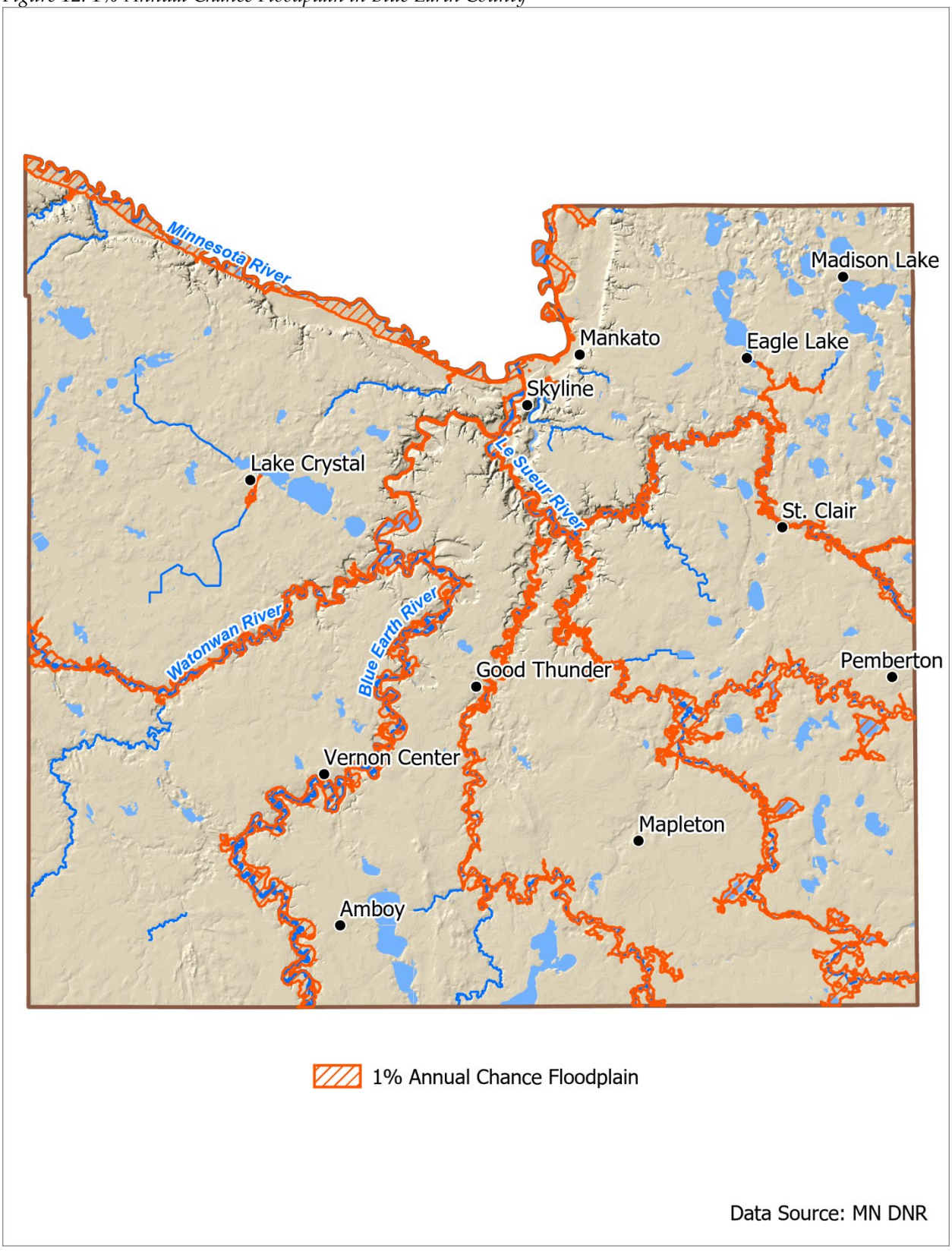


*Figure 13. Overview of 1% Annual Chance Flood Loss Estimation in Blue Earth County*

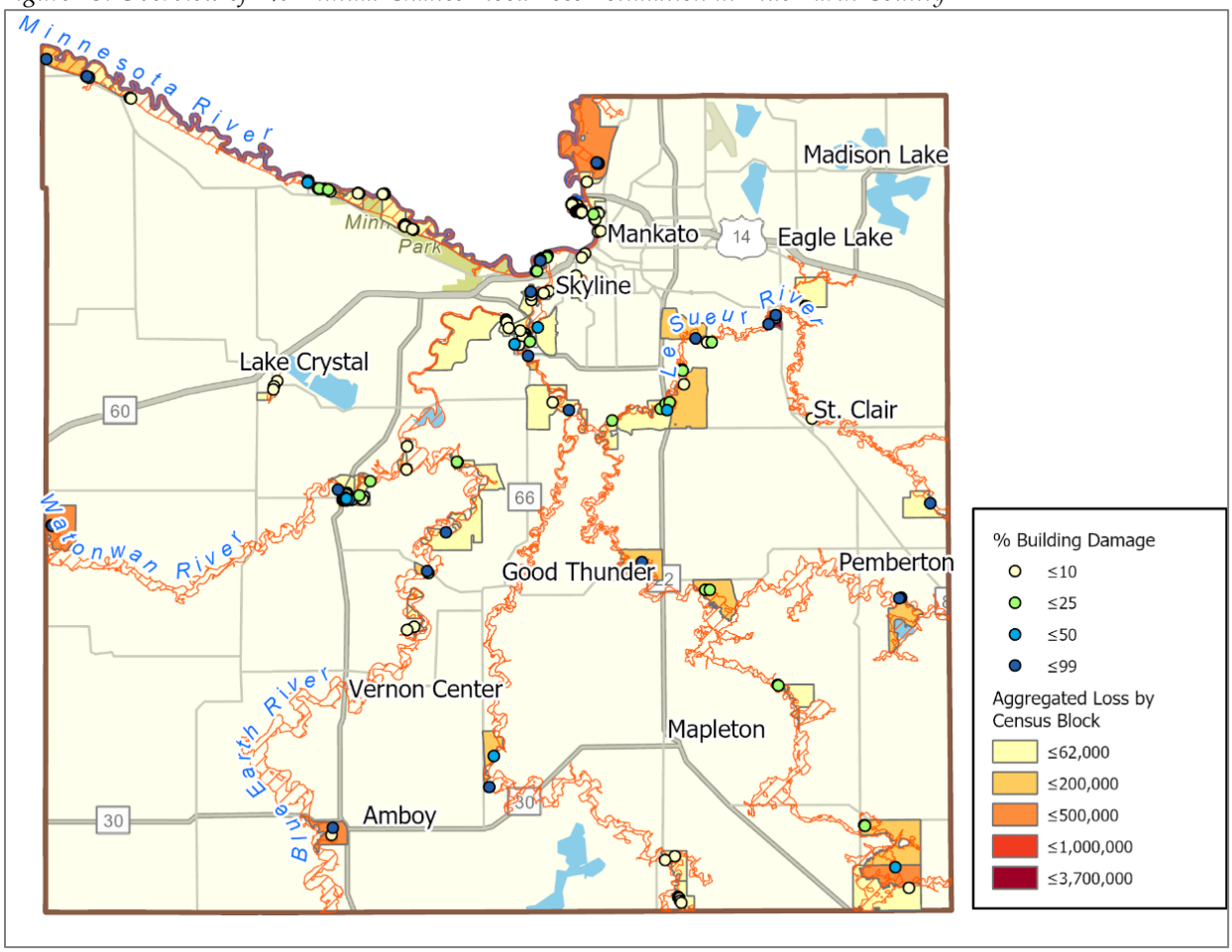



*Table 22. Summary of 1% Annual Chance Flood Loss Estimation Loss by Occupancy Class*

| General Occupancy | County Total Buildings | County Building and Contents Value | Floodplain Total Buildings | Floodplain Building + Contents Value | Buildings with damage | Building + Contents Loss |
|---|---|---|---|---|---|---|
| Residential | 20,301 | $5,751,717,000 | 161 | $18,807,052 | 69 | $4,324,903 |
| Commercial | 1,779 | $2,491,112,700 | 40 | $4,754,846 | 8 | $3,279,342 |
| Other | 296 | $1,286,854,100 | 6 | $6,506,758 | 2 | $4,198,866 |
| Totals | 22,376 | $9,529,683,800 | 207 | $30,068,656 | 79 | $11,803,111 |

## 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 infrastructures were identified in Section 3.8 and verified by Blue Earth County.

Buildings identified as essential facilities for the Hazus flood analysis include hospitals, police and fire stations, and schools (often used as shelters). Loss of essential facilities are vulnerable to structural failure, extensive water damage, and loss of facility functionality during a flood, negatively impacting

the communities relying on these facilities' services. Fortunately, none of Blue Earth County's essential facilities included in the Hazus flood analysis are located within the floodplain.

It is important to identify if any critical infrastructure within the 1% annual chance floodplain, given the higher risk of the facility or infrastructure being incapacitated or destroyed during a flood. In Blue Earth County, one electric substation was found to be at risk in the 1% annual chance flood. This substation is owned by Xcel Energy and mapped in Figure 14. No other information is available.

Losses were estimated by Census County Subdivision. The city of Mankato was the only city with a significant estimated loss. All jurisdictions with buildings identified in the 1% annual chance flood zone are listed in Table 23.

*Table 23. 1% Annual Chance Flood Building-Related Loss Estimates by Jurisdiction in Blue Earth County*

| Jurisdiction (county subdivision) | Count of Buildings in Floodplain | Estimated Building and Contents Loss* |
|---|---|---|
| Beauford Township | 3 | $224,140 |
| Cambria Township | 7 | $114,278 |
| Danville Township | 4 | $364,517 |
| Decoria Township | 8 | $217,522 |
| Garden City Township | 31 | $159,133 |
| Judson Township | 21 | $164,785 |
| Lake Crystal | 5 | $0 |
| Le Ray Township | 9 | $1,087,629 |
| Lime Township | 4 | $200,542 |
| Lincoln Township | 2 | $305,400 |
| Lyra Township | 4 | $124,846 |
| Mankato | 47 | $7,424,130 |
| Mankato Township | 9 | $409,386 |
| Mapleton Township | 7 | $5,936 |
| McPherson Township | 2 | $41,425 |
| Medo Township | 4 | $159,236 |
| North Mankato | 1 | $0 |
| Rapidan Township | 8 | $79,453 |
| Shelby Township | 2 | $353,832 |
| South Bend Township | 26 | $211,241 |
| St. Clair | 1 | $0 |
| Sterling Township | 2 | $155,679 |
| **Totals** | **207 (79 with damage)** | **$11,803,111** |

**It is possible for a building to register 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.*

The city of Mankato, with neighboring Lime Township to the north and South Bend Township to the south, is mapped in Figure 14. The communities of Le Ray Township and Decoria Township are shown in Figure 15 and Figure 16.

*Figure 14. 1% Annual Chance Flood Building-Related Loss Estimates, Mankato*

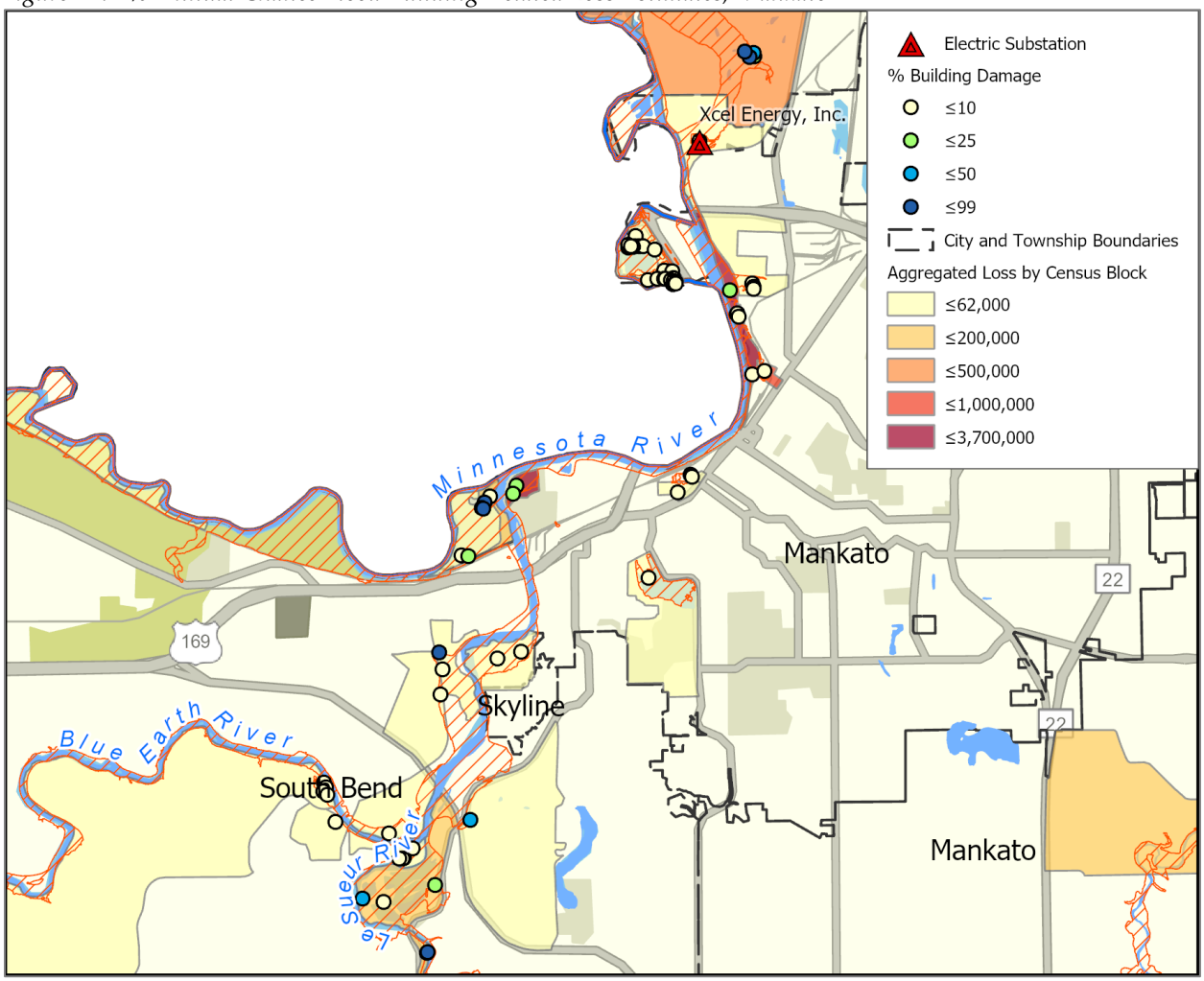


*Figure 15. 1% Annual Chance Flood Building-Related Loss Estimates, Le Ray*

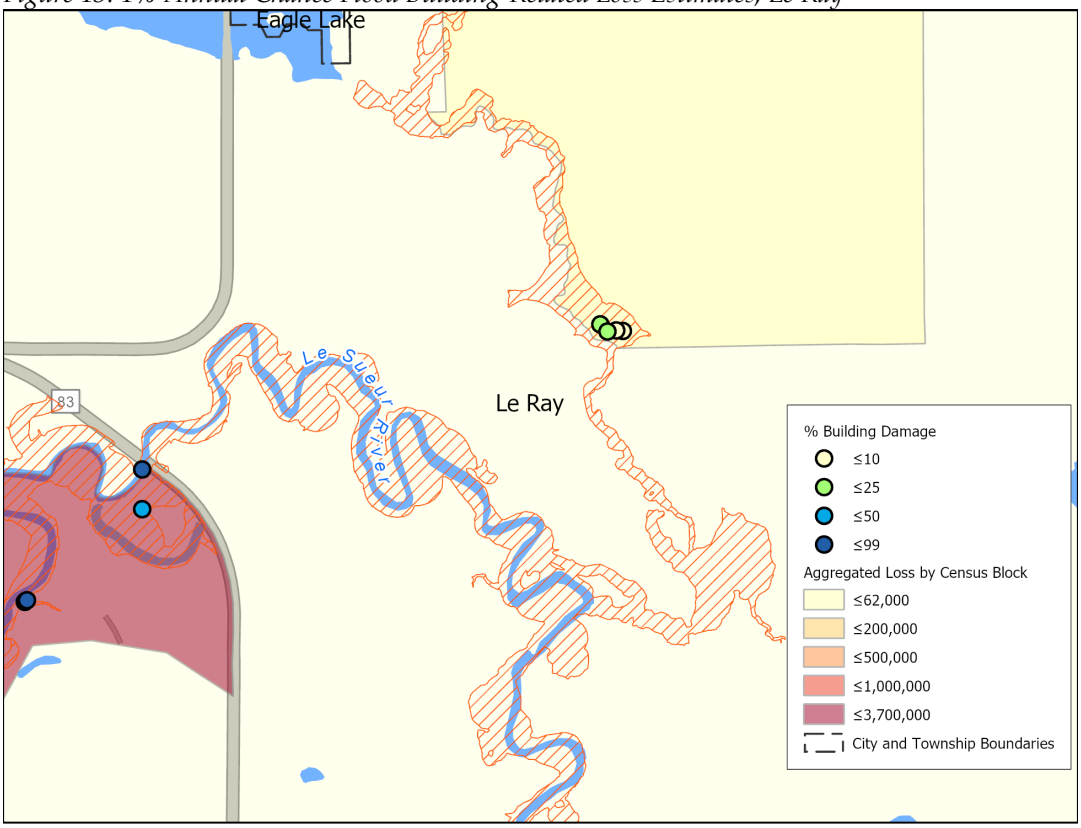
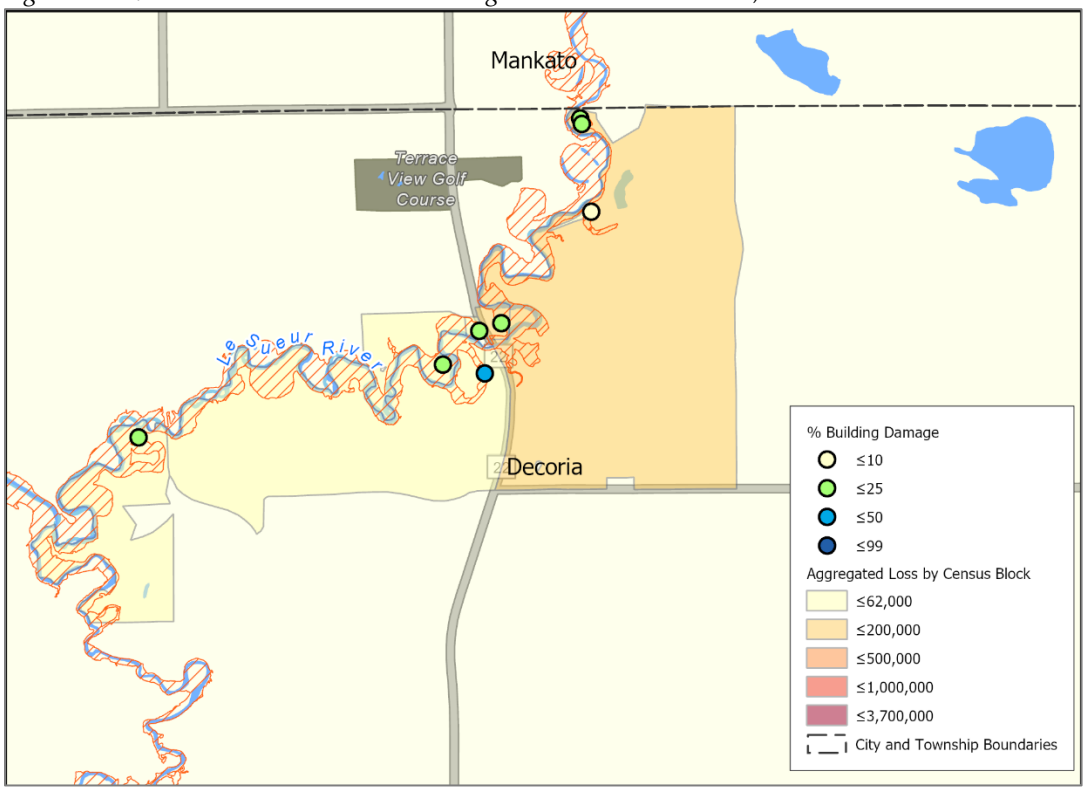



*Figure 16. 1% Annual Chance Flood Building-Related Loss Estimates, Decoria.*



### National Flood Insurance Program

*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 a financial protection against flood losses. Table 24 below summarizes the county's participation in the NFIP. The small cities of Skyline and Vernon Center do not have any structures at risk in the 1% annual chance floodplain.

*Table 24. Blue Earth County Participation in the NFIP*

| Community Name | Participation in the NFIP? | | Initial FIRM Date |
|---|---|---|---|
| Amboy | NOT Participating | No FEMA Mapped High Risk Areas | N/A |
| Eagle Lake | Participating in NFIP | Annexed / Mapped High Flood Risk Areas on Preliminary Map | 11/25/1972 |
| Good Thunder | Participating in NFIP (Emergency program) | No FEMA Mapped High Risk Areas | N/A |
| Lake Crystal | Participating in NFIP | FEMA Mapped High Risk Areas | 7/3/1985 |
| Madison Lake | Participating in NFIP | No FEMA Mapped High Risk Areas / annexed NSFA FIRM | 3/5/1990 |
| Mankato | Participating in NFIP | FEMA Mapped High Risk Areas | 12/22/1972 |
| Mapleton | NOT Participating | No FEMA Mapped High Risk Areas | N/A |
| Pemberton | NOT Participating | No FEMA Mapped High Risk Areas | N/A |
| Saint Clair | Participating in NFIP | No current FEMA Mapped High Risk Areas (but mapped areas on preliminary new maps) | N/A |
| Skyline | NOT Participating | FEMA Mapped High Risk Areas | N/A |
| Vernon Center | NOT Participating | FEMA Mapped High Risk Areas | N/A |
| Blue Earth County | Participating in NFIP | FEMA Mapped High Risk Areas | 11/25/1972 |

*Source: MN DNR (data current as of 10/1/2018)*

Blue Earth County Emergency Management identified that there are existing program gaps and deficiencies that make its citizens more vulnerable to flooding and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Increasing Culverts and Raising Roads* – Some roads, bridges, and culverts within the county continue to need improvements as they are impacted by annual high rain events.

### *4.3.6 Severe Winter Storms – Blizzards, Ice Storms*

Blizzards are storms that contain heavy snowfall, strong winds and cold temperatures. The combination of these elements creates blinding snow with near zero visibility, deep snowdrifts, and life-threatening wind chill temperatures. Blizzards are the most dramatic and destructive of all winter

storms that occur within Blue Earth County, and are generally characterized as storms bearing large amounts of snow accompanied by strong winds. They have the ability to completely immobilize travel in large areas and can be life-threatening to humans and animals in their path. According to the National Weather Service (NWS), there is no fixed temperature requirement for blizzard conditions, but the life-threatening nature of low temperatures in combination with blowing snow and poor visibility increases dramatically when temperatures fall below 20°F. Blizzards typically occur between October and April; however, they occur most frequently from early November to late March.

The greatest numbers of blizzards historically have occurred in the months of January, followed by March and November, respectively. Blue Earth County, along with all areas of Minnesota, is susceptible to blizzards.

*Figure 17. Armistice Day Blizzard, 1940*

Damages from blizzards can range from human and livestock deaths to significant snow removal costs. Stranded drivers can make uninformed decisions, such as leaving the car to walk in conditions that put them at risk. Because of the blinding potential of heavy snowstorms, drivers are also at risk of collisions with snowplows or another road traffic. Drivers and homeowners without emergency plans and kits are vulnerable to the life-threatening effects of heavy snowstorms such as power outages, cold weather, and inability to travel, communicate, obtain goods or reach their destinations. Heavy snow loads can cause structural damage, particularly in areas where there are no building codes or where residents live in manufactured home parks. The frequency of structural fires tends to increase during heavy snow events, primarily due to utility disruptions and the use of alternative heating methods by residents.

Between the years of 1975 and 1991, there were 49 deaths associated with blizzards statewide, or an average of three deaths per year. Deaths attributable to blizzards have dropped in recent years, primarily due to increased weather awareness and warning capabilities across the state. The economic costs of winter storms are generally not recorded by the NCEI; however, a winter storm in November 2001 resulted in property damage of $500,000.

Ice storms are described as occasions when damaging accumulations of ice occur due to freezing rain. The terms freezing rain and freezing drizzle warn the public that a coating of ice is expected on the ground and other exposed surfaces. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers.

Communications and power can be disrupted for days while utility companies work to repair extensive damage. Ice forming on exposed objects generally ranges from a thin glaze to coatings more than one inch thick. Even small accumulations of ice on sidewalks, streets, and highways may cause extreme

hazards to Blue Earth County motorists and pedestrians. Sleet does not stick to trees and wires, but sleet of sufficient thickness does cause hazardous driving conditions. Heavy sleet is a relatively rare occurrence, defined as an accumulation of ice pellets covering the ground to a depth of ½-inch or more.

Ice and sleet storms typically occur from October through April. The NWS notes that over 85% of ice storm-related deaths are the result of traffic accidents. Three ice storms have been reported in Blue Earth County by the NCEI.

Observing winter storm watches and warnings and adequate preparation can lessen the impact of blizzard events in Minnesota. Technical advances made in transportation, including safer vehicles and improved construction and maintenance of roads, have also contributed to the decline in deaths related to blizzards. Historical estimates of dollar losses associated with blizzards were not available for the purposes of this analysis. However, costs incurred by state and local government for snow removal associated with disaster declaration DR-1158 (January 1997) totaled over $27,300,000 dollars. Blizzards rank 9th out of the 10 natural hazards economically impacting Minnesota according to the statewide risk analysis.

### Severe Winter Storm History in Blue Earth County

The total of notable events defined as heavy snows, blizzards, ice storms, winter weather and winter storms in Blue Earth County recorded by the NCEI for the period from 1996 to April 2019 is 91. An overview of some of the most notable winter storm events is provided in Table 25 below.

The number of heavy snowfall years for the Midwest has fluctuated between 1900 and 2006. The periods of 1900-1920 and 1960-1985 had numerous years with snowfall totals over the 90th percentile. In the past three decades, the number of heavy seasonal snowfall totals has been much lower. Despite these generally lower seasonal snowfall totals, some areas of the Midwest have still experienced significant snow totals in the most recent decade. The 100-year linear trends based on decadal values show that the upper Midwest had statistically significant (1% level) upward linear trends in snowstorm frequency from 1901 to 2000 (Kunkel, et al., 2013).

It is highly probable that winter storms will continue to impact Blue Earth County annually.

*Table 25. Notable Winter Weather Events in Blue Earth County*

| Date | Type | Cost | Deaths | Injuries | Description |
|---|---|---|---|---|---|
| 2/7/2019 | Blizzard | *unknown* | 0 | 0 | Blizzard conditions occurred with 40 mph winds and visibility of 1/4-mile or less. Various roads in the county were nearly impassible and travel was not advised by the MN Department of Transportation. |
| 4/13/2018 | Winter Storm | *unknown* | 0 | 0 | Prolonged winter storm conditions in April resulted in snowfall of 9-12 inches, along with hail, thunder and sleet. |
| 1/22/2018 | Blizzard | *unknown* | 0 | 0 | 10-14 inches of snow was reported across the county, with wind speeds over 35 mph at times. |

| Date | Type | Cost | Deaths | Injuries | Description |
|---|---|---|---|---|---|
| 2/7/2016 | Blizzard | *unknown* | 0 | 0 | Blizzard conditions caused low visibility and poor driving conditions, resulting in the closure of Highway 60. Wind gusts over 50 mph worsened conditions in certain areas of the county. |
| 12/28/2015 | Winter Storm | *unknown* | 0 | 0 | 8 to 12 inches of snow was reported across Blue Earth county, with the heaviest near Mapleton. |

*Source: NCEI*

### Severe Winter Storms and Future Trends

Historically, winter storms have had a large impact on public safety in Minnesota. This will continue, with a possible increase in snowstorm frequency and annual total snowfall. Winter weather is often a cause of power outages. Pressures on energy use, reduced reliability of services, potential outages and the potential rise in household costs for energy are major risks to public health.

According to the 2015 Minnesota Weather Almanac, a recent study of seasonal snowfall records across the state from 1890-2000 showed that 41 of 46 climate stations recorded an increase in average annual snowfall, by as much as 10 inches. Higher snowfall levels can result in greater runoff potential during spring snowmelt, and many watersheds in Minnesota have shown more consistent measures of high-volume flows during spring, often at or above flood stage (Seeley M. , 2015).

### Severe Winter Storms and Electrical Outages

The leading cause of electric outages in Minnesota during 2008 to 2013 was weather/falling trees. Between 2008 and 2013, the greatest number of electric outages in Minnesota occurred during the month of March (U.S. Department of Energy, 2015).

### Vulnerability

Winter storms affect Blue Earth County each year. The amount of snow and ice, number of blizzard conditions, and days of sub-zero temperatures each year are unpredictable and within Blue Earth County the vulnerability of jurisdictions to winter storms does not vary geographically. Citizens living in climates such as these must always be prepared for situations that put their lives or property at risk. It is not always the size of the storm or the depth of the cold, but an unprepared individual with a vehicle breakdown or lack of a personal winter safety kit that are at risk. Rural citizens are more vulnerable to issues with deep snow.

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to severe winter storms and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Aboveground Power Lines* – A majority of the power lines in the county are aboveground and subject to damage from ice storms, wind and falling tree limbs. Power lines that are aboveground are susceptible to coming down during severe winter storm events, resulting in power outages.

*Backup Power* – Not all county and local community facilities have backup power in the event of a severe winter storm that takes out power.

*Communications* – Not all Blue Earth County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Facebook page to receive important messages. Gaps in cell phone coverage exist in some parts of the county.

### *4.3.7 Extreme Cold*

Below zero temperatures occur almost every winter in Minnesota. January is the coldest month, with daytime highs averaging 20°F and nighttime lows averaging 2°F. However, these averages do not tell the whole story. Maximum temperatures in January have been as high as 61°F and minimums as low as 36°F below zero.

January is the coldest month on average in Blue Earth County, with an average monthly minimum temperature of 4°F (based on data from 1895-2018). The coldest month on record for the county was January 1912, with a month-long average minimum temperature of -12°F (MN DNR, n.d.).

The Wind Chill Index is a calculation that can be made with wind speed to communicate the dangers to bare skin from winter winds and freezing temperatures. The NWS has produced a chart to simplify this calculation. The classification zones are delineated in terms of time to frostbite on bare skin and are due to the lowering of body temperature due to the passing-flow of lower-temperature air. Criteria for issuing official NWS wind chill warnings are set locally.

Cold winter weather can have severe or fatal impacts. Hypothermia occurs when the core body temperature drops below 96°F. Anyone who is exposed to severe cold without enough protection can develop hypothermia. Frostbite occurs when skin tissue and blood vessels are damaged from exposure to temperatures below 32°F. It most commonly affects the toes, fingers, earlobes, chin, cheeks, nose, and other body parts that are often left uncovered in cold temperatures. The NWS issues "Extreme cold" warnings when it feels like -30°F or colder across a wide area for several hours. Extreme cold watches are issued a day or two before the conditions are expected.

#### Extreme Cold History in Blue Earth County

The National Centers for Environmental information (NCEI) have recorded 21 extreme cold/wind chill events since 1996. Some notable events are described below.

In February of 2014, nearly all of Minnesota was between 10-15°F colder than normal (1981-2010 period) (High Plains Regional Climate Center, 2014). The winter of 2013-2014 was the sixth coldest on record in Minnesota (The Weather Channel, 2014), with schools in the Twin Cities canceling five times in January due to dangerous wind chills. It was the coldest winter in the Twin Cities in 35 years, with an average temperature for December-February of 9.7°F (MN DNR, 2014). Many areas in the state also experienced higher than average precipitation through the winter and spring months.

On January 5, 2005, an elderly couple died in Lincoln Township after becoming stranded in their vehicle in a snow drift. Both had perished due to exposure.

Extremely cold air settled over Minnesota on January 31st of 1996 and remained entrenched through February 4th. A new record low temperature for Minnesota was set in the town of Tower on February 2, 1996, at -60°F. Numerous record low temperatures were set during the period at St. Cloud, Rochester and the Twin Cities. Minneapolis/St. Paul set three new record low temperatures as well as recording the 2nd coldest day on record on February 2, 1996. A mean temperature of -25°F was measured that day with a high of -17°F and a low of -32°F in the Twin Cities. This was within two degrees of tying the all-time record low temperature set in the Twin Cities and the coldest temperature recorded this century. Many central and southern Minnesota locations set new record low temperatures the morning of the 2nd. The Governor closed all schools that day.

The amount of snow and ice, number of blizzard conditions, and days of sub-zero temperatures each year are unpredictable. Extreme cold temperatures affect the county nearly every year, and it is highly probable Blue Earth County will be affected by extreme cold events almost annually.

### Extreme Cold and Future Trends

Although 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 (NCEI, 2018), cold temperatures have always been a part of Minnesota's climate and extreme cold events will continue. An increase in extreme precipitation or storm events such as ice storms could lead to a higher risk of residents being exposed to cold temperatures during power outages or other storm-related hazards during extreme cold.

### Vulnerability

Within Blue Earth County the risk of extreme cold does not vary geographically. Citizens living in climates such as these must always be prepared for situations that put their lives or property at risk. It is not always the depth of the cold, but an unprepared individual with a vehicle breakdown or lack of a personal winter safety kit that are at risk. Rural citizens not connected to city gas lines are more vulnerable to issues with extreme cold.

Winter in Blue Earth County can be severe, and especially dangerous for disabled citizens and outdoor workers. Record temperature lows and arctic-like wind chills can cause cold-related illnesses such as frostbite and hypothermia, which can be deadly. Hypothermia is the greatest and most life-threatening cold weather danger.

Medical costs related to extreme heat and cold can be enormous: in 2005 the total was $1.5 billion nationwide, or more than $16,000 per patient (Union of Concerned Scientists, 2009).

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to extreme cold and should be addressed with new mitigation efforts to reduce vulnerability. They include:

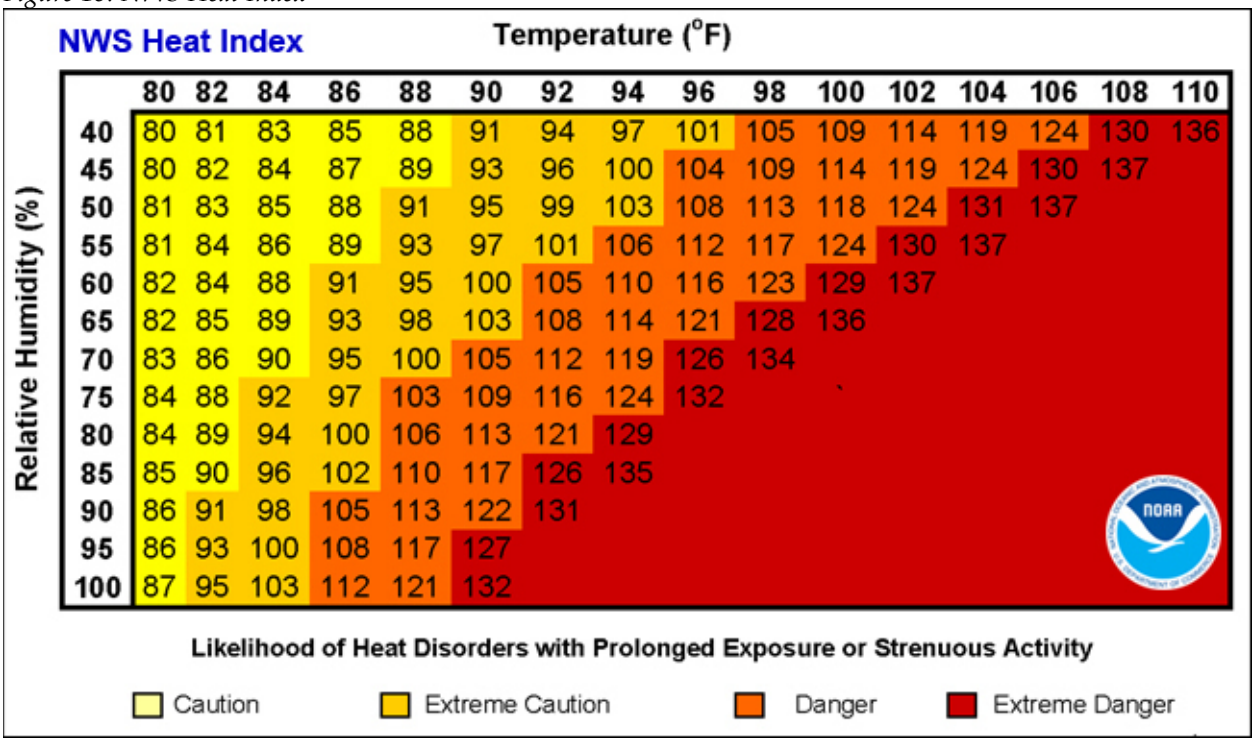
*Mass Care Shelter Facilities* – Blue Earth County Emergency Management is working with the American Red Cross to get additional local shelters identified, as well as to identify hotels that are willing to honor emergency shelter rates as an option for impacted residents.

*Generators for Backup Power to Shelter Facilities* – Not all of our designated shelter facilities have generator backup power to provide heat if there is a loss of power.

### *4.3.8 Extreme Heat*

Extreme heat is the combination of very high temperatures and exceptionally humid conditions. When the atmospheric moisture content is high, the rate of perspiration from the body decreases and the human body feels warmer. Heat stress can be indexed by combining the effects of temperature and humidity. The National Weather Service's (NWS) Heat Index (Figure 18) is a measure of how hot the body feels when relative humidity is factored in with actual air temperature. The heat index values are for shady locations - exposure to direct sunlight may increase these values by up to 15°F. The NWS will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F for at least two consecutive days (n.d.).

*Figure 18. NWS Heat Index*




*Source: (National Weather Service, n.d.)*

Figure 19 describes the effects increasing levels of heat has on the body during prolonged exposure and/or physical activity.

*Figure 19. Heat Effects on the Body*

| Classification | Heat Index | Effect on the body |
|---|---|---|
| Caution | 80°F - 90°F | Fatigue possible with prolonged exposure and/or physical activity |
| Extreme Caution | 90°F - 103°F | Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity |
| Danger | 103°F - 124°F | Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity |
| Extreme Danger | 125°F or higher | Heat stroke highly likely |

*Source: (National Weather Service - Amarillo, TX, n.d.)*

## Extreme Heat History in Blue Earth County

July is the hottest month on average in Blue Earth County, with an average monthly maximum temperature of 84°F (based on data from 1895-2018). The hottest month on record for the county was July 1936, with a month-long average maximum temperature of 95°F (MN DNR, n.d.).

The National Centers for Environmental Information has recorded nine instances of severe heat in six different years in Blue Earth County since 1996, with no deaths or injuries reported. The most recent event recorded occurred in July of 2016. The highest heat index in the county was 114 degrees.The relative frequency of extreme heat events in Blue Earth County is .26 in any one year, which we infer to represent the probability of these events occurring in the future.

## Extreme Heat and Future Trends

Minnesota's average temperature has increased more than 1.5°F since recordkeeping began in 1895, with increased warming happening in recent decades (International Climate Adaptation Team, 2013). Annual temperatures in the Midwest have generally been well above the 1901-1960 average since the late 1990s, with the decade of the 2000s being the warmest on record (Kunkel, et al., 2013). Seven of Minnesota's 10 warmest years occurred in the last 15 years. Projected increases are 2°F to 6°F more by 2050 and 5°F to 10°F by 2100 (MN Environmental Quality Board, 2014). The Midwest has experienced major heat waves and their frequency has increased over the last six decades (Perera, et al., 2012). For the U.S., mortality increases 4% during heat waves compared with non-heat wave days (Anderson & Bell, 2011). During July 2011, 132 million people across the U.S. were under a heat alert – and on July 20 the majority of the Midwest experienced temperatures in excess of 100°F. Heat stress is projected to increase as a result of climbing summer temperatures and humidity (Schoof, 2012). On July 19, 2011, Moorhead Minnesota set a new state record for the hottest heat index ever, at 134°F. That same day, Moorhead also recorded a new state record for the highest dew point at 88. It was the hottest, most humid spot on the planet that day (Douglas, 2011).

Recent statistics from NOAA show that there are more human fatalities each year due to heat waves than from floods, lightning, tornadoes and winter storms. Many cities have responded by creating Heat Wave Response Plans to ensure that those in marginal health without air conditioning can obtain the relief and care they need, and the Minnesota Department of Health developed the Extreme Heat

Toolkit to help educate at-risk populations on how to reduce risks associated with heat waves (Seeley M. , 2015).

Increasing temperatures impacts Minnesota's agricultural industry. Agriculture is highly dependent on specific climate conditions. As a result of increasing temperature, crop production areas may shift to new regions of the state where the temperature range for growth and yield of those crops is optimal. According to the National Climate Assessment, the Midwest growing season has lengthened by almost two weeks since 1950 due in large part to earlier timing of the last spring freeze. This trend is expected to continue. While a longer growing season may increase total crop production, other changes, such as increased crop losses and soil erosion from more frequent and intense storms, and increases in pests and invasive species, could outweigh this benefit. There may also be higher livestock losses during periods of extreme heat and humidity. Losses of livestock from extreme heat lead to a challenge in the disposal of animal carcasses. Currently there are only two rendering facilities in Minnesota available for livestock disposal. If a rendering facility is not available, lost livestock must be composted on an impervious surface. If losses are high, finding an impervious surface large enough is a challenge. In an attempt to adapt to increased temperatures, livestock areas in Minnesota may shift farther north. As a result of new livestock areas and the resulting manure production, farmers may transition to manure-based fertilizer applications in areas where traditionally only commercial fertilizers have been used, with accompanying environmental advantages and disadvantages (Adapting to Climate Change in Minnesota: 2013 Report of the Interagency Climate Adaptation Team, 2013). In order to minimize the detrimental effects of heat stress on animal metabolism and weight gain, Minnesota farmers have also begun redesigning and retrofitting dairy, hog, and poultry barns with better watering, feeding, and ventilation systems (Seeley M. , 2015).

### Vulnerability

Within Blue Earth County the risk of extreme heat does not vary geographically except for some possible minor urban island heat effects in downtown Mankato. Those who work outdoors or do not have permanent housing are also at greater risk.

Extreme heat events are linked to a range of illnesses, even death, and can exacerbate pre-existing chronic conditions such as cardiovascular, respiratory, liver, and neurological diseases, endocrine disorders, and renal disease or failure. Populations who are most vulnerable to extreme heat include persons over 65 or under five years old; living alone, without air-conditioning, or residing on the topmost floor of a building; and with an income at or below the poverty line. People who are exposed to heat because of recreational or job-related activities are also more vulnerable, including athletes, construction workers, and landscape/agricultural workers (Adapting to Climate Change in Minnesota: 2013 Report of the Interagency Climate Adaptation Team, 2013).

Medical costs related to extreme heat and cold can be enormous: in 2005 the total was $1.5 billion nationwide, or more than $16,000 per patient (Union of Concerned Scientists, 2009).

Blue Earth County Emergency Management identified that there are several program gaps and deficiencies that make its citizens more vulnerable to extreme heat and should be addressed with new mitigation efforts to reduce vulnerability. They include:

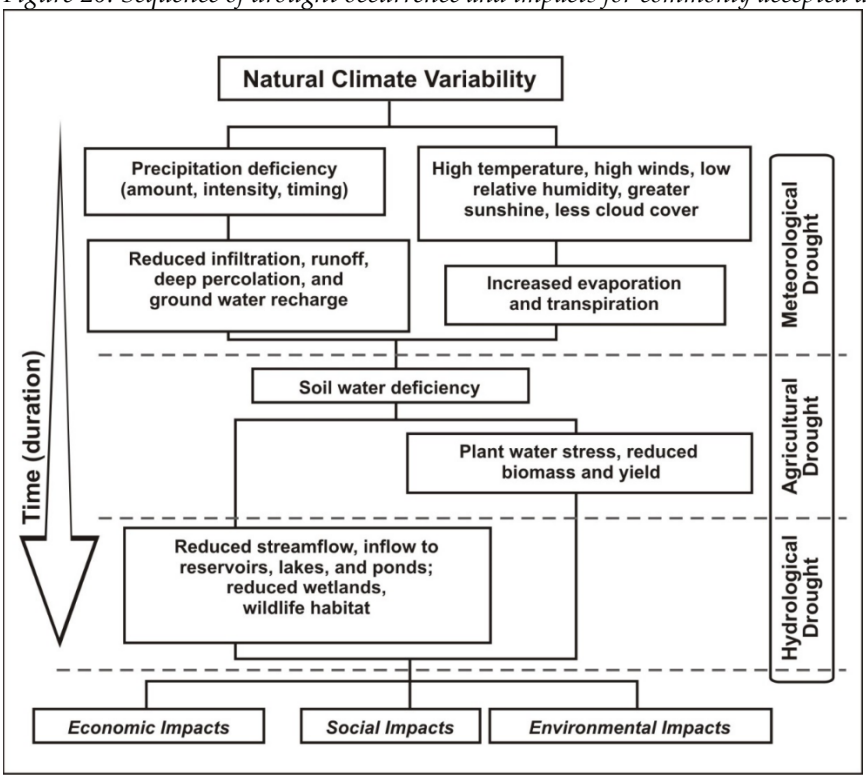
*Mass Care Shelter Facilities* – Blue Earth County Emergency Management is working with the American Red Cross to get additional local shelters identified, as well as to identify hotels that are willing to honor emergency shelter rates as an option for impacted residents.

*Generators for Backup Power to Shelter Facilities* – Not all of our designated shelter facilities have generator backup power to provide cooling if there is a loss of power.

### *4.3.9 Drought*

Within the broad domain of natural hazards that comprise disaster science, drought is unequivocally the most difficult to define. This is primarily due to its insidious nature, and because the parameters that typically control it vary both spatially and temporally. For instance, the hydro-meteorological conditions that constitute drought in one location, may not necessarily qualify as drought in a contrasting climate. Even in regions that share a statistically similar climate, other factors such as soil type, antecedent moisture conditions, ground cover and topography all play a vital role in dictating drought emergence. To further complicate matters, drought is associated with a diverse number of climatic and hydrological stressors, which come with a unique set of collective impacts that affect nearly every corner of our economy and environment. Subsequently, there are over a hundred and fifty different definitions of drought, not just because it is difficult to define, but precisely on the grounds that drought affects different regions in different ways (Fu, Svoboda, & Tang, 2013). When one attempts to merge and understand these various definitions and impacts, it is evident that drought can be integrated into five principal categories. These include: meteorological, agricultural, hydrological, ecological and socio-economic drought (Figure 20).

*Figure 20. Sequence of drought occurrence and impacts for commonly accepted drought types*




*Source:* (National Drought Mitigation Center, 2018)

Meteorological drought is qualified by any significant deficit of precipitation. Hydrological drought is manifest in noticeably reduced river and stream flow and critically low groundwater tables. The term agricultural drought indicates an extended dry period that results in crop stress and harvest reduction. Socioeconomic drought refers to the situation that occurs when water shortages begin to affect people and their lives. It associates economic goods with the elements of meteorological, agricultural and hydrological drought. Many supplies of economic goods (e.g., water, food grains, and hydroelectric power) are greatly dependent on the weather.

## Quantifying Drought Conditions

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) Map. Established by the National Drought Mitigation Center (NDMC) in 1999, the Drought Monitor is a weekly map that depicts drought conditions in all 50 states and Puerto Rico. Each weekly map is produced by a NDMC assigned author. Though drought map authors utilize a broad domain of geospatial, climatic data and drought indices that cover every aspect of drought, perhaps their most valuable resource is the input they receive each week from hundreds of drought experts throughout the country. The drought monitor map is thus a collective synthesis of the best quantitative and the most reliable qualitative information available (The National Drought Mitigation Center, 2018). Figure 21 displays an example map and statistics table prepared by the U.S. Drought Monitor for Minnesota on November 20, 2012. In total, there are four drought categories: moderate (D1), severe (D2), extreme (D3), and exceptional (D4). A fifth category, abnormally dry (D0) is used to depict areas that are

abnormally dry but not yet in drought. Abnormally dry conditions are indicative of the meteorological circumstances that precede drought onset and those that are coming out of drought. D0 is often considered a bellwether of drought but it is also an accurate warning sign that crop growth may be slowed and wildfire risk may be elevated. Table 26 displays these drought categories along with the potential impacts at each level.

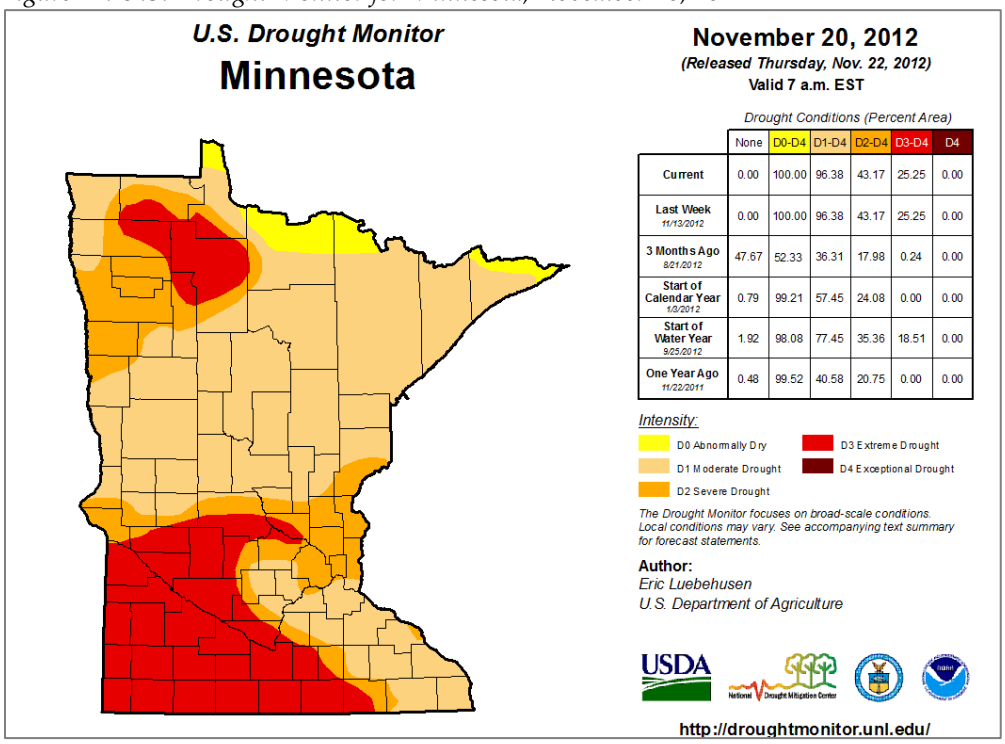
*Table 26. USDM Drought Classification*

| Category | Description | Possible Impacts |
|---|---|---|
| D0 | Abnormally Dry | Going into drought:<br>• Short-term dryness slowing planting, growth of crops or pastures<br>Coming out of drought:<br>• Some lingering water deficits<br>• Pastures or crops not fully recovered |
| D1 | Moderate Drought | • Some damage to crops, pastures<br>• Streams, reservoirs, or wells low, some water shortages developing or imminent<br>• Voluntary water-use restrictions requested |
| D2 | Severe Drought | • Crop or pasture losses likely<br>• Water shortages common<br>• Water restrictions imposed |
| D3 | Extreme Drought | • Major crop/pasture losses<br>• Widespread water shortages or restrictions |
| D4 | Exceptional Drought | • Exceptional and widespread crop/pasture losses<br>• Shortages of water in reservoirs, streams, and wells creating water emergencies |

*Source:* (USDM, n.d.)

The decision to declare or alter a drought category in a given location is dependent upon a comprehensive set of climate products that are specifically manufactured to quantify drought. Many of these products are referred to as drought indices. These indices each serve a specific purpose. There are indices that are designed for measuring short-term drought, and there are indices that are built to reflect long-term drought. Similarly, other indices are useful for sector specific areas such as water resources or agriculture.

*Figure 21. U.S. Drought Monitor for Minnesota, November 20, 2012*




*Source:* (National Drought Mitigation Center, 2018)

## Drought History in Blue Earth County

Blue Earth County experienced a number of droughts over the years. Table 27 lists some of the notable droughts which impacted the county.

*Table 27. Droughts Impacting Blue Earth County*

| Date | Remarks |
|---|---|
| 9/2011 – 5/2013 | Beginning in August of 2011, Blue Earth County witnessed a nearly continuous departure from normal precipitation. This period is actually comprised of two drought events as drought conditions ceased briefly during the late spring-early summer 2012. From October 2011 to May 2012 the majority of the county was considered to be in a severe drought. In August of 2012, the north eastern portion of the county was considered to be abnormally dry, the central portion of the county was in a moderate drought, and the south western portion of the county was in a severe drought. Portions of the county remained in severe drought status until mid-May 2013. |
| 7/2003 – 10/2003 | A persistent weather pattern resulted in extremely dry weather across Minnesota. Few widespread rain events moved through the state during the interval, and precipitation totals were less than six inches across much of Minnesota. During this three-month period, rainfall totals rank among the lowest on record for many areas of south central and southeastern Minnesota, and a small portion of west central Minnesota. |
| 1987-1989 | Established new "average low precipitation" and "average high temperature" records. Farmers lost most, if not all, of the year's crop. Drought also affected power production, the forest products industry, public water supplies and fish and wildlife dependent on adequate surface water. Mississippi River flow levels threatened to drop below the Minneapolis Water Works intake pipes. |

| Date | Remarks |
|---|---|
| 1976-1977 | Began in 1974 in parts of south-central and western MN. Most severely affected areas were the Otter Tail and Lac Qui Parle River basins. Dry conditions caused lower water levels in wells and caused record low stream flows throughout the state. Late summer forest fires broke out and conflicts arose between domestic well owners and neighboring high capacity well owners. |

*Note: Data from Region Nine Development Commission* (2013). *The description of the September 2011 - May 2013 drought was edited to reflect the conclusion of this drought.*

To determine the probability of future drought events in Blue Earth County we considered past-observed droughts. The USDM database was examined from January 2000 – August 5, 2019 (1,022 weeks) for any occurrence of drought in the county, regardless of the duration or severity of the drought. According to the weekly reported data, the county experienced drought conditions ≥ D1 21% of the weeks and drought conditions ≥ D2 11% of the weeks. We infer the relative frequency of past droughts to represent the probability of similar droughts occurring in the future.

When comparing the two most recent five-year timeframes (2014-2018 & 2009-2013) the data shows either a decrease or no change in each drought category ≥ D0. Table 28 shows the breakdown of this comparison.

*Table 28. Average Percent of Blue Earth County's Land Area by Drought Category*

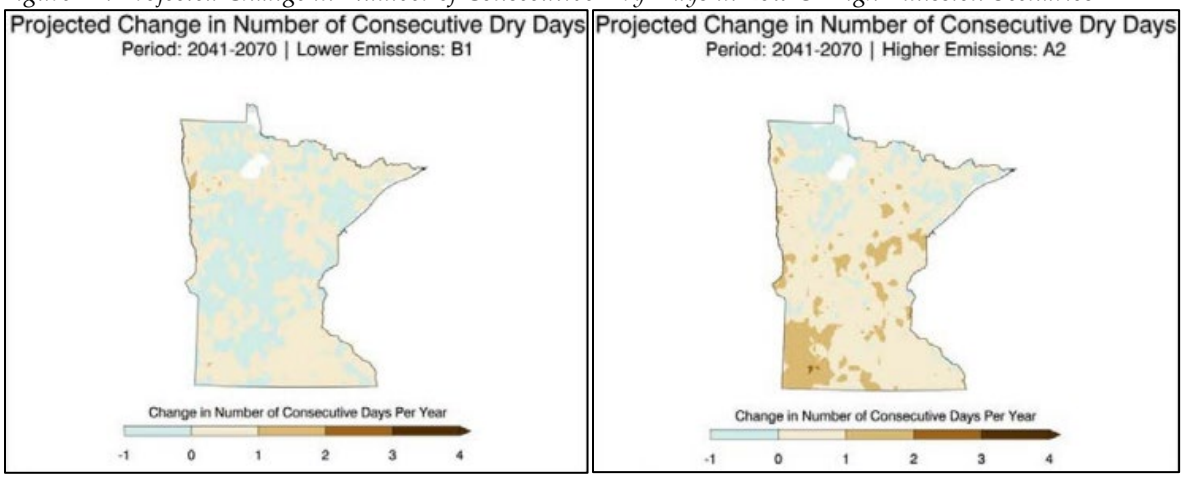
| Timeframe | No Drought | D0 | D1 | D2 | D3 | D4 |
|---|---|---|---|---|---|---|
| **2009-2013** | 44.15% | 21.39% | 9.74% | 14.19% | 10.53% | 0% |
| **2014-2018** | 77.58% | 17.59% | 4.84% | 0% | 0% | 0% |
| **% Change** | +75.72% | -17.77% | -50.31% | -100% | -100% | 0% |

## Drought and Future Trends

In 2007, 24 Minnesota counties received drought designation, while seven counties were declared flood disasters; in 2012, 55 Minnesota counties received federal drought designation at the same time 11 counties declared flood emergencies (MN Environmental Quality Board, 2014); and in May of 2015, over 90% of Minnesota was undergoing severe or moderate drought (MN DNR, 2015). Droughts have been happening throughout Minnesota's history, but it is not yet clear the degree to which future trends may impact future droughts (International Climate Adaptation Team, 2013). While there was no apparent change in drought duration in the Midwest over the past century (Dai, 2011), the average number of days without precipitation is projected to increase in the future (National Climate Assessment Development Advisory Committee, 2013).

The climate models used in the 2014 National Climate Assessment projects Minnesota to have an increase in days over 90°F by mid-century; however, the future drought situation is less clear. The climate model run with the lower emissions scenario projects no significant change in the number of consecutive days of no rain, while the higher emissions scenario show an increase in dry periods, increasing Minnesota's drought risk (Minnesota Pollution Control Agency, 2017). These climate models are shown in Figure 22.

*Figure 22. Projected Change in Number of Consecutive Dry Days in Low & High Emission Scenarios*




*Source:* (ICAT, 2017)

Even in areas where precipitation does not decrease, projected higher air temperatures will cause increased surface evaporation and plant water loss, leading to drier soils. As soil dries out, a larger proportion of the incoming heat from the sun goes into heating the soil and adjacent air rather than evaporating its moisture, resulting in hotter summers under drier climatic conditions (Mueller & Seneviratne, 2012).

## Vulnerability

All jurisdictions in Blue Earth County are vulnerable to drought, which has impacted the county a few times over the years.

The National Drought Mitigation Center (NDMC) oversees the Drought Impact Reporter (DIR) - a comprehensive database which gathers drought-related reports from a variety of sources and identifies the sector(s) being impacted by each drought. The NDMC (n.d.) defines a drought impact as "An 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 impacting multiple sectors will be categorized into each respective sector.

DIR records show four incidents of drought impacting at least one sector in Blue Earth County from 2007-2018. Table 29 lists the number of times each sector was impacted by these droughts.

*Table 29. Reported Drought Impacts for Blue Earth County*

| Sector | # of drought impacts reported |
|---|---|
| Agriculture | 1 |
| Business & Industry | 0 |
| Energy | 0 |
| Fire | 0 |
| Plants & Wildlife | 0 |
| Relief, Response & Restrictions | 4 |
| Society & Public Health | 0 |
| Tourism & Recreation | 0 |

| Sector | # of drought impacts reported |
|---|---|
| Water Supply & Quality | 0 |

*Source:* (National Drought Mitigation Center)
*Note: For additional information about each category/sector, visit:* *https://droughtreporter.unl.edu/help/dir/mapping.aspx*

Since droughts are regional in nature, jurisdictions within Blue Earth County do not vary in their vulnerability to drought; however, jurisdictions with a greater number of vulnerable residents may be more negatively impacted. For example, droughts can contribute to poor air quality by increasing the risk of wildfires and creating a dustier than normal environment. Populations vulnerable to these conditions include children, older adults, and those with respiratory issues. The Household Composition & Disability SVI theme map (section 3.6.1) is made up of these population groups and should be reviewed to better understand the vulnerability of each jurisdiction.

Blue Earth County Emergency Management identified that there are existing program gaps and deficiencies that make its citizens more vulnerable to periods of drought and should be addressed with new mitigation efforts to reduce vulnerability. They include:

*Water Conservation Provisions/Use Restrictions* – Water conservation provisions and use restrictions in times of drought are not included in county or city ordinances.

### *4.3.10 Wildfire*

A wildfire is an uncontrolled fire spreading through vegetative fuels, posing danger and destruction to property. Wildfires can occur in undeveloped areas and spread to urban areas where structures and other human developments are more concentrated. While some wildfires start by natural causes like lightning, humans cause four out of every five wildfires. Debris burns, arson or carelessness are the leading causes of wildfires. As a natural hazard, a wildfire is often the direct result of a lightning strike that may destroy personal property and public land areas, especially on national and state forestlands. The dangers from wildfire include the destruction of timber, property and wildlife, and injury or loss of life to people living in the affected area or using the area for recreational facilities.

While wildfires are often viewed in a negative light, they are a naturally occurring part of the environment. Wildfires are an important component of healthy forest and prairie ecology and can be beneficial by reducing dangerously high fuel levels and putting nutrients into the ground that spur new growth. In addition, many flora species require fire for seed germination. However, as people settled this country and began clearing land and building homes, roads, railroads, and campgrounds, new artificial causes of wildfire emerged, and their frequency and level of destruction increased.

Causes of wildfires vary from state to state. For example, in Florida, lightning ignites approximately half of all wildfires, while in Minnesota lightning causes less than 5% of all wildfires. These variations are due to climate, vegetation, topography and weather. People burning debris cause most wildfires in Minnesota. However, wildfires are also caused by vehicle exhaust, sparks from trains and heavy equipment, camping, smoking and lightning.

Topography affects the movement of air and fire over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity and wind affect the severity and duration of wildfires.

Homes threatened by wildfire are primarily those located in the "wildland-urban interface." This is the zone where homes and subdivisions have been located in wildland areas where natural wildfires can have an impact. While wildfires are necessary for healthy ecosystems, they burn whatever fuel is in their path, whether vegetation or buildings.

Because the severity of a wildfire directly impacts soil productivity and the vegetative recovery timeframe, the USDA Natural Resources Conservation Service (NRCS) classifies wildfires by burn severity to estimate soil heating and the severity of root damage. Wildfires are classified into one of three classifications based on post-fire vegetative and soil condition indicators. The most severe fires result in greatly reduced soil productivity, slow vegetative recovery (5-10 years) and great potential for soil erosion. Severe burning wildfires typically occurs in areas with steep north or east slopes and dense timber. On the opposite spectrum, the vegetation of an area impacted by a low-severity fire is likely to recover naturally, with regrow occurring within a year. Low-severity wildfires primarily occur on grasslands (USDA NRCS, n.d.).

One of the most common causes of a home being damaged or destroyed is due to radiant heat. In a wildfire, radiant heat is the heat given off by burning vegetation. The high temperatures of some wildfires can cause the deck, siding, or roof of a home to ignite, because the fire was too near the home. Studies in western wildfires have shown that approximately 85% of homes surviving a major wildfire had 30-50 feet of defensible space around them, coupled with fire-resistant roofing.

Approximately 1,600 wildfires occurred each year in Minnesota on average from 1976-2011 (MN DNR, 2011). Wildfires occur throughout the spring, summer and fall, however, most wildfires in Minnesota take place in March, April, and May. During this period, much of the existing vegetation has been killed due to winter temperatures and is dead, brown and combustible. Also, there is little green vegetation to serve as a barrier for a moving wildfire.

### Wildfire History in Blue Earth County

The Minnesota DNR responded to 22 wildfires in Blue Earth County between 1985 and June 2019, most being human caused, burning over 3,100 acres (Figure 23). These include fires not only on state lands, but also rural private lands for which there is not another agency with primary responsibility. Wildfires that are not included in this data are those that occur on federal lands and those that are responded to by local fire departments. The largest wildfire in Blue Earth County was caused by arson and burned 2,909 acres in November of 2006 north of Madison Lake.

Only one wildfire in this dataset was ignited by natural causes (lightning). It occurred in June 2014 and burned 30 acres. No other wildfires have occurred in the county since then.

According to MN DNR data, there are 2,799 acres of peat in Blue Earth County. Peat is partially decayed plant matter found in ancient bogs and swamps. Minnesota has approximately six million acres of peatland, the highest total acreage in the contiguous United States. Peat fires are deep-rooted fires that burn underground, lasting for weeks, months, or even years. They can smolder during winter months beneath the snow, surfacing again in the spring to burn above ground. Peat ignites when its moisture content is low, and then it supports combustion rather than flame. Once started, combustion is persistent because peat contains oxygen and needs little or no outside oxygen to continue burning. Peat's insulating qualities mean the fire loses little heat. As the peat dries, it becomes water repellent. These factors result in long-lasting fires that require extensive operations to extinguish. However, peat fires have not been an issue in Blue Earth County.

To determine the probability of future wildfire events in Blue Earth County we considered past-observed events. Based on Minnesota DNR records, from January 1985 through June 20, 2019, the relative frequency of wildfire events in Blue Earth County is .65 events per year, which we infer to represent the probability of these events occurring in the future.

### Wildfire and Future Trends

Temperatures are predicted to rise in the state, which could lead to more extreme heat events and associated wildfire risks. As Minnesota's trends shift, 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.

### Vulnerability

Some residents are more vulnerable to air quality conditions of wildfire and those include children, older adults, and those with respiratory issues. The Household Composition & Disability SVI theme map (section 3.6.1) is made up of these population groups and should be reviewed to better understand the vulnerability of each jurisdiction.

The SILVIS Lab at University of Wisconsin – Madison created a nationwide dataset documenting the 2010 Wildland Urban Interface. With the increase of development in metropolitan fringes and rural areas, the wildland-urban interface (WUI) is increasing. The WUI is defined as the area where structures and other human development meet or intermingle with undeveloped wildland. The expansion of the WUI in recent decades has significant implications for wildfire management and impact. The WUI 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.

There are two types of WUI: intermix and interface. Intermix WUI are areas where housing and vegetation intermingle; interface WUI are areas with housing in the vicinity of contiguous wildland vegetation. Figure 24 below maps the WUI in Blue Earth County. There are no areas of interface in the county. However, there are intermix areas around Mankato and Skyline, and along the Minnesota and Le Sueur Rivers.

*Figure 23. Wildfires by Acres Burned (1985-June 2019) and Peat Soil Area in Blue Earth County*

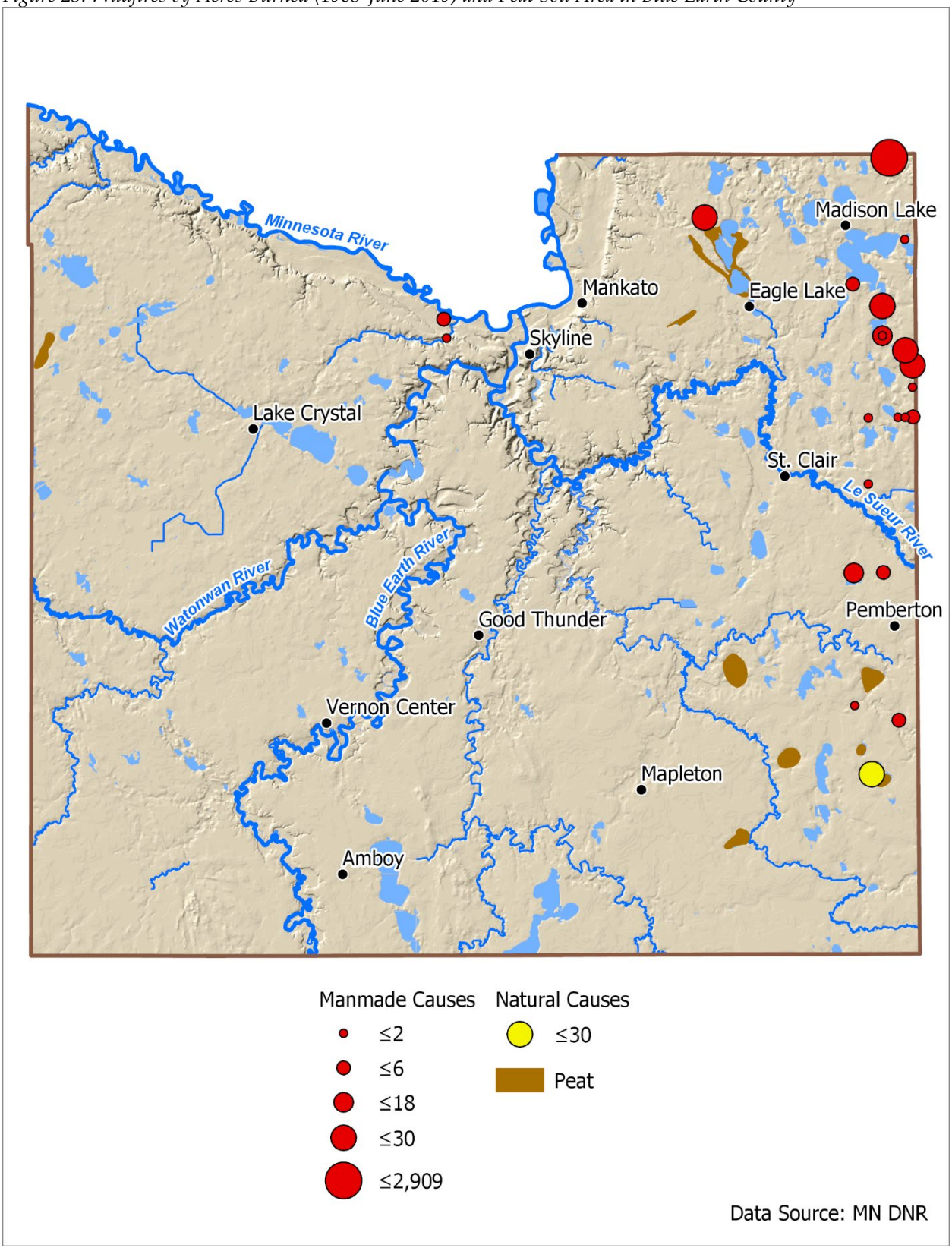
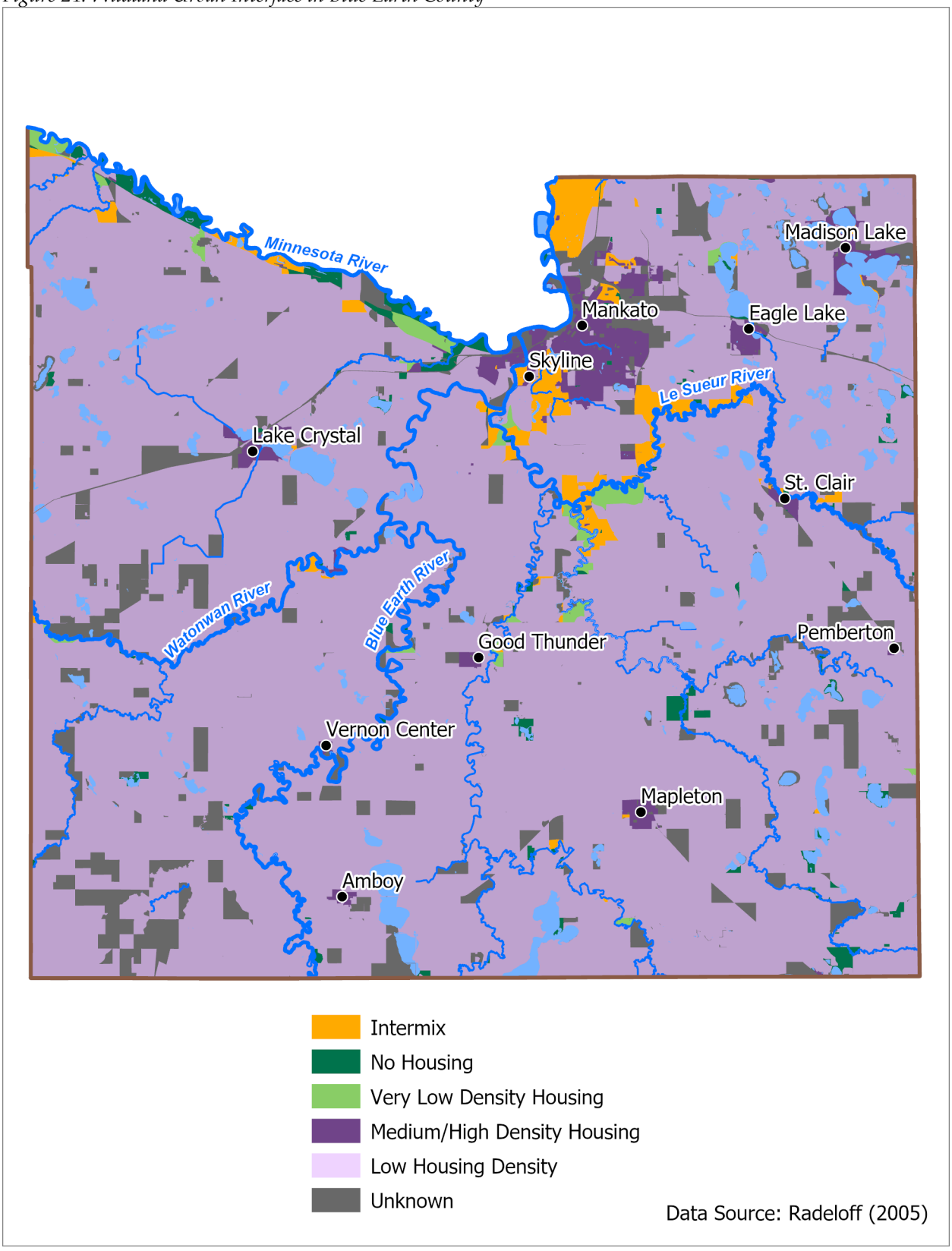


*Figure 24. Wildland Urban Interface in Blue Earth County*



### *4.3.11 Landslides and Soil Erosion*

Erosion is the wearing away of land, such as the loss of a riverbank, beach, shoreline, or dune material. It is measured as the rate of change in the position or displacement of a riverbank or shoreline over a period of time. Short-term erosion typically results from periodic natural events, such as flooding, hurricanes, storm surges and windstorms, but may be intensified by human activities. Long-term erosion is a result of multi-year impacts such as repetitive flooding, wave action, sea level rise, sediment loss and subsidence. Death and injury are not typically associated with erosion; however, major incidents of erosion, such as landslides, can destroy buildings and infrastructure (FEMA, 2013).

The movement of a mass of rock, debris, or earth down a slope by the force of gravity is considered a landslide. They occur when the slope or soil stability changes from stable to unstable, which may be caused by earthquakes, storms, volcanic eruptions, erosion, fire, or additional human-induced activities. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high. Potential impacts include environmental disturbance, property and infrastructure damage, and injuries or fatalities (FEMA, 2013).

#### Soil Erosion/Landslides History in Blue Earth County

The National Centers for Environmental Information have recorded several instances of mudslides in conjunction with major flood events. The following is a summary of NCEI data.

- In July of 2018, approximately 75-100 feet of Highway 68 new Courtland was covered in mud and debris due to a rain-induced mudslide. No one was injured.
- On June 17, 2016, severe storms occurred in the region, resulting in a mudslide on Apple Road south of Highway 68. A few days before, on the 14$^{th}$, torrential rainfall caused major flooding in Mankato, in addition to mudslides along the Minnesota River.
- Severe flash flooding in June of 2014 occurred across the county, damaging approximately 215 homes. Various roads within Mankato were impassible, and a portion of Highway 66 south of Mankato was closed due to a mudslide.
- In June of 2006 a mudslide occurred on the southern edge of Mankato after several inches of rain fell.
- After approximately 7 inches of rainfall on June 9, 2004, saturated soil caused a mudslide on Warren Street near MSU in Mankato.
- In June of 1996, mudslides occurred in Mankato. One mudslide resulted in the closure of Highway 169 two miles north of Mankato.

The city of Mankato has noted that in the past five years there have been numerous locations of erosion and sediment deposition that have occurred along the Minnesota River.

Decoria Township has reported that in the past five years, there has been severe river erosion on the Le Sueur River, adjacent to township roads. River stabilization projects then took place.

Le Ray Township has worked with the Blue Earth County Public Works Department to replace culverts that needed replacement due to erosion.

Current research led by the University of Minnesota is underway to acquire, analyze, and distribute new data on landslides across the state of Minnesota. Part of this work is conducted by Minnesota State University Mankato. Between New Ulm and North of Mankato 479 points have been mapped in the Minnesota River Valley where some sort of landslide activity has occurred (Mewes, 2018). By June 2020, this research will produce tools and data for mitigation and restoration including a landslide inventory and landslide susceptibility maps. (ENRTF, 2017). These data were unavailable for this plan.

The sandy river bluffs along the Mississippi and Minnesota Rivers suffer erosion regularly, and intense or frequent rains exacerbate this issue. The State of Minnesota has acknowledged in its 2019 Hazard Mitigation Plan that a lack of information exists, particularly for landslide and erosion events. Without a comprehensive record of events and their locations, a frequency calculation of events and inferred probability of these events occurring is not possible. Blue Earth County river valleys have been included in multiple studies of erosion rates including the *Special Hazard Mitigation Risk Assessment of Near Channel Riverine Erosion Hazards in Blue Earth County - Streambanks, Bluffs, and Ravines*. (Day, 2013). However, river channel erosion does not occur at a steady rate per year or in all locations. Given the geology and landuse of the Minnesota, LeSueur and Blue Earth River valleys, the probability of landslide events occurring is extremely high, and is evidenced by jurisdictional reporting for this plan.

### Landslides/Soil Erosion and Future Trends

The Minnesota River Valley is still changing thousands of years after it was first formed. Dating of landslides is not easy to reconstruct, however, the UMN mapping study is using various methods that reveal that landslides, mudslides, rockfalls and other geological events are more common in the Mankato area than previously thought. There is always evidence of some soil movement after heavy rains in the valley (Mewes, 2018). And rainstorms are projected to increase in intensity and duration. Near channel erosion occurs with and sometimes years after large rainfall events.

The increased magnitude and frequency of flooding events and storm activity may in turn increase the risk of soil erosion and landslides. According to University of Washington geologist Dave Montgomery, "If the climate changes in a way that we get a lot more rainfall you would expect to see a lot more landslides" (Phillips, 2014).

In Minnesota, the wettest days are getting wetter. This can contribute to increased erosion in many locations due to flooding and saturation of soils. Reduced ice cover on lakes and shorelines (due to warmer temperatures) could potentially expose shorelines to increased erosion or damage during weather events when they previously may have been covered with ice (National Climate Assessment Development Advisory Committee, 2013).

According to the 2014 National Climate Assessment, "Increased precipitation intensity also increases erosion, damaging ecosystems and increasing delivery of sediment and subsequent loss of reservoir storage capacity" (Pryor, et al., 2014).

## Vulnerability

The geology, geography and land use of the Minnesota River watershed makes this region very prone to erosion that leads to slope failures. Infrastructure and buildings vulnerabilities to due to erosion and landslides were reported by its jurisdictions during the mitigation planning process. These vulnerabilities are addressed in the jurisdiction's respective mitigation action charts.

The city of Mankato noted that in the past five years there have been numerous locations of erosion and sediment deposition that have occurred. Erosion is threatening or damaging public and private property or reducing the function of public drainage facilities, while damage to embankments is threatening critical water supply infrastructure. The city has developed a Surface Water Management Policy to address uses of drainage in natural channels and conveyances to reduce erosion and protect improvements.

Blue Earth County officials noted that public drainage systems, including erosion control systems, sustained damage during the major flooding/storm events of June 2014, June 2016, September 2016, July 2017 and June 2018. Blue Earth County has been replacing older intake structures with newer designs that are stronger and able to temporarily store water reducing peak flows to downstream rivers and lakes. Blue Earth County has also been rip-rap armoring vulnerable bridge abutments, roads and other public infrastructure to protect it from flood damage.

The city of Vernon Center noted an increased rate in flood-related erosion along the Blue Earth River that is posing future risk to the city's WWTP.

An analysis in the Blue Earth County 2013 Hazard Mitigation Plan identified 89 structures valued at over $6.5 million within 30 feet of bluffs identified in *Special Hazard Mitigation Risk Assessment of Near Channel Riverine Erosion Hazards in Blue Earth County - Streambanks, Bluffs, and Ravines* (Day, 2013). Additionally, 186 miles of roadway were found to be located within 30 feet of bluffs. Minnesota State Highways 60 and 68 have been threatened numerous times by landslide events.

Blue Earth County is seeing continued development in areas that are vulnerable to erosion, bluff failure and lake shore sluffing. Lake shore sluffing adds impervious surfaces that impact vulnerable areas. This is due to an increased number of torrential rain events as opposed to multi-day or soaking rains.

In the last five years, Blue Earth County used FEMA mitigation funds along with DNR Flood Damage Reduction funding to purchase three residences in the Riverhills Subdivision that were in jeopardy of sliding into the Le Sueur River.

Blue Earth County Emergency Management identified that there are existing program gaps and deficiencies that make its citizens more vulnerable to landslides and soil erosion and should be addressed with new mitigation efforts to reduce vulnerability. Blue Earth County Emergency Management noted that erosion, landslides, land subsidence and soil surface displacement continue to be ongoing concerns. Continued high rainfall amounts are changing the landscape of Blue Earth County rivers, putting additional structures/homes in danger.

### *4.3.12 Dam & Levee Failure*

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below create large amounts of potential energy, allowing the chance for failure. Dams can fail due to either 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (transportation routes and utility lines required to maintain or protect life), and environmental damage. Dams require constant monitoring and regular maintenance to insure their integrity.

#### Dam & Levee Regulation

The agencies with regulatory authority of dams in Minnesota are:

- 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 program sets minimum standards for dams and regulates the design, construction, operation, repair, and removal of dams. Both privately and publicly owned dams are regulated.
- The U.S. Army Corp of Engineers (USACE) maintains the lock and dam system on the Mississippi River and has regulatory authority over the flood control dams that it owns. USACE also participates with local communities in all phases of flood control that includes dams, levees, or other means.
- The Federal Power Act (FPA) authorizes the Federal Energy Regulatory Commission (FERC) to issue exemptions or licenses to construct, operate and maintain dams, water conduits, reservoirs, and transmission lines to improve navigation and to develop power from streams and other bodies of water over which it has jurisdiction. 16 U.S.C. § 797(e). Regulatory tools include the Federal Power Act, Public Utility Regulatory Policies Act, the Electric Consumers Act of 1986 and the Energy Policy Act of 1992.

#### Dam & Levee Failure History in Blue Earth County

According to the State Dam Safety Engineer at the MN DNR, there has been only one case of dam failure in Blue Earth County. In April of 1965, heavy spring floods at the Rapidan Dam destroyed seven spillway gates and the powerhouse intake structures. The normal pool level fell eight feet.

#### Dam & Levee Failure and Future Trends

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 may change the expected flow pattern. 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.

Minnesota had a dam failure due to a large storm event in June 2012. The Forebay Canal in Carlton County had operated as designed for nearly 100 years. The intensity of the 2012 rain event caused a

failure of the canal wall, which caused significant damage. Future trends are adding a new level of uncertainty that needs to be considered with respect to assumptions made during dam construction.

### Vulnerability

Although dam regulatory authorities vary 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 hazard potential classification system that is adaptable to any agency's current system. Table 30 provides an overview of the main criteria agencies consider when determining a dam's hazard potential classification. 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 (2004).

*Table 30. Hazard Potential Classification Criteria*

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

*Source:* (US Army Corps of Engineers, 2008)

Minnesota's hazard classifications for dams are as follows:

- **High (Class I)** - loss of life or potential serious hazards; damage to health, main highways, high-value industrial or commercial properties, or major public utilities; or serious direct or indirect economic loss to the public;
- **Significant (Class II)** - possible health hazard or probable loss of high-value property; damage to secondary highways, railroads or other public utilities; or limited direct or indirect economic loss to the public other than that described in Class III (Low); and
- **Low (Class III)** - property losses restricted mainly to rural buildings and local county and township roads that are an essential part of the rural transportation system serving the area involved.

Class I dam owners are required to have an Emergency Action Plan (EAP) on file, notifying individuals whose lives, property, or health may be endangered by failure, mis-operation, or other circumstances affecting the dam (Minnesota Legistlature - Office of the Revisor of Statutes, 2008).

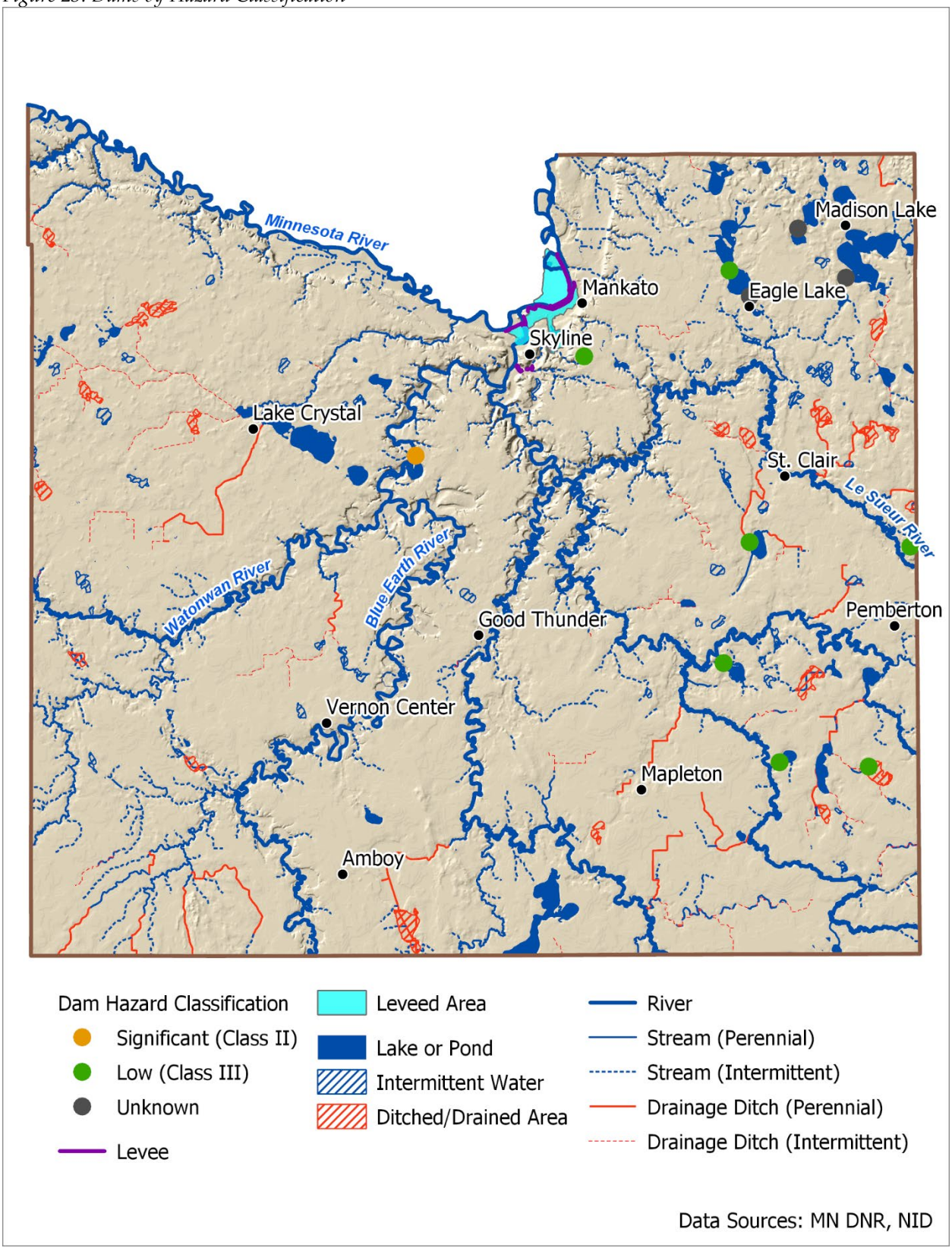
Dams for which a hazard potential (as defined above) has not been designated, or is not provided, are classified as "Undetermined".

Figure 25 below maps the dams in Blue Earth County by hazard classification. None of the dams in the county are listed as a high hazard. Only the Rapidan Dam is listed as a "Significant" hazard dam. It is owned by Blue Earth County and operated by North American Hydro, which maintains a detailed

Emergency Action Plan for the dam that addresses response measures such as emergency public notification and evacuation in the event of a dam breach. North American Hydro also maintains an inundation map to identify the affected public and assets in the event of dam failure.

The Rapidian Dam EAP maps were reviewed for information about inundation areas in the event of a dam failure. The Blue Earth River below the dam flows through a mostly deciduous forested riparian area. Cultivated crops and pasture land make up most of the land cover beyond the forest. In a "fair weather" dam failure event, no structures or campsites would be in the projected floodway. In a "flood condition" failure, there are seven campsites within the first mile of river below the dam and there is one structure at about 1.7 miles downstream in the floodway. In South Bend township there are thirteen structures between about eight and eleven miles downstream of the dam. At about 8.2 miles downstream, the County Road 33 Bridge would be affected, where the peak flow was calculated to be reached in 3.6 hours in a "fair weather" failure event and in 1.2 hours in a "flood condition" failure event.

*Figure 25. Dams by Hazard Classification*



In addition to dams being classified by their hazard potential, the physical condition of dams is inspected and given a condition ranking. The condition of a dam is categorized into one of the following classifications:

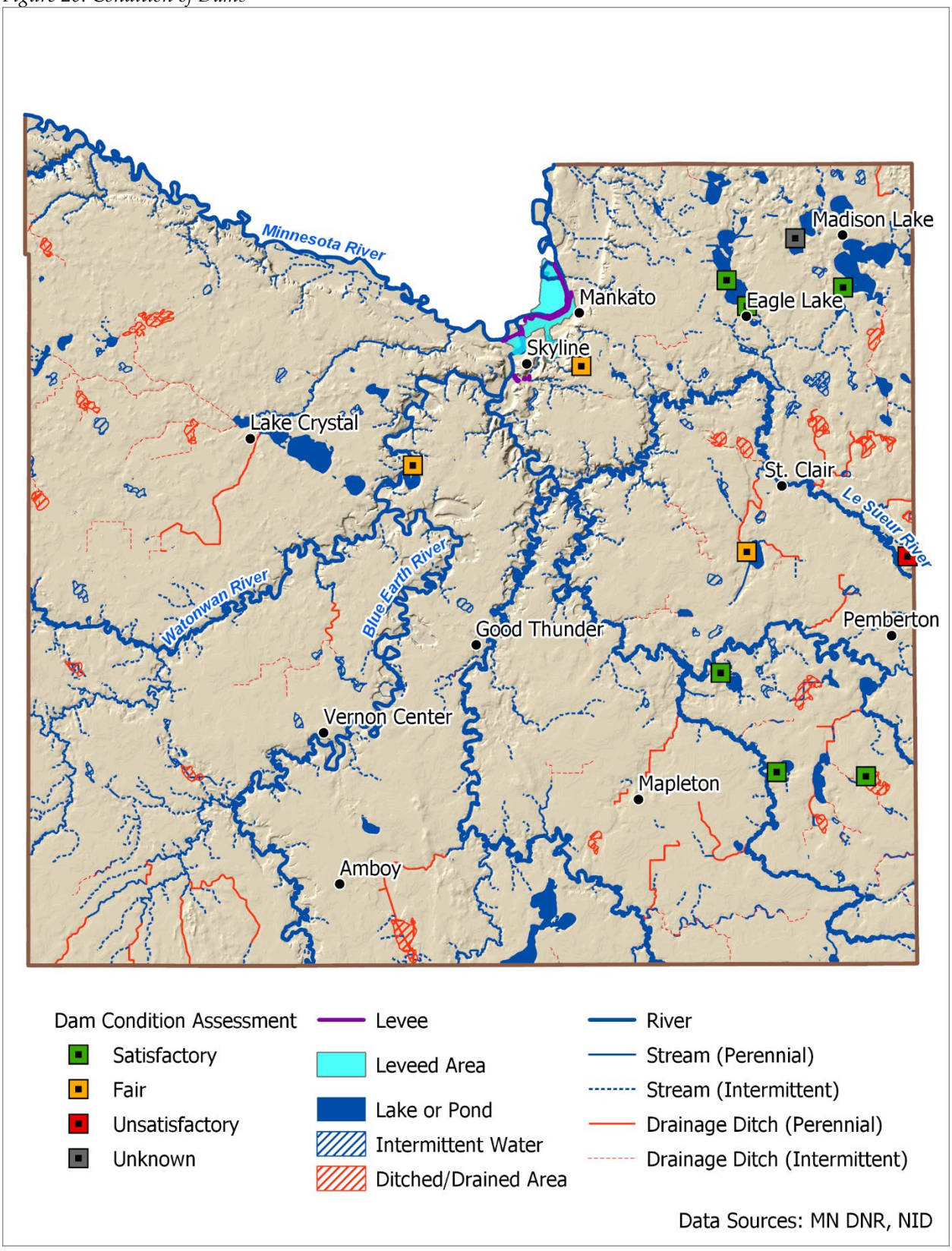
- **Satisfactory** - No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.
- **Fair** - No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.
- **Poor** - A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. "Poor" may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.
- **Unsatisfactory** - A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.
- **Not Rated** - The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated (US Army Corps of Engineers, 2008).

Dams in "Poor" or "Unsatisfactory" condition are more vulnerable to failure and pose a greater threat to the surrounding community and infrastructure.

*Rapidan Dam EAP* – The Rapidan Dam is located on the Blue Earth River, two miles west of Rapidan. It is owned by Blue Earth County and operated by North American Hydro. North American Hydro maintains a detailed Emergency Action Plan for the dam which addresses response measures such as emergency public notification and evacuation in the event of a dam breach. North American Hydro also maintains an inundation map to identify the affected public and assets in the event of dam failure.

There is one dam in the county with a conditional assessment of "Unsatisfactory," the McPherson Twp. 25 Dam (Figure 26).

*Figure 26. Condition of Dams*



Similar to dams, levees have a Levee Safety Action Classification (LSAC) "…designed to take into account the probability of the levees being loaded, existing condition of the levee, the current and future maintenance of the levee, and the consequences if a levee were to fail or be overwhelmed" (US Army Corps of Engineers - New Orleans District, n.d.). Figure 27 shows the LSAC's five levels of risk, as well as the actions which should be taken at each risk level.

*Figure 27. USACE's Levee Safety Action Classification (LSAC)*

| USACE Levee Safety Action Classification Table* | | |
|---|---|---|
| Risk | Actions for Levee Systems and Leveed Areas in this Class<br>*(Adapt actions to specific levee system conditions.)* | Risk Characteristics of this Class |
| Very High (1) | Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring, communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as very high priority. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very high risk. |
| High (2) | Based on risk drivers, implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as high priority. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in high risk. |
| Moderate (3) | Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure O&M is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as a priority. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in moderate risk. |
| Low (4) | Verify risk information is current and implement routine monitoring program and interim risk reduction measures if appropriate; assure O&M is up to date; communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in low risk. |
| Very Low (5) | Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very low risk. |
| No Verdict | Not enough information is available to assign an LSAC. | |
| *Levee risk is the risk that exists due to the presence of the levee system and this is the risk used to inform the decision on the LSAC assignment.<br>The information presented in this table does not reflect the overtopping without breach risk associated with the presence or operation of the levee system. | | |

*Source: (US Army Corps of Engineers - New Orleans District, n.d.)*

The levees in Blue Earth County are used to regulate water levels and protect communities from flooding. A breached levee can have serious consequences to the community relying on the levee to hold water back. Table 31 provides a summary of the county's levees and community assets protected by the respective levee.

*Table 31. Assets in Leveed Areas*

| Levee Name | Location | LSAC Rating | Property Value | Structures at Risk | People at Risk |
|---|---|---|---|---|---|
| Minnesota River – Mankato | Mankato | Not screened | $1,260,000,000 | 814 | 5,529 |
| Minnesota River – North Mankato | North Mankato | Moderate | $350,000,000 | 1,445 | 4,167 |
| Minnesota River – Lehillier | South Bend Township | Moderate | $61,100,000 | 120 | 328 |

*Source: (US Army Corps of Engineers, n.d.)*

# Section 5 – Mitigation Strategy

The goal of mitigation is to protect lives and reduce the future impacts of hazards including property damage, disruption to local and regional economies, the amount of public and private funds spent to assist with recovery, and to build disaster-resistant communities. Mitigation actions and projects should be based on a well-constructed risk assessment, provided in Section 4 of this plan. 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 the lessening of disaster damages. The assessment also provides an evaluation of these capabilities to determine whether the activities can be improved in order to more effectively reduce the impact of future hazards. The following sections identify existing plans and mitigation capabilities within all of the communities:

- *Appendix J:* Lists the plans and programs in place in Blue Earth County as related to hazard mitigation.
- *Appendix K:* As part of the Blue Earth County MHMP update, the county, its cities, and townships were asked to participate in filling out a "Local Mitigation Survey" (LMS) form to report on their current mitigation capabilities and program gaps. Appendix K lists the LMS reports gathered for Blue Earth County.

### *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 a financial protection against flood losses.

Table 32 below shows which jurisdictions in Blue Earth County participate in the National Flood Insurance Program (NFIP). There are three cities (Amboy, Mapleton and Pemberton) that do not participate in the NFIP due to having no FEMA mapped high risk areas. The cities of Skyline and Vernon Center both have FEMA Mapped High Risk Areas, but do not participate in the program. Each of these cities elected not to participate in the NFIP as they have no residential or commercial structures in their designated high risk floodplain area.

*Table 32. NFIP Participation in Blue Earth County*

| Community Name | Participation in the NFIP? | | Initial FIRM Date |
|---|---|---|---|
| Amboy | NOT Participating | No FEMA Mapped High Risk Areas | N/A |
| Eagle Lake | Participating in NFIP | Annexed / Mapped High Flood Risk Areas on Preliminary Map | 11/25/1972 |
| Good Thunder | Participating in NFIP (Emergency program) | No FEMA Mapped High Risk Areas | N/A |
| Lake Crystal | Participating in NFIP | FEMA Mapped High Risk Areas | 7/3/1985 |
| Madison Lake | Participating in NFIP | No FEMA Mapped High Risk Areas / annexed NSFA FIRM | 3/5/1990 |
| Mankato | Participating in NFIP | FEMA Mapped High Risk Areas | 12/22/1972 |
| Mapleton | NOT Participating | No FEMA Mapped High Risk Areas | N/A |
| Pemberton | NOT Participating | No FEMA Mapped High Risk Areas | N/A |
| Saint Clair | Participating in NFIP | No current FEMA Mapped High Risk Areas (but mapped areas on preliminary new maps) | N/A |
| Skyline | NOT Participating | FEMA Mapped High Risk Areas | N/A |
| Vernon Center | NOT Participating | FEMA Mapped High Risk Areas | N/A |
| Blue Earth County | Participating in NFIP | FEMA Mapped High Risk Areas | 11/25/1972 |

*Source: MN DNR (data current as of 10/1/2018)*

Repetitive loss properties are defined as properties that have had 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. Blue Earth County has three repetitive loss properties, as described in Table 33. All three RL properties are single-family dwellings.

*Table 33. Repetitive Loss Properties in Blue Earth County*

| Location | Total Losses | Number of Properties | Total Building Payments | Total Contents Payments | Total Payments |
|---|---|---|---|---|---|
| Blue Earth County | 5 | 2 | $124,071 | $41,121 | $165,193 |
| St. Clair | 3 | 1 | $80,371 | $29,420 | $109,792 |

*Source: MN DNR (data current as of 3/31/2019)*

No properties are classified as "Severe Repetitive Loss" (SRL). An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- 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
- 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.
- 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.

For more on the areas that flood repeatedly in Blue Earth County, see Section 4.4.5 *Flash Flood and Riverine Flood.*

### *5.1.2 Plans and Ordinances*

Blue Earth County and its incorporated communities have a number of plans and ordinances in place to ensure the safety of residents and the effective operation of communities, including a Zoning Ordinance, Floodplain Ordinance, Emergency Operations Plan, Continuity of Operations Plan, and Water Management Plan.

### *5.1.3 Plans and Programs in Place to address Natural Hazards*

Blue Earth County has numerous plans and programs in place to address natural hazards from warning to response. Some of these programs are specific to a hazard and others address impacts and human safety for many types of events. The natural hazard(s) the plan or program is most relevant to is highlighted. Note: For the purpose of grouping related natural hazards, "Summer Storms" encompasses Tornadoes, Windstorms, Lighting and Hail and "Winter Storms" encompasses Blizzards and Ice Storms (see Section 4.3).

**Summer Storms** **Winter Storms** **Floods** Erosion Extreme Temps Drought Dam Failure **Wildfire**

*Emergency Operations Plan* – Blue Earth County maintains an all-hazards Emergency Operations Plan which contains information applicable to severe summer storms, i.e. emergency public notification/information, evacuation, mass care sheltering, etc.

**Summer Storms** Winter Storms Floods Erosion Extreme Temps Drought Dam Failure Wildfire

*Emergency Notifications* – Summer storm warnings are initiated by the National Weather Service, law enforcement or local trained SKYWARN spotters. The emergency warning system is activated by the dispatch center as directed. Residents receive warnings by NOAA weather radio, local media, CodeRED, cell phone apps and the outdoor warning siren system.

**Summer Storms** **Winter Storms** **Floods** Erosion **Extreme Temps** Drought Dam Failure **Wildfire**

*Public Warning and Notification* – In the event of emergencies or hazardous conditions that require timely and targeted communication to the public, Blue Earth County utilizes the CodeRED emergency notification system, Blue Earth County and Blue Earth County Sheriff's Office Facebook pages and local news media. Blue Earth County promotes the use of NOAA weather radios by critical facilities and the public to receive information broadcast from the National Weather Service. Local media outlets assist with sharing public information. Blue Earth County can send CodeRED messages to all landlines in the county, and many residents are subscribed to multiple means of CodeRED contact.

**Summer Storms** Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire

*SKYWARN Program* – Blue Earth County offers SKYWARN training on an annual basis to local fire and law enforcement departments and local residents that wish to be trained as volunteers. SKYWARN spotters help keep their local communities safe by providing timely and accurate reports of severe weather to their local National Weather Service office.

**Summer Storms** Winter Storms Floods Erosion Extreme Temps Drought Dam Failure Wildfire

*Severe Weather Awareness Week* – Blue Earth County helps promote and participates in the National Weather Service's "Severe Weather Awareness Week" held in April each year. The event seeks to

educate residents on the dangers of severe summer storms and highlights the importance of preparing for severe weather before it strikes.

Summer Storms **Winter Storms** Floods Erosion **Extreme Temps** Drought Dam Failure Wildfire

*School Closings* – All school districts within Blue Earth County have a school closing policy and communications plan in place if inclement weather or temperatures create a hazardous situation for students or staff.

**Summer Storms** Winter Storms Floods Erosion Extreme Temps Drought Dam Failure Wildfire

*MDH Requirements for Manufactured Home Parks* – The Minnesota Department of Health (MDH) has requirements for storm shelters and evacuation plans with respect to manufactured home parks. Blue Earth County has 11 manufactured home parks.

**Summer Storms** **Winter Storms** **Floods** Erosion **Extreme Temps** Drought Dam Failure Wildfire

*Backup Power* – Generator backup power is in place for all Blue Earth County offices, with the exception of the library.

**Summer Storms** Winter Storms **Floods** Erosion **Extreme Temps** Drought Dam Failure Wildfire

*Mass Care Shelter Facilities* – A period of extreme heat or cold coupled with a major power outage, as well as major storm events may require emergency sheltering for those in need. Blue Earth County has designated shelter facilities that have agreements with the Red Cross as well as Sheltering and Pet Sheltering Plans.

Summer Storms **Winter Storms** Floods Erosion **Extreme Temps** Drought Dam Failure Wildfire

*Winter Weather Warnings* – Winter weather warnings are issued by the National Weather Service.

Summer Storms **Winter Storms** Floods Erosion **Extreme Temps** Drought Dam Failure Wildfire

*Winter Hazard Awareness Week* – Blue Earth County helps promote and participates in the National Weather Service's "Winter Hazard Awareness Week" held in November each year. The event provides education to residents on the dangers of winter weather and how to properly deal with it.

Summer Storms **Winter Storms** Floods Erosion Extreme Temps Drought Dam Failure Wildfire

*Snow Removal* – Blue Earth County, cities, and townships complete the snow removal and disperse sand/salt as needed on all county, city and township roads. MnDOT removes the snow from state highways as well as disperses salt/sand as needed.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire

*Drinking Water Supply Management Area (DWSMA) & Wellhead Protection* – The city of Mankato has a wellhead protection water supply plan in place. The Minnesota Department of Health assists public water suppliers with preparing and implementing wellhead protection plans.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire

*Floodplain & Shoreland Ordinances* – Blue Earth County Environmental Services administers land use and zoning ordinances for rural and unincorporated portions of Blue Earth County, including floodplains and shoreland. The department also provides information and support for environmental health issues that may impact water quality after flooding occurs. Blue Earth County zoning ordinances address shoreland management regulations including building regulations to mitigate against flooding during high-water elevation (for structures along lakes, ponds, flowages, rivers and streams).

Summer Storms Winter Storms **Floods** Erosion Extreme Temps **Drought** Dam Failure Wildfire

*Water Management Plan* – Blue Earth County zoning ordinances address storm water management for the county. Blue Earth County's Water Management Plan was prepared by the county cooperatively with the SWCD. This plan addresses three priority concerns: protect drinking water supplies and groundwater quality and quantity; protect and restore the quality and manage the quantity of surface water; and protect and manage wetlands for multiple benefits.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire

*Floodplain Ordinance/Mapping* – Blue Earth County's Environmental Services Department maintains the floodplain maps and ordinance for the county.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire

*Blue Earth County Highway Department* – The highway department is responsible for the efficient planning, design, construction and maintenance of the Blue Earth County highway system, which comprises 744 centerline miles of roadways and 200 bridges. To accomplish this, the highway department secures funding from federal, state and local resources. In addition, there are 165 miles of trunk highways in Blue Earth County.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire

*Blue Earth County Transportation Plan* – The Blue Earth County Highway Department develops and maintains a five-year transportation improvement plan which prioritizes and details the improvement projects for implementation, i.e. roads, culverts, bridges and more.

Summer Storms Winter Storms Floods Erosion Extreme Temps **Drought** Dam Failure Wildfire

*Public Awareness (Drought)* – In the event of drought conditions, Blue Earth County Emergency Management works in concert with the MN DNR and U.S. Forest Service to raise public awareness of the dry conditions and increased danger of wildfire.

Summer Storms Winter Storms Floods Erosion Extreme Temps **Drought** Dam Failure Wildfire

*MN Drought Response Plan* – The State of Minnesota has a statewide drought response plan in place. The plan was prepared by the Minnesota DNR.

Summer Storms Winter Storms **Floods** **Erosion** Extreme Temps **Drought** Dam Failure Wildfire

*Blue Earth County Soil and Water Conservation District* – The Blue Earth County Soil & Water Conservation District is a local agency that provides access to natural resource management and conservation services. In cooperation with local, state and federal agencies, the SWCD provides technical, financial and educational assistance to address natural resource concerns. Assistance is available to all taxpayers and land users within the borders of Blue Earth County. SWCD technicians can review landowner plans for roads, building sites and vegetation. They can advise on restoration of damaged areas and recommend specific best management practices to manage storm water and prevent erosion and soil loss. The SWCD is allocated money each year to assist landowners in implementing conservation projects. Examples of eligible projects include erosion and sediment control, rain gardens and shoreland restoration.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**

*Local Fire Departments* – There are 10 fire departments located in Blue Earth County. Each department is responsible for wildfires within their department boundaries; however, they often work together on larger fires.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**

*Mutual Aid Agreements* – All fire departments in Blue Earth County have mutual aid agreements with each contiguous department that borders their respective fire district. Written mutual aid agreements are on file with each city.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**

*Public Outreach & Education* – Fire Prevention Week is held annually each October. Most fire departments participate and provide an opportunity for local residents to learn fire safety with open houses. In addition, local media assists in sharing fire safety information with the public.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**

*MN DNR Information* – The MN DNR maintains current statewide map information on seasonal wildfire risks.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**

*Burning Permits/Restrictions* – The Blue Earth County Sheriff's Office regulates when burning permits are available and requires permit holders to notify the county prior to burning.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought **Dam Failure** Wildfire

*Rapidan Dam EAP* – The Rapidan Dam is located on the Blue Earth River, two miles west of Rapidan. It is owned by Blue Earth County and operated by North American Hydro. North American Hydro maintains a detailed Emergency Action Plan for the dam which addresses response measures such as emergency public notification and evacuation in the event of a dam breach. North American Hydro also maintains an inundation map to identify the affected public and assets in the event of dam failure.

See *Appendix J* for a list of all plans and programs, ordinances and staff in place in Blue Earth County, and Append*ix K: Local Mitigation Survey Report* further details each jurisdiction's plans, policies, programs, staff, funding and other resources they have in place in support of hazard mitigation.

## 5.2 Mitigation Goals

In Section 4 of this plan, the risk assessment identified Blue Earth County as prone to a number of natural hazards. The steering committee members understand that although hazards cannot be eliminated altogether, Blue Earth County can work toward building disaster-resistant communities.

The goals and strategies developed for the 2019 Minnesota State Hazard Mitigation Plan for natural hazards were adopted for use in the Blue Earth County Plan (Table 34). This framework will allow for integration of the mitigation actions that are listed by Blue Earth 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.

*Table 34. Goals from the 2019 Minnesota State Hazard Mitigation Plan*

| |
|---|
| **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. |
| **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). Also included are the new FEMA Climate Resilient Mitigation Actions (CRMA) released in 2016. Minnesota HSEM recommends the use of these mitigation strategies to be in alignment with the state plan and those recommended by FEMA. A fifth strategy type was determined by Minnesota HSEM for use within the state. They are listed in Table 35 below:

*Table 35. 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<br>• Land use ordinances<br>• Planning and zoning<br>• Building codes and enforcement<br>• Floodplain ordinances<br>• NFIP Community Rating System<br>• Capital improvement programs<br>• Open space preservation<br>• Shoreline codes<br>• Stormwater management regulations and master plans |

| Mitigation Strategy | Description | Example Mitigation Actions |
|---|---|---|
| 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.<br><br>This type of action also involves projects to construct manmade structures to reduce the impact of hazards.<br><br>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<br>• Utility undergrounding<br>• Structural retrofits<br>• Floodwalls and retaining walls<br>• Detention and retention structures<br>• Culverts<br>• Safe rooms |
| 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<br>• Stream corridor restoration<br>• Forest management<br>• Conservation easements<br>• Wetland restoration and preservation |
| Education and Awareness Programs | These are actions to inform and educate citizens, 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<br>• Websites with maps and information<br>• Real estate disclosure<br>• Presentations to school groups or neighborhood organizations<br>• Mailings to residents in hazard-prone areas.<br>• StormReady<br>• 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<br>• Flood fight plans and preparedness<br>• Dam emergency action plans<br>• Warning<br>• Backup power<br>• Emergency capabilities |

In the review and discussion of selected mitigation strategies and actions, steering committee members and the public were asked to consider the ranking of mitigation actions by priority for implementation. Table 36 provides criteria that were taken into consideration in the process.

### *5.3.1 Hazard Mitigation Actions*

Blue Earth County and its included municipalities share a common Multi-Hazard Mitigation Plan and worked closely to develop it. Local leaders work together with the Blue Earth County Emergency Management Director to assure that the hazards and mitigation actions included in this plan are accurate and addressed in their jurisdictions.

The Blue Earth County Mitigation Action Chart is provided in Table 37. Appendix G contains the jurisdictional mitigation action charts for the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, St. Clair, Skyline and Vernon Center.

Following is an overview the mitigation action charts and description of each element of the chart (columns A-K).

**Column A – Numbered Item**
Each mitigation action is identified by a number.

**Column B – Hazard**
Each mitigation action is identified by the hazard that it relates to. Actions that fall under "All-Hazards" relate to both natural and non-natural hazards. Other actions are specific to the natural hazards addressed in Section 4.3, Hazard Profiles. Note: For the purpose of grouping related natural hazards, "Summer Storms" encompasses Tornadoes, Windstorms, Lighting and Hail and "Winter Storms" encompasses Blizzards and Ice Storms (see Section 4.3).

**Column C – Mitigation Strategy**
Each mitigation action is identified by one of the following 5 mitigation strategies.

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

See Section 5.3 and Table 35 for a description of each mitigation strategy and related types of actions.

**Column D – Mitigation Action**
Each mitigation action provides a concise, action-oriented description of the action or project to be undertaken.

**Column E - Reduces Risk to New / Existing Buildings or Infrastructure**
Each mitigation action identifies if the activity reduces risk to new or existing buildings and infrastructure. This element of the chart ensures jurisdictions include consideration of actions that address the built environment.

**Column F – Status**
Each mitigation action identifies the status of implementation. Status categories include:

- New – New actions that have been identified since the last plan.
- Ongoing – Actions from the last plan that require continuing application.
- In Progress – Actions from the last plan that are currently being acted upon.

Mitigation actions that have been completed or deleted from the 2013 Blue Earth County Multi 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.

**Column G – Priority**

Each mitigation action identifies the jurisdiction's priority ranking for implementation of the action. See Table 36.

*Table 36. Criteria for Mitigation Action Priority Ranking*

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

**Column H – Expected Timeframe**

Each mitigation action identifies the anticipated timeframe for implementation of the action. Most mitigation actions fall within the next 5-year planning cycle. Actions that have a specific timeframe are noted.

**Column I – Responsible Party**
Each mitigation action identifies what personnel, department or agency will be lead for the administration or implementation of the action.

**Column J - Comments on Implementation, Administration & Integration into Local Planning Mechanisms**
Each mitigation action provides a description of how the jurisdiction will work to incorporate the mitigation activity into other existing planning mechanisms, such as Capital Improvement Plans, ordinance enforcement, public outreach measures or partnership coordination.

**Column K – Possible Funding**
Each mitigation action identifies where potential funding may come from to support implementation of the mitigation activity, such as existing county or city funding, state or federal funding. Projects that may be eligible for future FEMA Hazard Mitigation Assistance grant funding are noted.

*Table 37. Blue Earth County Mitigation Action Chart (2020-2025)*

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | **CODE RED** Conduct public outreach to increase public awareness of the County's CodeRED Emergency Notification System and continue to promote additional outreach delivery systems that are in place. | n/a | **New (2020)** | High | 2020-2025 | BEC Emergency Mgmt. in cord. with local City & Twp. Govt's | This is an ongoing program effort of the BEC Emergency Mgmt. program in coordination with city and township governments. A link for signup for CodeRED is provided on the BEC website. We will continue to promote residents to sign up for the system through our social media, local media and during events or presentations. We will also continue to direct our citizens to the BEC website, local media & social media for updates during emergency events. | County funding |
| 2 | All-Hazards | Education & Awareness Programs | **SOCIAL MEDIA** Work to increase social media following by Blue Earth County residents to support delivery of emergency information and notifications. | n/a | **New (2020)** | High | 2020-2025 | BEC Admin, Emergency Mgmt. | This is an ongoing program effort of the BEC Emergency Mgmt. program. BEC uses Facebook, Twitter, and the BEC website to communicate information to our local constituents. We will work to increase public awareness and use of our social media through social media posts, local news media and during public events or presentations. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 3 | All-Hazards | Mitigation Preparedness & Response Support | **IPAWS** Develop protocol on when to implement the use of the Integrated Public Alert and Warning System (IPAWS) for major emergency events. | n/a | **New (2020)** | High | 2020 | BEC Emergency Mgmt. | BEC Emergency Mgmt. is responsible for the administration and use of our IPAWS system. Developing protocol on when this should be used is an identified need and will be incorporated in the BEC Emergency Operations Plan update. | County funding |
| 4 | All-Hazards | Mitigation Preparedness & Response Support | **STAFF FUNDING/DISASTER RELIEF FUNDING** Continue to adequately fund emergency response staff and ensure there is county disaster relief funding in place. | n/a | Ongoing | High | 2020-2025 | BEC Admin. | In conjunction with the EMPG grant, Blue Earth County continues to provide funds needed for operations. Blue Earth County moved money from the general fund to a disaster relief fund. | County funding, EMPG grant |
| 5 | All-Hazards | Mitigation Preparedness & Response Support | **EM PARTNERSHIPS** Continue to build strong partnerships and provide outreach & education to key partners and local governments regarding disaster preparedness. | n/a | Ongoing | High | 2020-2025 | BEC Emergency Mgmt. | This is an ongoing effort of the BEC Emergency Mgmt. program. We conduct bi-monthly meetings with members of the business community, utilities, hospital, college and First Responders, along with other county departments and key community stakeholders. BEC Emergency Mgmt. holds meetings with city clerks and also conducts regular safety meetings with representatives from our local schools. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 6 | All-Hazards | Mitigation Preparedness & Response Support | **EVACUATION & MASS CARE** Ensure evacuation and mass care sheltering plans & facilities are in place to care for residents at-risk due to a severe weather or other emergency event that poses risk to life safety. | n/a | Ongoing | Mod | 2020-2025 | BEC Emergency Mgmt. | The Blue Earth County EOP addresses evacuation, sheltering plans for people and pets and has designated shelter facilities that have agreements with the American Red Cross. If requested, BEC will provide guidance to critical facilities such as hospitals, nursing homes, schools and civic centers to see that adequate evacuation plans and shelter areas are designated. Such facilities are required to develop their own policies and procedures for emergencies. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 7 | All-Hazards | Mitigation Preparedness & Response Support | **RESPONSE TRAINING** Provide continual training for emergency response personnel that are likely to be involved with the immediate effects of a hazard event. | n/a | Ongoing | High | 2020-2025 | BEC Sheriff's Office & BEC Emergency Mgmt.in coordination with local FD's and other key partners | This is an ongoing effort of the BEC Sheriff's Office and BEC Emergency Mgmt. program. We continue to develop and hold Active Violence/Active Shooter curriculum for the county & region and conduct training events for LE, fire and EMS. Hazmat response exercises are routinely held for emergency personnel and local FD's. The BEC Sheriff's Office holds routine training, including highly contagious infectious disease/ PPE awareness. BEC Emergency Mgmt. participates in annual Healthcare Coalition communication exercises and separate functional exercises. | County, Agency & Partner funding |
| 8 | All-Hazards | Mitigation Preparedness & Response Support | **EOP UPDATES** Continue to update the Blue Earth County Emergency Operations Plan (EOP) to ensure it adequately details the needed steps to respond to all potential hazards. | n/a | Ongoing | High | 2020-2025 | BEC Emergency Mgmt. | This is an ongoing effort of the BEC Emergency Mgmt. program. Our EOP is reviewed on an annual basis. BEC EM staff assures all of the requirements in the MNWALK are implemented into the EOP. The EOP update is presented to the County Board every year. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 9 | All-Hazards | Local Planning & Regulations | **CYBER-ATTACK** Encourage all county departments to evaluate their exposure to a cyber-attack and plan data backups appropriately. | n/a | Ongoing | High | 2020-2025 | BEC Info. Technology | Blue Earth County Information Technology Dept. conducts regular backup on all systems. The county has installed multiple firewalls with encryption that meets BCA and NCIC standards. BEC IT conducts bi-annual security training, requires multi-factor authentication and ongoing staff training to combat phishing e-mails. | County funding |
| 10 | All-Hazards | Mitigation Preparedness & Response Support | **TERRORISM** Conduct an annual review of security measures at government buildings throughout Blue Earth County to ensure current practices are adequate. | n/a | Ongoing | High | 2020-2025 | BEC Safety Committee | The Blue Earth County Safety Committee completed a formal review and update of the Emergency Procedure Manual. AVAS (Active Violence Active Shooter) awareness training has been conducted with several departments, including Human Services, Highway, Courts, County Attorney and Probation. | County funding |
| 11 | All-Hazards | Local Planning & Regulations | **WATER SUPPLY CONTAMINATION** Develop increased protection measures for residential water supplies and systems throughout Blue Earth County. | Yes *(Water Supply Infrastructure)* | Ongoing | Mod. | 2020-2025 | BEC Property & Enviro. Resources | BEC Property and Environmental Services continues to work with well contractors to drill wells which meet the requirements of the state well code. The department also continues to engage in well head protection and works with homeowners to cap unused wells. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 12 | All-Hazards | Mitigation Preparedness & Response Support | **INFECTIOUS DISEASE (EDUCATION)** Provide health education to public and private businesses where the risks of infectious diseases are a concern. | n/a | Ongoing | Mod. | 2020-2025 | BEC Public Health | Blue Earth County Public Health conducts frequent public health education programs to educate public and private businesses on the risk of infectious diseases and tracks the county population to maintain awareness of infectious disease issues. | County funding |
| 13 | All-Hazards | Mitigation Preparedness & Response Support | **INFECTIOUS DISEASE (VACINNATION)** Continue collaborating with health systems to encourage participation in vaccination programs for all Blue Earth County residents. | n/a | Ongoing | Mod. | 2020-2025 | BEC Public Health | BEC Public Health has face-to-face trainings with IMMTRAC programs to help track required inoculations, thus helping to ensure infectious diseases do not readily spread. | County funding |
| 14 | All-Hazards | Local Planning & Regulations | **ANIMAL DISEASE OUTBREAK** Work to prevent and be prepared for a disease outbreak concerning livestock. | n/a | Ongoing | Mod. | 2020-2025 | BEC Property & Enviro. Resources | Environmental Services has studied and is prepared to work with the Board of Animal Health to address any disease outbreaks. We now have access to "City View" program that allows us to see locations of livestock and feedlots. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 15 | Severe Winter & Summer Storms | Education & Awareness Programs | **PUBLIC EDUCATION & AWARENESS** Provide education and awareness on severe winter, spring and summer storms to residents and visitors and promote personal and family emergency preparedness. | n/a | Ongoing | High | 2020-2025 | BEC Emergency Mgmt. | This is an ongoing effort of the BEC Emergency Mgmt. program. We participate in the NWS "Winter Hazard Awareness Week" held in November each year and the "Severe Weather Awareness Week" held in April each year. We encourage the public to listen to local news sources, including television and radio broadcasts and to sign up for our social media outlets. We created PSA's with our local television station on severe weather events and outdoor warning systems. We conduct winter weather talks with third grade students annually in all of our local schools. | County funding |
| 16 | Severe Winter & Summer Storms | Mitigation Preparedness & Response Support | **NOAA WEATHER RADIOS** Continue to ensure placement of severe weather radios in schools and county buildings and promote their use by local residents. | n/a | Ongoing | Mod. | 2020-2025 | BEC Emergency Mgmt. | This is an ongoing effort of the BEC Emergency Mgmt. program. We continue to promote the use of NOAA weather radios in schools, county buildings and by the public. Since 2013 we have added 800 MHz radios in all of the schools. All school administrators have access to CodeRED weather alerts. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 17 | Severe Winter & Summer Storms | Structure & Infrastructure Projects | **BURY/STRENGTHEN POWERLINES** Work with rural & 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. | Yes *(Power System Infrastructure)* | **New (2020)** | High | 2020-2025 | BEC Public Works/Parks in cord. with rural / municipal electric providers | During severe weather events such as: Ice storms, tornados and high winds, many power lines and poles can be damaged or destroyed. BEC in conjunction with our local municipalities and electrical cooperatives will continue address upgrades as needed. | Rural or Municipal Coop funding, FEMA HMA Grant funding |
| 18 | Severe Summer Storms / Tornado | Mitigation Preparedness & Response Support | **SKYWARN TRAINING** Continue to offer annual SKYWARN training to first responders and the public and utilize our BEC storm spotter network. | n/a | Ongoing | Mod. | 2020-2025 | BEC Emergency Mgmt. | BEC Emergency Mgmt. will continue to work with the National Weather Service (NWS) to schedule and promote annual SKYWARN training with the public, firefighters and law enforcement. The training is also provided to any community member wishing to attend. | County, funding, NWS funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 19 | Severe Summer Storms / Tornado | Mitigation Preparedness & Response Support | **WARNING SIRENS** Install new warning sirens within the Blue Earth County parks system and continue to update & maintain existing warning sirens throughout the county. | n/a | **New (2020)** | High | 2020-2025 | BEC Emergency Mgmt. in cord. with BEC Public Works/Parks | There are no warning sirens located in county parks. BEC Emergency Mgmt. along with BEC Parks will work on the potential purchase and installation of new sirens in parks where deemed necessary and feasible. Since 2013 BEC Emergency Mgmt. in conjunction with the local municipalities have updated seven warning sirens throughout the county. Monthly warning siren tests are conducted to ensure functionality. | County funding, USDA Rural Develop-ment Grant |
| 20 | Severe Summer Storms / Tornado | Local Planning & Regulations | **MOBILE HOME PARKS** Encourage mobile home park operators to meet MDH requirements for evacuation plans and storm shelters. | n/a | Ongoing | Low | 2020-2025 | BEC Emergency Mgmt. in cord. with city EM's | MDH sets regulations for mobile home parks (MHP's) in local communities and the county. These entities are required to review these regulations. BEC Emergency Mgmt. will encourage the local communities to work with local MHPs to maintain compliance. BEC currently works with one mobile home park to ensure the storm shelter is open and functional prior to the beginning of each tornado season. | County funding, municipal funding, MHP Operators |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 21 | Severe Summer Storms / Tornado | Structure & Infrastructure Projects | **STORM SHELTERS / TORNADO SAFE ROOMS** Construct new storm shelter facilities or tornado safe rooms in Blue Earth County parks and campgrounds where they are needed and are feasible. | n/a | **New (2020)** | High | 2020-2025 | BEC Emergency Mgmt. and BEC Public Works/Parks | BEC County Public Works/Parks Dept. desires to construct storm-rated facilities within the county park system as it replaces restrooms and comfort stations. Priorities will be given to parks with campground facilities (Bray Park, Daly Park and Rapidan Park). Construction of any shelter or safe room facilities will be carried out in conjunction with BEC Emergency Mgmt. Planning efforts will be administered by the Parks Dept. and may include an application for FEMA grant funding. | County funding, FEMA HMA Grant funding |
| 22 | Extreme Temps | Mitigation Preparedness & Response Support | **VULNERABLE POPULATIONS** Provide outreach & education to vulnerable populations in the community (i.e., senior citizens, young adults) on personal safety measures to take during periods of extreme heat / cold. | n/a | Ongoing | High | 2020-2025 | BEC Emergency Mgmt. in cord. with BEC PH & BEC HS | During periods of extreme temps BEC Emergency Mgmt. works to inform the public on dangerous conditions due to heat/cold, in particular to the elderly or to youth. If temporary sheltering is needed during a period of extreme heat/cold, it is coordinated jointly by BEC PH and BEC HS. | County funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 23 | Flood | Local Planning & Regulations / Education & Awareness Programs | **NATIONAL FLOOD INSURANCE PROGRAM** Continue to administer the County's participation in the NFIP and encourage property owners to learn about and purchase NFIP insurance. | Yes *(NFIP Enforcement)* | Ongoing | High | 2020-2025 | BEC Property & Enviro. Resources in cord. with BEC Emergency Mgmt. | BEC Property & Enviro. Services continues to administer and enforce requirements of the NFIP. The department oversees regulation for any construction, development and use activities within the various areas of floodplain and works with private property owners to ensure they are in compliance. BEC will continue to recommend to our local communities and county residents who have been affected, or potentially could be affected by flood, to educate themselves and subscribe to personal NFIP insurance. | County funding |
| 24 | Flood | Local Planning & Regulations | **FLOODPLAIN MAPS & ORDINANCE** Adopt the preliminary FEMA Flood Insurance Rate Maps when they are approved by FEMA and revise the county floodplain ordinance to conform to FEMA/MNDNR standards. | Yes *(Floodplain Maps)* | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix H – Flooding Section. Planning and project management efforts are led by the BEC Property and Environmental Services Dept. | County funding, FEMA |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 25 | Flood | Local Planning & Regulations | **GIS – FLOOD RISK ANALYSIS** Conduct geospatial analysis of high-risk areas in the county to help identify infrastructure, homes and property deemed at high-risk to flooding. | n/a | **New (2020)** | Mod. | 2020-2025 | BEC Public Works in cord. with BEC Info Technology | BEC has a part-time GIS Coordinator position that can support the BEC Emergency Management team, plus there are additional GIS resources available in various county departments. | County funding |
| 26 | Flood | Structure & Infrastructure Projects | **LOCALIZED FLOOD REDUCTION PROJECTS** Maintain or replace levees, storm water drains or other flood reduction structures to prevent damage to structures/utilities due to flooding. | Yes *(Stormwater System Infrastructure)* | Ongoing | High | 2020-2025 | BEC Public Works/Parks in cord. with city & twp. Gov't. | The BEC Public Works/Parks Dept. continuously maintains our local levee system and stormwater systems. BEC has been replacing older intake structures with newer designs that are stronger and able to temporarily store water, thus reducing peak flows to downstream rivers and lakes. In Sept. 2016 the county worked with the city of St. Clair to construct an additional levee to prevent flooding of their wastewater treatment plant. | County, municipal funding, FEMA HMA grant funding, MN DNR Flood Hazard Mitigation Grant |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 27 | Flood | Structure & Infrastructure Projects | **TRANSPORTATION FLOOD IMPROVEMENT PROJECTS**<br><br>Increase culvert size and road height in locations across the county where repetitive water overtopping and erosion damages occur. | Yes *(Transportation Infrastructure)* | **New (2020)** | High | 2020-2025 | BEC Public Works/Parks | The BEC Public Works/Parks department develops and maintains a 5-year transportation improvement plan which prioritizes and details the improvement projects for roads, culverts, bridges and more across the county. Since 2010 several township roads have been upgraded with FEMA disaster relief funds. Public Works performs routine inspections every two years and more frequently for bridges designated higher risk, in conjunction with MNDOT and FHWA administration. Public Works has also been rip-rap armoring vulnerable bridge abutments, roads and other public infrastructure to protect against flood damage. | County funding, FEMA HMA grant funding, MN DNR Flood Hazard Mitigation Grant |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 28 | Flood | Local Planning & Regulations | **HOMES IN FLOODPLAIN/ HIGHLY ERODIBLE AREAS (BUYOUTS)** Identify and acquire repetitive flood properties or properties in highly erodible areas through a buyout process and convert them to open space. | Yes *(Property Buyouts)* | **New (2020)** | High | 2020-2025 | BEC Public Works/Parks in cord. with MN DNR | This is an ongoing effort led by BEC Public Works/Parks Dept. and BEC Planning & Zoning. BEC will continue to work to buy out flood-prone or highly erodible properties and convert them to open space. Currently in 2020, the county is reviewing the buyout of flooded/highly erodible properties. FEMA mitigation grant funding would be pursued to support this effort. The county has been successful in past property acquisitions using FEMA HMA funding. The initial focus for acquisitions will be on flooded areas in Garden City. | County funding, MN DNR funding, FEMA HMA grant funding |
| 29 | Flood | Natural Systems Protection / Structure & Infrastructure Projects | **MAINTAIN EXISTING WATER STORAGE CAPACITY** Maintain the existing water storage capacity in the floodplain by preventing further development and fill from being added to the floodplain. | n/a | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix H – Flooding Section. Planning and project management efforts are led by the BEC Property and Environmental Services Dept. | County funding, FEMA HMA grant funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 30 | Flood | Natural Systems Protection / Structure & Infrastructure Projects | **INCREASE NEW WATER STORAGE CAPACITY** Increase the water storage capacity at or below 100-year flood elevations and in areas with known flood inundation to help minimize the severity and frequency of flooding and high water by targeting wetland restorations and water storage in wetland areas. | n/a | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix H – Flooding Section. Planning and project management efforts are led by the BEC Property and Environmental Services Dept. | County, FEMA HMA Grant Funding |
| 31 | Flood | Natural Systems Protection / Structure & Infrastructure Projects | **WATERSHED MANAGEMENT** Increase water storage to enhance stormwater storage within and draining to developed areas by restoring wetlands and developing green infrastructure to increase water storage in watersheds with developed/developing land use. | Yes (Existing/New Buildings) | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix H – Flooding Section. Planning and project management efforts are led by the BEC Property and Environmental Services Dept. | County funding, FEMA HMA Grant Funding, SWCD Cost Share Program |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 32 | Flood / Erosion | Natural Systems Protection / Structure & Infrastructure Projects | **STREAM CHANNEL RESTORATION** Restore channelized stream corridors to provide flood water storage and attenuation, wildlife habitat and nutrient assimilation functions. | n/a | **New (2020)** | Mod. | 2020-2025 | BEC Property & Enviro. Resources in cord. with BEC SWCD | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix H – Flooding Section. Planning and project management efforts are led by the BEC Property and Environmental Services Department. | County funding, FEMA HMA Grant Funding, SWCD Cost Share Program |
| 33 | Flood/ Erosion | Natural Systems Protection | **RURAL ROADS EROSION** Ensure township roads throughout the county are resistant to over-the-road flooding and erosion. | Yes *(Transportation Infrastructure)* | Ongoing | Mod. | 2020-2025 | BEC Public Works/Parks in cord. with Twp. Govt's. | This is an ongoing effort of BEC Public Works in coordination with local townships. Since 2010, many of the township roads in Blue Earth County have been upgraded. This occurred in conjunction with five Presidential disaster declarations. Township governments maintain a list of necessary road, culvert and bridge improvements and work with Blue Earth County as needed to address those improvements. In cases where extensive mitigation measures are needed outside grant funding may be pursued (i.e., FEMA HMA, MN DNR). | County funding, FEMA HMA Grant Funding, MNDNR Flood Hazard Mitigation Grant Funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 34 | Erosion | Local Planning & Regulations | **BLUFF PROTECTION & STABILIZATION** Increase zoning requirements for dwelling set-backs from bluffs to decrease development impacts and reduce risk of slope failure. | Yes *(Limits Risk to New Buildings)* | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix L – Near Channel Erosion Section. BEC Environmental Services and Emergency Mgt. will work with elected county and city officials in an attempt to increase setbacks on highly erodible land. | County funding |
| 35 | Erosion | Natural Systems Protection | **EROSION ASSESSMENTS (LiDAR DATA)** Evaluate the need for use of elevated and ground LIDAR data to help determine rates of erosion and change along the river valleys, bluffs, ravines and steep slopes in the county. | n/a | **New (2020)** | Mod. | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix L – Near Channel Erosion Section. Planning and project management efforts are led by the BEC Property and Environmental Services Department. | County funding |
| 36 | Erosion | Natural Systems Protection | **WATER STORAGE / WETLAND RETENTION** Restore wetlands and construct water storage practices in areas contributing runoff directly to bluffs streambanks, bluff and ravines. | n/a | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix L – Near Channel Erosion Section. Planning and project management efforts are led by the BEC Property and Environmental Services Department. | County funding, FEMA HMA Grant Funding, SWCD Cost Share Program |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
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| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 37 | Erosion | Local Planning & Regulations | **STORMWATER REGULATIONS** Review and revise stormwater management and land use ordinances and policies to decrease surface runoff and subsurface tile drainage water discharges directed to streambanks, bluffs and ravines to reduce erosion with stormwater management practices. | n/a | **New (2020)** | High | 2020-2025 | BEC Property & Enviro. Resources | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix L – Near Channel Erosion Section. Planning and project management efforts are led by the BEC Property and Environmental Services will work in conjunction with local municipalities to enhance these practices. | County funding |
| 38 | Erosion | Local Planning & Regulations / Education & Awareness Programs / Natural System Protection | **LANDOWNER EDUCATION & TECHNICAL ASSISTANCE** Seek funds and develop funding mechanisms to provide technical information for landowners about preventing and managing ravine erosion. Also provide outreach and assistance to farmers on soil conservation best practices to reduce agricultural soil losses due to flooding that can affect nearby streams and rivers. | n/a | **New** | High | 2020-2025 | BEC Property & Enviro. Resources, USDA-NRCS, BEC SWCD | This is a mitigation action identified in the 2017-2026 Blue Earth County Water Management Plan, Appendix L – Near Channel Erosion Section. Planning and project management efforts are led by the BEC Property and Environmental Services Department. The USDA – NRCS office in Mankato as well as the Blue Earth County SWCD regularly provide outreach and technical assistance to agricultural landowners in the County to assist with flood and erosion control measures. | County funding, USDA-NRCS funding, BEC SWCD Funding |

| Blue Earth County Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New/ Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 39 | Dam Failure | Local Planning & Regulations | **EMERGENCY ACTION PLAN** Maintain an updated Emergency Action Plan (EAP) for the Rapidan Dam and the adjacent Park/Campground. | n/a | **New (2020)** | Low | 2020-2025 | Ontario Power Generation | The EAP is annually updated by Ontario Power Generation and submitted to the Federal Energy Regulatory Committee as well as Blue Earth County. The Rapidan Dam is not a high-risk dam and has not experienced dam failure. | Ontario Power Generation Funding |
| 40 | Dam Failure | Structure & Infrastructure Projects | **DAM SAFETY** Inspect all Blue Earth County dams and reservoirs to ensure structural integrity and safety. | Yes *(Dams & Reservoirs Infrastructure)* | Ongoing | Mod. | 2020-2025 | Ontario Power Generation | Blue Earth County's dam operations are managed by Ontario Power Generation. OPG conducts annual inspections with the Federal Energy Regulatory Committee. | Ontario Power Generation Funding |

*The mitigation activities listed in the **Blue Earth County Mitigation Action Chart** were identified for inclusion in the county's 2020 Multi-Hazard Mitigation Plan Update through county staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into county planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of Blue Earth County.*

### 5.3.2 Mitigation Actions by Community

This plan is a multi-jurisdictional plan that covers Blue Earth County, its school districts and the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, St. Clair, Skyline and Vernon Center. Steering committee members from each community participated directly in the development of local mitigation action charts for implementation. The Blue Earth County risks and mitigation activities identified in this plan also incorporate the concerns and needs of townships and other entities participating in this plan.

Steering committee members, elected government officials and staff from each city jurisdiction actively participated in the development of mitigation action charts for implementation over the next five years (2020-2025). Identification of local mitigation actions were informed by a community's known high-risk hazards, vulnerabilities and capabilities for mitigation (i.e., policies, programs, staff, funding or other resources).

The following representatives provided review and input to mitigation actions to be included in their respective draft Mitigation Action Chart (MAC) as part of the Blue Earth County 2020 MHMP Update.

*Table 38. Representatives Providing Input for Mitigation Actions*

| Name of Jurisdiction | MAC Reviewers |
|---|---|
| Blue Earth County | Michael Maurer, Chief Deputy/EM Director<br>Brenda Olmscheid, Asst. EM Coordinator<br>Paul Barta, Captain/EM Member<br>Dan Davidson, Lieutenant/EM Member |
| City of Amboy | Patty Smith, City Clerk/Administrator |
| City of Eagle Lake | Jennifer Bromeland, City Administrator |
| City of Good Thunder | Ashney Helleksen, Clerk-Treasurer<br>Sarah Karels, City Council<br>Robert Anderson, Mayor<br>Brian Beckel, City Maintenance<br>Phil Klammer, Fire Chief |
| City of Lake Crystal | Taylor Gronau, City Administrator<br>Bill Daley, Public Works Superintendent<br>Dean Tibbetts, Streets & Maintenance Superintendent<br>Mathias Phelps, Electric Utility Superintendent |
| City of Madison Lake | Liz Wille, City Clerk<br>Dan Bunde, Chief of Police |
| City of Mankato | Pam Hermanson, EM Director<br>Justin Neuman, Administrative Sergeant<br>Jim Tatge, Facilities Project Coordinator<br>Michael McCarty, Senior Civil Engineer |
| City of Mapleton | Patty Woodruff, City Clerk/Administrator<br>Amber Duncanson, City Staff |
| City of Pemberton | Darla Ward, City Clerk/Administrator |
| City of Skyline | Paige Attarian, Mayor |
| City of St. Clair | Catherine Seys, City Clerk/Administrator |
| City of Vernon Center | Diane Roelofs, City Clerk/Administrator |

Mitigation actions are separated by jurisdiction in Appendix G.

# Section 6 – Plan Maintenance

## 6.1 Monitoring, Evaluation, and Updating the Plan

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

The Blue Earth County Emergency Management Director is the individual responsible for leading all efforts to monitor, evaluate and update the hazard mitigation plan within the five-year window. Throughout the five-year planning cycle, the Blue Earth County Emergency Management Director will work with Blue Earth County and its constituents to monitor, review, evaluate and update the Multi-Hazard Mitigation Plan. Blue Earth County, Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, Skyline, St. Clair and Vernon Center along with any additional stakeholders will meet as needed to complete these objectives. If necessary, the Blue Earth County Emergency Management Director will convene the group to meet on a regular basis 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 Blue Earth 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 MHMP goals and objectives to determine their relevance to changing situations in Blue Earth County. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The committee will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The parties responsible for implementation actions will report on the status of their projects, and 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 MHMP 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 the committee deems appropriate and necessary, and approved by county commissioners.

Throughout the five-year window of the plan, each respective county department and jurisdiction will monitor the progress of mitigation actions and retain records to provide Blue Earth County Emergency Management progress notes that will be maintained for the next plan update.

## 6.2 Implementation

Blue Earth County and its municipalities share a common Multi-Hazard Mitigation Plan and work together closely to develop, revise and implement it. The MHMP provides a comprehensive chart of mitigation actions for Blue Earth County and its jurisdictions (see Section 5.3.1, *Hazard Mitigation Actions*). The cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, Skyline, St. Clair and Vernon Center participated in the MHMP planning process and 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 Section 5.3.

A number of implementation tools are available to address hazards. Many of these tools are below, however, in some cases additional discussion is needed to identify the most important strategies. These tools and strategies are part of ongoing discussions as Blue Earth 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 man-made hazards.

**Data Collection and Needs Assessments:** Data collection and needs assessments aid in gaining a better understanding of threats and facilitate planning for mitigation strategies. Because resources are limited for this part of the planning process, additional data collection is likely to occur as resources become available.

**Coordination:** Responsibilities for mitigation strategies include, local fire and ambulance departments, city and township governments, and a host of state and federal agencies. Ongoing coordination ensures resources are used efficiently. Coordination avoids duplication of efforts, prevents gaps created by unclear roles and responsibilities. The mitigation plan review process functions as a tool providing ongoing discussion of roles, responsibilities, and opportunities for coordination.

**Regional Cooperation:** Counties and public safety services providers throughout the region share similar challenges and concerns. In some cases, a regional approach may be warranted as a mitigation strategy 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 help in lobbying for funding priorities that address concerns relating to challenges in service delivery in rural areas. Organizations such as FEMA Region V and the MN Department of HSEM through the Regional Program Coordinator offer tools and resources to assist in these cooperative efforts.

**Regulation:** Regulation is an important mitigation tool for Blue Earth County. Regulation plays a particularly important role for 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 Multi-Hazard Mitigation Plan (MHMP). Blue Earth County Emergency Management and their local constituents will continue to engage new public stakeholders in planning discussions and project implementation during the five-year cycle of this plan.

In order to seek continued public participation after the plan has been approved and during the five-year window of implementation for this plan, Blue Earth County will take the following measures:

- The plan will be posted on the Blue Earth County Emergency Management website for the public to read and provide feedback. The feedback collected will be reviewed and the plan will be amended as necessary.

- Following any major storms or natural disasters, Blue Earth County Emergency Management will gather concerns and new ideas for mitigation from residents to be included in the next update of the plan.

- Each community participating in the plan will be responsible to keep their local government, schools and community members updated and engaged in the implementation of their respective mitigation action charts (see *Appendix G: Mitigation Actions by Jurisdiction*). Each respective jurisdiction will maintain records of the status of their mitigation actions.

- Jurisdictions will use public outreach to engage new stakeholders in providing input on mitigation efforts or concerns on hazards by sharing information at city council / township board meetings, sharing information at special events, working with local schools and partner organizations, and posting information on relevant local or social media that their 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.

# APPENDICES

Appendix A – Blue Earth County Maps
Appendix B – Blue Earth County Critical Facilities
Appendix C – Blue Earth County Hazard Events
Appendix D – Adopting Resolutions
Appendix E – Steering Committee Meetings
Appendix F – Public Outreach & Engagement Documentation
Appendix G – Mitigation Actions by Jurisdiction
Appendix H – Past Mitigation Action Review Status Report (2013-2019)
Appendix I – Works Cited
Appendix J – Blue Earth County Plans & Programs In Place
Appendix K – Local Mitigation Survey Report
Appendix L – Minnesota Department of Health Climate & Health Report

# Appendix A
# Blue Earth County Maps

*Figure A - 1. Hydrography of Blue Earth County*

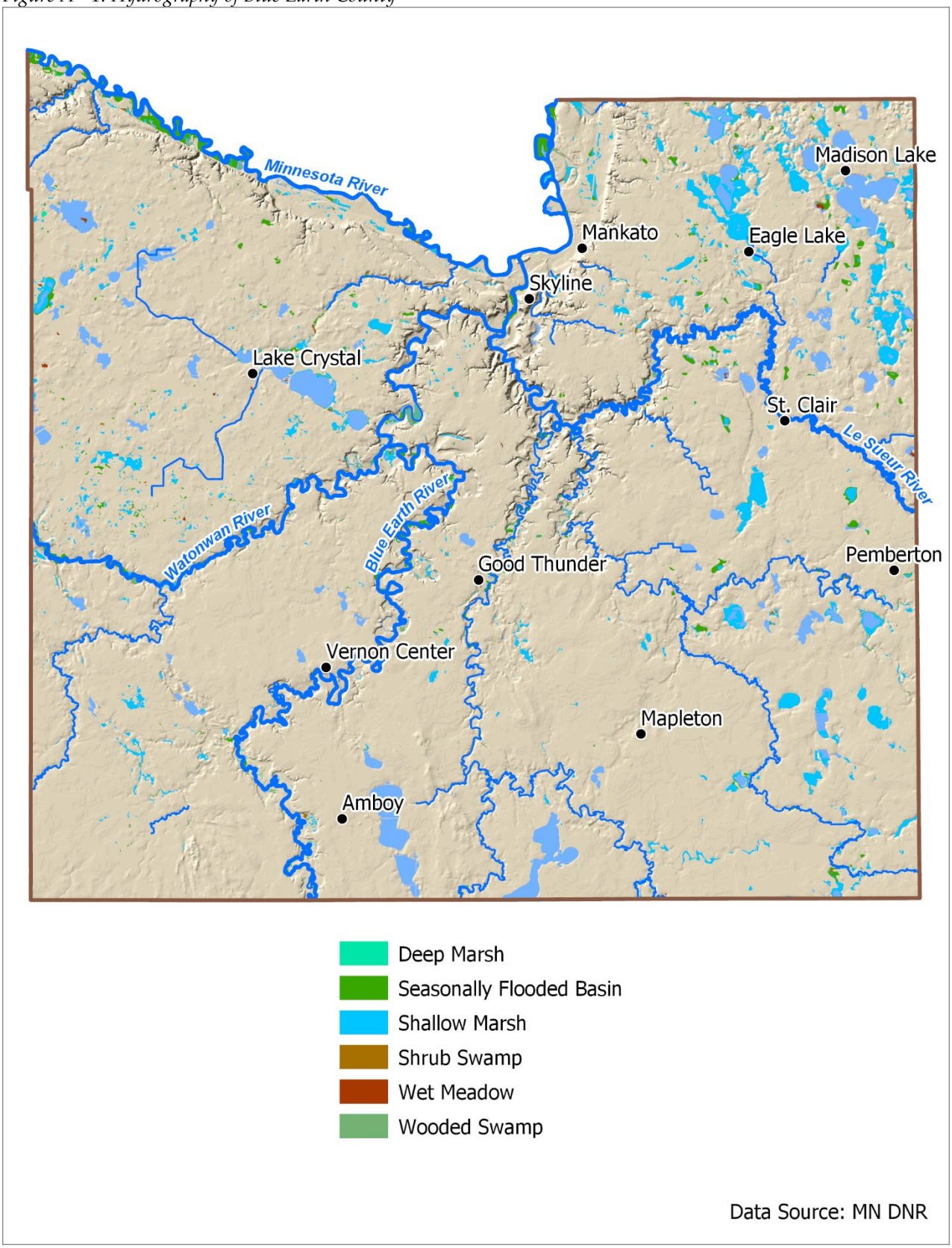


*Figure A - 2. Blue Earth County Population by Census Block, 2010*

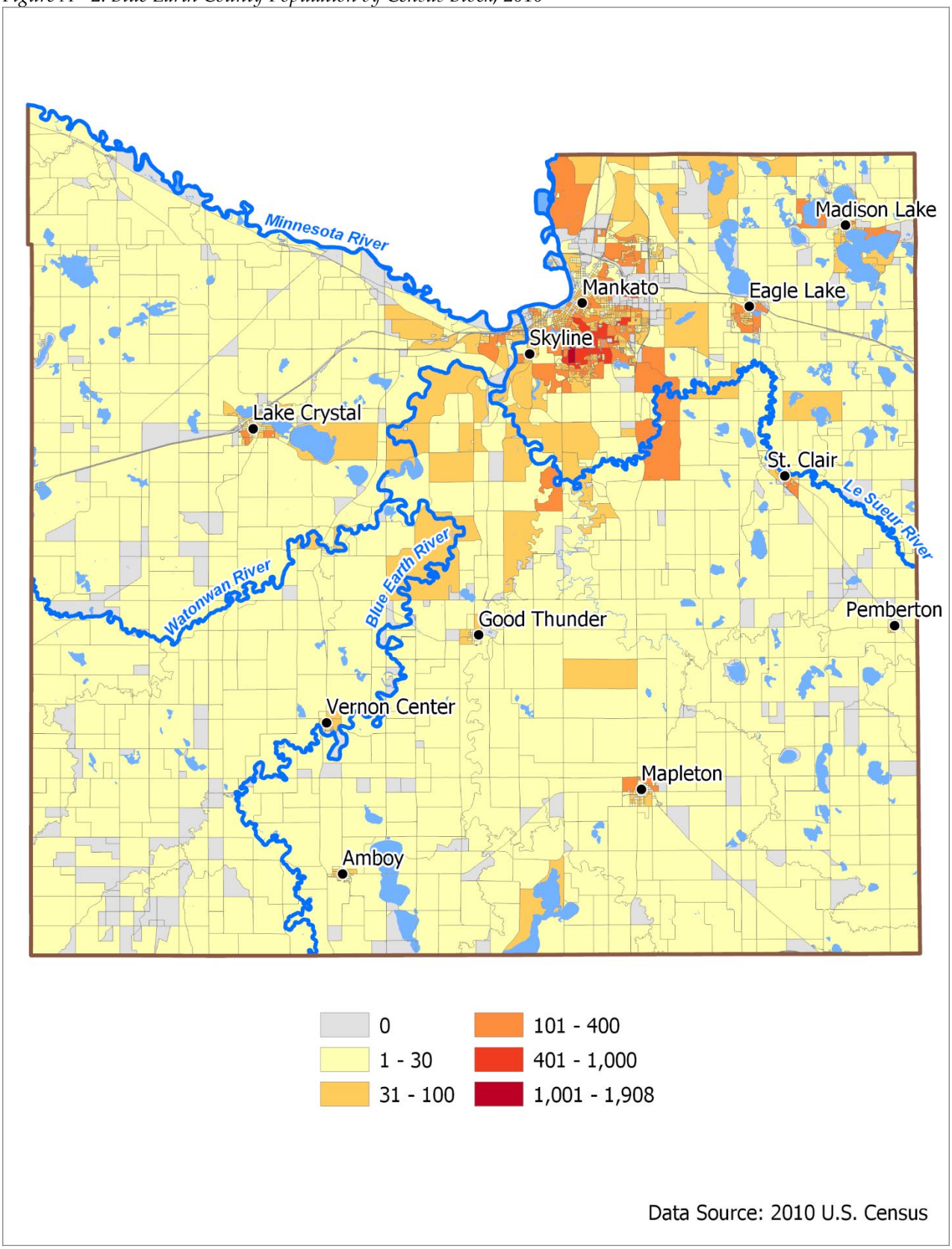


*Figure A - 3. Percent Population Change, 2000-2010*

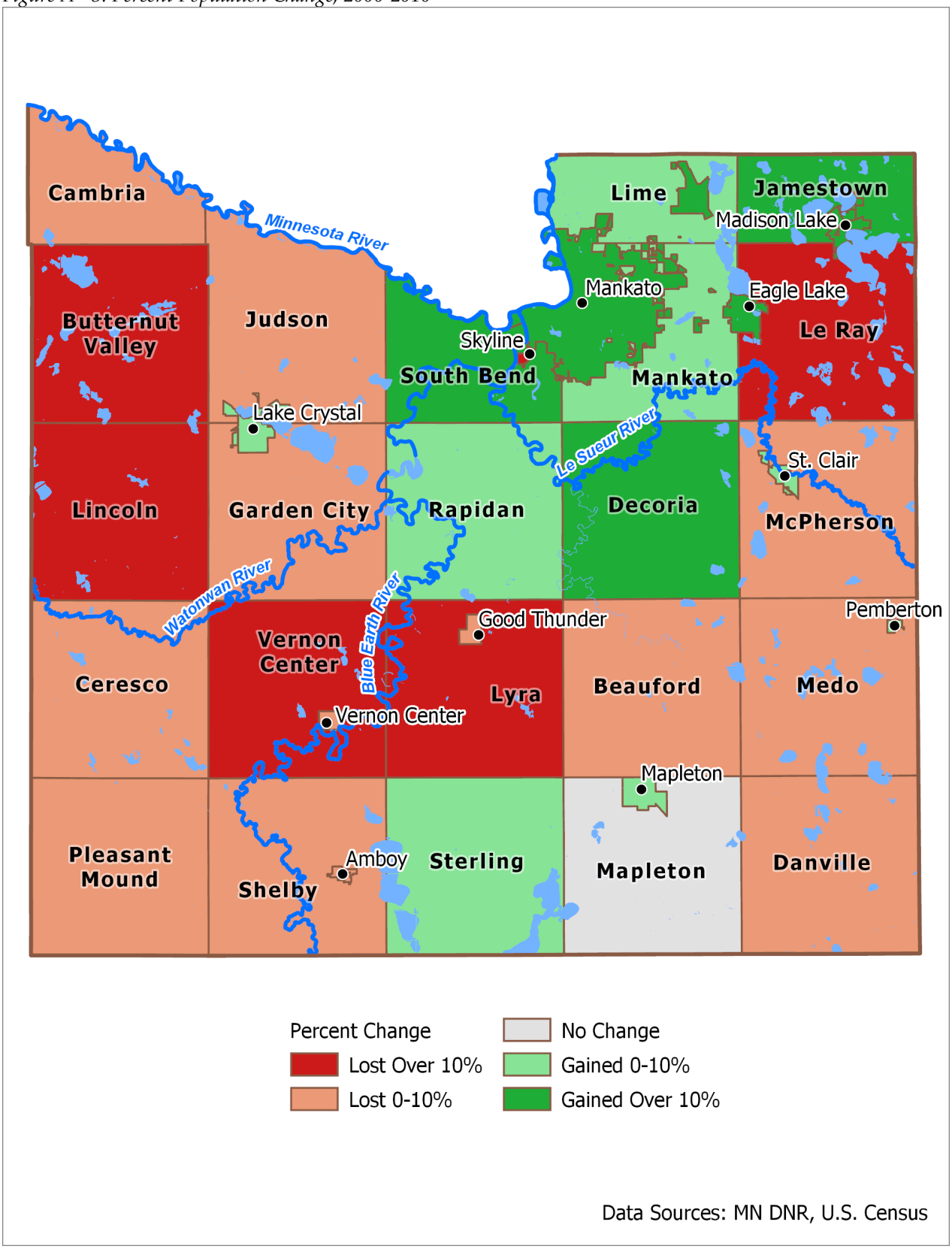


*Figure A - 4. Emergency Facilities and Shelters in Blue Earth County*

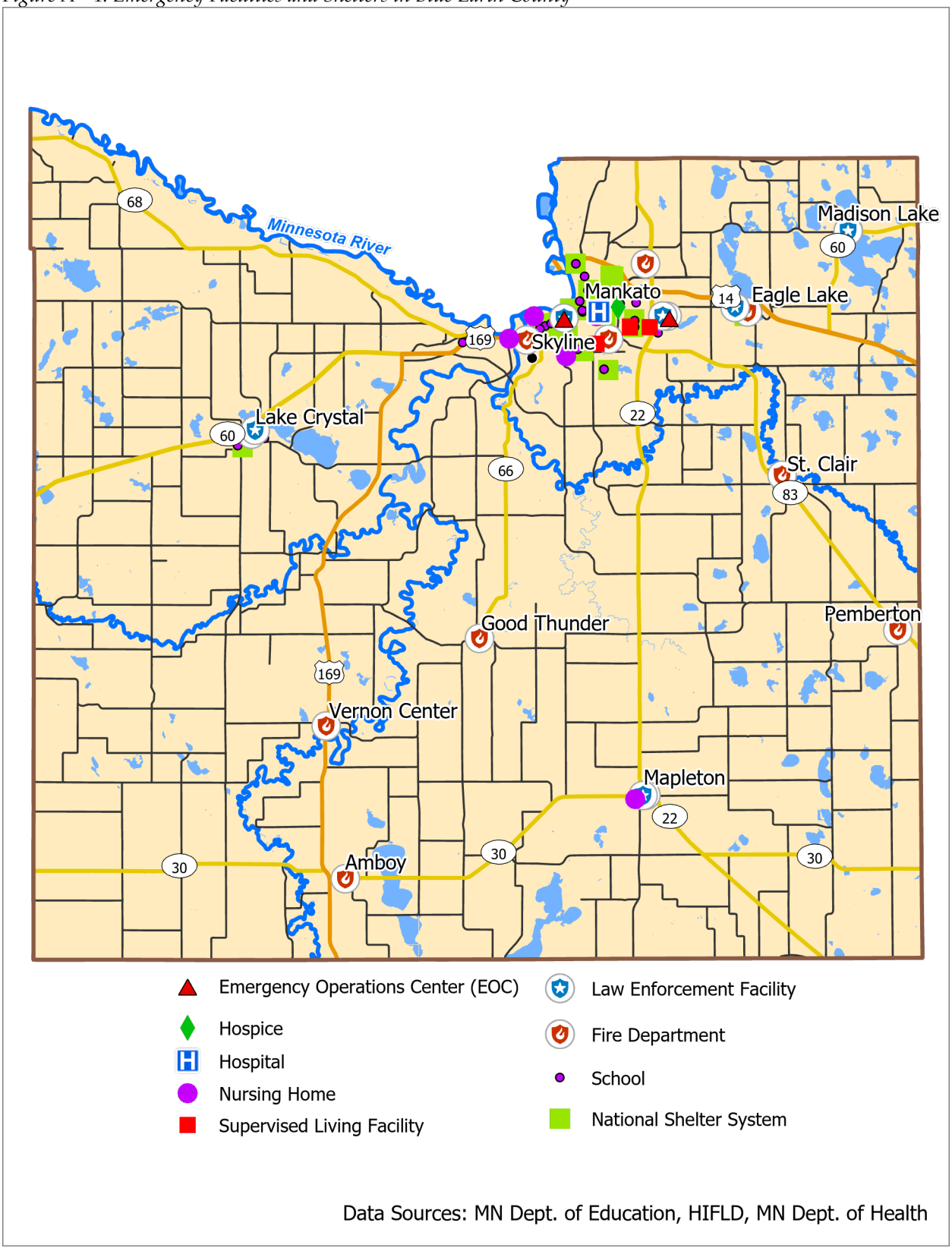


*Figure A - 5. Fire Departments and Fire Response Times in Minutes in Blue Earth County*

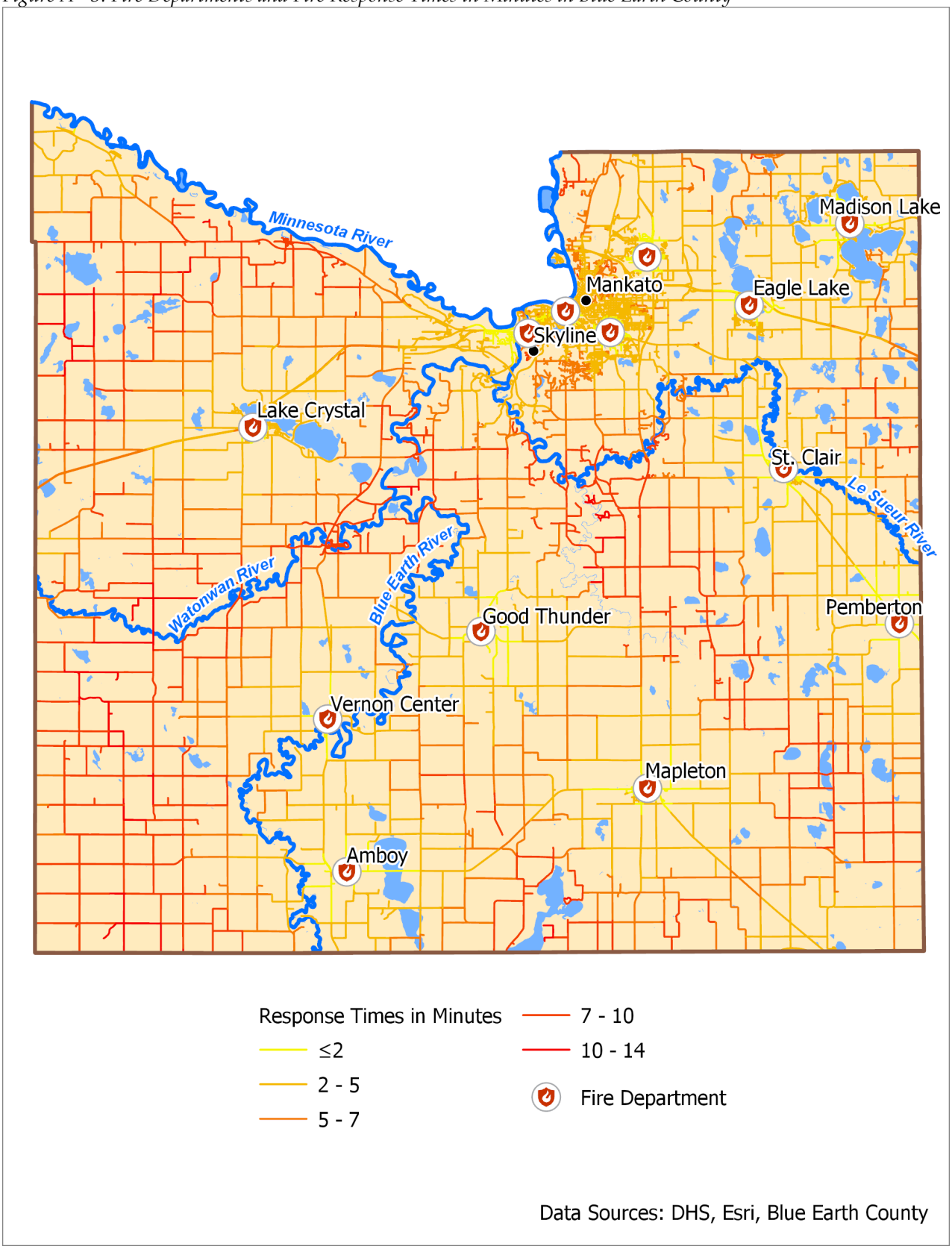


*Figure A - 6. Blue Earth County Utilities and Communication Infrastructure*

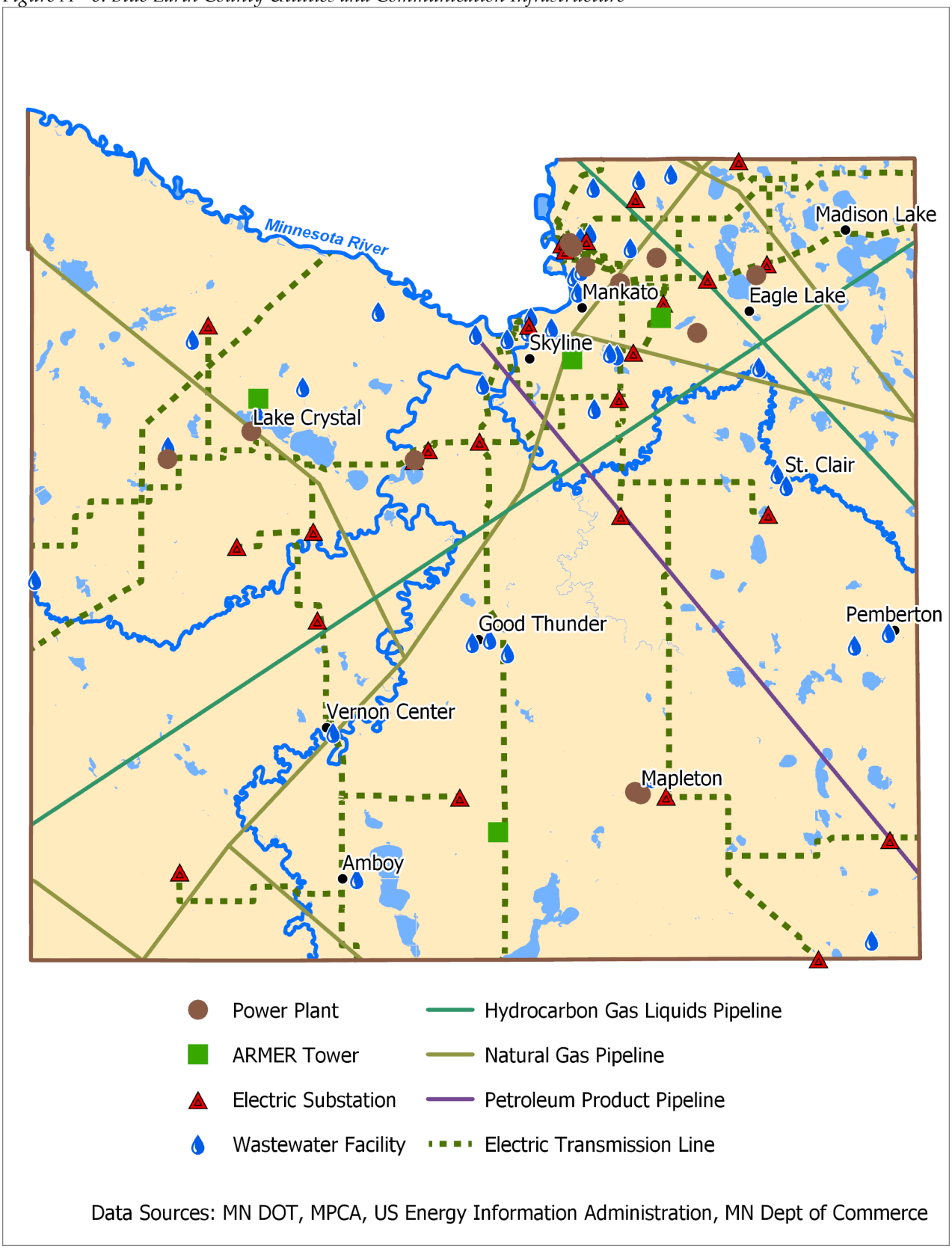


*Figure A - 7. Blue Earth County Transportation Infrastructure*

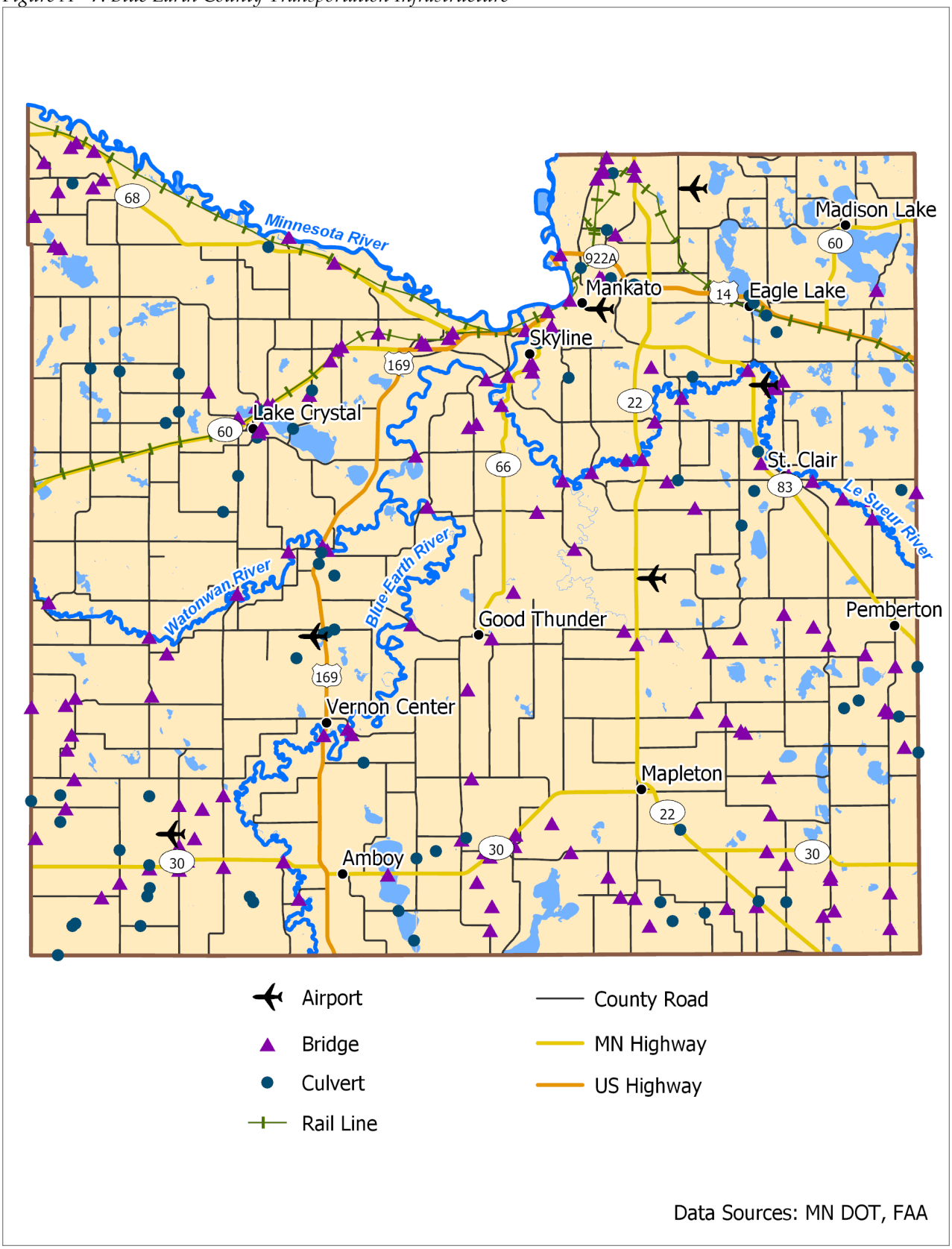


*Figure A - 8. Blue Earth County Land Cover, National Land Cover Database, 2011*

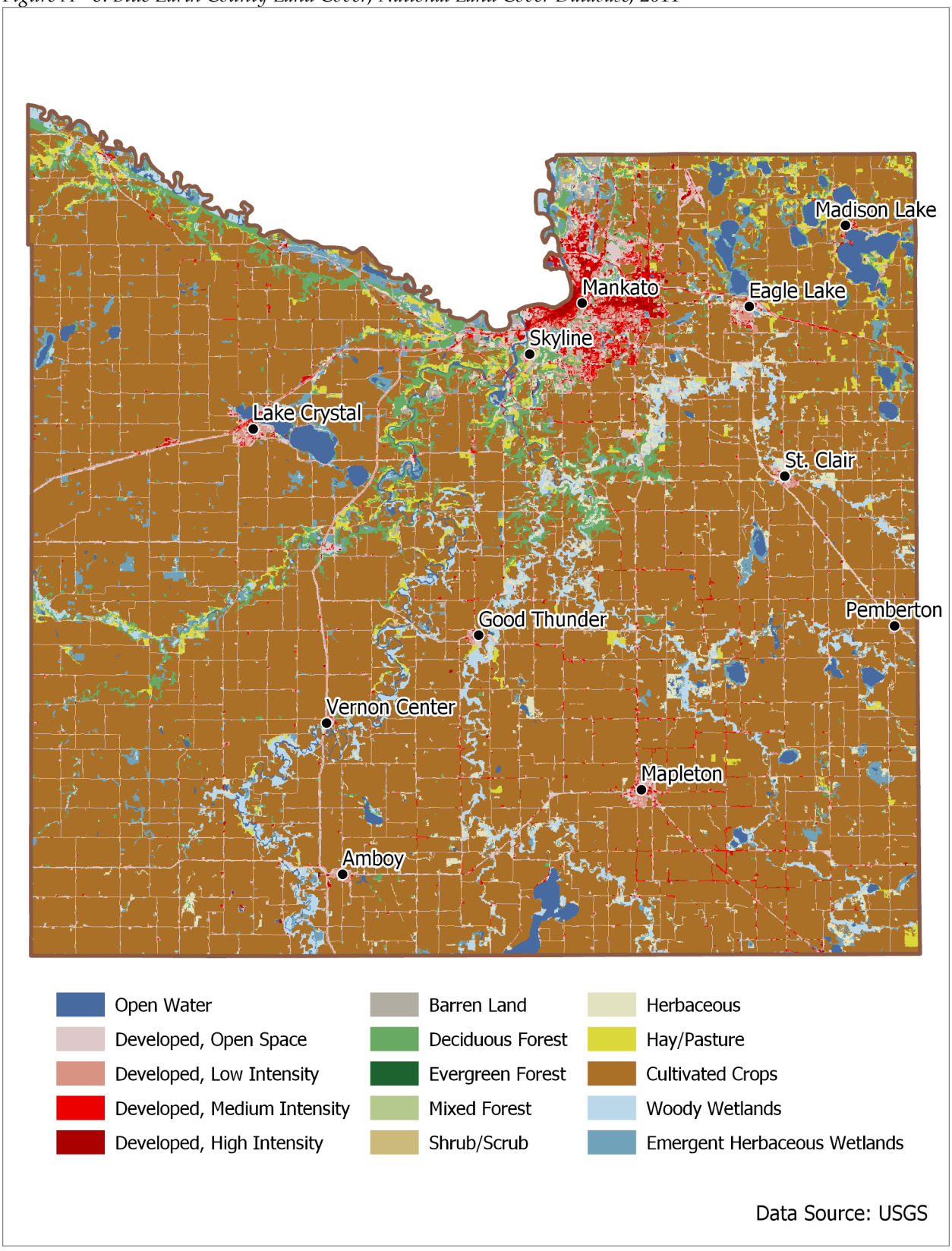


*Figure A - 9. Blue Earth County Land Ownership by Agency*

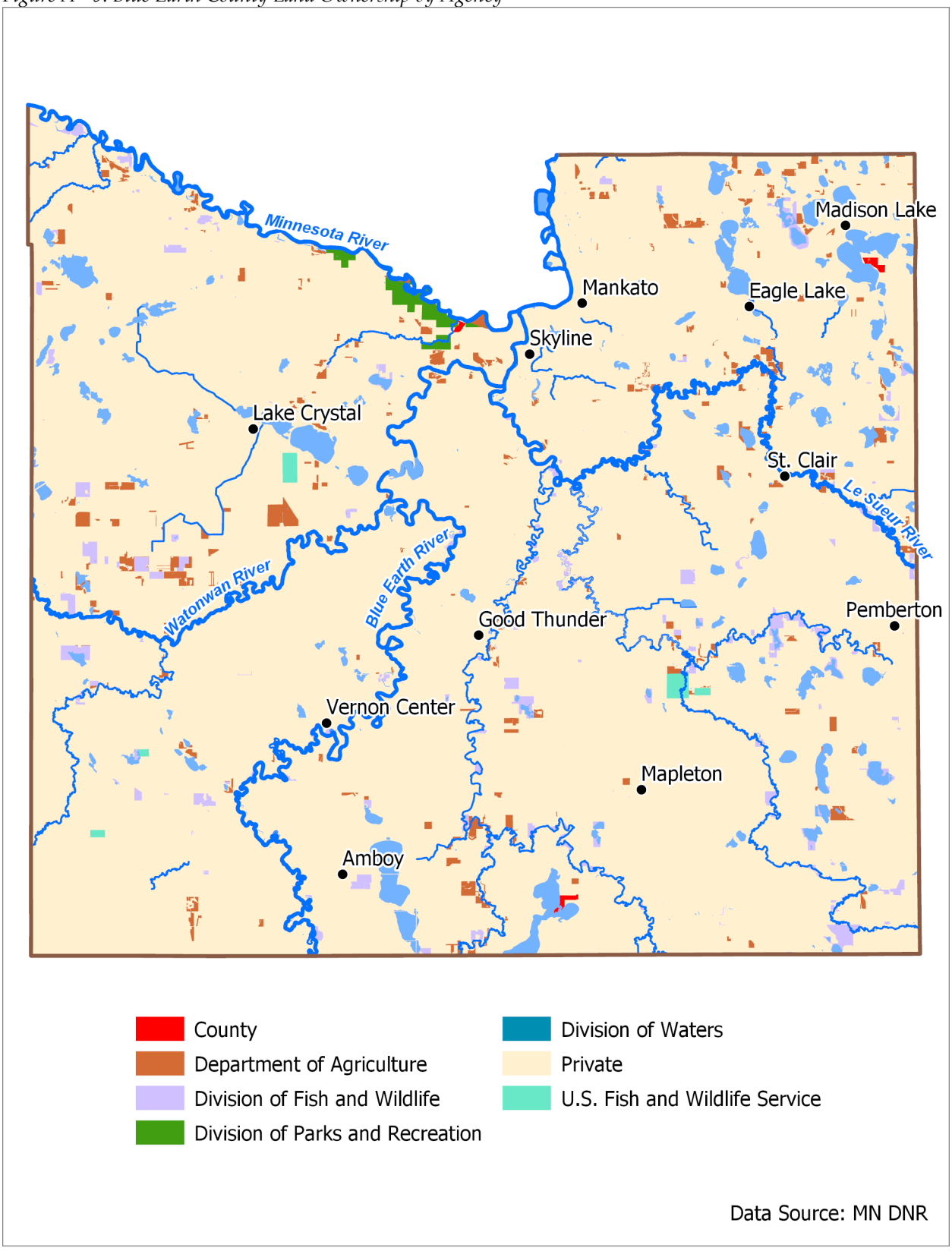


*Figure A - 10. Mobile Home Parks in Blue Earth County*

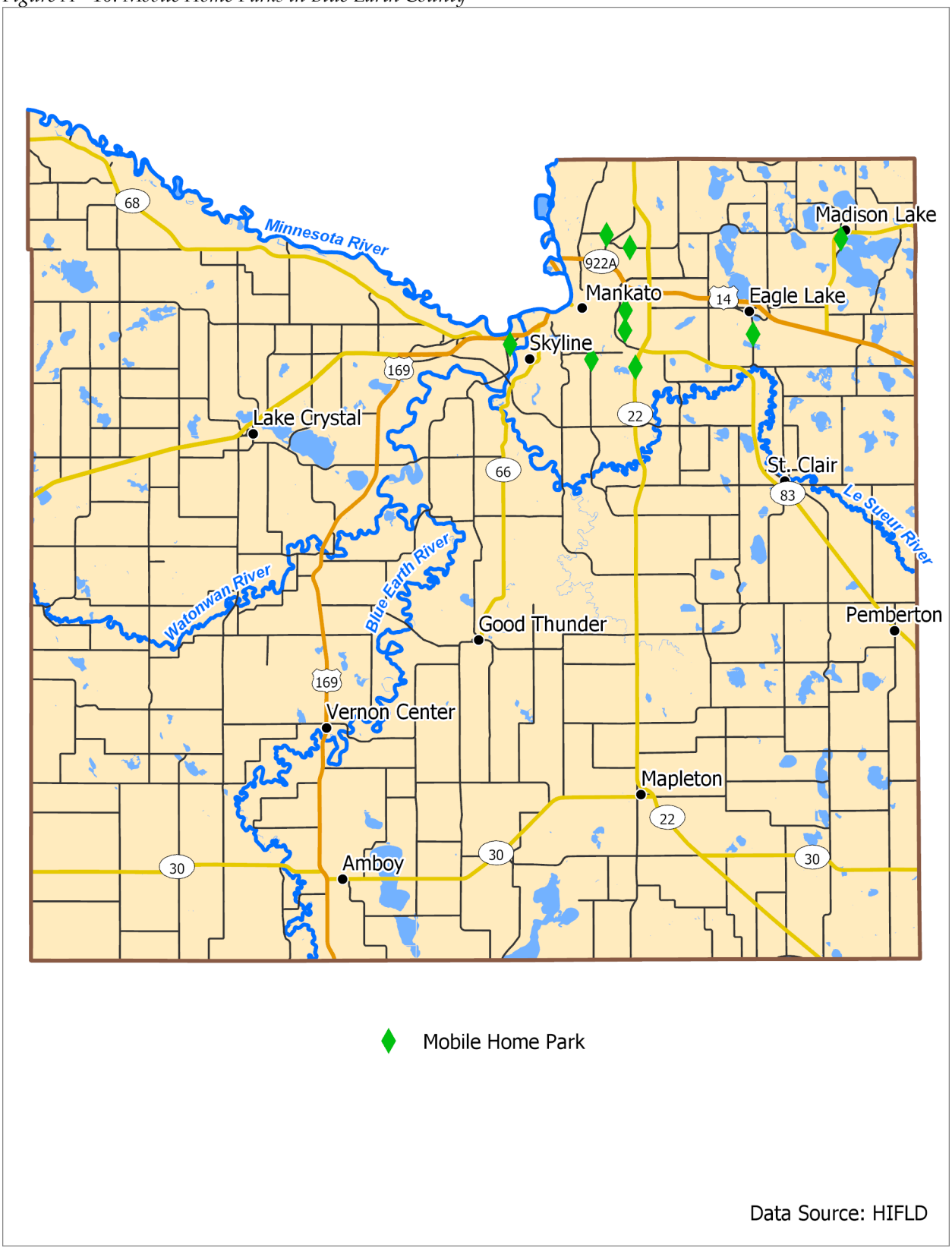


*Figure A - 11. Severe Hailstorms in Blue Earth County, 1955-April 2019*

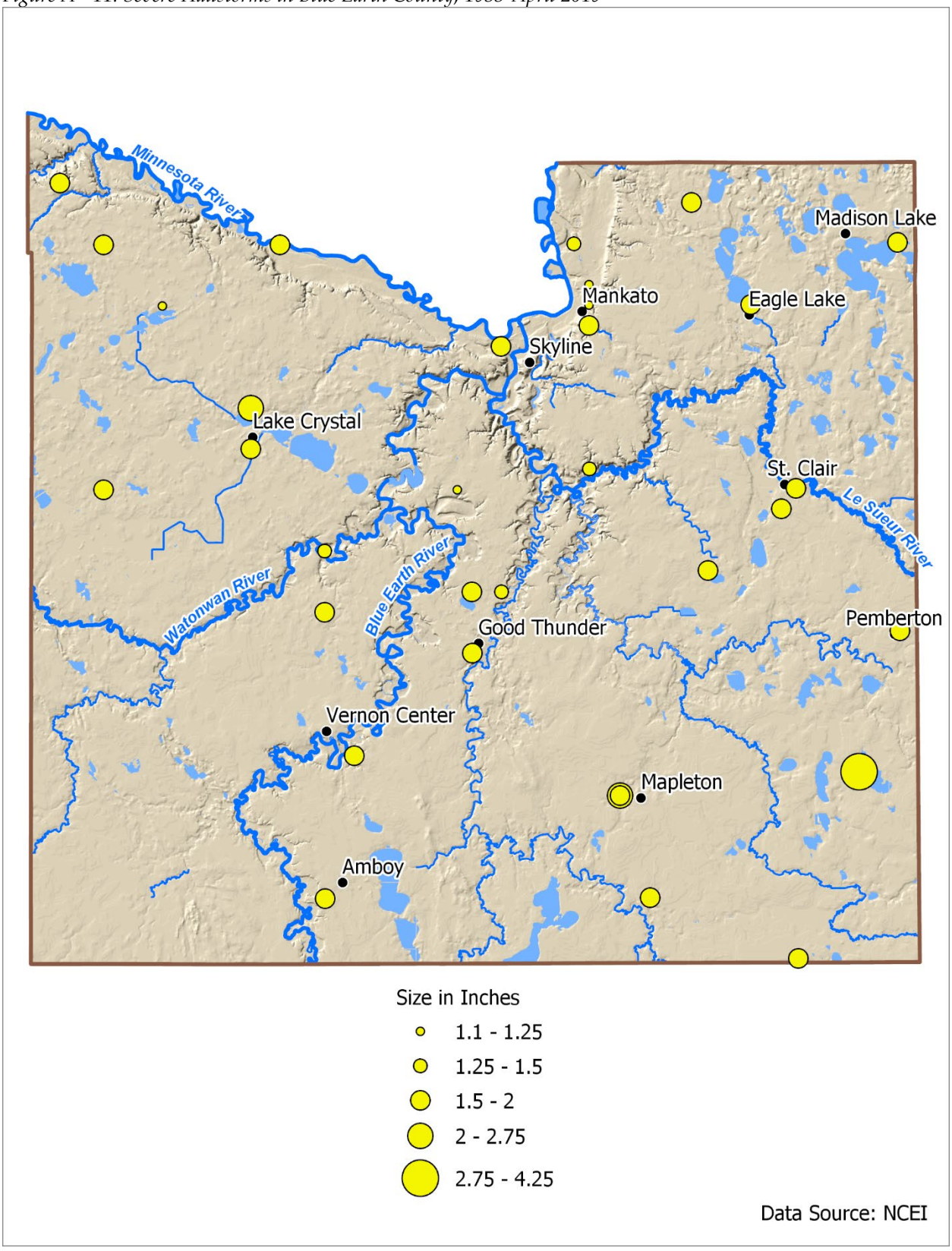


*Figure A - 12. Severe Windstorms in Blue Earth County, 1955-April 2019*

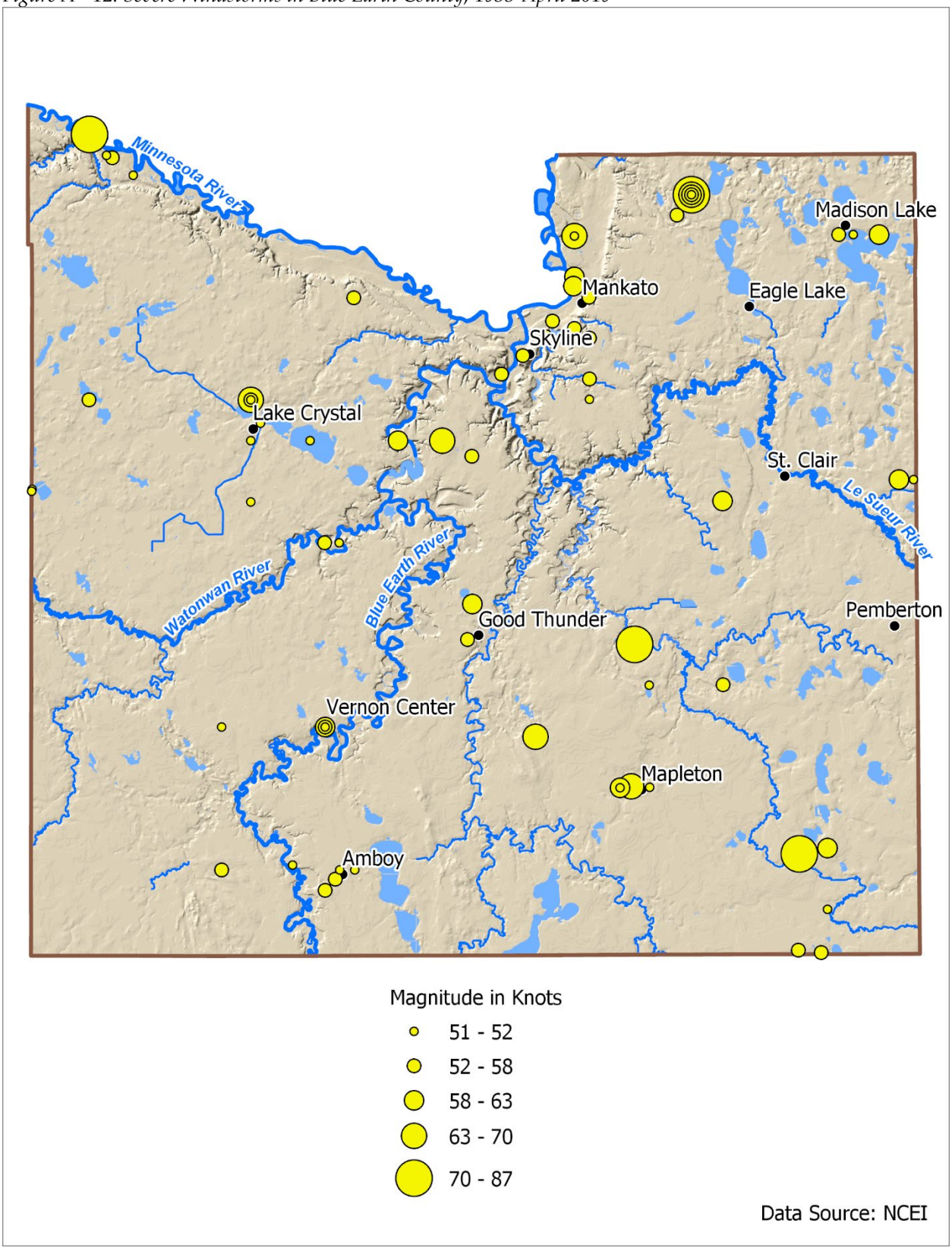


*Figure A - 13. Tornado Touchdowns and Paths in Blue Earth County, 1950-April 2019*

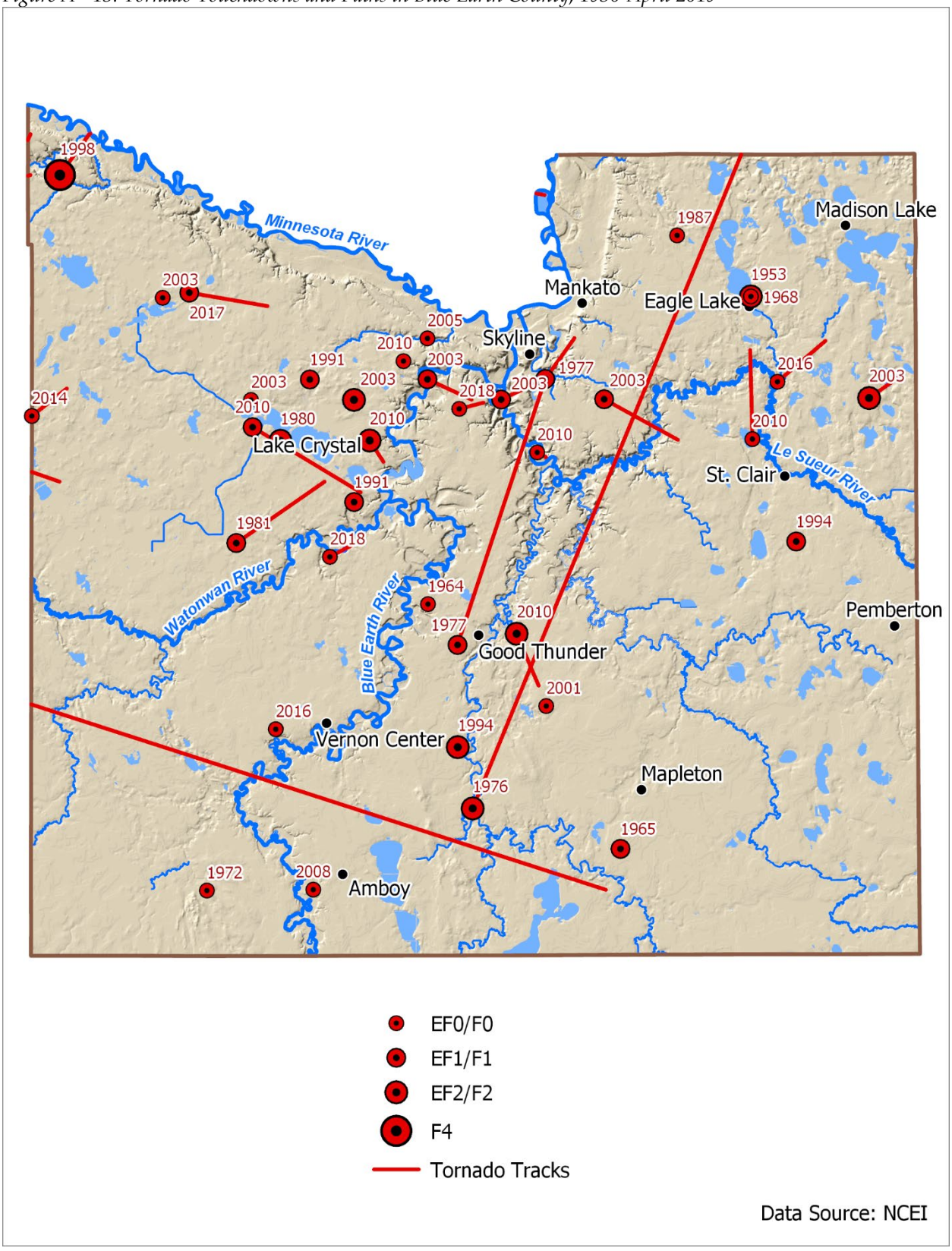


*Figure A - 14. Dams by Hazard Classification*

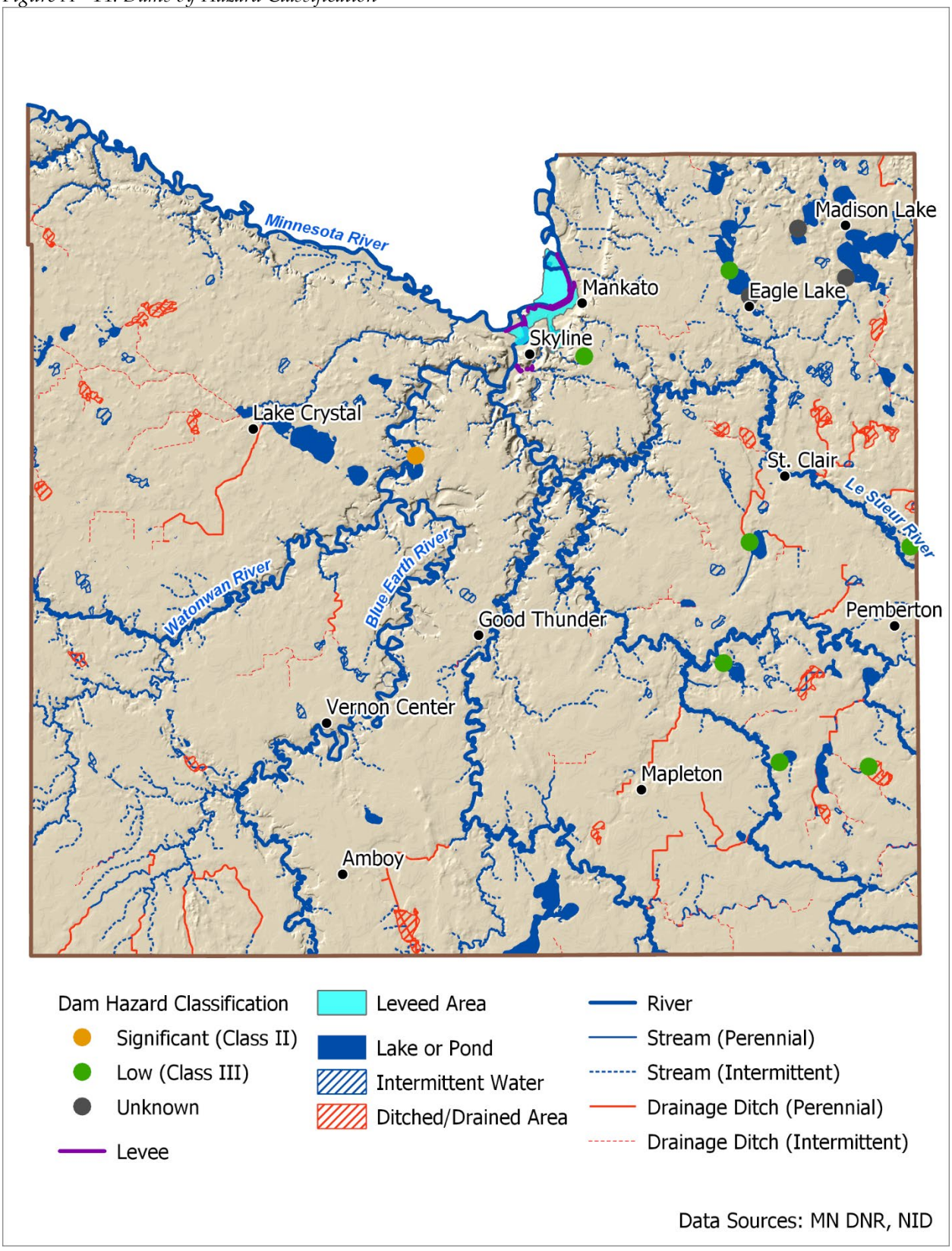


*Figure A - 15. Condition of Dams*

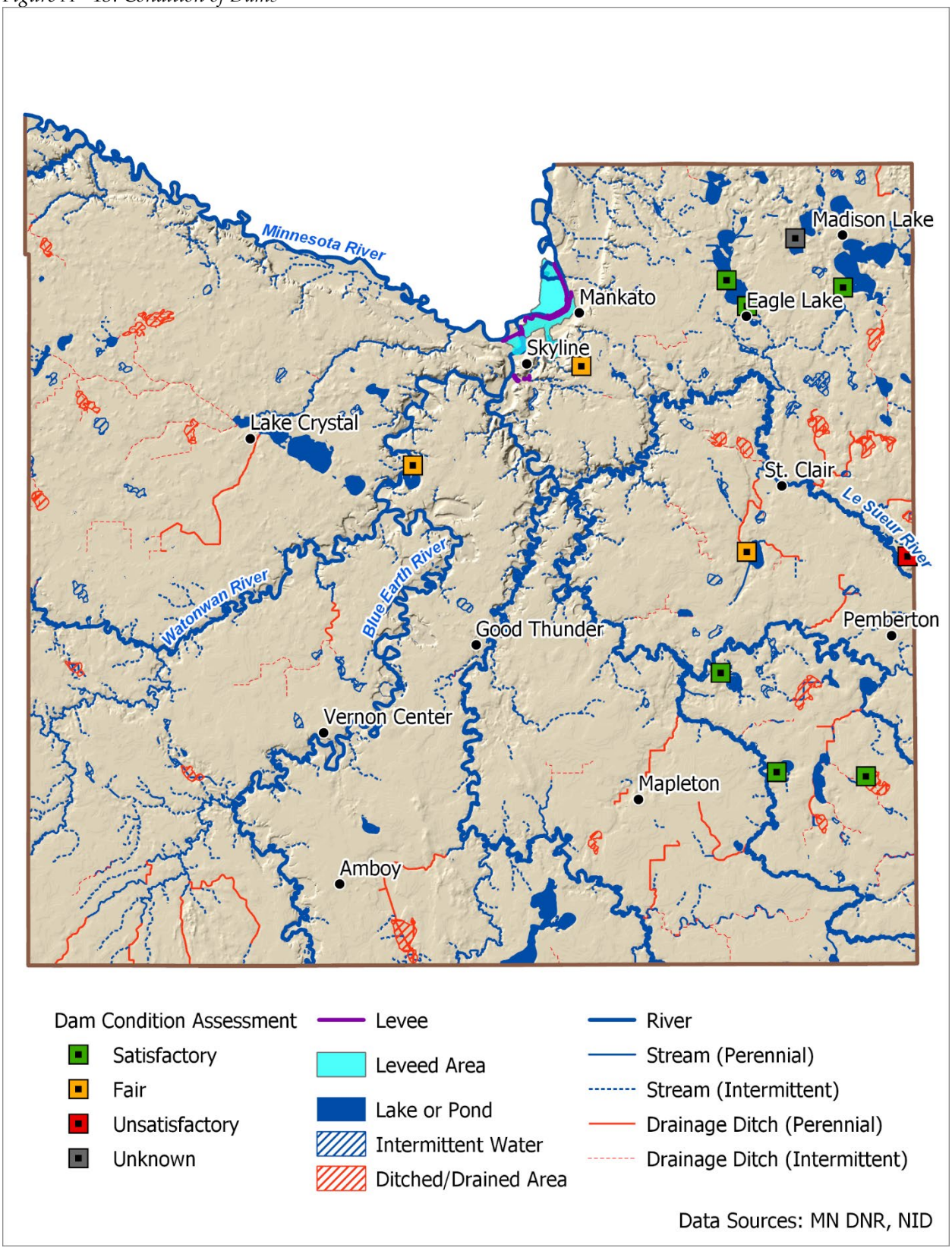


*Figure A - 16. Blue Earth County Aquifer Vulnerability and Public/Municipal Wells*

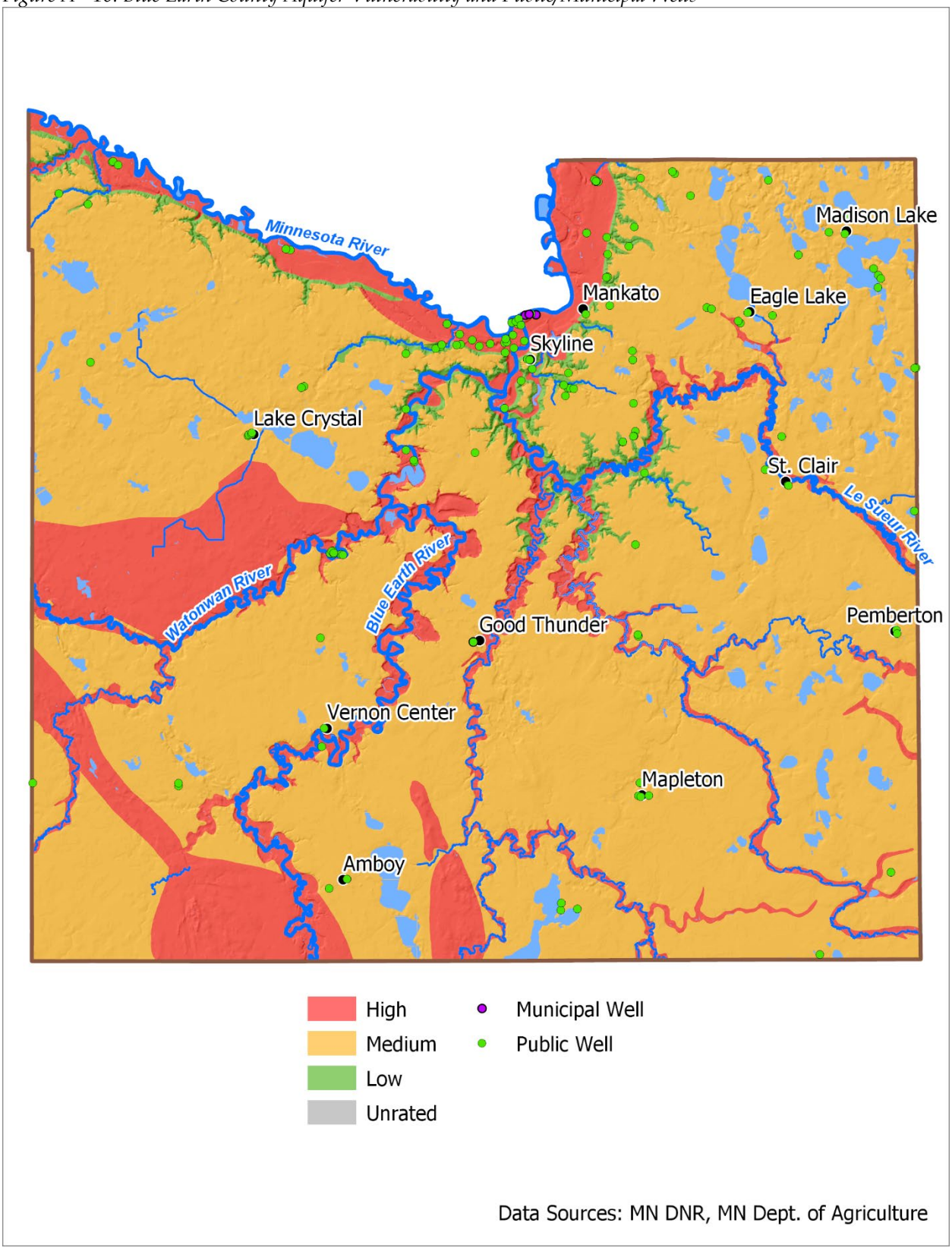


*Figure A - 17. Wildfires by Acres Burned (1985-June 2019) in Blue Earth County*

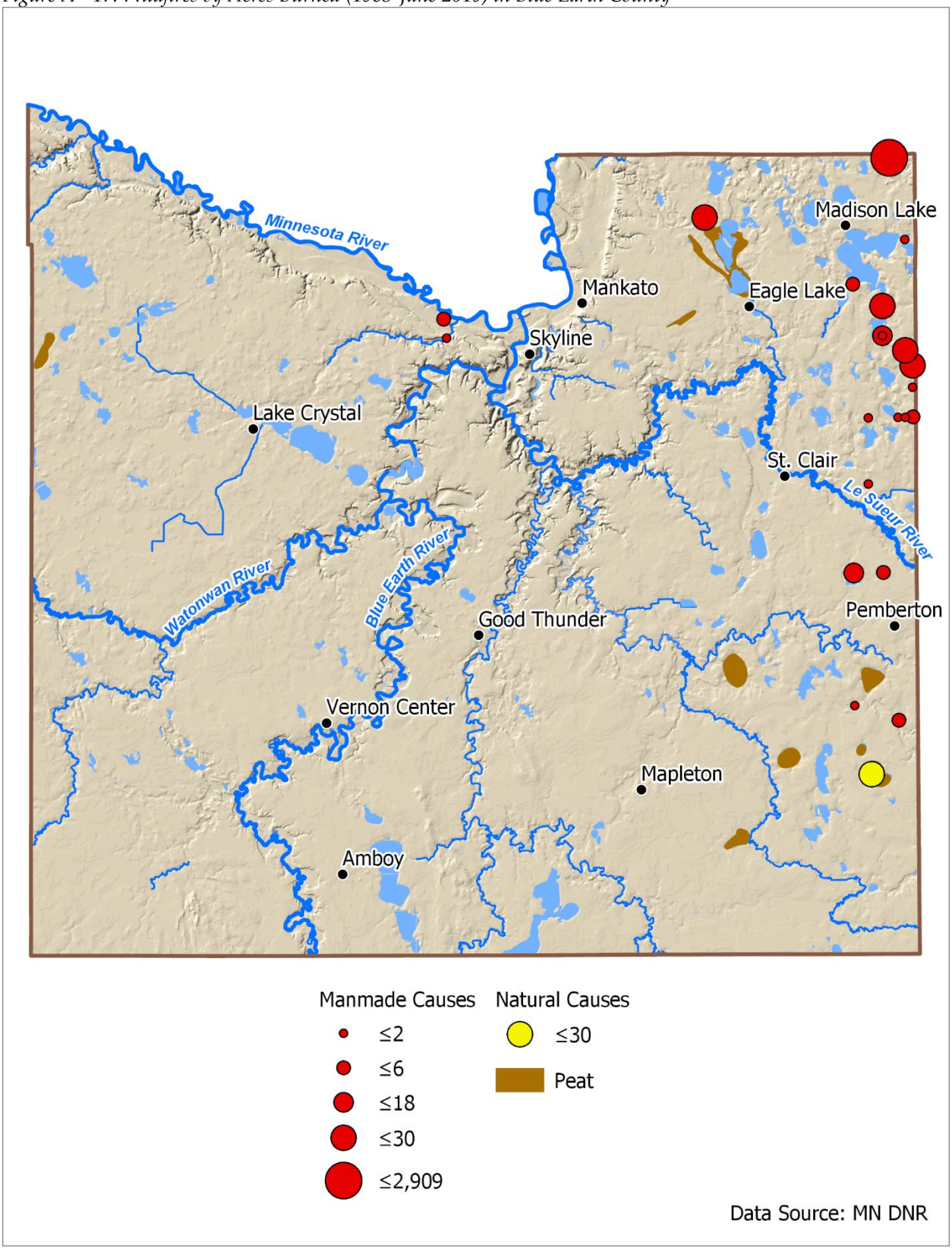


*Figure A - 18. Wildland Urban Interface in Blue Earth County*

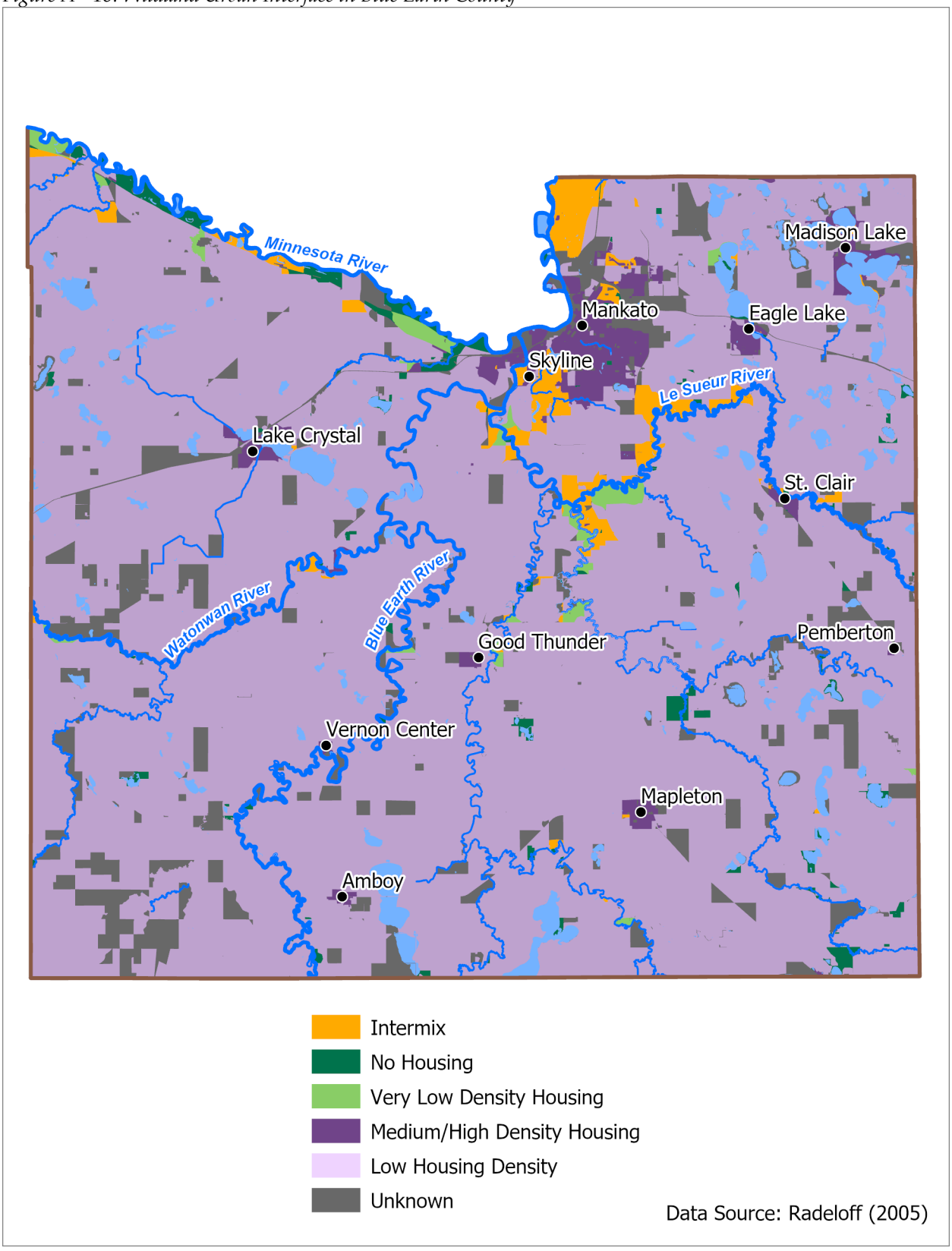


*Figure A - 19. 1% Annual Chance Floodplain in Blue Earth County*

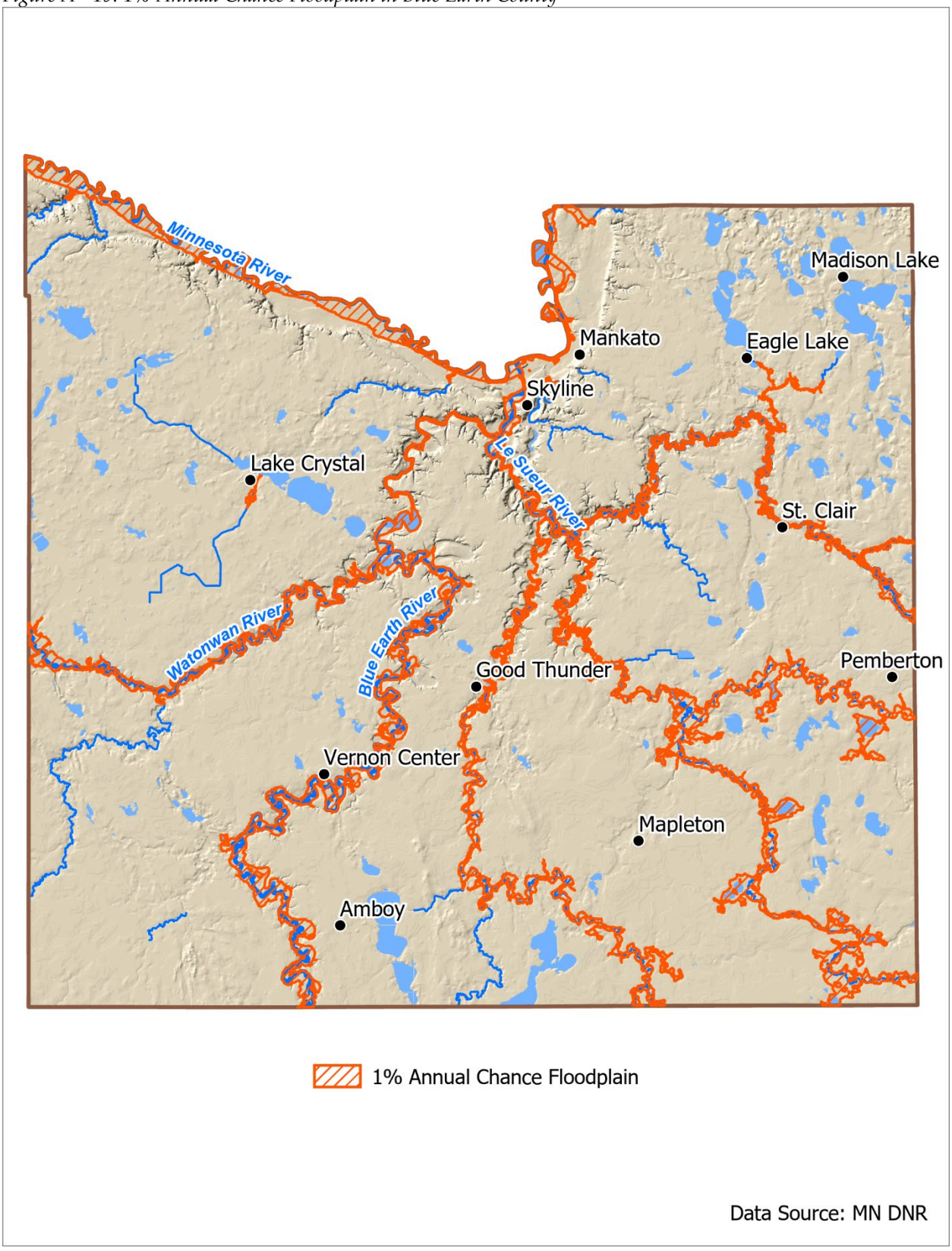


*Figure A - 20. Overview of 1% Annual Chance Flood Loss Estimation in Blue Earth County*

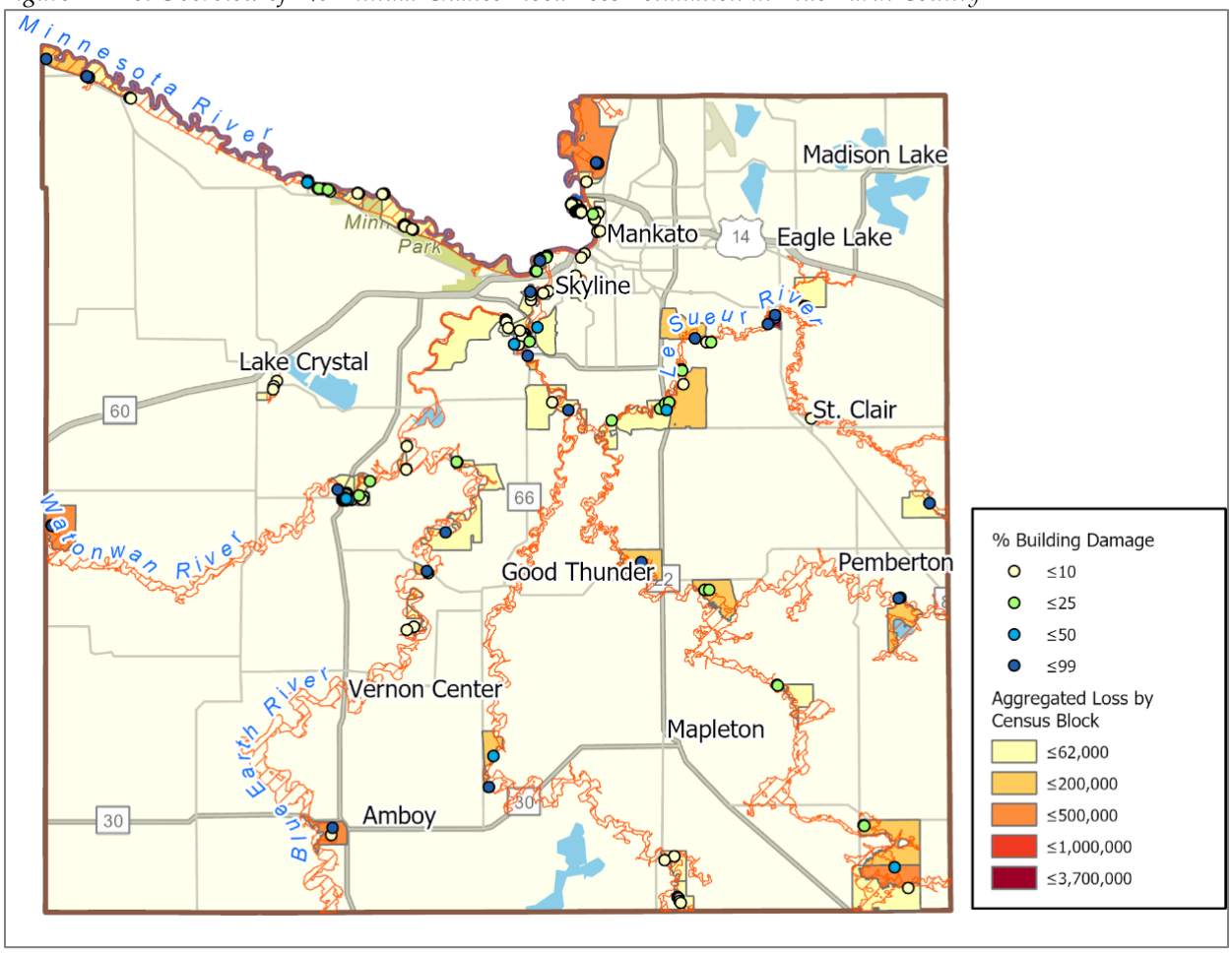


*Figure A - 21. 1% Annual Chance Flood Building-Related Loss Estimates, Mankato*

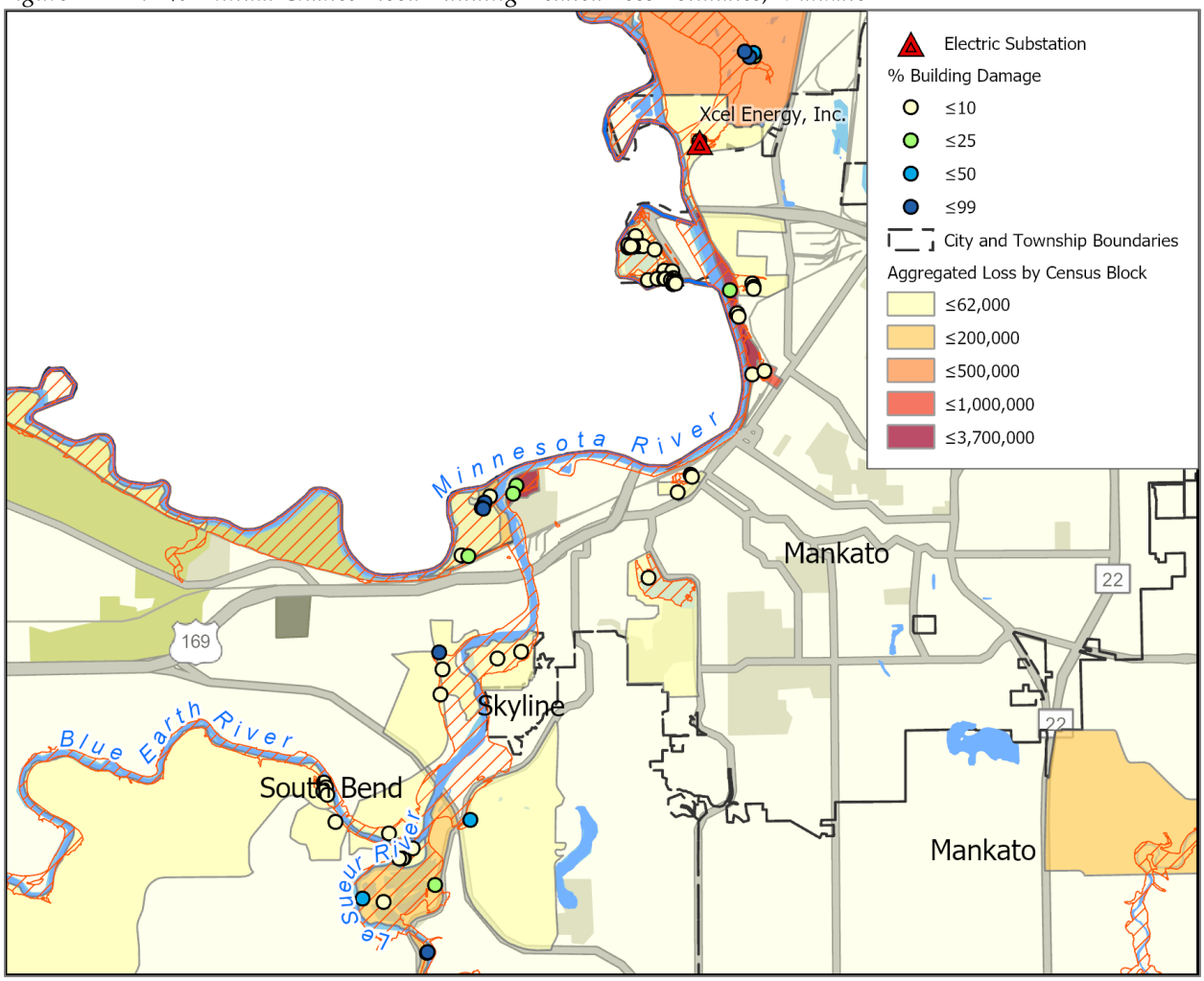


*Figure A - 22. 1% Annual Chance Flood Building-Related Loss Estimates, Le Ray*

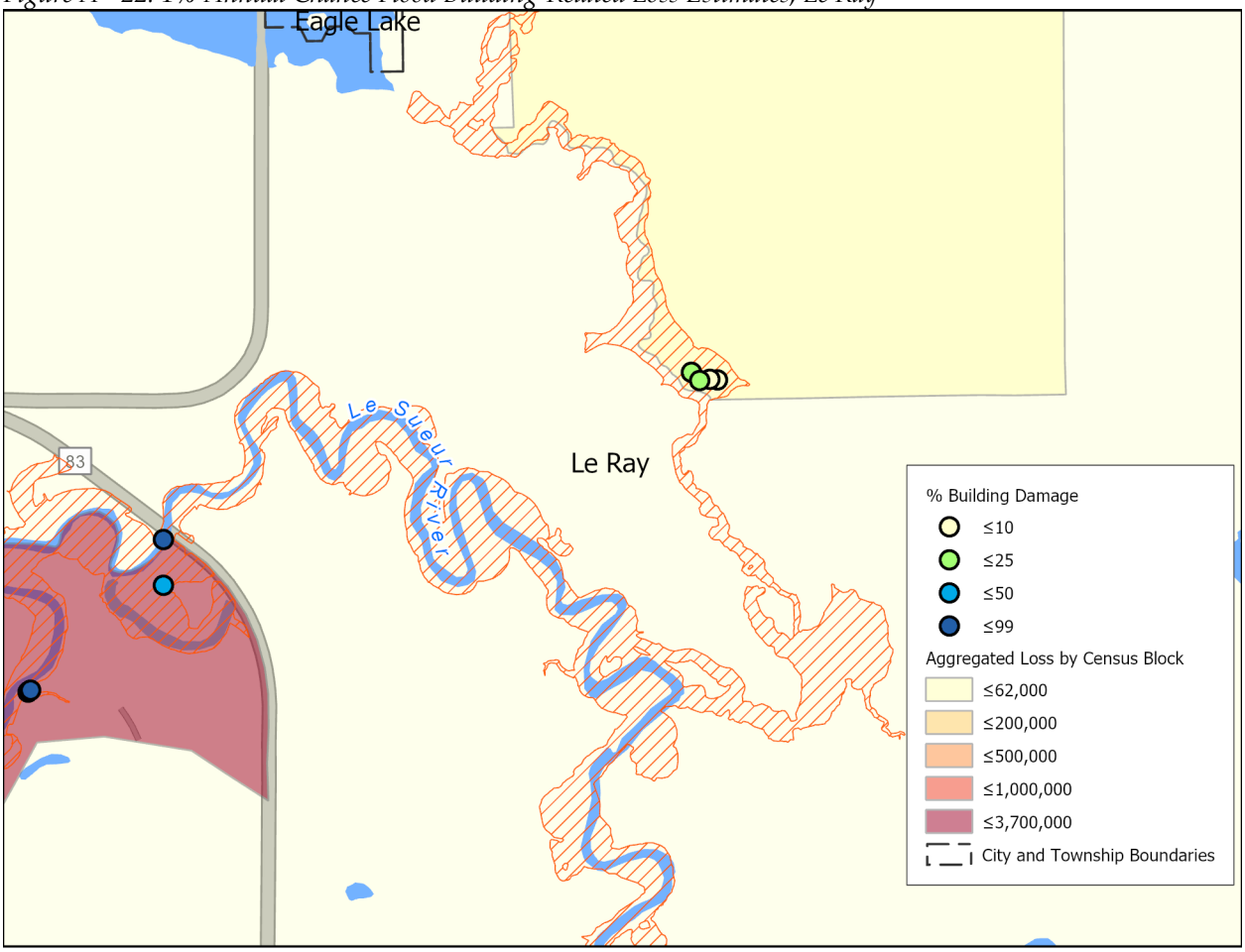


*Figure A - 23. 1% Annual Chance Flood Building-Related Loss Estimates, Decoria*

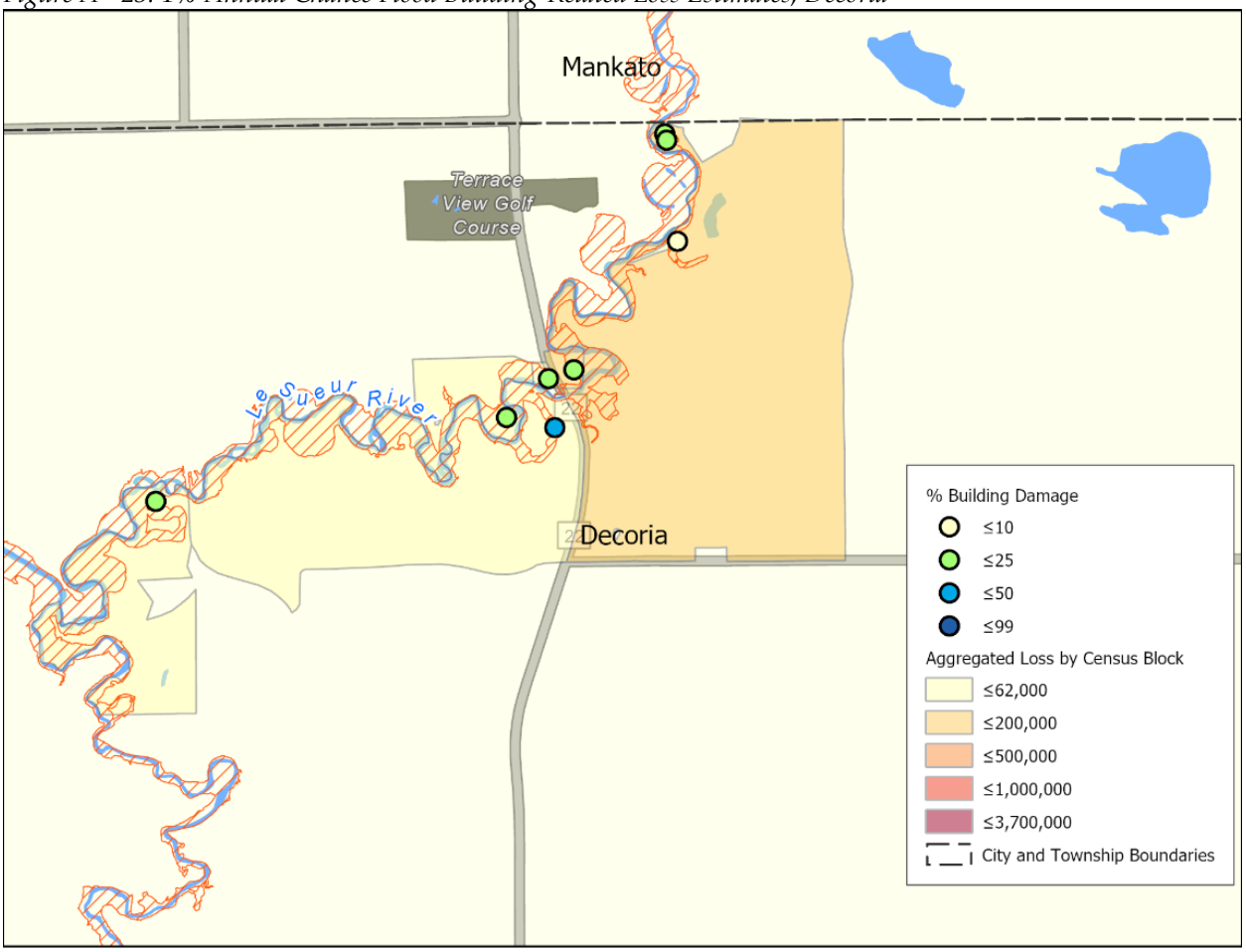


*Figure A - 24. Feedlots in Blue Earth County*

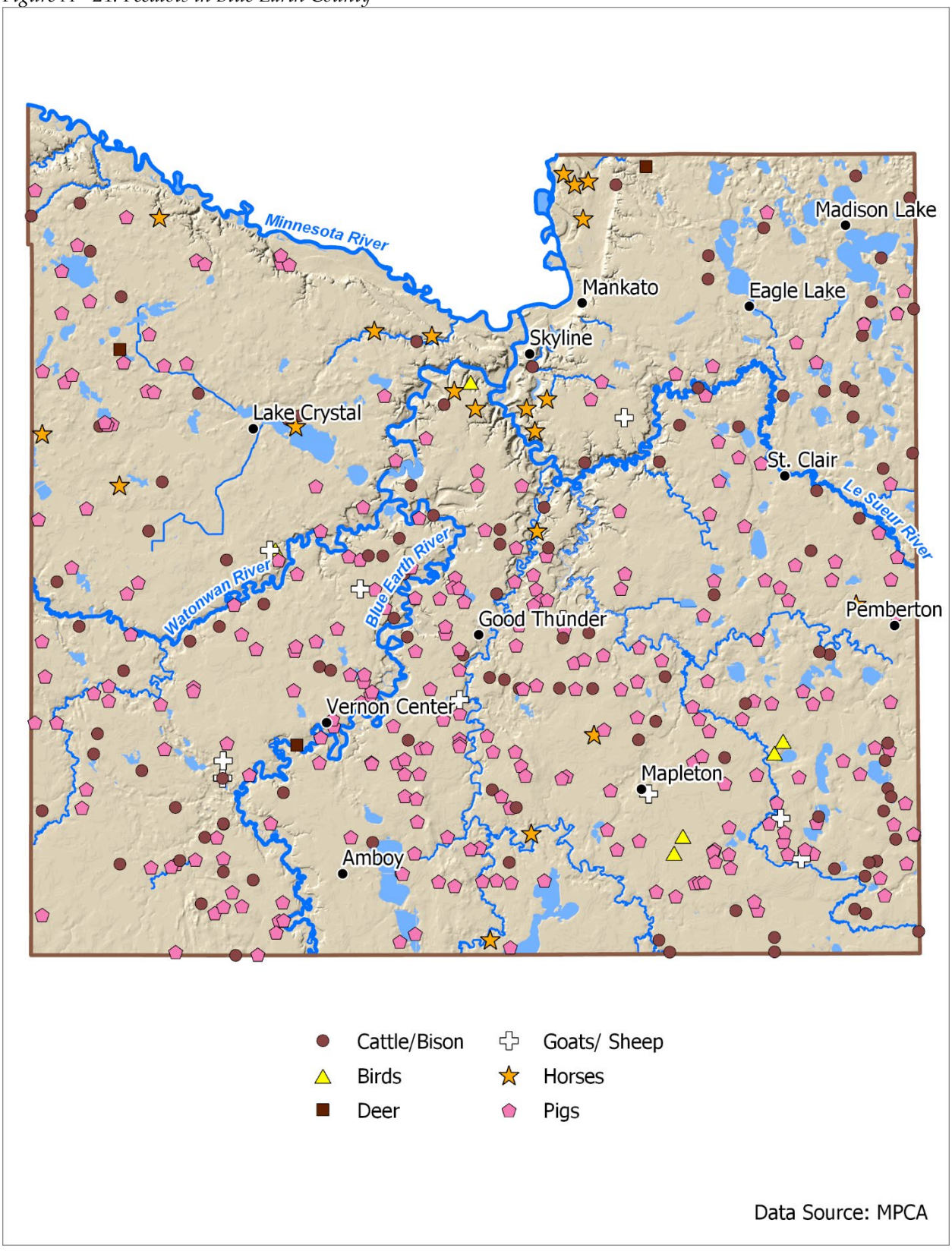
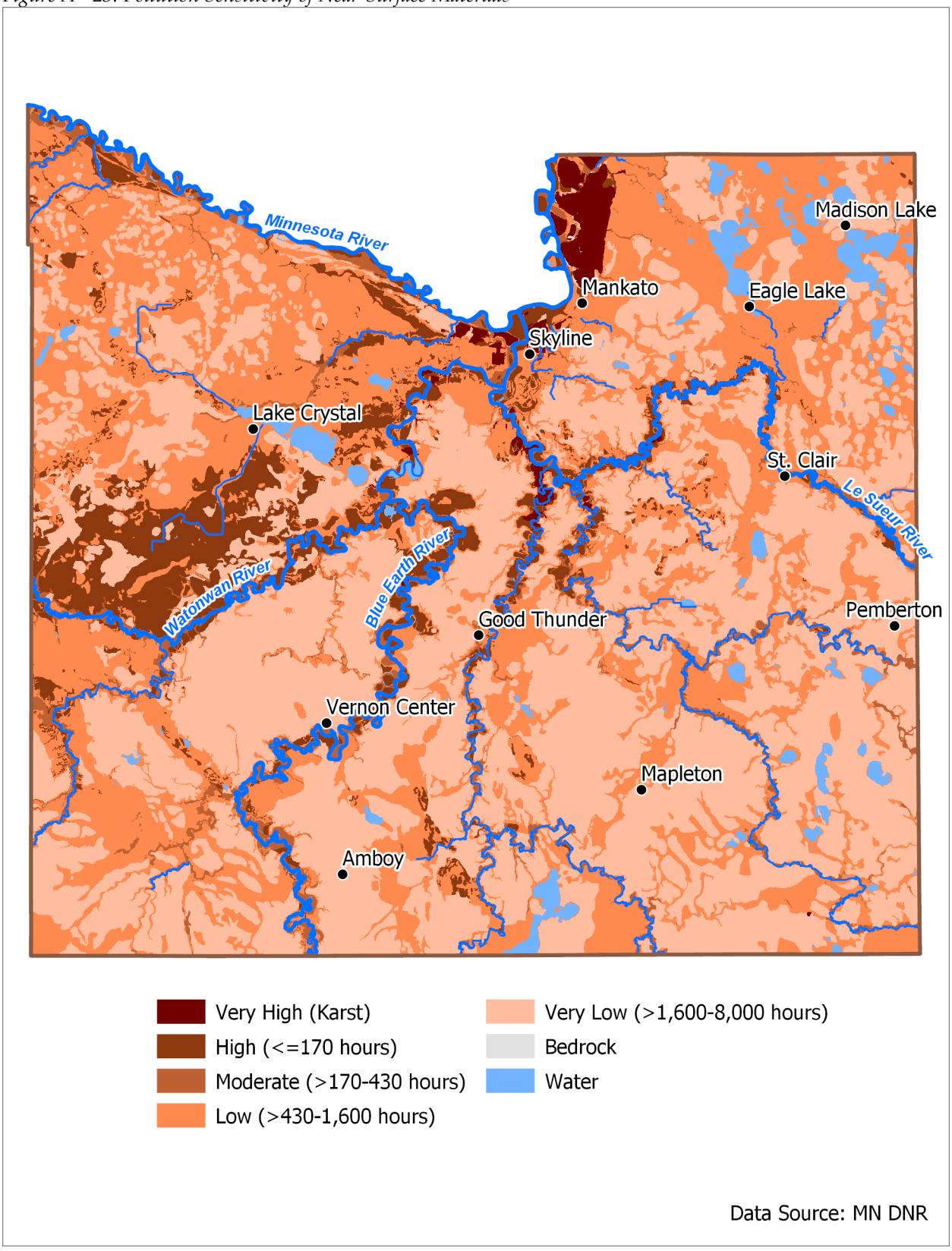


*Figure A - 25. Pollution Sensitivity of Near-Surface Materials*



# Appendix B
# Blue Earth County Critical Facilities

| Chemical Facilities | | | | |
|---|---|---|---|---|
| *No data provided* | | | | |

| Communications | | | | |
|---|---|---|---|---|
| ARMER Tower – Lake Crystal | | Lake Crystal | MN | |
| ARMER Tower – Mankato DOT | | Mankato | MN | |
| ARMER Tower – Mankato State University KMSU | | Mankato | MN | |
| ARMER Tower – Mapleton | | Mapleton | MN | |

| Correctional Facilities | | | | |
|---|---|---|---|---|
| *None* | | | | |

| Critical Manufacturing | | | |
|---|---|---|---|
| *No data provided* | | | |

| Cultural Resources | | | | |
|---|---|---|---|---|
| ARTifact – Paint your own Pottery | 321 North Riverfront Drive | Mankato | MN | |
| The 410 Project | 523 South Front Street | Mankato | MN | |
| Carnegie Art Center | 120 South Broad Street | Mankato | MN | |
| CityArt On the Go | | Mankato | MN | |
| CityArt Public Art Tour | | Mankato | MN | |
| CityArt Walking Sculpture Tour | | Mankato | MN | |
| Design & Wine | | | MN | |
| Emy Frentz Art Guild | 523 South Second Street | Mankato | MN | |
| Marian Anderson Fine Art Gallery | 424 Warren Street | Mankato | MN | |
| Twin Rivers Council for the Arts | 523 South Second Street | Mankato | MN | |
| Betsy-Tacy Society | 333 Center Street | Mankato | MN | |
| Blue Earth County History Center | 242 Warren Street | Mankato | MN | |
| Children's Museum of Southern Minnesota | 224 Lamm Street | Mankato | MN | |
| Historic R.D. Hubbard House | 606 South Broad Street | Mankato | MN | |

| Cultural Resources | | | | |
|---|---|---|---|---|
| Bethany Lutheran College Theatre | 700 Luther Drive | Mankato | MN | |
| AMC Classic Mankato 6 | 1600 Warren Street | Mankato | MN | |
| Cine Grand Theatre | 12 Civic Center Plaza, Suite 1640 | Mankato | MN | |
| Cinemark Movies 8 – River Hills Mall | 1850 Adams Street #15 | Mankato | MN | |
| Dance Express | 2105 North Broad Street | Mankato | MN | |
| Kato Ballroom | 200 Chestnut Street | Mankato | MN | |
| Mankato Children's Chorus | | Mankato | MN | |
| Mankato Ballet Company | 731 South Front Street | Mankato | MN | |
| Mankato Symphony Orchestra | 523 South Second Street | Mankato | MN | |
| Merely Players Community Theatre, Inc. | 110 Fulton Street | Mankato | MN | |
| Minnesota State University, Mankato – Theatre & Dance | 320 Maywood Avenue | Mankato | MN | |
| Minnesota Valley Chorale | | | MN | |

| Dams | | | | |
|---|---|---|---|---|
| Cottonwood Lake | | | | |
| Eagle Lake | | | | |
| Gilfillin Lake Outlet | | | | |
| Lost Marsh WMA | | | | |
| McPherson Twp. 25 | | | | |
| North Eagle Lake | | | | |
| Perch Lake | | | | |
| Rapidan | | | | |
| Rice Lake | | | | |
| Madison Lake | | | | |
| Warren St Detention | | | | |
| Cottonwood Lake | | | | |

| Emergency Services | | | | |
|---|---|---|---|---|
| Amboy Volunteer Fire Department | 101 East Main Street | Amboy | MN | 56010 |
| Blue Earth County Emergency Operations Center | 401 Carver Road | Mankato | MN | 56001 |
| Blue Earth County Sheriff's Office | 401 Carver Road | Mankato | MN | 56001 |

| Emergency Services | | | | |
|---|---|---|---|---|
| City of Mankato Emergency Operations Center | 710 South Front St | Mankato | MN | 56001 |
| Eagle Lake Police Department | 705 Parkway Avenue | Eagle Lake | MN | 56024 |
| Eagle Lake Volunteer Fire Department | 101 Plainview Street | Eagle Lake | MN | 56024 |
| Good Thunder Fire Department | 440 Main Street | Good Thunder | MN | 56037 |
| Lake Crystal Fire Department | 181 South Hunt Street | Lake Crystal | MN | 56055 |
| Lake Crystal Police Department | 101 North Main Street | Lake Crystal | MN | 56055 |
| Madison Lake Fire Department | 525 Main Street | Madison Lake | MN | 56063 |
| Madison Lake Police Department | 525 Main Street | Madison Lake | MN | 56063 |
| Mankato Department of Public Safety | 710 South Front Street | Mankato | MN | 56001 |
| Mankato Fire Department Station 1 | 300 Madison Avenue | Mankato | MN | 56001 |
| Mankato Fire Department Station 2 | 1721 Augusta Drive | Mankato | MN | 56001 |
| Mankato Fire Department Station 3 | 1230 Pohl Road | Mankato | MN | 56001 |
| Mapleton Fire Department | 103 Third Avenue Northeast | Mapleton | MN | 56065 |
| Mapleton Police Department | 104 2nd Avenue Northeast | Mapleton | MN | 56065 |
| Minnesota State Patrol - District 2200 | 501 South Victory Drive | Mankato | MN | 56001 |
| Pemberton Volunteer Fire Department | 306 Main Street | Pemberton | MN | 56078 |
| Public Safety Department of Amboy | 244 East Maine Street | Amboy | MN | 56010 |
| Saint Clair Volunteer Fire Department | 304 Main Street West | Saint Clair | MN | 56080 |
| South Bend Volunteer Fire Department | 307 Eleanor Street | Mankato | MN | 56001 |
| Vernon Center Volunteer Fire Department | 101 North Oak Street | Vernon Center | MN | 56090 |

| Energy (Power Plants) | | | | |
|---|---|---|---|---|
| Archer Daniels Midland Mankato | 2019 Third Ave | Mankato | MN | 56001 |
| Corvus Community Solar | 198 Sakatah Dr | Mankato | MN | 56002 |
| Eastwood Solar | 21280 594th Ave | Mankato | MN | 56001 |
| Koppelman Sun CSG | 22262 604th Ave. | Eagle Lake | MN | 56024 |

| Energy (Power Plants) | | | | |
|---|---|---|---|---|
| Lake Crystal | 111 W. Humphrey St. | Lake Crystal | MN | 56055 |
| Mankato Energy Center | 1 Fazio Lane | Mankato | MN | 56001 |
| Mapleton Community Solar | 12220 590th Avenue | Mapleton | MN | 56065 |
| Novel - OYA of Mapleton | 211 Maple Street | Mapleton | MN | 56055 |
| Poet Biorefining Lake Crystal | 19200 499th Avenue | Lake Crystal | MN | 56055 |
| Rapidan Hydro Facility | 54126 Glory Lane | Mankato | MN | 56001 |
| School Sisters CSG | 1095 N Victory Drive | Mankato | MN | 56001 |
| Wilmarth | 800 Summit Ave | Mankato | MN | 56001 |

| Food & Agriculture | | | | |
|---|---|---|---|---|
| *No data provided* | | | | |

| Government Buildings | | | | |
|---|---|---|---|---|
| Blue Earth County Government Center | 410 S 5th Street | Mankato | MN | 56001 |
| Blue Earth County Jail | 401 Carver Road | Mankato | MN | 56002 |
| Blue Earth County Justice Center | 401 Carver Road | Mankato | MN | 56002 |

| Healthcare & Public Health | | | | |
|---|---|---|---|---|
| Dialysis at Mankato Clinic | 1400 Madison Avenue Ste 400 | Mankato | MN | 56001 |
| Harry Meyering Ctr Inc | 109 Homestead Road | Mankato | MN | 56001 |
| Hillcrest Care & Rehab Center | 714 Southbend Avenue | Mankato | MN | 56001 |
| Laurels Peak Care & Rehab Ctr | 700 James Avenue | Mankato | MN | 56001 |
| Mapleton Community Home | 301 Troendle Street | Mapleton | MN | 56065 |
| Mayo Clinic Health System Lake Crystal Clinic | 200 E Prince Street | Lake Crystal | MN | 56055 |
| Mayo Clinic Health Sys Mankato | 1025 Marsh Street | Mankato | MN | 56001 |
| Mayo Clinic Health Sys Mankato | 1400 Madison Avenue Ste 324a | Mankato | MN | 56002 |
| Oaklawn Care & Rehab Center | 201 Oaklawn Avenue | Mankato | MN | 56001 |
| Pathstone Living | 718 Mound Avenue | Mankato | MN | 56001 |
| Prairies Edge | 152 Cougar Drive | Mankato | MN | 56001 |
| REM Heartland Inc Birch | 206 Thomas Drive | Mankato | MN | 56001 |
| REM Heartland Inc Cypress | 204 Thomas Drive | Mankato | MN | 56001 |

| Schools | | | | |
|---|---|---|---|---|
| Bethany Lutheran College | 700 Luther Drive | Mankato | MN | 56001 |
| Central Freedom | 110 Fulton St | Mankato | MN | 56001 |
| Central High ALC | 110 Fulton St | Mankato | MN | 56001 |
| Eagle Lake Elem | 500 Le Sueur Ave | Eagle Lake | MN | 56024 |
| Franklin Elem | 1000 N Broad St | Mankato | MN | 56001 |
| Grace Christian | 600 Lind St | Mankato | MN | 56001 |
| Immanuel Lutheran | 421 N 2nd St | Mankato | MN | 56001 |
| Jefferson Elem | 100 James Ave | Mankato | MN | 56001 |
| Kennedy Elem | 2600 E Main St | Mankato | MN | 56001 |
| LCWM Elem | 502 E Watonwan St | Lake Crystal | MN | 56055 |
| LCWM High | 607 Knights Ln | Lake Crystal | MN | 56055 |
| Life Lines ALP | 110 Fulton St | Mankato | MN | 56001 |
| Loyola Catholic | 145 Good Counsel Dr | Mankato | MN | 56001 |
| Mankato Area Night School | 110 Fulton St | Mankato | MN | 56001 |
| Mankato Area Summer School | 110 Fulton St | Mankato | MN | 56001 |
| Mankato East High | 2600 Hoffman Rd | Mankato | MN | 56001 |
| Mankato TS | 110 Fulton St | Mankato | MN | 56001 |
| Mankato West High | 1351 S Riverfront Dr | Mankato | MN | 56001 |
| Minnesota State University | 228 Wiecking Center | Mankato | MN | 56001 |
| Mount Olive Lutheran | 1123 Marsh St | Mankato | MN | 56001 |
| MR High | 101 6th Ave Ne | Mapleton | MN | 56065 |
| MR West Elem | 311 Willard St | Good Thunder | MN | 56037 |
| MR West ESY | 101 6th Ave Ne | Mapleton | MN | 56065 |
| Nova Academy of Cosmetology | 1701 Adams Street | Mankato | MN | 56001 |
| Phoenix Recovery Programs | 54945 210th Ln | Mankato | MN | 56001 |
| Prairie Winds Middle | 1200 Prairie Winds Dr | Mankato | MN | 56001 |
| Rasmussen College | 1400 Madison Ave | Mankato | MN | 56001 |
| Risen Savior Lutheran | 502 W 7th St | Mankato | MN | 56001 |
| RMIC-Region 5 | 314 Chestnut St | Mankato | MN | 56001 |
| Roosevelt Elem | 300 W 6th St | Mankato | MN | 56001 |
| Rosa Parks Elem | 1001 Heron Dr | Mankato | MN | 56001 |
| St. Clair Elem | 121 Main St West | Saint Clair | MN | 56080 |
| St. Clair High | 121 Main St West | Saint Clair | MN | 56080 |
| Washington Elem | 1100 Anderson Dr | Mankato | MN | 56001 |

| Transportation Systems | | | | |
|---|---|---|---|---|
| Zarn | | Amboy | MN | |
| Eagles Nest Aerodrome | | Eagle Lake | MN | |
| Bergemann | | Garden City | MN | |
| Hoppe Sky Ranch | | Mankato | MN | |

| Transportation Systems | | | | |
|---|---|---|---|---|
| Immanuel - St Joseph's Hospital | | Mankato | MN | |
| Mankato Rgnl | | Mankato | MN | |

| Water | | | | |
|---|---|---|---|---|
| Amboy WWTP | 600 E Maine St | Amboy | MN | 56010 |
| Archer Daniels Midland - Mankato | 2019 3rd Ave | Mankato | MN | 56001 |
| Blue Earth County Highway Department | 35 Map Dr | Mankato | MN | 56001 |
| CHS Mankato | 2020 Riverfront Dr | Mankato | MN | 56001 |
| City of Mankato WTP | 730 Mound Ave | Mankato | MN | 56001 |
| Erosion Control Plus Inc | 524 Main St S | Winnebago | MN | 56098 |
| Former Hardees Site | 17 Stoltzman Rd | Mankato | MN | 56001 |
| Forrey Sand & Gravel Pit | 55415 Hemlock Rd | Mankato | MN | 56001 |
| Good Thunder WTP | 130 Ewing St S | Good Thunder | MN | 56037 |
| Good Thunder WWTP | 130 Ewing St S | Good Thunder | MN | 56037 |
| Hillcrest Rehabilitation Center | 714 Southbend Ave | Mankato | MN | 56001 |
| Hiniker Co | 58766 240th St | Mankato | MN | 56001 |
| Hiniker Co - General | 58766 240th St | Mankato | MN | 56001 |
| Holtmeier Construction Inc | 3799 3rd Ave | Mankato | MN | 56001 |
| Jansen-Hard Rock Quarries Inc | | Good Thunder | MN | 56037 |
| Jordan Sands LLC | 818 Willow St | Mankato | MN | 56001 |
| Jordan Sands LLC | 820 Willow St | Mankato | MN | 56001 |
| JR Bruender Construction Inc | 60318 206th St | Eagle Lake | MN | 56024 |
| Kasota Stone Fabricators Inc - L231 | National Forest Road 428 | Ely | MN | 55731 |
| Knollwood Mobile Home Park WWTP | 100 McElroy Dr | Mankato | MN | 56001 |
| Lake Crystal WWTP | 100 Robinson St E | Lake Crystal | MN | 56055 |
| Madison Lake WWTP | 22603 Nectar Rd | Madison Lake | MN | 56063 |
| Magellan Pipeline Co LP - Mankato | 55199 State Highway 68 | Mankato | MN | 56001 |
| Mankato, City of | Pohl Rd & Stadium Dr | Mankato | MN | 56001 |
| Mankato Water Resource Recovery Facility | 701 Pine St | Mankato | MN | 56001 |
| Mapleton WWTP | 88 State Highway 22 | Mapleton | MN | 56065 |
| Midwest Electric Products Inc | 58155 240th St | Mankato | MN | 56001 |
| Minnesota Elevator Inc | 19336 607th Ave | Mankato | MN | 56001 |

| Water | | | | |
|---|---|---|---|---|
| Minnesota Lake WTP | 10002 Lake Ave | Minnesota Lake | MN | 56068 |
| MnSCU - Minnesota State University - Mankato | Ellis Ave & South Road | Mankato | MN | 56001 |
| OMG Midwest Inc/Southern MN Construction Co Inc | 1905 3rd Ave | Mankato | MN | 56001 |
| Pemberton WTP | 251 4th St | Pemberton | MN | 56078 |
| Pemberton WWTP | | Pemberton | MN | 56078 |
| POET Biorefining - Lake Crystal | 19200 499th Ave | Lincoln Township | MN | 56055 |
| Rehnelt Excavating LLC | 21579 535th Ave | Mankato | MN | 56001 |
| Saint Clair WWTP | 336 Main St W | Saint Clair | MN | 56080 |
| St Clair WTP | 200 Park St S | Saint Clair | MN | 56080 |
| TBEI Inc | 52182 Ember Rd | Lake Crystal | MN | 56055 |
| Vernon Center WWTP | 312 Hilltop St | Vernon Center | MN | 56090 |
| Vetter Stone Co | 23894 3rd Ave | Mankato | MN | 56001 |
| WW Blacktopping Inc | 700 N Industrial Rd | Mankato | MN | 56001 |
| Xcel - Wilmarth Generating Plant - Drdg | 1040 Summit Ave | Mankato | MN | 56001 |
| Xcel Energy - Key City/Wilmarth | 1040 Summit Ave | Mankato | MN | 56001 |

# Appendix C
# Blue Earth County Hazard Events

The National Centers for Environmental Information storm events database was queried for all notable events since 1950. However, some categories of events do not have records prior to 1996. Data was available through April of 2019.

*Table C - 1. All tornadoes recorded by NCEI, 1950-April 2019*

| Location or County | Date | Magnitude | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Rapidan | 9/20/2018 | EF0 | 0 | 0 | $50,000 |
| Garden City | 9/20/2018 | EF0 | 0 | 0 | *Unknown* |
| Judson | 7/9/2017 | EF1 | 0 | 0 | *Unknown* |
| Eagle Lake | 6/14/2016 | EF0 | 0 | 0 | *Unknown* |
| Vernon Center | 6/14/2016 | EF0 | 0 | 0 | *Unknown* |
| Butternut | 5/8/2014 | EF0 | 0 | 0 | $1,000 |
| Rapidan | 8/13/2010 | EF0 | 0 | 0 | *Unknown* |
| Rapidan | 6/25/2010 | EF0 | 0 | 0 | *Unknown* |
| Good Thunder | 6/25/2010 | EF2 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/25/2010 | EF1 | 0 | 0 | *Unknown* |
| Rapidan | 6/25/2010 | EF2 | 0 | 0 | *Unknown* |
| St Clair | 6/17/2010 | EF0 | 0 | 0 | *Unknown* |
| Amboy | 7/17/2008 | EF0 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/29/2005 | F0 | 0 | 0 | *Unknown* |
| St Clair | 7/14/2003 | F2 | 0 | 0 | $2,000,000 |
| Mankato | 7/14/2003 | F1 | 0 | 0 | $100,000 |
| Rapidan | 7/14/2003 | F1 | 0 | 0 | $500,000 |
| Rapidan | 7/14/2003 | F1 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/14/2003 | F2 | 0 | 0 | $100,000 |
| Lake Crystal | 7/9/2003 | F0 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/9/2003 | F0 | 0 | 0 | *Unknown* |
| Mapleton | 5/1/2001 | F0 | 0 | 0 | *Unknown* |
| Cambria | 3/29/1998 | F4 | 0 | 0 | *Unknown* |
| Vernon Center | 8/7/1994 | F2 | 0 | 0 | $50,000 |
| St. Clair | 6/30/1994 | F1 | 0 | 1 | $500,000 |
| Blue Earth County | 4/29/1991 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 4/29/1991 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 7/14/1987 | F0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/14/1981 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 8/18/1980 | F2 | 0 | 1 | $2,500,000 |
| Blue Earth County | 5/28/1977 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 5/28/1977 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 6/14/1976 | F2 | 1 | 6 | $2,500,000 |
| Blue Earth County | 5/24/1972 | F0 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/20/1968 | F0 | 0 | 0 | *Unknown* |

| Location or County | Date | Magnitude | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 8/2/1965 | F1 | 0 | 0 | $25,000 |
| Blue Earth County | 5/25/1964 | F0 | 0 | 0 | $25,000 |
| Blue Earth County | 7/25/1953 | F2 | 0 | 1 | $250,000 |
| | | | | | |
| **Highest Value Property Damage** | | | | | **$2,500,000** |

*Table C - 2. All severe hail storm events recorded by NCEI, 1950-April 2019*

| Location or County | Date | Size in Inches | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Lake Crystal | 7/9/2017 | 1 | 0 | 0 | *Unknown* |
| Pemberton | 5/15/2017 | 0.75 | 0 | 0 | *Unknown* |
| St Clair | 5/8/2017 | 0.75 | 0 | 0 | *Unknown* |
| Beauford | 5/8/2017 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 9/20/2016 | 1.75 | 0 | 0 | *Unknown* |
| Madison Lake | 7/13/2016 | 0.88 | 0 | 0 | *Unknown* |
| Vernon Center | 7/13/2016 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 5/26/2016 | 1 | 0 | 0 | *Unknown* |
| Butternut | 5/26/2016 | 0.75 | 0 | 0 | *Unknown* |
| Eagle Lake | 9/17/2015 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 8/6/2015 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 8/6/2015 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 8/6/2015 | 1 | 0 | 0 | *Unknown* |
| Mankato | 6/3/2015 | 0.75 | 0 | 0 | *Unknown* |
| Madison Lake | 5/25/2015 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 9/20/2014 | 0.88 | 0 | 0 | *Unknown* |
| Mapleton | 8/18/2014 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 6/17/2014 | 1.25 | 0 | 0 | *Unknown* |
| Mankato | 6/17/2014 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 6/17/2014 | 1 | 0 | 0 | *Unknown* |
| Good Thunder | 6/17/2014 | 1.5 | 0 | 0 | *Unknown* |
| Good Thunder | 6/17/2014 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 5/7/2014 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 5/7/2014 | 1 | 0 | 0 | *Unknown* |
| Eagle Lake | 5/7/2014 | 0.88 | 0 | 0 | *Unknown* |
| Rapidan | 5/7/2014 | 1.5 | 0 | 0 | *Unknown* |
| Mankato | 5/7/2014 | 0.75 | 0 | 0 | *Unknown* |
| Minnesota Lake | 6/12/2013 | 1 | 0 | 0 | *Unknown* |
| Mankato | 5/24/2012 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 5/2/2012 | 1 | 0 | 0 | *Unknown* |

| Location or County | Date | Size in Inches | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Lake Crystal | 5/2/2012 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 5/9/2011 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 9/15/2010 | 1 | 0 | 0 | *Unknown* |
| Minneopa | 8/13/2010 | 0.75 | 0 | 0 | *Unknown* |
| Pemberton | 6/25/2010 | 4.25 | 0 | 0 | $250,000 |
| Benning | 6/25/2010 | 1.25 | 0 | 0 | *Unknown* |
| Pemberton | 6/17/2010 | 1.75 | 0 | 0 | *Unknown* |
| Benning | 6/1/2010 | 0.75 | 0 | 0 | *Unknown* |
| St Clair | 4/12/2010 | 1.75 | 0 | 0 | *Unknown* |
| Beauford | 4/12/2010 | 1.75 | 0 | 0 | *Unknown* |
| Good Thunder | 4/12/2010 | 0.75 | 0 | 0 | *Unknown* |
| Garden City Arpt | 4/12/2010 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 8/25/2009 | 0.75 | 0 | 0 | *Unknown* |
| Perth | 8/2/2009 | 1 | 0 | 0 | *Unknown* |
| St Clair | 7/21/2009 | 0.75 | 0 | 0 | *Unknown* |
| Beauford | 7/21/2009 | 1 | 0 | 0 | *Unknown* |
| Beauford | 7/21/2009 | 1 | 0 | 0 | *Unknown* |
| Minnesota Lake | 7/17/2008 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 7/11/2008 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 7/3/2007 | 0.75 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/21/2007 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/21/2007 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/21/2007 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/21/2007 | 0.88 | 0 | 0 | *Unknown* |
| Amboy | 6/21/2007 | 1.75 | 0 | 0 | *Unknown* |
| Good Thunder | 6/21/2007 | 0.88 | 0 | 0 | *Unknown* |
| Vernon Center | 6/21/2007 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/21/2007 | 1 | 0 | 0 | *Unknown* |
| Vernon Center | 5/19/2007 | 0.88 | 0 | 0 | *Unknown* |
| Mapleton | 5/19/2007 | 0.88 | 0 | 0 | *Unknown* |
| Eagle Lake | 4/30/2007 | 0.88 | 0 | 0 | *Unknown* |
| Lake Crystal | 9/26/2006 | 0.75 | 0 | 0 | *Unknown* |
| Good Thunder | 7/19/2006 | 1.75 | 0 | 0 | *Unknown* |
| Good Thunder | 7/19/2006 | 1 | 0 | 0 | *Unknown* |
| Mankato | 4/18/2006 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 10/4/2005 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 6/29/2005 | 0.88 | 0 | 0 | *Unknown* |
| Good Thunder | 6/27/2005 | 0.75 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/20/2005 | 0.75 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/7/2005 | 0.88 | 0 | 0 | *Unknown* |

| Location or County | Date | Size in Inches | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Mapleton | 6/7/2005 | 1 | 0 | 0 | *Unknown* |
| Mankato | 6/7/2005 | 0.75 | 0 | 0 | *Unknown* |
| Pemberton | 6/11/2004 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 6/11/2004 | 1 | 0 | 0 | *Unknown* |
| Mankato | 6/8/2004 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 5/19/2004 | 1 | 0 | 0 | *Unknown* |
| Eagle Lake | 5/9/2004 | 1 | 0 | 0 | *Unknown* |
| Mankato | 5/9/2004 | 1 | 0 | 0 | *Unknown* |
| Cambria | 5/9/2004 | 1 | 0 | 0 | *Unknown* |
| Cambria | 5/9/2004 | 0.88 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/9/2003 | 1.25 | 0 | 0 | *Unknown* |
| St Clair | 6/23/2003 | 1 | 0 | 0 | *Unknown* |
| Lake Crystal | 5/14/2003 | 0.88 | 0 | 0 | *Unknown* |
| Madison Lake | 5/14/2003 | 1 | 0 | 0 | *Unknown* |
| Vernon Center | 5/14/2003 | 0.88 | 0 | 0 | *Unknown* |
| Mankato | 5/14/2003 | 0.88 | 0 | 0 | *Unknown* |
| Lake Crystal | 5/14/2003 | 1 | 0 | 0 | *Unknown* |
| Cambria | 6/3/2002 | 0.75 | 0 | 0 | *Unknown* |
| St Clair | 5/28/2002 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 5/8/2002 | 1.25 | 0 | 0 | *Unknown* |
| Mapleton | 4/18/2002 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 4/18/2002 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 6/1/2001 | 0.75 | 0 | 0 | *Unknown* |
| St Clair | 5/1/2001 | 1.75 | 0 | 0 | *Unknown* |
| Garden City | 5/1/2001 | 1.5 | 0 | 0 | *Unknown* |
| Mapleton | 5/1/2001 | 0.88 | 0 | 0 | *Unknown* |
| Vernon Center | 9/2/2000 | 1.75 | 0 | 0 | *Unknown* |
| Amboy | 9/2/2000 | 0.75 | 0 | 0 | *Unknown* |
| Amboy | 7/25/2000 | 0.75 | 0 | 0 | *Unknown* |
| Eagle Lake | 7/25/2000 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 7/25/2000 | 1.5 | 0 | 0 | *Unknown* |
| Mankato | 7/25/2000 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 5/17/2000 | 1 | 0 | 0 | *Unknown* |
| Garden City | 5/17/2000 | 0.75 | 0 | 0 | *Unknown* |
| Garden City | 5/17/2000 | 0.75 | 0 | 0 | *Unknown* |
| Lake Crystal | 5/17/2000 | 1.75 | 0 | 0 | *Unknown* |
| Cambria | 5/17/2000 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 8/9/1999 | 0.75 | 0 | 0 | *Unknown* |
| Vernon Center | 6/20/1998 | 0.88 | 0 | 0 | *Unknown* |
| Judson | 5/18/1998 | 1.75 | 0 | 0 | *Unknown* |

| Location or County | Date | Size in Inches | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Cambria | 5/18/1998 | 1.75 | 0 | 0 | *Unknown* |
| Cambria | 5/18/1998 | 1.75 | 0 | 0 | *Unknown* |
| Beauford | 5/15/1998 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 7/18/1997 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 7/18/1997 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 7/18/1997 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 7/5/1997 | 0.75 | 0 | 0 | *Unknown* |
| Mapleton | 6/28/1997 | 0.88 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/28/1997 | 0.75 | 0 | 0 | *Unknown* |
| Mankato | 5/17/1996 | 0.75 | 0 | 0 | *Unknown* |
| Tracked To The | 8/7/1994 | 1.75 | 0 | 0 | *Unknown* |
| Rapidan | 8/7/1994 | 1.75 | 0 | 0 | *Unknown* |
| Mankato | 6/10/1994 | 0.75 | 0 | 0 | $500 |
| Mankato | 9/13/1993 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/19/1991 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/19/1991 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/22/1990 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/24/1989 | 1 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/30/1983 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/4/1982 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/22/1981 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/14/1981 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/27/1980 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/29/1980 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/15/1978 | 2.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/5/1975 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/28/1974 | 1.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/28/1974 | 2.75 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/23/1968 | 1.25 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/23/1962 | 1.5 | 0 | 0 | *Unknown* |
| Blue Earth County | 8/29/1958 | 2 | 0 | 0 | *Unknown* |
| | | | | | |
| **Highest Value Property Damage** | | | | | **$250,000** |

*Table C - 3. All severe thunderstorm wind events recorded by NCEI, 1950-April 2019*

| Location or County | Date | Type | Magnitude (Knots) | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|---|
| Mankato | 9/20/2018 | Thunderstorm Wind | 58 | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Magnitude (Knots) | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|---|
| (Mkt)Mankato Muni Ar | 9/20/2018 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| Madison Lake | 9/20/2018 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| Butternut | 7/19/2017 | Thunderstorm Wind | 54 | 0 | 0 | *Unknown* |
| Rapidan | 7/19/2017 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Beauford | 7/19/2017 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Minnesota Lake | 7/9/2017 | Thunderstorm Wind | 63 | 0 | 0 | *Unknown* |
| Amboy | 6/16/2017 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Vernon Center | 6/12/2017 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Amboy | 6/12/2017 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Rapidan | 8/19/2016 | Thunderstorm Wind | 56 | 0 | 0 | $150,000 |
| Butternut | 8/18/2016 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Lake Crystal | 8/18/2016 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 8/18/2016 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| (Mkt)Mankato Muni Ar | 7/13/2016 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Cambria | 6/17/2016 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Vernon Center | 6/14/2016 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Mankato | 6/14/2016 | Thunderstorm Wind | 56 | 0 | 0 | $5,000 |
| Rapidan | 6/10/2016 | Thunderstorm Wind | 65 | 0 | 0 | *Unknown* |
| Mankato | 6/10/2016 | Thunderstorm Wind | 56 | 0 | 0 | $25,000 |
| Good Thunder | 6/10/2016 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Minnesota Lake | 5/26/2016 | Thunderstorm Wind | 56 | 0 | 0 | $25,000 |
| Amboy | 5/25/2016 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Mankato | 7/17/2015 | Thunderstorm Wind | 61 | 0 | 0 | $100,000 |
| Vernon Center | 6/22/2015 | Thunderstorm Wind | 61 | 0 | 0 | $50,000 |
| Blue Earth County | 6/22/2015 | High Wind | 52 | 0 | 0 | *Unknown* |
| Cambria | 9/20/2014 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Lake Crystal | 9/20/2014 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 9/20/2014 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Minnesota Lake | 8/18/2014 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Garden City | 6/16/2014 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Vernon Center | 6/16/2014 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mapleton | 6/16/2014 | Thunderstorm Wind | 65 | 0 | 0 | *Unknown* |
| Mapleton | 6/16/2014 | Thunderstorm Wind | 65 | 0 | 0 | $10,000 |
| Beauford | 6/16/2014 | Thunderstorm Wind | 78 | 0 | 0 | $100,000 |
| Mankato | 6/16/2014 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Minnesota Lake | 6/16/2014 | Thunderstorm Wind | 87 | 0 | 0 | $500,000 |
| Mankato | 6/23/2013 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| (Mkt)Mankato Muni Ar | 6/21/2013 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Magnitude (Knots) | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|---|
| Vernon Center | 6/12/2013 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Mapleton | 6/12/2013 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 8/3/2012 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/10/2012 | Thunderstorm Wind | 52 | 0 | 0 | $250 |
| Garden City | 6/10/2012 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/15/2011 | Thunderstorm Wind | 52 | 0 | 0 | $2,500 |
| Blue Earth County | 10/26/2010 | High Wind | 50 | 0 | 0 | *Unknown* |
| Butternut | 8/19/2010 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 7/23/2010 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Madison Lake | 7/23/2010 | Thunderstorm Wind | 52 | 0 | 0 | $5,000 |
| Perth | 7/17/2010 | Thunderstorm Wind | 51 | 0 | 0 | *Unknown* |
| Amboy | 7/17/2010 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 6/26/2010 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Mankato | 6/25/2010 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Amboy | 6/25/2010 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Blue Earth County | 10/26/2008 | High Wind | 50 | 0 | 0 | *Unknown* |
| Mankato | 7/31/2008 | Thunderstorm Wind | 54 | 0 | 0 | *Unknown* |
| Mankato | 7/31/2008 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Mankato | 7/31/2008 | Thunderstorm Wind | 58 | 0 | 0 | *Unknown* |
| Mankato | 7/11/2008 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/6/2007 | High Wind | 59 | 0 | 0 | *Unknown* |
| Mankato | 6/24/2006 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Lake Crystal | 8/3/2005 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mapleton | 7/25/2005 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 6/20/2005 | Thunderstorm Wind | 63 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/20/2005 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/8/2005 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Mankato | 6/8/2005 | Thunderstorm Wind | 57 | 0 | 0 | *Unknown* |
| Mankato | 5/26/2005 | Thunderstorm Wind | 54 | 0 | 0 | *Unknown* |
| Blue Earth County | 12/12/2004 | High Wind | 40 | 0 | 0 | *Unknown* |
| Amboy | 7/21/2004 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Lake Crystal | 4/18/2004 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Mankato | 4/18/2004 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Good Thunder | 4/18/2004 | Thunderstorm Wind | 60 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/18/2004 | High Wind | 52 | 0 | 0 | *Unknown* |
| Garden City | 8/21/2003 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/9/2003 | Thunderstorm Wind | 70 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/4/2003 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Mankato | 7/4/2003 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mankato | 8/3/2002 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Magnitude (Knots) | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|---|
| Mankato | 8/3/2002 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Madison Lake | 7/23/2001 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/13/2001 | Thunderstorm Wind | 50 | 0 | 0 | $2,000 |
| Mankato Arpt | 6/13/2001 | Thunderstorm Wind | 54 | 0 | 0 | *Unknown* |
| Mankato Arpt | 5/6/2001 | Thunderstorm Wind | 54 | 0 | 0 | *Unknown* |
| Mapleton | 5/1/2001 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/7/2001 | High Wind | 69 | 0 | 0 | *Unknown* |
| Lake Crystal | 8/7/2000 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Mankato | 8/7/2000 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/5/2000 | High Wind | 64 | 0 | 0 | *Unknown* |
| Lake Crystal | 6/26/1999 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Mankato | 6/22/1999 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Blue Earth County | 3/17/1999 | High Wind | 55 | 0 | 0 | *Unknown* |
| Blue Earth County | 11/10/1998 | High Wind | 54 | 0 | 0 | *Unknown* |
| Lake Crystal | 8/19/1998 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/20/1998 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Madison Lake | 6/25/1998 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Mankato | 6/24/1998 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| St Clair | 5/15/1998 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| St Clair | 5/15/1998 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| Mankato | 5/15/1998 | Thunderstorm Wind | 61 | 0 | 1 | *Unknown* |
| Mankato | 5/15/1998 | Thunderstorm Wind | 61 | 0 | 0 | $20,000,000 |
| Mankato | 7/1/1997 | Thunderstorm Wind | 60 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/6/1997 | High Wind | 51 | 0 | 0 | *Unknown* |
| Blue Earth County | 10/29/1996 | High Wind | 64 | 0 | 0 | *Unknown* |
| Lake Crystal | 10/16/1996 | Thunderstorm Wind | 50 | 0 | 0 | *Unknown* |
| Mankato | 6/5/1996 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Mapleton | 5/19/1996 | Thunderstorm Wind | 60 | 0 | 0 | *Unknown* |
| Blue Earth County | 2/10/1996 | High Wind | 48 | 0 | 0 | *Unknown* |
| Lake Crystal | 7/27/1995 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Sterling Center | 7/27/1995 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Mankato | 7/24/1995 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Mankato | 7/7/1994 | Thunderstorm Wind | 72 | 0 | 0 | $500 |
| Mankato | 6/30/1994 | Thunderstorm Wind | 65 | 0 | 0 | *Unknown* |
| Mapleton | 6/30/1994 | Thunderstorm Wind | 0 | 0 | 0 | $5,000 |
| St Clair | 6/30/1994 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Mankato | 6/10/1994 | Thunderstorm Wind | 56 | 0 | 0 | $500 |
| Blue Earth County | 5/28/1991 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/29/1991 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/29/1991 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Magnitude (Knots) | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|---|
| Blue Earth County | 6/12/1990 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/12/1990 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/12/1990 | Thunderstorm Wind | 57 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/2/1990 | Thunderstorm Wind | 0 | 0 | 1 | *Unknown* |
| Blue Earth County | 5/24/1989 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 9/3/1986 | Thunderstorm Wind | 60 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/30/1986 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/30/1986 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/8/1986 | Thunderstorm Wind | 64 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/27/1984 | Thunderstorm Wind | 56 | 0 | 0 | *Unknown* |
| Blue Earth County | 7/19/1983 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/30/1983 | Thunderstorm Wind | 55 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/13/1983 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/4/1982 | Thunderstorm Wind | 76 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/4/1982 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/23/1981 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/14/1981 | Thunderstorm Wind | 61 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/30/1981 | Thunderstorm Wind | 60 | 0 | 0 | *Unknown* |
| Blue Earth County | 9/20/1980 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 8/19/1980 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/19/1979 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/19/1979 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/26/1978 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 9/10/1975 | Thunderstorm Wind | 65 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/20/1974 | Thunderstorm Wind | 70 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/20/1974 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/18/1974 | Thunderstorm Wind | 52 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/20/1974 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 8/29/1973 | Thunderstorm Wind | 51 | 0 | 0 | *Unknown* |
| Blue Earth County | 8/21/1973 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 4/19/1973 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/29/1971 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/29/1971 | Thunderstorm Wind | 69 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/29/1971 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/24/1971 | Thunderstorm Wind | 68 | 0 | 0 | *Unknown* |
| Blue Earth County | 9/21/1970 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 8/23/1968 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/10/1968 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 6/28/1963 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| Blue Earth County | 5/30/1959 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Magnitude (Knots) | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|---|
| Blue Earth County | 9/1/1957 | Thunderstorm Wind | 0 | 0 | 0 | *Unknown* |
| | | | | | | |
| **Highest Value Property Damage** | | | | | | **$20,000,000** |

*Table C - 4. All extreme flood events recorded by NCEI, 1996-April 2019*

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Cambria | 3/17/2019 | Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 9/22/2016 | Flood | 0 | 0 | *Unknown* |
| Cambria | 6/17/2016 | Flash Flood | 0 | 0 | *Unknown* |
| Amboy | 6/14/2016 | Flash Flood | 0 | 0 | *Unknown* |
| Lake Crystal | 6/14/2016 | Flash Flood | 0 | 0 | *Unknown* |
| Judson | 6/18/2014 | Flood | 0 | 0 | $2,300,000 |
| Eagle Lake | 6/17/2014 | Flash Flood | 0 | 0 | *Unknown* |
| Vernon Center | 6/16/2014 | Flash Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 6/21/2013 | Flash Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 3/21/2011 | Flood | 0 | 0 | *Unknown* |
| Amboy | 9/23/2010 | Flood | 0 | 0 | $2,100,000 |
| Minnesota Lake | 9/23/2010 | Flash Flood | 0 | 0 | *Unknown* |
| South Bend | 6/26/2010 | Flash Flood | 0 | 0 | *Unknown* |
| Mankato | 6/25/2010 | Flash Flood | 0 | 0 | *Unknown* |
| Pemberton | 3/17/2010 | Flood | 0 | 0 | $400,000 |
| Minnesota Lake | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Mapleton | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Minnesota Lake | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Pemberton | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Beauford | 3/15/2010 | Flood | 0 | 0 | *Unknown* |
| Mankato | 8/19/2007 | Flash Flood | 0 | 0 | *Unknown* |
| Mapleton | 5/19/2007 | Flash Flood | 0 | 0 | *Unknown* |
| Eagle Lake | 6/16/2006 | Flash Flood | 0 | 0 | *Unknown* |
| Mankato | 6/9/2006 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 10/4/2005 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 8/18/2005 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 5/12/2005 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 6/9/2004 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 6/9/2004 | Flash Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 5/1/2001 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 4/1/2001 | Flood | 0 | 0 | *Unknown* |
| Mankato | 8/9/1999 | Flood | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 5/1/1997 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 4/1/1997 | Flood | 0 | 0 | *Unknown* |
| Blue Earth County | 3/15/1997 | Flood | 0 | 0 | *Unknown* |
| Mankato | 9/2/1996 | Flash Flood | 0 | 0 | *Unknown* |
| Mankato | 6/16/1996 | Flash Flood | 0 | 0 | *Unknown* |
| | | | | | |
| **Highest Value Property Damage** | | | | | **$2,300,000** |

*Table C - 5. All severe winter weather events recorded by NCEI, 1996-April 2019*

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 4/10/2019 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/24/2019 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 2/20/2019 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/7/2019 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/27/2019 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/18/2019 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/1/2018 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 4/14/2018 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 4/13/2018 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 4/3/2018 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/23/2018 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/4/2018 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/22/2018 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 3/12/2017 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/23/2017 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/10/2016 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/7/2016 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 2/2/2016 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/28/2015 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/8/2015 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 11/26/2014 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 4/3/2014 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/4/2014 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 2/26/2014 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 2/20/2014 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/26/2014 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/22/2014 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/16/2014 | Blizzard | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 4/22/2013 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 4/18/2013 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 4/11/2013 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/3/2013 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/21/2013 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 12/31/2011 | Winter Weather | 0 | 0 | *Unknown* |
| Blue Earth County | 2/20/2011 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/30/2011 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/23/2010 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/20/2010 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/10/2010 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 12/3/2010 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 11/12/2010 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/7/2010 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/25/2010 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 12/23/2009 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/8/2009 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 10/12/2009 | Winter Weather | 0 | 0 | *Unknown* |
| Blue Earth County | 1/12/2009 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/20/2008 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 12/1/2007 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/1/2007 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/23/2007 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/14/2007 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 12/31/2006 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 11/9/2006 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 3/12/2006 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/13/2005 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 3/18/2005 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/21/2005 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/1/2005 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/5/2004 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/1/2004 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/24/2004 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/9/2003 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 11/22/2003 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/11/2003 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 3/14/2002 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/8/2002 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 2/9/2002 | Winter Storm | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 3/11/2001 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 2/24/2001 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/29/2001 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/19/2000 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 10/1/1999 | Winter Weather | 0 | 0 | *Unknown* |
| Blue Earth County | 3/8/1999 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/8/1999 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/17/1999 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/1/1999 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 1/4/1998 | Ice Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/22/1997 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/15/1997 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/9/1997 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 12/23/1996 | Winter Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 12/14/1996 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 11/22/1996 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 11/20/1996 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 11/14/1996 | Ice Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 3/23/1996 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 1/28/1996 | Blizzard | 0 | 0 | *Unknown* |
| Blue Earth County | 1/25/1996 | Heavy Snow | 0 | 0 | *Unknown* |
| Blue Earth County | 1/17/1996 | Ice Storm | 0 | 0 | *Unknown* |
| Blue Earth County | 1/10/1996 | Heavy Snow | 0 | 0 | *Unknown* |
| | | | | | |
| **Highest Value Property Damage** | | | | | *Unknown* |

*Table C - 6. All severe cold/wind chill events recorded by NCEI, 1996-April 2019*

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 1/29/2019 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/1/2018 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 12/30/2017 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 12/17/2016 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/17/2016 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 3/2/2014 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/27/2014 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/23/2014 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/5/2014 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 12/29/2013 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 1/7/2010 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/14/2009 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 12/15/2008 | Extreme Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 2/19/2008 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 2/10/2008 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/5/2005 | Cold/Wind Chill | 2 | 0 | *Unknown* |
| Blue Earth County | 1/15/1997 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 12/24/1996 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 2/1/1996 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/31/1996 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| Blue Earth County | 1/18/1996 | Cold/Wind Chill | 0 | 0 | *Unknown* |
| | | | | | |
| **Highest Value Property Damage** | | | | | ***Unknown*** |

*Table C - 7. All extreme heat/heat events recorded by the NCEI, 1996-April 2019*

| Location or County | Date | Type | Deaths | Injuries | Property Damage |
|---|---|---|---|---|---|
| Blue Earth County | 7/20/2016 | Excessive Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 8/25/2013 | Excessive Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 7/18/2011 | Excessive Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 7/30/2006 | Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 8/4/2001 | Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 8/1/2001 | Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 7/30/2001 | Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 7/29/1999 | Heat | 0 | 0 | *Unknown* |
| Blue Earth County | 7/23/1999 | Heat | 0 | 0 | *Unknown* |
| | | | | | |
| **Highest Value Property Damage** | | | | | ***Unknown*** |

*Table C - 8. All lightning events recorded by the NCEI, 1996-April 2019*

| Location or County | Date | Deaths | Injuries | Property Damage |
|---|---|---|---|---|
| Lehillier | 9/2/1996 | 0 | 0 | $100,000 |
| | | | | |
| **Highest Value Property Damage** | | | | **$100,000** |

# Appendix D
# Adopting Resolutions

*Resolutions to be added to Appendix D by Blue Earth County following final approval of the plan by FEMA.*

# Appendix E
# Steering Committee Meetings

7/3/2019

# Minnesota 10-County Multi-Hazard Mitigation Update Project

## Kick-off Orientation Webinar

UNIVERSITY OF MINNESOTA GEOSPATIAL ANALYSIS CENTER

SWENSON COLLEGE OF SCIENCE & ENGINEERING
UNIVERSITY OF MINNESOTA DULUTH
Driven to Discover

## Webinar Purpose & Goals

**Purpose:**

The purpose of this webinar is provide an orientation kick-off meeting for the Emergency Managers participating in the Minnesota 10-County Multi-Hazard Mitigation Plan Update project.

**Goals:**

- Introduce the UMD Team and County contacts.
- Provide an overview of the project.
- Clarify roles and responsibilities.
- Outline the planning process, discuss key tasks and timelines.
- Discuss next steps and answer your questions.

## Introductions

**Who We Are (UMD Project Team)**


Stacey Stark, Director
Geospatial Analysis Center (GAC)


Bonnie Hundrieser, Emergency Management Planning Consultant (Hundrieser Consulting, LLC)


Zach Vava
GIS Specialist
Content gathering, Analysis (GAC)


Steve Graham, Research Associate and Flood Modeling Specialist (GAC)


Micaella Penning, Research Associate, GIS Specialist, Cartographer, and Editor (GAC)

**Who You Are (County Emergency Managers):**

- Name, Title, and County
- Past Experience with MHMP?

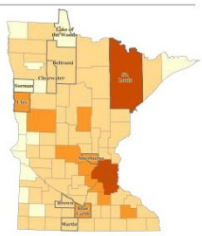
**Minnesota HSEM:**

Jennifer Nelson, MN HSEM
State Hazard Mitigation Officer

## Project Overview

- **10 Counties**

| County | FEMA's Expiration Date |
|---|---|
| St. Louis | 8/12/2018 |
| Brown | 8/13/2018 |
| Martin | 8/13/2018 |
| Blue Earth | 9/17/2018 |
| Lake of the Woods | 9/17/2018 |
| Beltrami | 9/25/2018 |
| Norman | 9/25/2018 |
| Sherburne | 9/25/2018 |
| Clearwater | 10/31/2018 |
| Clay | 11/26/2018 |



GEOSPATIAL ANALYSIS CENTER

## Why UMD-GAC?

- **Proven experience**
  GAC has extensive experience in the comprehensive review and update of county MHMPs, as well as update of the State MHMP.
- **Advanced Capabilities**
  GAC has expertise in the application of GIS, HAZUS, and research to support MHMP development and meeting all FEMA requirements.
- **Ability to Expedite**
  GAC has the ability to expedite the MHMP update process for multiple counties through a consistent approach and format, which also supports State and FEMA review of draft plans.
- **Planning Team**
  GAC project team includes working with advanced GIS students and experienced consultants to effectively complete tasks.

## Overview of MHMP Update Process

*Key Considerations for Discussion*

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7/3/2019

## EM Roles & Responsibilities

- Act as main Point of Contact.
- Track required local match and submit to HSEM.
- Coordinate communication and outreach to engage local planning team, additional key stakeholders, and the public.
- Review past mitigation actions and provide status update.
- Provide information for Capabilities Assessment (Plans & Programs in Place / Program Gaps or Deficiencies) for each hazard.
- Assist in development of new mitigation action chart (must be county and jurisdictionally specific) that includes projects for HMA eligibility.
- Provide information for Critical Facilities forms.
- Provide coordination with GIS and assessor's data managers in order to obtain GIS and parcel information for GIS analyses.
- Assist in timely review of material throughout the plan update process via phone, email, and in-person meetings.

## Planning Team Engagement

Each EM will play a critical role in identification and engagement of a planning team during the plan update process. The MHMP must document who was involved & how, and include representation from the county and each participating city jurisdiction. Neighboring communities, local and regional agencies should also be given the opportunity to participate.

***Key Considerations:***

- **Planning Team** – Should include key county departments/staff and representation from all participating cities, as well as other key agency or organizational personnel (i.e., MNDNR, Utility reps, Schools)
- **In-Person Meetings** – Our planning process consists of 2 in-person planning team meetings (Kickoff Meeting and Mitigation Action Chart review meeting).
- **Other Communication** – At different parts of the planning process we will seek additional participation & feedback via email.

## Public Engagement

As part of the planning process, the MHMP must document how the public was given the opportunity to be involved in the planning process and how their feedback was incorporated into the plan.

***Key Considerations:***

- Our public outreach process consists of 2 outreach periods (early in the process and for public review of draft plan).
  - We provide you with a news release for posting/distribution.
  - We work with you to document your public outreach in the plan.
  - We provide a website for posting the plan and collection of public feedback.
  - If you wish to do additional public outreach, you may do so (i.e., Facebook postings, providing an update at meetings, or distributing information at public events, such as a booth at the County Fair).

## Hazard Identification and Risk Assessment

All plans will address the **natural hazards** identified to pose risk to the county and its jurisdictions. Non-natural hazards (technological and human-caused) will not be included in the risk and vulnerability assessment and development of mitigation strategies and actions.

***Key Considerations:***

- Identify specific impacts and vulnerabilities (at the county/jurisdiction level) due to natural hazards.
- Identify if and how any priorities changed since the last plan (i.e., financial, legal, political realities, and post-disaster conditions).
- Identify existing development or future development that may increase or decrease the community's vulnerability to natural hazard events.

## Mitigation Action Plan

Key activities to support the update of the 5-year Mitigation Action Plan will include a capabilities assessment for mitigating against natural hazards, as well as a comprehensive review of the status of mitigation actions in the previously approved plan.

***Key Considerations:***

- Plans and Programs in Place that support mitigation.
- Program Gaps or Deficiencies that hinder mitigation.
- Past Mitigation Action Review (Completed, Deleted, or Ongoing)
- Identification of projects that may be eligible for HMA funding.
- Local Mitigation Survey to assess local-level capabilities and mitigation actions.

## Plan Adoption

After FEMA has provided "APA" status (Approval Pending Adoption), the county and all participating jurisdictions must formally adopt the plan.

***Key Considerations:***

- Engaging key County and City personnel throughout the planning process will help to ensure understanding of the purpose and process of the MHMP update, including expectation of follow-through to adopt the plan.

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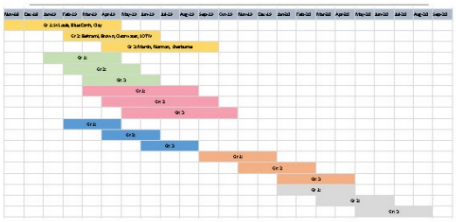
## Project Timeline

- 30-Month total timeline - 24 months active
- Staggering of Counties will be required to complete UMD's update of risk assessments, research of hazard histories, etc. for each county.
- Many tasks occur concurrently, others must be done in succession.

## Estimated Time-line

| STAGE | TIME | WHAT | CONSULTANT ROLES | COUNTY ROLES |
|---|---|---|---|---|
| A | 3-6 mo | Research, planning, initial research, review previous mitigation actions | Outlines and GIS data requests; discussions; coordinate schedules | Coordinate discussions; e-mail and questions/schedules |
| B | 2 mo | News Releases #1, Plans & Programs in Place, Capabilities Assessment, Past Mitigation Action Review, coordinate planning information, schedule for Planning Team meeting | Prepare Base Level County EM and Building Block Maps | Prepare, maintain non-history records |
| C | 1 mo | Obtain additional GIS data from County as determined; initial progress/collection of data | GIS workflow risk analysis; HAZUS assessments; County Assessor's data requests | same; maintain non-history records |
| D | 2 mo | Planning Team Meeting #1; Identify Planning Team Meeting #2; develop draft County & municipal information about status | Prepare Base Level County EM and Building Block Maps | Prepare, maintain non-history records |
| E | 2 mo | Obtain and format Hydrologic and Hydraulic and non-inundation data for flood analysis | GIS workflow risk analysis; HAZUS and Risk Assess; GIS Specialist | Prepare, maintain non-history records; review; as-built plans |
| F | 2-3 mo | Flood data review and flood analysis | GIS specialist - Tailor created file; Billing and flood data to review and file in County | coordinate discussions; e-mail and questions/schedules |
| G | 2-4 mo | Planning Team Meeting #2; Compile Final County & Jurisdictional Mitigation Action Plans | Prepare and GAS deliverables | Prepare, maintain non-history records |
| H | 2-4 mo | Compile draft plan and public review; News Release #2; Conduct public review & comment period; Submit draft plan to HSEM | Prepare all deliverables | same; maintain non-history records |

## Estimated Time-line (scenario)



## Our Recent Experience

These things help speed up the update process.

**The UMD Team provides you with prepared communications & formats.**

- *Using the existing formats we provide to you for particular tasks (i.e. data collection, meeting notices, owner classes) will expedite our process, effectively use your time, and maintain consistency among plans.*

**EM's complete task assignments in a through and timely fashion.**

- *The quicker you get them back to us with complete information, the faster we can work with them.*

**EM's help coordinate getting information that we need.**

- *Your assistance to coordinate with your GIS dept. or County Assessor will help to ensure we get the information we need to update the plan.*
- *Your assistance to coordinate with county departments and city personnel to get information or feedback is also extremely helpful.*

**EM's do a great job of convening planning team meetings & outreach.**

- *Well-attended planning team meetings help to ensure easier communication on this project with all those involved, and helps document required participation to HSEM and FEMA in the planning process. It also helps secure your local match.*

## EM Tasks

The UMD Team will work with each County EM or designated POC to facilitate completion of the following tasks:

- ✓ Public News Releases (2)
- ✓ Plans & Programs in Place Checklist
- ✓ Capabilities Assessment
- ✓ Past Mitigation Action Review
- ✓ Coordination of Local Mitigation Survey
- ✓ Planning Team Meetings (2)
- ✓ Compilation of Critical & Essential Facilities in Each Jurisdiction
- ✓ Building Attribute Checklist for Flood Economic Loss Analysis

## Match

- ✓ Make sure all stakeholders/participants know where/how to record their time for county's match
- ✓ Report match time quarterly to HSEM

3

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## Next Steps

UMD Team members will follow up with each EM to provide & discuss the following task assignments you can begin to work on:

- Disseminate News Release #1 (Bonnie)
- Complete Plans in Place Checklist (Bonnie)
- Complete Capabilities Assessment (Bonnie)
- Conduct Past Mitigation Action Review (Bonnie)
- Disseminate Local Mitigation Survey (Bonnie)
- Schedule 1st Planning Team Meeting (Bonnie)
- Complete Listing of Critical Facilities (Zach)

## Questions?

What questions do you have for UMD or HSEM about the MHMP Update process?

## Contact Information

Stacey Stark, MS, GISP
**Geospatial Analysis Center**
slstark@d.umn.edu
218-726-7438

Example Plans:
https://z.umn.edu/hazardmitigation

4

**Blue Earth County**
**Multi-Hazard Mitigation Plan Update**
Wednesday, April 24, 2019 MHMP Planning Team Meeting #1
Blue Earth County Justice Center – Mankato, MN
2:00 p.m. – 4:00 p.m.

**Meeting Summary:**
On Wednesday, April 24, 2019, key county, city, and township representatives, as well as other stakeholders were convened to participate in a Planning Team Meeting for the update of Blue Earth County Multi-Hazard Mitigation Plan (MHMP). The meeting was facilitated by the University of Minnesota – Duluth Geospatial Analysis Center (GAC) project team who are leading the update of the Blue Earth County MHMP. A total of **38** people attended the meeting.

**The opening presentation covered 6 key areas:**

1. The purpose of hazard mitigation planning.

2. The role & responsibilities of the Planning Team.

3. An overview of content in the MHMP (County physical & social profile, Asset Inventory, Hazard Assessment and Vulnerability Analysis, Capability Assessment and Mitigation Actions).

4. Review and discussion of natural hazards that pose risk to the County, including consideration of the following:

    - How has the risk to severe natural hazard events *increased or decreased* since the last plan?
    - Are there *jurisdictional variations* in risk?
    - Are there *local vulnerabilities* to consider?
    - Have there been *changes in development*?

    **Planning Team Discussion Notes:**

    - ***Severe Winter Storms – No noted changes in the last 5 years. Heavy snow, blizzards and ice storms are common each winter. Burying of powerlines was noted for a mitigation action for loss of power due to heavy ice/snow that may bring down lines.***

    - ***Severe Summer Storms - No noted changes in the last 5 years. Severe thunderstorms, strong winds, hail and even the chance of tornadoes are common each year. Identification of where there are storm shelters or safe rooms is a top priority, such as campgrounds and mobile home parks. Also burying of powerlines where possible.***

    - ***Flooding – There has been an increase in high-rain/flood events in the last 5 years. Mitigation for flood issues is a higher priority for both the County and local communities. Improving stormwater systems and culverts were noted.***

    - ***Extreme Temperatures - No noted changes in the last 5 years.***

- ***Erosion, Landslides & Land Subsidence – The group felt that the hazard of erosion & landslides has increased due to the increase in high rain/flood events since the last 2013 plan. Resulting soil instability due to rain events was noted to be more problematic and posing risk to areas near structures (i.e., bridges, roads and private properties adjacent to receding lakeshores). The county noted that they have acquired a number of properties due to their imminent risk of falling into the river due to erosion.***

- ***Wildfire – No noted change in the last 5 years. Wildfire is considered a low risk.***

- ***Drought – No noted change in the last 5 years.***

- ***Dam Failure – Dam failure is considered a low probability / low risk to the County. The Rapidan Dam is owned by Blue Earth County and operated by North American Hydro. They maintain a detailed Emergency Action Plan and also have an inundation map to identify the affected public and assets in the event of dam failure.***

5. Review of mitigation strategies and examples of related mitigation actions.

6. An overview of the FEMA Hazard Mitigation Assistance (HMA) Grants program.

Following the presentation, a facilitated Mitigation Action Working Session was held. Participants discussed the natural hazards of concern to their communities and filled out Mitigation Ideas Worksheets to identify new, jurisdictionally-specific mitigation actions to be included in the MHMP plan update. Mitigation actions were required to fall within one of the 5 mitigation action strategies:

1. Local Planning and Regulations
2. Structure and Infrastructure Projects
3. Natural Systems Protection
4. Education and Awareness Programs
5. Mitigation Preparedness and Response Support

Following the Mitigation Action Working Session, the group then discussed the upcoming process and anticipated timeline for engaging the public and other key stakeholders in the plan update. Meeting attendees were told that they would be contacted for additional information and kept informed on the upcoming steps in the planning process, including development of local mitigation action charts and review of the final draft plan.

**Attached to this meeting summary are the following documentation items:**

- 4-24-19 Planning Team Meeting Stakeholder Invite List
- 4-24-19 Blue Earth County Meeting Email Invite
- 4-24-19 Meeting Agenda
- 4-24-19 Meeting Sign-in Sheets (typed & scanned)
- 4-24-19 Power Point Presentation Slides
- 4-24-19 Meeting Handouts (Mitigation Strategies, HMA Grants, Mitigation Ideas Worksheet)
- 4-24-19 Mitigation Ideas Working Session Notes

*Meeting Summary Prepared By: Bonnie Hundrieser, UMD Project Team*

# Blue Earth County 2019 MHMP Update

## 4-24-19 Planning Team Meeting Stakeholder Invite List

Following is the list of stakeholders that were invited via email to attend the Blue Earth County MHMP Update Planning Team Meeting #1 held on April 24, 2019.

Blue Earth County Contacts

| Name | Position | E-Mail Address |
|---|---|---|
| Colleen Landkamer | County Commissioner | colleen.landkamer@blueearthcuntymn.gov |
| Vance Stuehrenberg | County Commissioner | vances@blueearthcountymn.gov |
| Mark Piepho | County Commissioner | mark.piepho@blueearthcountymn.gov |
| Will Purvis | County Commissioner | will.purvis@blueearthcountymn.gov |
| Kip Bruender | County Commissioner | kip.bruender@blueearthcountymn.gov |
| Bob Meyer | County Administrator | bob.meyer@blueearthcountymn.gov |
| Mike Maurer | Emergency Mgmt. Director | mike.maurer@blueearthcountymn.gov |
| Brenda Olmscheid | Asst. Emergency Mgmt. Coordinator | brenda.olmscheid@blueearthcountymn.gov |
| Eric Weller | Dep. Emergency Mgmt. Coordinator | eric.weller@southcentral.edu |
| Paul Barta | Dep. Emergency Mgmt. Coordinator | paul.barta@blueearthcountymn.gov |
| Dan Davidson | Dep. Emergency Mgmt. Coordinator | dan.davidson@blueearthcountymn.gov |
| Phil Claussen | Director of Human Services | phil.claussen@blueearthcountymn.gov |
| Ryan Thilges | Public Works Director | ryan.thilges@blueearthcountymn.gov |
| Chad Wilde | Public Works Supervisor | Chad.wilde@blueearthcountymn.gov |
| Julie Conrad | Environmental Services | julie.conrad@blueearthcountymn.gov |
| Scott Salsbury | Environmental Services | scott.salsbury@blueearthcountymn.gov |
| George Leary | Environmental Services | George.leary@blueearthcountymn.gov |
| Kelley Haeder | Public Health | kelley.haeder@blueearthcountymn.gov |
| Brad Peterson | Sheriff | brad.peterson@blueearthcountymn.gov |
| Amy Holst | Public Information Officer | amy.holst@blueearthcountymn.gov |
| Jessie Anderson | County Administration | Jessie.anderson@blueearthcountymn.gov |
| Jonathan Graves | GIS | jonathan.graves@blueearthcountymn.gov |
| Michael Stalberger | Director of Taxpayer Services | michael.stalberger@blueearthcountymn.gov |

City Contacts

| City | City Clerk/Administrator | E-Mail Address |
|---|---|---|
| Amboy | Patty Smith | patty@amboymn.com |
| Eagle Lake | Jennifer Bromeland | jbromeland@eaglelakemn.com |
| Lake Crystal | Taylor Gronau | lccity@hickorytech.net |
| Madison Lake | Curt Kephart | admin@madisonlakemn.gov |
| Mankato | Patrick Hentges | phentges@mankatomn.gov |
| Mapleton | Patty Woodruff | mptn@hickorytech.net |
| Pemberton | Darla Ward | pemberton.city@mchsi.com |
| Skyline | Cathy Dahl | clerk@cityofskyline.com |
| St. Clair | Catherine Seys | citystc@hickorytech.net |
| Vernon Center | Diane Roelofs | vcclerk18@gmail.com |

Township Contacts

| Township | Clerk | E-Mail Address |
|---|---|---|
| Beauford | Kim Krengel | krenfarm@gmail.com |
| Butternut Valley | Adam Jones | jone0602@gmail.com |
| Cambria | Brenda Thorson | N/A |
| Ceresco | Tammy Sonnabend | tsonna@mytvwireless.com |
| Danville | Laurie Stenzel | lauriehstenzel@gmail.com |

| | | |
|---|---|---|
| Decoria | Valerie Levos | vdlevos@msn.com |
| Garden City | Liz Thiesse | lizb@hickorytech.net |
| Jamestown | James Anderson | jamestownmn@gmail.com |
| Judson | Jeff Davis | jc1990davis@gmail.com |
| LeRay | Karyn Block | leraytownship@exede.net |
| Lime | Laurie DeGezelle | limets.ld@gmail.com |
| Lincoln | Tammy Petterson | tammy.petterson@crystalvalley.coop |
| Lyra | Sandra Miller | lyratownship@gmail.com |
| Mankato | Dan Fogal | danfogal@hotmail.com |
| Mapleton | Gail Jaeger | gjjaeger56@yahoo.com |
| McPherson | Lynda Kruse | 7krusenkruses@gmail.com |
| Medo | Sheryl Olson | sherylaolson@gmail.com |
| Pleasant Mound | Dennis Urban | pmtamboy@yahoo.com |
| Rapidan | Maria Bartsch | Mbartsch1.MB@gmail.com |
| Shelby | Gloria Mack | jenemack@aol.com |
| Southbend | Jamie Malvin | southbendtownship@gmail.com |
| Sterling | Barb Lake | tonkabrat@gmail.com |
| Vernon Center | Janice Roelofs | roe279@hotmail.com |
| Township Assn | Sandy Hooker | sandy.hooker@mntownships.org |

Other Stakeholder Contacts

| Name | Agency | E-Mail Address |
|---|---|---|
| Jerad Bach | Soil & Water Conservation District | jerad.bach@blueearthswcd.org |
| Bradley Flatin | USDA Farm Service Agency | bradley.flatin@mn.usda.gov |
| Reginald Liddell | NRCS | reginald.liddell@mn.usda.gov |
| Paul Hansen | DNR | paul.j.hansen@state.mn.us |
| Tim Braulik | BENCO Electric | timb@benco.coop |
| Trisha Rosenfeld | Xcel Energy | trisha.a.rosenfeld@xcelenergy.com |
| Jacki Niss | MCHS | niss.jacki@mayo.edu |
| Alvin Roath | Ecumen Pathstone Living | alvinroath@ecumen.org |
| Sheri Allen | ISD 77 | aallen1@isd77.k12.mn.us |
| Sandi Schnorenberg | MSU Mankato | sandi.schnorenberg@mnsu.edu |
| Tom Bruels | St. Clair Public Schools | tbruels@stclaircyclones.org |
| Kevin Winkelman | Eagle Creek/Rapidan Dam | kevin.winkelman@eaglecreekre.com |

| | |
|---|---|
| **From:** | Mike Maurer |
| **To:** | Adam Jones; Alvin Roach; Amy Holst; Barb Lake; Bob Meyer; Brad Peterson; Bradley Flatin; Brenda Olmscheid; Cathrine Seys; Cathy Dahl; Chad Wilde; Curt Kephart; Dan Davidson; Dan Fogal; Darla Ward; Dennis Urban; Diane Roelofs; Weller, Eric; Gail Jaeger; George Leary; Gloria Mack; Jacki Niss; James Anderson; Jamie Malvin; Janice Roelofs; Jarad Bach; Jeff Davis; Jennifer Bromeland; Jessie Anderson; Jonathan Graves; Julie Conrad; Karyn Block; Kelley Haeder; Kevin Winkelman; Kim Krengel; Laurie DeGezelle; Laurie Stenzel; Liz Thiesse; Lynda Kruse; Maria Bartch; Michael Stalberger; Patrick Hentges; Patty Smith; Patty Woodruff; Paul Barta; Paul Hansen; Phil Claussen; Reginald Liddell; Ryan Thilges; Sandi Schnorenberg; Sandra Miller; Sandy Hooker; Scott Salsbury; Sheryl Olson; Tammy Petterson; Tammy Sonnabend; Taylor Gronau; Tim Braulick; Tom Bruels; Trisha Rosenfeld; Valerie Levos |
| **Cc:** | Pam Hermanson; Justin Neumann; Bonnie K Hundrieser |
| **Subject:** | RESCHEDULED: 2019 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION |
| **Date:** | Wednesday, April 10, 2019 10:26:57 AM |

# BLUE EARTH COUNTY

# RESCHEDULED

**2019 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION**

Greetings,

Your presence is requested at a Planning Team Meeting to update of the **2019 Blue Earth County Multi-Hazard Mitigation Plan**. You are requested to participate in this vital meeting because you have a position of administrative or departmental responsibility within either the County, a municipal government, or are a key stakeholder related to the planning process.

**Meeting Detail**

**Date: Wednesday, April 24, 2019**

**Time: 2:00 p.m. – 4:00 p.m.**

**Location: Blue Earth County Justice Center (2nd Floor Conference Room)**
**401 Carver Rd., Mankato, MN 56001**

**About the Plan**

The update of the Blue Earth County Multi-Hazard Mitigation Plan (MHMP) is a requirement by the State of Minnesota Department of Homeland Security & Emergency Management (HSEM) as well as the Federal Emergency Management Agency (FEMA) every 5 years. The plan addresses the natural hazards that face Blue Earth County and will result in the identification of mitigation actions that will help reduce or eliminate the impact of flooding or severe storms.

Your participation in this plan update is important for several reasons:

1. You can help identify critical mitigation projects to implement at the county or local level, and how they can be integrated with existing plans, policies, or project efforts.

2. Participating jurisdictions will be eligible to apply for FEMA hazard mitigation grant funding.

3. Mitigation planning is necessary to keep our communities resilient against future disasters

and reduce the costs of recovery.

4. FEMA requires documentation of how local government and key stakeholders participated in the planning process.

During this meeting we will review and rank the natural hazards that pose risk to Blue Earth County and individual communities and discuss a range of mitigation measures for local implementation. The meeting will be facilitated by personnel from the University of Minnesota Duluth - Geospatial Analysis Center team who are working closely with us on this project.

**Please RSVP**

Please RSVP back to me via email to indicate your attendance. If you cannot attend, please plan to send someone in your stead to ensure representation.

Thank you,

Michael J. Maurer
Chief Deputy/Emergency Management Director
Blue Earth County Sheriff's Office
507-304-4808
507-317-7002

Michael J. Maurer
Chief Deputy
Blue Earth County Sheriff's Office
507-304-4808
507-317-7002

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# Blue Earth County

## 2019 Multi-Hazard Mitigation Plan Update

### Planning Team Meeting

Wednesday, April 24, 2019 – 2:00 p.m. – 4:00 p.m.
Blue Earth County Justice Center – Mankato, MN

**Presenting:**

- Zachary Vavra, University of Minnesota –Duluth, Geospatial Analysis Center
- Bonnie Hundrieser, Hundrieser Consulting LLC (UMD Project Team)

**Agenda:**

1. Welcome and Introductions

2. Overview of MHMP Update
   - *Purpose of the Plan*
   - *Role of the Planning Team*
   - *Content of the Plan*
   - *Review of Natural Hazards*

3. Review of Mitigation Strategies

4. Overview of FEMA Hazard Mitigation Assistance (HMA) Grants

5. Mitigation Action Working Session

**Point of Contact:**
Mike Maurer
Blue Earth County Emergency Management Director
Phone: 507-304-4808
Email: Mike.Mauer@blueearthcountymn.us

## Blue Earth County

4/24/19 MHMP Planning Team Meeting #1

List of Participants *(38 Attendees)*

| Blue Earth County MHMP Update - Planning Team Meeting #1<br>Wednesday, April 24, 2019 - 2:00 p.m. - 4:00 p.m.<br>Participant Sign-in List | | | |
|---|---|---|---|
| **Name** | **Agency/Organization** | **Title** | **Email** |
| Catherine Seys | City of St. Clair | City Clerk-Treasurer | citystc@hickorytech.net |
| Gloria Mack | Shelby Township | Clerk | jenemack@aol.com |
| Maria Bartsch | Rapidan Township | Clerk-Treasurer | mbartsch1.mb@gmail.com |
| Ava Adams-Morris | Jamestown Township | Clerk | kreolelady@aol.com |
| Jonathan Graves | Blue Earth County | Appraiser/GIS Coordinator | jonathan.graves@blueearthcountymn.gov |
| Mark Piepho | Blue Earth County | Commissioner | mark.piepho@blueearthcountymn.gov |
| Daniel Bunde | Madison Lake | Chief of Police | dbunde@madisonlakemn.gov |
| Ray Cornelius | Rapidan Township | Chairman | rdweld@hickorytech.net |
| Patty Woodruff | City of Mapleton | City Administrator | mptn@hickorytech.net |
| Darla Ward | City of Pemberton | City Clerk-Treasurer | pemberton.city@mchi.com |
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| Paul Baer | LeRay Township | Chairman | pabaer1@gmail.com |
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| Erin Berle | Garden City Township | Chair | berles4@icloud.com |
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| Paul Barta | Blue Earth County | Captain | paul.barta@blueearthcountymn.gov |
| Mike Maurer | Blue Earth County | Chief Deputy/EM | mike.maurer@blueearthcountymn.gov |
| Dan Davidson | Blue Earth County | Lieutenant | dan.davidson@blueearthcountymn.gov |

**Blue Earth County – Multi Hazard Mitigation Plan Update**
**Planning Team Meeting #1 – Wednesday, April 24, 2019 – 2:00 p.m. – 4:00 p.m.**

## PARTICIPANT SIGN IN SHEET

| | Name | Agency/Organization | Title | Email |
|---|---|---|---|---|
| 1. | CATHERINE SEYS | CITY of ST. CLAIR | CITY CLERK-TREAS | citystc@hickorytech.net |
| 2. | GLORIA MACK | SHELBY TWP | CLERK | jenemacke@aol.com |
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| 4. | Ava Adams-Morris | Jamestown Twnship | Clerk | Krolelady@aol.com |
| 5. | Jonathon Graves | Blue Earth County | Appraiser/GIS coordinato | jonathon.graves@blueearthcountymn.gov |
| 6. | MARK PISPIKO | BLUE EARTH COUNTY | COMM COMMIS | MARK.PISPIKO@BLUEEARTHCOUNTYMN.GOV |
| 7. | Daniel Bunde | Madison Lake | Chief of police | dbunde@madison-lk.gov |
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| 9. | Patty Woodruff | city of mapleton | city Administrator | mptn@hickorytech.net |
| 10. | Darla Ward | City of Pemberton | City Clerk/Treasurer | pemberton.city@mchsi.com |
| 11. | Charles Friedrichsen | Decoora Township | Supervisor | MYA 77/13 @ 8:30AM |
| 12. | Trisha Duncan | Xcel Energy | Area Manager | trisha.a.duncan@xcelenergy.com |
| 13. | Jeff Johnson | City of Mankato | Director of Public Wks | jjohnson@mankatomn.gov |
| 14. | Paul Baer | LeRay Township | Chair | pabaer1@gmail.com |
| 15. | Ryan Thilges | Blue Earth County | Public Works Director | ryan.thilges@blueearthcountymn.gov |
| 16. | Kevin Winkelman | Eagle Creek Rapidan Dam | Regional Mgr. | Kevin.winkelman@eaglecreekre.com |
| 17. | Tom Bruels | St. Clair Public School | Superintendent | tbruels@stclaircyclones.org |
| 18. | Amy VOKAL | Mankato DPS | DIRECTOR | avokal@mankatomn.gov |
| 19. | Justin NEUMANN | Mankato DPS | Sergeant | jneuman@ " " " |
| 20. | Jeff Bengtson | Mankato DPS | Associate Director | jbengtson@mankatomn.gov |
| 21. | Julie Conrad | Blue Earth Co ES | Planner | |
| 22. | Scott Saltsman | Blue Earth County ES | Planner | |

## Blue Earth County – Multi Hazard Mitigation Plan Update
## Planning Team Meeting #1 – Wednesday, April 24, 2019 – 2:00 p.m. – 4:00 p.m.

| | Name | Agency/Organization | Title | Email |
|---|---|---|---|---|
| 23. | Tammy Pettersen | Lincoln Townships | Clerk | tmtpet@ecccinternet.net |
| 24. | Jennifer Bromeland | Eagle Lake | Admin. | |
| 25. | Brian Gorthl | Eagle Lake | P.W.D. | |
| 26. | Diane Roelofs | Vernon Ctr | Clerk-Treas | Vc.clerk18@gmail.com |
| 27. | Bradley Flatin | USDA - Farm Service Agency | County Exec Director | bradley.flatin@usda.gov |
| 28. | Taylor Gronau | Lake Crystal | Admin | |
| 29. | JSullAnderson | BEC | Admin Spec. | |
| 30. | Aaron Stubbs | BEC | Land use Planner | |
| 31. | Kelley Haeder | BEC | Public Hlth | |
| 32. | George Leary | BEC | County Zoning Admin | george.leary@blueearthcountymn.gov |
| 33. | Reginald h. Huddell | USDA/NRCS | District Conservationist | reginald.huddell@usda.gov |
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| 39. | | | | |
| 40. | | | | |
| 41. | | | | |
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| 45. | | | | |

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# Blue Earth County

2019 MULTI-HAZARD MITIGATION PLAN UPDATE
PLANNING TEAM MEETING #1
APRIL 24, 2019

## Agenda

1. Welcome and Introductions
2. Overview of MHMP Update
   - *About the Plan*
   - *Role of the Planning Team*
   - *Content of the Plan*
   - *Review of Natural Hazards*
3. Review of Mitigation Strategies
4. Overview of FEMA Hazard Mitigation Assistance (HMA) Grants & Eligible Activities
5. Mitigation Action Working Session


September 2016, Rural Mankato


2016, City of St. Clair

## About your UMD Project Team

UMD
Geospatial Analysis Center
University of Minnesota Duluth
Driven to Discover

- The **Geospatial Analysis Center (GAC) at the University of Minnesota Duluth (UMD)** was contracted by MN HSEM to facilitate the development of this plan and to conduct spatial analysis, mapping and research for the plan.
- The GAC has worked on 30 MHMP's (2011-2019), working with both Minnesota counties and tribes.
- Working with the GAC is **Bonnie Hundrieser**, who specializes in Emergency Management planning.

## About the Plan

The Multi-Hazard Mitigation Plan (MHMP) is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000). **The development of a local government plan is required in order to maintain eligibility for FEMA hazard mitigation grant programs.**

***MHMP's must:***

- Be updated every 5 years
- Identify hazards and conduct a risk assessment
- Include goals, strategies, and mitigation actions
- Address all jurisdictions
- Engage stakeholders and include public participation

## What is Hazard Mitigation?

**Hazard Mitigation is the effort to reduce loss of life and property by lessening the impact of future disasters.**

- Identifying Risks and Vulnerabilities
- Developing long-term strategies for risk reduction.
- Building partnerships.
- Communicating priorities.


## Role of the Planning Team

An MHMP **must** be developed with the participation of jurisdictional representatives and other key stakeholders. This group is referred to generally as the "Planning Team".

***The role of the Planning Team is to help:***

1. Review the natural hazards that pose risk to the county and its jurisdictions since the last plan was adopted.
2. Identify mitigation activities for implementation, including eligible FEMA HMA grant activities.
3. Assist with public outreach and gathering feedback.
4. Review of the draft plan and provide input to mitigation action charts.
5. Facilitate final adoption of the MHMP by local government.

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## Who the Plan Covers

This is a **multi-jurisdictional plan** that covers Blue Earth County, including the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, Skyline, St. Clair, and Vernon Center.

*The County and Cities are required to adopt the final plan. Townships are covered under the umbrella of the County.*

## Content of the Plan

- Documentation of the Planning Process
- Physical & Social Profile
- Critical Infrastructure Inventory
- Risk Assessment & Vulnerability Analysis
- Capability Assessment
- Mitigation Strategies and Actions

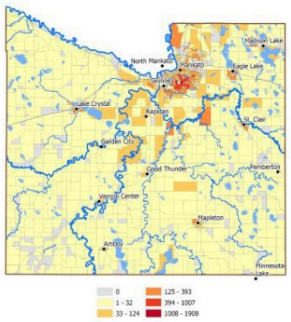
*2014 Severe Storm Damage*

Led by HC
Led by UMD

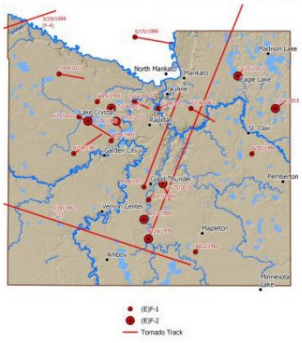
## Role of GAC

- Project Management and communication with HSEM
- Technical writing, editing of plan
- Research to create/update the county profile
  - characteristics of county: physical, environmental, economic, demographic
  - work with county to identify Critical Infrastructures
- Research to create/update hazard profiles
  - hazard history; frequency of the hazard; who's most vulnerable to the hazard; influence climate change has on hazard
- GIS is used to inform our research

## County Profile: Pop. by Census Block

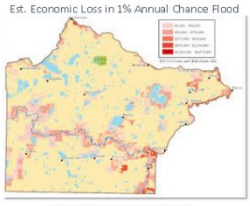



## Hazard Profile: Tornado History




## Vulnerability Analysis: Flood Modeling

Est. Economic Loss in 1% Annual Chance Flood



County-wide analysis by census block

Parcels in floodplain

Jurisdictions at risk

HAZUS

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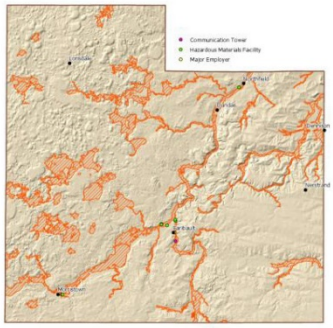
## Critical Infrastructures (CI)

| Group | Sub-Group | Examples |
|---|---|---|
| Emergency & Shelter Facilities | Healthcare Facilities | hospitals; nursing homes; hospices; dialysis centers; boarding care homes; supervised living facilities; blood banks; other housing for the elderly or occupants who may not be sufficiently mobile to avoid the loss of life or injury during natural disasters |
| Emergency & Shelter Facilities | Emergency Services | Law Enforcement, Fire & Rescue Services, Emergency Medical Services (EMS), Emergency Operations Centers (EOC) |
| Emergency & Shelter Facilities | Schools & Evacuation Centers/Shelters | schools (elementary, middle, high schools, and post-secondary schools); churches; community centers; other facilities designated as emergency shelters |
| Infrastructure Systems | Transportation Systems | airports; roadways; railways; commercial shipping ports |
| Infrastructure Systems | Utility Systems | Energy Utilities (electricity): power generating stations (including wind farms, solar farms, etc), main above-ground transmission lines, substations<br>Pipeline Systems (oil & natural gas): above-ground assets, such as pipelines, pumping stations & compressor stations<br>Water & Sewer Utilities: water treatment plants<br>Communication: radio towers used for emergency communication; (ARMER) sites |

## Critical Infrastructures (CI)

| Group | Sub-Group | Examples |
|---|---|---|
| High Potential Loss Structures | Dams & Levees | hydroelectric power generation, municipal and industrial water supplies, agricultural irrigation, sediment and flood control, river navigation for inland bulk shipping, industrial waste management, and recreation |
| High Potential Loss Structures | Hazardous Materials Facilities | facilities required to submit an EPA Tier II report; facilities that use, produce, or store highly volatile, flammable, explosive, toxic or water-reactive materials |
| Significant County Assets | Employers | large employers (e.g. factories, manufactures, hospitals, universities, etc.); employers who represent the primary economic sector of a community |
| Significant County Assets | Government Buildings (Federal, State, Local, Tribal) | main government service centers; court houses; jails & prisons |
| Significant County Assets | Cultural Resources | Cultural and historic assets that are unique or irreplaceable, or any asset that is deemed important to the community |

## CI Intersecting Floodplain

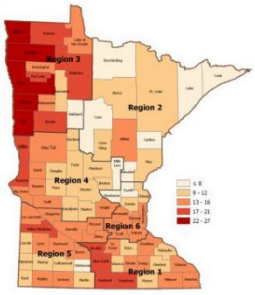



## UMD – County Coordination

The UMD GAC Team works closely with personnel from the County to collect key information for the plan update, commonly including:

- County Emergency Management Director
- County GIS Specialist
- County Assessor
- County Departments (i.e. Highway, Planning & Zoning, SWCD, others).

## FEMA-Declared Disasters & Emergencies in Blue Earth County




Blue Earth County has been part of **20** FEMA-declared disasters & emergencies.

**Most Recent:**

***2018: DR-4390*** *(due to severe storms, tornadoes, straight-line winds, & flooding).*

***2016: DR-4290*** *(due to severe storms & flooding).*

## What Hazards are Addressed?

A Multi-Hazard Mitigation Plan looks primarily at natural disasters, including:

| | | |
|---|---|---|
| Flooding | Hail | Drought |
| Dam/Levee Failure | Lightning | Extreme Heat |
| Wildfire | Winter Storms | Extreme Cold |
| Windstorms | Landslides/Erosion | Earthquakes |
| Tornadoes | Land Subsidence (Sinkholes & Karst) | |

***Hazard Categories from the Minnesota State Plan***

Manmade hazards are not required by the DMA 2000 to be addressed in the MHMP.

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## Review of Natural Hazards that Pose Risk to Blue Earth County

**The MHMP update needs to include a review of the following:**

- How has the risk to severe natural hazard events *increased or decreased* since the last plan?
- Are there *jurisdictional variations* in risk?
- Are there *local vulnerabilities* to consider?
- Have there been *changes in development*?

Main Risk Factors:

Probability & Severity (Impacts)

## Severe Winter Storms


- ***Probability:*** **High**
- ***Possible Impacts:***
  - Danger to Life Safety (road passage, homes)
  - Interruption to Transportation and Community Services
  - Damage to Property
  - ***Cascading Effects*** such as downed power lines & extended power outages to homes and critical facilities.





## Severe Summer Storms

- ***Probability:*** **High**
- ***Possible Impacts:***
  - Danger to Life Safety
  - Damage to Natural Resources
  - Damage to Property
  - ***Cascading Effects*** such as flooding to roads, area lakes & streams, downed power lines & extended power outages to homes and critical facilities.

## Flooding

**Flash Flood & Riverine Flood**

- ***Probability:*** **High**
- ***Possible Impacts:***
  - Danger to Life Safety (road passage, flooding of homes)
  - Interruption to Transportation and Community Services
  - Flooding of ag land and lost harvest / tiled land run-off
  - Damage to Property
  - ***Cascading Effects*** such as pump station failure or dam failure; displacement of residents.

## Extreme Temperatures

- ***Probability:*** **Moderate**
- ***Possible Impacts:***
  - Danger to Life Safety
  - Potential impact to critical infrastructure / energy supply failure
  - ***Cascading Effects*** such as need provide temporary mass care sheltering for vulnerable populations.



## Erosion, Landslides & Land Subsidence

- ***Probability:*** **Moderate**
- ***Possible Impacts:***
  - Erosion of slopes, streambanks, riverbanks, lake edges
  - Sediment load to lakes
  - Damage to Property or Imminent Risk
  - ***Cascading Effects*** such as road closures and impacted storm water systems from sediment load

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## Wildfire

- ***Probability:*** **Low**
- ***Possible Impacts:***
  - Danger to Life Safety (homes in wooded areas)
  - Loss of Forests/Grasslands and Natural Resources
  - Damage to Property
  - ***Cascading Effects*** such as air quality pollution, need for extended evacuation.

## Drought

- ***Probability:*** **Low**
- ***Possible Impacts:***
  - Impacts to local water resources and lakes
  - Impact to agricultural harvest
  - ***Cascading Effects*** such as increased danger for wildfire.

## Dam Failure

- ***Probability:*** **Low**
- ***Possible Impacts:***
  - Danger to Life Safety (downstream residents)
  - Localized flooding

## Review of Mitigation Capabilities

Multi-Hazard Mitigation Plans require that each jurisdiction **must** document the existing authorities, policies, programs, and resources in place for mitigation.

- What **plans and programs** are in place to support mitigation against that hazard?
- What **program gaps or deficiencies** exist to support mitigation against that hazard?

## Mitigation Strategies


1. Local Planning & Regulations
2. Structure & Infrastructure Projects
3. Natural Systems Protection
4. Education and Awareness Programs
5. Mitigation Preparedness & Response Support

## STRATEGY #1
## Local Planning & 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
- Mobile home park compliance for storm shelters

FEMA HMA GRANTS

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## STRATEGY #2
## Structure & Infrastructure Projects

**These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area.**

**This type of action also involves projects to construct manmade structures to reduce the impact of hazards.**

- Property Acquisitions and elevations of structures in flood prone areas
- Utility undergrounding
- Structural retrofits (i.e., metal roofs)
- Floodwalls and retaining walls
- Detention and retention structures
- Culvert Installation/Modification
- Roads & Bridge risk reduction
- Safe Room (new construction or facility retrofit)
- Green Infrastructure Methods

FEMA HMA GRANTS

Community Safe Rooms

*Wadena-Deer Creek School, June 17 2010*

August, 2012 – 1st school based tornado safe room (Wadena)

Green Infrastructure Projects

Power Line retrofit/burial

## STRATEGY #3
## Natural Systems Protection

**These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.**

- Soil stabilization for sediment and erosion control
- Floodplain and Stream corridor restoration
- Slope management
- Forest management (defensible space, fuels reduction, sprinkler systems)
- Conservation easements
- Wetland restoration and preservation
- Aquifer Storage & Recovery
- Flood Diversion and Storage

FEMA HMA GRANTS

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Natural Systems Protection examples

## STRATEGY #4
## Education & Awareness Programs

**These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.**

- Radio or television spots
- Websites with maps and information
- Social media outreach
- Promotion of sign-up for emergency warnings
- Real estate disclosure
- Promotion of NFIP insurance to property owners
- "Turn Around Don't Drown"
- Presentations to school groups or neighborhood organizations
- Mailings to residents in hazard-prone areas.
- NWS StormReady Program

Education & Awareness Program Examples


## STRATEGY #5
## Mitigation Preparedness & Response Support

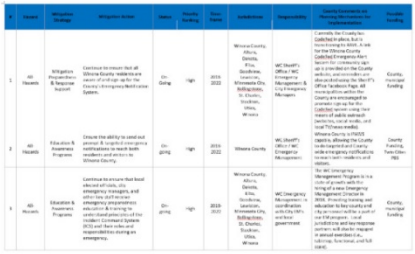
**This is a State of Minnesota mitigation strategy with the intent of covering emergency preparedness actions that protect life and property prior to, during, and immediately after a disaster or hazard event.**

*These activities are typically not considered mitigation, but support reduction of the effects of damaging events.*

- Emergency Operations Plan
- Flood fight plans and preparedness measures
- Dam emergency action plans
- Emergency Warning Systems (i.e., CodeRed, Everbridge, warning sirens)
- Generator backup power
- NWS Storm Spotter Training
- Training and education for local elected officials and key partners.
- Exercises to test capabilities

Mitigation Preparedness & Response Support examples


**5-Year Mitigation Action Chart (MAC)**



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## MAC Development: 2019-2023

- **Past Mitigation Action Review** (2013-2019)
- **County Capabilities Assessment**
- **Local Mitigation Survey** (LMS)
- **Additional Mitigation Action Ideas gathered during HMP Planning Team Meeting #1**
- **2019 State Hazard Mitigation Plan**
- **MDH Climate Profiles & MPCA/paleBLUEdot Climate Adaptation Strategies**

## FEMA HMA Grant Program

A current and adopted MHMP is required for eligibility.

Eligible applicants: Local Government (county, cities), Tribal Government, and private non-profits.

Cost Share: 75%/25%

Eligible projects must be identified in the local MHMP.

**HMGP**
**PDM**
**FMA**

## HMA Eligible Project Types

- **Property Acquisition / Demolition / Relocation**
- **Safe Room Retrofit or Construction**
- **Flood & Erosion Mitigation**
- **Green Infrastructure**
- **Infrastructure Retrofits (Utility Systems, Roads & Bridges)**
- **Minor Localized Flood Reduction Projects**
- **Wildfire Mitigation**
- **Soil Stabilization**
- **5 Percent Initiative Projects**


**Historical projects in Blue Earth County resulting from Hazard Mitigation funding**

| Year | Project Description | Sub-Grantee | Funding Type | Federal Share |
|---|---|---|---|---|
| 2016 | Blue Earth County Landslide Acquisition/Demolition | Blue Earth County | HMGP | $296,438 |
| 2013 | Blue Earth County landslide-acquisition/demolition | Blue Earth County | HMGP | $332,538 |
| 2011 | City of Pemberton Warning Siren Installation | Pemberton | HMGP | $13,862 |
| 2010 | Blue Earth County - Property Acquisition | Blue Earth County | HMGP | $50,765 |
| 2009 | Blue Earth County Hazard Mitigation Plan Comprehenskre Review | Blue Earth County | HMGP | $56,001 |
| 2002 | BENCO Electric - Line Replacement | Frost-Benco-Wells Electric Co | HMGP | $93,079 |
| 2001 | Region 9 RDC Mitigation Plan | Region 9 Regional Development Commission | HMGP | $68,404 |
| 1998 | Frost-Benco Wells Electric Cooperative Rebuild Project | Frost-Benco-Wells Electric Co | HMGP | $645,526 |
| 1997 | MNDOT - Living Snow Fence | Minnesota Department of Transportation-District-7 | HMGP | $247,952 |
| Total HMGP/PDM Funding – Blue Earth County | | | | $1,804,565 |

## Mitigation Action Working Session

- Review Blue Earth County 2019 LMS Report – Excerpt of Mitigation Ideas.
- Use the Mitigation Ideas Worksheet for new mitigation projects (county / local level).
- Consider projects that may be eligible for FEMA HMA grant funding.

## Next Steps in MHMP Process

- Draft Mitigation Action Charts will be developed.
- Follow-up will be conducted as necessary.
- UMD will be working on the full draft plan with the County.
- 2nd HMP Planning Team meeting for MAC Review (estimated Fall, 2019).
- Completion of draft plan and public review period.

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# Mitigation Strategies & Action Types

Following are the five types of mitigation strategies that will be used in the update of the Multi-Hazard Mitigation Plan with examples of related mitigation actions. Minnesota HSEM recommends the use of these mitigation strategies to be in alignment with the State plan and those recommended by FEMA. The first four strategies listed are taken from the FEMA publications *Local Mitigation Planning Handbook* (2013) and *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* (2013). The fifth strategy type was determined by Minnesota HSEM for use within the state.

These strategies will provide the framework for identification of new jurisdictional-level mitigation actions for implementation over the next 5-year planning cycle.

| Mitigation Strategy | Description | Example Mitigation Actions |
|---|---|---|
| **Local Planning and Regulations** | These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built. | • Comprehensive plans<br>• Land use ordinances<br>• Planning and zoning<br>• Building codes and enforcement<br>• Floodplain ordinances<br>• NFIP Community Rating System<br>• Capital improvement programs<br>• Open space preservation<br>• Shoreline codes<br>• Stormwater management regulations and master plans<br>• Mobile home park compliance for storm shelters |
| **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.<br>This type of action also involves projects to construct manmade structures to reduce the impact of hazards. | • Property Acquisitions and elevations of structures in flood prone areas<br>• Utility undergrounding<br>• Structural retrofits (i.e., metal roofs)<br>• Floodwalls and retaining walls<br>• Detention and retention structures<br>• Culvert Installation/Modification<br>• Roads & Bridge risk reduction<br>• Safe Room (New construction or facility retrofit)<br>• Green Infrastructure Methods<br><br>*Many of these types of actions are projects eligible for funding through FEMA HMA grant programs.* |

| 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. | • Soil stabilization for sediment and erosion control<br>• Floodplain and Stream corridor restoration<br>• Slope management<br>• Forest management (defensible space, fuels reduction, sprinkler systems)<br>• Conservation easements<br>• Wetland restoration and preservation<br>• Aquifer Storage & Recovery<br>• Flood Diversion and Storage<br><br>*Many of these types of actions are projects eligible for funding through FEMA HMA grant programs.* |
| **Education and Awareness Programs** | These are actions to inform and educate citizens, 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 that support life safety and lessen property damage. | • Radio or television spots<br>• Websites with maps and information<br>• Social media outreach<br>• Promotion of sign-up for emergency warnings<br>• Real estate disclosure<br>• Promotion of NFIP insurance to property owners<br>• Presentations to school groups or neighborhood organizations<br>• Mailings to residents in hazard-prone areas.<br>• NWS StormReady Program<br>• Firewise Communities<br><br>*Some of these types of actions may be projects eligible for funding through the FEMA HMA "5 Percent Initiative Program".* |
| **Mitigation Preparedness and Response Support** | This is a State of Minnesota mitigation strategy with the intent of covering emergency preparedness actions that protect life and property prior to, during, and immediately after a disaster or hazard event. These activities are typically not considered mitigation, but support reduction of the effects of damaging events. | • Emergency Operations Plan<br>• Flood fight plans and preparedness measures<br>• Dam emergency action plans<br>• Emergency Warning Systems (i.e., CodeRed, warning sirens)<br>• Generator backup power<br>• NWS Storm Spotter Training<br>• Training and education for local elected officials and key partners. |

State of Minnesota
Department of Public Safety
Division of Homeland Security and Emergency Management
445 Minnesota Street, Suite 223
St. Paul, MN 55101-6223

# HAZARD MITIGATION ASSISTANCE

Hazard Mitigation Assistance (HMA) grant programs provide funding with the aim to reduce or eliminate risk to property and loss of life from future natural disasters. HMA programs are typically a 75%/25% cost share program. The federal share is 75% of total eligible project reimbursement costs. The local applicant is responsible for 25% of the project costs. The amount of HMGP funds availability is based on a percent of Public Assistance provided by Federal Emergency Management Agency (FEMA).

- Hazard Mitigation Grant Program (HMGP) funds assists in implementing long-term hazard mitigation measures following a Presidential major disaster declaration.
- Pre-Disaster Mitigation (PDM) provides funds for hazard mitigation planning and projects on an annual basis.
- Flood Mitigation Assistance (FMA) provides funds on an annual basis to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP).

**Who is eligible for grant funding?**
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

**What types of projects can be funded?**
All projects must be eligible, technically feasible, and cost-effective. All projects are subject to environmental and cultural resource review. Examples of projects include:

- **Advance Assistance** may be used to develop mitigation strategies and obtain data, including for environmental and historic preservation compliance considerations, and develop complete project applications in a timely manner.

- **Aquifer Storage and Recovery** (ASR) projects serve primarily as a drought management tool, but can also be used to reduce flood risk and restore aquifers that have been subject to overdraft. The concept is to capture water when there is an abundant supply, store the water in subsurface aquifers, and recover water from the storage aquifer when needed. Storing water underground can help protect it from pollutants, evaporation, and weather events.

- **Floodplain and stream restoration** (FSR) projects are used primarily to reduce flood risk and erosion by providing stable reaches, and may also mitigate drought impacts. FSR projects restore and enhance the floodplain, stream channel and riparian ecosystem's natural function. They provide base flow recharge, water supply augmentation, floodwater storage, terrestrial and aquatic wildlife habitat, and recreation opportunities by restoring the site's soil, hydrology and vegetation conditions that mimic pre-development channel flow and floodplain connectivity.

- **Flood Diversion and Storage** (FDS) projects often are used to reduce flood risk, but also can be used to mitigate drought and improve ecosystem services. These projects involve diverting floodwaters from a stream, river, or other body of water into a conduit such as a canal, pipe, or wetland and storing them in an above-ground storage facility. Water is then slowly released, reducing flood risk.

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- **Green Infrastructure Methods** are a sustainable approach to natural landscape preservation and storm water management. Include in *eligible hazard mitigation activities* as well as provide additional ecosystem benefits. Ecosystem-based approach to replicate a site's pre-development, natural hydrologic function. Benefits include: Increase water supply, improved water quality, can be scaled to size and designed to fit site conditions.

- **Property Acquisition and Structure Demolition or Relocation –** The voluntary acquisition of an existing at-risk structure and the underlying land, and conversion of the land to open space through the demolition or relocation of the structure. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

- **Retrofit Flood-Prone Residential Structures** are changes made to an existing structure to reduce or eliminate the possibility of damage to that structure from flooding, erosion, or other hazards. Examples of this mitigation are primarily elevation of structures above flood levels and floodwalls.

- **Safe Room Construction -** Safe room construction projects are designed to provide immediate life-safety protection for people in public and private structures from tornado and severe wind events. Includes retrofits of existing facilities or new safe room construction projects, and applies to both single and dual-use facilities

- **Minor Localized Flood Reduction Projects -** Projects to lessen the frequency or severity of flooding and decrease predicted flood damages, such as the installation or up-sizing of culverts, and stormwater management activities, such as creating retention and detention basins. These projects must not duplicate the flood prevention activities of other Federal agencies and may not constitute a section of a larger flood control system.

- **Infrastructure Retrofit -** Measures to reduce risk to existing utility systems, roads, and bridges.

- **Soil Stabilization -** Projects to reduce risk to structures or infrastructure from erosion and landslides, including installing geotextiles, stabilizing sod, installing vegetative buffer strips, preserving mature vegetation, decreasing slope angles, and stabilizing with rip rap and other means of slope anchoring. These projects must not duplicate the activities of other Federal agencies. *New tools for Bioengineered Shoreline Stabilization, Bioengineered Streambank Stabilization.*

- **Wildfire Mitigation -** Projects to mitigate at-risk structures and associated loss of life from the threat of future wildfire through: Defensible Space for Wildfire, Application of Ignition-resistant Construction and Hazardous Fuels Reduction. *New tool for Bioengineered Wildfire Mitigation.*

- **HMGP only - 5 Percent Initiative Projects** – These projects, which are only available pursuant to an HMGP disaster, provide an opportunity to fund mitigation actions that are consistent with the goals and objectives of approved mitigation plans and meet all HMGP program requirements, but for which it may be difficult to conduct a standard Benefit-Cost Analysis (BCA) to prove cost-effectiveness.

**How do I apply?**
Start by submitting a Notice of Interest, available on HSEMs website at:
https://dps.mn.gov/divisions/hsem

**Where can I obtain further information?**
For additional information about the HMA grant program, you can refer to the FEMA website:
http://www.fema.gov/hazard-mitigation-assistance

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# MITIGATION IDEAS WORKSHEET

Please use the following worksheet to identify mitigation actions that you feel will help to reduce or eliminate the impact of future natural hazard events to the county or to your individual jurisdiction.

**JURISDICTION:**

**CONTACT**
**Name:**
**Phone:**
**Email:**

| Hazard | Description / Proposed Mitigation Action |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

# BLUE EARTH COUNTY

## April 24, 2019 MHMP Planning Meeting #1

## Mitigation Ideas Worksheet Notes

Following are notes from the **Blue Earth County 4-24-19 MHMP Planning Team Meeting #1** "Mitigation Action Working Session". Participants used worksheets to provide input on mitigation activities they felt would help to reduce or eliminate the impact of future natural hazard events to the county or local jurisdictions. The mitigation actions identified will be used to support development of new mitigation actions to include in the Blue Earth County MHMP 2019 Update.

**Blue Earth County Public Works Department**

*Submitted by: Ryan Thilges, County Engineer/Public Works Director*

Hazard: Severe Weather
Action: Tornado/Storm Shelters in Blue Earth County campgrounds (Bray Park, Daly Park and Rapidan Park).

Hazard: Flooding/Erosion
Action: Geospatial/Geotechnical analysis of high risk areas. Identification and mitigation strategies for infrastructure, homes and property deemed at high risk.

Hazard: Flooding/Erosion
Action: Increased precipitation and runoff rates have inundated many culverts resulting in additional erosion damages to the road from overtopping and excessive flows.

Hazard: Severe Weather
Action: Develop an Emergency Notification and Evacuation Plan for County campgrounds and parks.

**Blue Earth County Environmental Services**

*Submitted by: Julie Conrad, Planner*

Hazard: Erosion
Action: Increase dwelling set-backs from bluffs.

Hazard: Erosion
Action: Conduct technical analysis of soils, geology to assess vulnerability in river corridors.

Hazard: Erosion
Action: Water storage, wetland restoration.

Hazard: Erosion/Flooding
Action: Update stormwater and floodplain ordinances to prevent runoff and new construction in hazard areas. Note – Please reference the Blue Earth County Water Management Plan 2017 and Land Use Plan 2018 for more information.

**Blue Earth County Planning and Zoning**
*Submitted by: George Leary, County Zoning Administrator*

Hazard: Homes in Floodplain
Action: Review buyout of 2019 Garden City flooded properties.

Hazard: Lakeshore and Riverbank Restoration
Action: Large-scale armoring projects. This will also help improve and protect water quality.

Hazard: Floods
Action: Retain water on farm fields in retention ponds designed to store water from farm tile drainage.

Hazard: Bluff Stabilization
Action: Address development impacts on bluffs. The development adds impervious surface and turf grass that leads water to the bluffs and ravines leading to failures.

**City of Lake Crystal**
*Submitted by: Taylor Gronau, Administrator*

Hazard: Severe Storms
Action: Identify "at risk" powerlines and bury them underground.

Hazard: Tornado (mobile home park protection)
Action: Inspect/construct storm shelters for Rambush Estates.

Hazard: Lakeshore Erosion
Action: Update shoreland ordinance to prevent erosion. Offer grants to stabilize shoreline?

Hazard: Major Power Outage
Action: Update the power plant potential for creating a new micro-grid for power redundancy.

**City of St. Clair**
*Submitted by: Catherine Seys, City Clerk/Treasurer*

Hazard: Power Outage
Action: Obtain a generator for City Hall. We currently have a generator at our wastewater treatment plan, water plant and lift station, but not generator at City Hall (includes office, meeting room, Fire Dept. and public workshop).

Hazard: Severe Wind Event/Tornado
Action: Need for community "Safe Room" potentially at the school for students as well as community members to take shelter.

**St. Clair Public School**
*Submitted by: Tom Bruels, Superintendent*

Hazard: Severe Wind Event/Tornado
Action: Construct a safe room to be built onto the St. Clair Public School to provide shelter to students, staff and community residents in the event of a tornado or severe wind event.

**City of Vernon Center**
*Submitted by: Diane Roelofs, Clerk/Treasurer*

Hazard: High Rain Events
Action: Replace individual sewer service lines through ordinance deadline. Infrastructure project to install new water/sewer/storm sewers. USDA Rural Development (RD) application completed and submitted.

Hazard: Power Outage
Action: Included in RD application, but looking for MDH grant money to fund if RD funding is not adequate. Look into construction of a safe room for combo with generator.

**City of Eagle Lake**
*Submitted by: Jennifer Bromeland, City Administrator & Grian Goettl, Public Works Director*

Hazard: Well failure due to loss of electricity
Action: Obtain backup generator.

Hazard: Severe Weather Events/Rain
Action: Pump to the storm drain outlet.

Hazard: Lack of Community-accessible Safe Room
Action: Look into construction or retrofit of a storm shelter or safe room. City hall does not have a safe room or shelter for severe weather such as a tornado.

Hazard: Ongoing Cleaning and Dredging of Creek along 598th
Action: Create a maintenance schedule to dredge creek and promote freer flow of water.

Hazard: Public Sign up for Emergency Notifications
Action: Encourage residents to sign up for the County's emergency notification system.

**City of Mankato**
*Submitted by: Jeff Bengston, Mankato Dept. of Public Safety, Associate Director*

Hazard: Severe Storms
Action: Evaluate utility undergrounding to critical infrastructure.

Hazard: Severe Wind Event/Tornado
Action: Evaluate need for shelters at mobile home parks and Land of Memories Campground.

Hazard: High Rain/Flood Events

Action: Construct stormwater impoundment areas to reduce erosion.

**Le Ray Township**
*Submitted by: Paul Baer, Chairman*

Hazard: Road erosion due to overtopping and flooding.
Action: Replace township road culverts with large size to accommodate larger rain events which are becoming more frequent.

**Shelby Township**
*Submitted by: Gloria Mack, Clerk*

Hazard: Erosion
Action: Riverbank sloughing in 2 places. Have moved the road once already. May have to move road in both places where sloughing is occurring.

Hazard: Flooding
Action: Over-the-road flooding occurs due to high lake levels after high-rain events. Raise road?

**Rapidan Township**
*Submitted by: Ray Cornelius, Chairman & Maria Bartsch, Clerk/Treasurer*

Hazard: Erosion/Flooding
Action: 181 Lane – We need to raise the road about 4 feet to prevent water from washing out road and flooding farm field.

Hazard: Erosion/Flooding
Action: 563 Avenue - Repair road ditch to stop further erosion to road ditch and private property.

Hazard: Erosion/Flooding
Action: 561 Avenue – Need to build a water stop gate on a live stock culvert to prevent water from flooding land when the Maple River floods.

Hazard: Erosion/Flooding
Action: Address 177 Lane due to stream erosion, 169 Lane due to water run off erosion and Blue Earth River bank erosion and Ivy Road Bridge due to river bank erosion.

Hazard: Severe Storms (Dead Tree Removal)
Action: Remove dead trees and/or branches that are in danger of falling on township roads. This problem exists on all township roads.

Blue Earth County MHMP Update
Jurisdictional Mitigation Action Chart Discussion Meeting
August 14, 2019
Blue Earth County Justice Center – 11:00 a.m.

*Attendees:*

- Mike Maurer, BEC Emergency Management Director
- Brenda Olmscheid, Asst. Emergency Management Coordinator
- Paul Barta, Captain, EM Member
- Patty Smith, Amboy City Clerk/Administrator
- Jennifer Bromeland, Eagle Lake City Administrator
- Ashney Helleksen, Good Thunder Clerk-Treasurer
- Sarah Karels, Good Thunder City Council Member
- Taylor Gronau, Lake Crystal City Administrator
- Pam Hermanson, Mankato Associate Director, EM
- Justin Neumann, Mankato Administrative Sergeant, EM
- Patty Woodruff, Mapleton City Clerk/Administrator
- Amber Duncanson, Mapleton City Staff
- Darla Ward, Pemberton City Clerk/Administrator
- Catherine Seys, St. Clair City Clerk/Administrator
- Diane Roelofs, Vernon Center City Clerk/Administrator

*Meeting Summary*

On August 14, 2019, Blue Earth County Emergency Management convened the city clerks from the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Mankato, Mapleton, Pemberton, St. Clair and Vernon Center to discuss review and development of their draft local mitigation action charts. Representatives from Madison Lake and Skyline were unable to attend in person. Those two communities did have phone discussions with Blue Earth County staff to review their draft local mitigation action charts.

An overview of Blue Earth County's mitigation action chart was presented and discussed. This naturally led to discussion of mitigation action charts at the local community level. Information sharing and idea exchange amongst the local communities was clearly evident. The end product local mitigation action charts appear to accurately reflect the local communities here in Blue Earth County.

Blue Earth County Multi-Hazard Mitigation Plan Update
Planning Team Meeting #2
December 5, 2019, 10:00 a.m. – 12:00 p.m.
Blue Earth County Justice Center, Mankato, MN

**Meeting Summary:**

On Thursday, December 5, 2019 Blue Earth County Emergency Management convened representatives from Blue Earth County, cities, townships and other key stakeholders to participate in the 2nd Planning Team Meeting for the Blue Earth County Multi-Hazard Mitigation Plan (MHMP) Update for 2020-2025. The meeting was held at the Blue Earth County Justice Center in Mankato, MN from 10:00 a.m. – 12:00 p.m. and a total of **30** people attended the meeting. The meeting was facilitated by members of the U-Spatial at the University of Minnesota Duluth (U-Spatial@UMD) team that is leading the update of the Blue Earth County MHMP.

The opening Power Point presentation covered a re-cap of key points about the plan update, a review of the Risk Assessment & Vulnerability Analysis, an overview of FEMA Hazard Mitigation Assistance (HMA) grant funding; an overview of how mitigation actions are developed and an overview of the Mitigation Action Charts (MACs). Following the presentation, participants were provided with an opportunity to review and discuss the County and jurisdictional mitigation action charts (MACs). Prior to this meeting, County staff and personnel from each city reviewed and approved of their draft MACs. This discussion period offered a facilitated opportunity for participants to consider any changes or new additions to the MACs prior to completion of the draft plan for public review.

Throughout the presentation participants were invited to ask questions or provide other feedback about the plan update. Following is an overview of any key questions or discussion:

- *In the discussion of Severe Summer Storms, the Blue Earth County Public Works Director re-iterated that construction of storm shelters or tornado safe rooms for several county parks and campgrounds is a priority. It was noted that a mitigation action for this is included in the Blue Earth County Mitigation Action Chart (#21 -* ***STORM SHELTERS / TORNADO SAFE ROOMS).***

- *In the discussion on Flooding / Erosion, a representative from the city of Vernon Center noted that there was erosion due to flooding that was impacting a private residence and that would also eventually threaten the city's wastewater treatment plan. A follow-up response was provided from the USDA – NRCS District Conservationist that they may have supportive funding to assist with mitigation on this issue. The U-Spatial Team followed up with the City representative to discuss inclusion of a new mitigation action to add to the city's jurisdictional mitigation action chart that would address this local concern.*

- *In the discussion on FEMA Hazard Mitigation Assistance (HMA) grant funding and eligible project activities, the Blue Earth County Emergency Management Director clarified that the County is not responsible for development of grant applications but will provide initial feedback to project ideas and any assistance as appropriate. The process of submitting a Notice of Interest to HSEM was discussed for potential projects that jurisdictions may be considering for an HMA application.*

The meeting concluded with an overview and timeline of the upcoming next steps of posting the plan for public review and input and submitting the draft plan to HSEM and FEMA for final review and approval.

**Attached to this meeting summary are the following documentation items:**

- 12-5-19 Planning Team Meeting Stakeholder Invite List
- 12-5-19 Blue Earth County HMP Mtg. #2 Email Invite
- 12-5-19 Meeting Agenda
- 12-5-19 Meeting Sign-in Sheets
- 12-5-19 Power Point Presentation Slides
- 12-5-19 Meeting Handout (Mitigation Strategies & Action Types)

*Meeting Summary Prepared By: Bonnie Hundrieser, U-Spatial@UMD Project Team*

# Blue Earth County 2020 MHMP Update

**12-5-19 Planning Team Meeting #2 Stakeholder Invite List**

Following is the list of stakeholders that were invited via email to attend the Blue Earth County MHMP Update Planning Team Meeting #2 held on December 5, 2019.

Blue Earth County Contacts

| Name | Position | E-Mail Address |
|---|---|---|
| Colleen Landkamer | County Commissioner | colleen.landkamer@blueearthcuntymn.gov |
| Vance Stuehrenberg | County Commissioner | vances@blueearthcountymn.gov |
| Mark Piepho | County Commissioner | mark.piepho@blueearthcountymn.gov |
| Will Purvis | County Commissioner | will.purvis@blueearthcountymn.gov |
| Kip Bruender | County Commissioner | kip.bruender@blueearthcountymn.gov |
| Bob Meyer | County Administrator | bob.meyer@blueearthcountymn.gov |
| Mike Maurer | Emergency Mgmt. Director | mike.maurer@blueearthcountymn.gov |
| Brenda Olmscheid | Asst. Emergency Mgmt. Coordinator | brenda.olmscheid@blueearthcountymn.gov |
| Eric Weller | Dep. Emergency Mgmt. Coordinator | eric.weller@southcentral.edu |
| Paul Barta | Dep. Emergency Mgmt. Coordinator | paul.barta@blueearthcountymn.gov |
| Dan Davidson | Dep. Emergency Mgmt. Coordinator | dan.davidson@blueearthcountymn.gov |
| Phil Claussen | Director of Human Services | phil.claussen@blueearthcountymn.gov |
| Ryan Thilges | Public Works Director | ryan.thilges@blueearthcountymn.gov |
| Chad Wilde | Public Works Supervisor | Chad.wilde@blueearthcountymn.gov |
| Julie Conrad | Environmental Services | julie.conrad@blueearthcountymn.gov |
| Scott Salsbury | Environmental Services | scott.salsbury@blueearthcountymn.gov |
| George Leary | Environmental Services | George.leary@blueearthcountymn.gov |
| Kelley Haeder | Public Health | kelley.haeder@blueearthcountymn.gov |
| Brad Peterson | Sheriff | brad.peterson@blueearthcountymn.gov |
| Amy Holst | Public Information Officer | amy.holst@blueearthcountymn.gov |
| Jessie Anderson | County Administration | Jessie.anderson@blueearthcountymn.gov |
| Jonathan Graves | GIS | jonathan.graves@blueearthcountymn.gov |
| Michael Stalberger | Director of Taxpayer Services | michael.stalberger@blueearthcountymn.gov |

City Contacts

| City | City Clerk/Administrator | E-Mail Address |
|---|---|---|
| Amboy | Patty Smith | patty@amboymn.com |
| Eagle Lake | Jennifer Bromeland | jbromeland@eaglelakemn.com |
| Lake Crystal | Taylor Gronau | lccity@hickorytech.net |
| Madison Lake | Curt Kephart | admin@madisonlakemn.gov |
| Mankato | Patrick Hentges | phentges@mankatomn.gov |
| Mapleton | Patty Woodruff | mptn@hickorytech.net |
| Pemberton | Darla Ward | pemberton.city@mchsi.com |
| Skyline | Cathy Dahl | clerk@cityofskyline.com |
| St. Clair | Catherine Seys | citystc@hickorytech.net |
| Vernon Center | Diane Roelofs | vcclerk18@gmail.com |

## Township Contacts

| Township | Clerk | E-Mail Address |
|---|---|---|
| Beauford | Kim Krengel | krenfarm@gmail.com |
| Butternut Valley | Adam Jones | jone0602@gmail.com |
| Cambria | Brenda Thorson | N/A |
| Ceresco | Tammy Sonnabend | tsonna@mvtvwireless.com |
| Danville | Laurie Stenzel | lauriehstenzel@gmail.com |
| Decoria | Valerie Levos | vdlevos@msn.com |
| Garden City | Liz Thiesse | lizb@hickorytech.net |
| Jamestown | James Anderson | jamestownmn@gmail.com |
| Judson | Jeff Davis | jc1990davis@gmail.com |
| LeRay | Karyn Block | leraytownship@exede.net |
| Lime | Laurie DeGezelle | limets.ld@gmail.com |
| Lincoln | Tammy Petterson | tammy.petterson@crystalvalley.coop |
| Lyra | Sandra Miller | lyratownship@gmail.com |
| Mankato | Dan Fogal | danfogal@hotmail.com |
| Mapleton | Gail Jaeger | gjjaeger56@yahoo.com |
| McPherson | Lynda Kruse | 7krusenkruses@gmail.com |
| Medo | Sheryl Olson | sherylaolson@gmail.com |
| Pleasant Mound | Dennis Urban | pmtamboy@yahoo.com |
| Rapidan | Maria Bartsch | Mbartsch1.MB@gmail.com |
| Shelby | Gloria Mack | jenemack@aol.com |
| Southbend | Jamie Malvin | southbendtownship@gmail.com |
| Sterling | Barb Lake | tonkabrat@gmail.com |
| Vernon Center | Janice Roelofs | roe279@hotmail.com |
| Township Assn | Sandy Hooker | sandy.hooker@mntownships.org |

## Other Stakeholder Contacts

| Name | Agency | E-Mail Address |
|---|---|---|
| Jerad Bach | Soil & Water Conservation District | jerad.bach@blueearthswcd.org |
| Bradley Flatin | USDA Farm Service Agency | bradley.flatin@mn.usda.gov |
| Reginald Liddell | NRCS | reginald.liddell@mn.usda.gov |
| Paul Hansen | DNR | paul.j.hansen@state.mn.us |
| Tim Braulik | BENCO Electric | timb@benco.coop |
| Trisha Rosenfeld | Xcel Energy | trisha.a.rosenfeld@xcelenergy.com |
| Jacki Niss | MCHS | niss.jacki@mayo.edu |
| Alvin Roath | Ecumen Pathstone Living | alvinroath@ecumen.org |
| Sheri Allen | ISD 77 | aallen1@isd77.k12.mn.us |
| Sandi Schnorenberg | MSU Mankato | sandi.schnorenberg@mnsu.edu |
| Tom Bruels | St. Clair Public Schools | tbruels@stclaircyclones.org |
| Kevin Winkelman | Eagle Creek/Rapidan Dam | kevin.winkelman@eaglecreekre.com |

## HSEM Region 1 Neighboring Jurisdictions

| Name | Agency | E-Mail Address |
|---|---|---|
| Lisa Frommie | Faribault County Emergency Management | lisaf@frcsd.org |
| Denise Wright | Waseca County Emergency Management | Denise.wright@co.waseca.mn.us |
| Justin Block | Nicollet County Emergency Management | justin.block@co.nicollet.mn.us |
| Ann Traxler | Le Sueur County Emergency Management | atraxler@co.le-sueur.mn.us |

**From:** Mike Maurer

**To:** Adam Jones; Alvin Roach; Amy Holst; Barb Lake; Bob Meyer; Brad Peterson; Bradley Flatin; Brenda Olmscheid; Cathrine Seys; Cathy Dahl; Chad Wilde; Curt Kephart; Dan Davidson; Dan Fogal; Darla Ward; Dennis Urban; Diane Roelofs; Weller, Eric; Gail Jaeger; George Leary; Gloria Mack; Jacki Niss; James Anderson; Jamie Malvin; Janice Roelofs; Jarad Bach; Jeff Davis; Jennifer Bromeland; Jessie Anderson; Jonathan Graves; Julie Conrad; Karyn Block; Kelley Haeder; Kevin Winkelman; Kim Krengel; Laurie DeGezelle; Laurie Stenzel; Liz Thiesse; Lynda Kruse; Maria Bartch; Michael Stalberger; Patrick Hentges; Patty Smith; Patty Woodruff; Paul Barta; Paul Hansen; Phil Claussen; Reginald Liddell; Ryan Thilges; Sandi Schnorenberg; Sandra Miller; Sandy Hooker; Scott Salsbury; Sheryl Olson; Tammy Petterson; Tammy Sonnabend; Taylor Gronau; Tim Braulick; Tom Bruels; Trisha Rosenfeld; Valerie Levos

**Cc:** Bonnie K Hundrieser

**Subject:** INVITE - Second Hazard Mitigation Planning Meeting **Date:** Friday, October 25, 2019 8:06:53 AM **Attachments:** Hazard Mitigation 2nd Planning Team Invitation.docx

To All:

Please Join us for the 2nd Hazard Mitigation Planning Team Meeting. For those of you that attended the first meeting this is now an opportunity to review and discuss a DRAFT of the completed plan.

Thanks again to all of you that have put time and effort into this process.

Michael J.
Maurer Chief
Deputy

Blue Earth County Sheriff's Office

507-304-4808

507-317-7002

## MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

Your presence is requested at the **2nd Planning Team Meeting** for the update of the **Blue Earth County Multi-Hazard Mitigation Plan (MHMP).** You are requested to participate in this vital meeting because you have a position of administrative or departmental responsibility within either the County, a municipal government, or are a key stakeholder related to the planning process.

Meeting Detail

| | |
|---|---|
| **Date:** | **Thursday, December 5th** |
| **Time:** | **10:00 a.m. – 12:00 p.m.** |
| **Location:** | **Blue Earth County Justice Center (2nd Floor Conference Room) 401 Carver Rd., Mankato, MN 56001** |

The draft Blue Earth County MHMP is complete and is ready for review by planning team members in advance of this meeting. Below is a link where you can download the plan.

https://sites.google.com/d.umn.edu/blueearthcounty/home

The purpose of this meeting is to provide an overview of the plan, including a review of the updated risk assessment for natural hazards that affect the county (history, local vulnerabilities, and future trends). We will also discuss the Mitigation Action Charts that have been developed for Blue Earth County and each city, as well as potential funding opportunities for future projects under the FEMA Hazard Mitigation Assistance grant program. Your participation in this meeting and feedback on the draft plan is important to us.

**Meeting Attendance:** Please RSVP your attendance to me via email. You are encouraged to bring associate staff with you. If you cannot attend, please seek to send someone else in your stead for your representation.

**Draft Plan Review:** You are encouraged to review the plan prior to this meeting. If you do so, please inform me that you have reviewed it and approximate time spent, which counts towards the County's 25% in-kind match to our planning grant. Comments or questions on the draft plan may be submitted to me via email or presented in person at the meeting on December 5th.

If you have any questions, please do not hesitate to contact me. Thank you,

Michael J. Maurer

Chief Deputy

Blue Earth County Sheriff's Office

507-304-4808
507-317-7002

# Blue Earth County

## 2020 Multi-Hazard Mitigation Plan (MHMP) Update

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### Planning Team Meeting #2

Thursday, December 5, 2019 – 10:00 a.m. – 12:00 p.m.

Blue Earth County Justice Center – Mankato, MN

**Presenting:**

- Stacey Stark, U-Spatial at University of MN Duluth
- Bonnie Hundrieser, Hundrieser Consulting LLC

**Agenda:**

1. Welcome & Introductions
2. Recap of MHMP Key Points
3. Review of Risk Assessment & Vulnerability Analysis
4. Overview of Mitigation Actions & HMA Grant Funding
5. Mitigation Action Chart Review & Feedback
6. Next Steps (Public Review & Plan Submission)

Point of Contact:

Mike Maurer

Blue Earth County Emergency Management Director

Phone: 507-304-4808

Email: Mike.Maurer@blueearthcountymn.us

# Blue Earth County

## 12/5/19 MHMP Planning Team Meeting #2

## List of Participants *(30 Attendees)*

| Blue Earth County MHMP Update - Planning Team Meeting #2<br>Thursday, December 5, 2019 - 10:00 a.m. - 12:00 p.m.<br>Participant Sign-in List | | | |
|---|---|---|---|
| **Name** | **Agency/Organization** | **Title** | **Email** |
| Alvin Roath | Ecumen Pathstone | Corporate Facilities/EM | alvinroath@ecumen.org |
| Jeff Shoobridge | City of Madison Lake | City Administrator | admin@madisonlakemn.gov |
| Daniel Bunde | Madison Lake | Chief of Police | dbunde@madisonlakemn.gov |
| John Kopp | City of Eagle Lake | Police Chief | elpd@eaglelakemn.com |
| Ed Pankratz | Mankato Township | Supervisor | edpan@hickorytech.net |
| Catherine Seys | City of St. Clair | City Clerk-Treasurer | citystc@hickorytech.net |
| Brenda Olmscheid | Blue Earth County | Asst. Emergency Mgmt Coordinator | brenda.olmscheid@blueearthcountymn.gov |
| Eric Weller | Blue Earth County | Emergency Manager | eric.weller@southcentral.edu |
| Brian Goettl | City of Eagle Lake | Public Works Department | bkgoettl@eaglelakemn.com |
| Jennifer Bromeland | City of Eagle Lake | Administrator | jbromeland@eaglelakemn.com |
| Ava Adams-Morris | Jamestown Township | Clerk | kreolelady@aol.com |
| Randy Bakken | ECRE/Rapidan Dam | Plant Manager | randy.bakken@eaglecreekre.com |
| Kevin Winkelman | ECRE/Rapidan Dam | Regional Manager | kevin.winkelman@eaglecreekre.com |
| Tylor Gronan | City of Lake Crystal | Administrator | lccity@hickorytech.net |
| Myles Elsen | USDA - NRCS | Soil Conservationist | myles.elsen@usda.gov |
| Loren Jansen | MSU - Mankato | Emergency Management | loren.jansen@mnsu.edu |
| Jackie Niss | Mayo Clinic | Emergency Mgmt. & Envir. Safety | niss.jackie@mayo.edu |
| Diane Roelofs | Vernon Center | Clerk-Treasurer | vcclerk18@gmail.com |
| Patty Smith | City of Amboy | Administrator/Clerk-Treasurer | patty@amboy.mn.com |
| Ryan Thilges | Blue Earth County | Public Works Director | ryan.thilges@mankatomn.gov |
| Kelley Haeder | Blue Earth County | Public Health | kelley.haeder@blueearthcountymn.gov |
| Paul Baer | LeRay Township | Chairman | pabaer1@gmail.com |
| Lynda Kruse | McPherson Township | Clerk | 7KrusenKruses@gmail.com |
| Sarah Fay | City of Mapleton | Deputy Clerk | info@mapletonmn.com |
| Amber Duncanson | City of Mapleton | City Clerk | mptn@hickorytech.net |
| Jessica Anderson | Blue Earth County | Administrative Specialist | jessie.anderson@blueearthcountymn.gov |
| Reginald Liddell | USDA - NRCS | District Conservationist | reginald.liddell@usda.gov |
| Mike Maurer | Blue Earth County | Chief Deputy/EM | mike.maurer@blueearthcountymn.gov |
| Dan Davidson | Blue Earth County | Lieutenant | dan.davidson@blueearthcountymn.gov |
| Paul Barta | Blue Earth County | Captain | paul.barta@blueearthcountymn.gov |

## 12/5/19 Hard Copy Sign-in Sheets

**Blue Earth County – Multi Hazard Mitigation Plan Update**
**Planning Team Meeting #2 – Thursday, December 5, 2019 – 10:00 a.m. – 12:00 p.m.**

## PARTICIPANT SIGN IN SHEET

| Name | Agency/Organization | Title | Email |
|---|---|---|---|
| 1. Alvin Roath | Ecumen Pathstone | Corporate Facilities/EM | alvinroath@ecumen.org |
| 2. Jeff Shoobridge | Madison Lake | City Administrator | Admin@MadisonLakeMN.gov |
| 3. Daniel Bunde | Madison Lake | police chief | dbunde@madisonlakemn.gov |
| 4. John Kopp | Eagle Lake | police chief | elpd@eaglelakemn.com |
| 5. Ed Pankratz | Mankato Township | Supervisor | ed.pan@hickorytech.net |
| 6. CATHERINE SEYS | CITY OF ST. CLAIR | CITY OF ST. CLAIR | citystc@hickorytech.net |
| 7. Brenda Olmscheid | Blue Earth Co. | Asst. EM | brenda.olmscheid@blueearthcountymn.gov |
| 8. ERIC WELLER | Blue Earth Co | EM | eric.weller@southcentralcc.edu |
| 9. Brian Goettl | Eagle Lake | Public Works Dir | bkgoettl@eagle lake mn.com |
| 10. Jennifer Braveland | Eagle lake | Admin. | jbraveland@eaglelakemn.com |
| 11. Ava Adams-Morris | Jamestown Township | Clerk | Kreolelady@aol.com |
| 12. Randy Bakken | ECRE / Rapidan Dam | Plant Manager | Randy.Bakken@eaglecreekre.com |
| 13. Kevin Winkelman | Eagle Creek Renewable Energy | Regional Mgr. | kevin.winkelman@eaglecreekre.com |
| 14. Taylor Gronau | Lake Crystal | Administrator | lccity@hickorytech.net |
| 15. Myles Elsen | USDA - NRCS | Soil Conservationist | myles.elsen@usda.gov |
| 16. Loren Jansen | MSU - Mankato | Emergency Mgmt | loren.jansen@mnsu.edu |
| 17. Jacki Niss | Mayo Clinic | Mgr Gen Mgmt & Env Safety | niss.jacki@mayo.edu |
| 18. Diane Raeloff | City of Vernon Ctr | Clerk-Treasurer | vcclerk18@gmail.com |
| 19. Patty Smith | City of Amboy | Administrator-Clerk-Treas | patty@amboymn.com |
| 20. Ryan Thilges | Blue Earth County | Public Works Director | ryan.thilges@blueearthcountymn.gov |
| 21. Kelley Haeder | Blue Earth City Hall | Supervisor | kelley.haeder@blueearthcitymn.gov |
| 22. Paul Baer | Le Ray Township | Township Chair | pabaer1@gmail.com |

**Blue Earth County – Multi Hazard Mitigation Plan Update**
**Planning Team Meeting #2 – Thursday, December 5, 2019 – 10:00 a.m. – 12:00 p.m.**

| Name | Agency/Organization | Title | Email |
|---|---|---|---|
| 23. Lynda Kruse | McPherson Twsp | Clerk | 7krusenkruses@gmail.com |
| 24. Sarah Fay | City of Mapleton | Deputy Clerk | info@mapletonmn.com |
| 25. Amber Duncanson | City of Mapleton | City Clerk | mpnt@hickoryTech.com |
| 26. Jessica Anderson | BEC Admin | Admin Specialist | jessie.anderson@blueearthcountymn.gov |
| 27. Reginald Liddell | USDA/NRCS | Dist. Conservationist | reginald.liddell@usda.gov |
| 28. Michael Maurer | BECSO | Dist Deputy / EM Dir | mike.maurer@blueearthcountymn.gov |
| 29. Dan Davidson | BECSO | Lt BEC | dan.davidson@blueearthcountymn.gov |
| 30. Paul Barta | BECSO | Captain / Em mgmt | paul.barta@blueearthcountymn.gov |
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**12/5/19 Power Point Slides**

# Blue Earth County



2020 MULTI-HAZARD MITIGATION PLAN UPDATE
PLANNING TEAM MEETING #2
DECEMBER 5, 2019

1

## Agenda

1. Welcome and Introductions
2. Recap of MHMP Key Points
3. Review of Risk Assessment & Vulnerability Analysis
4. Overview of FEMA HMA Funding and Mitigation Action Chart (MAC)
5. MAC Review & Feedback
6. Next Steps

BLUE EARTH COUNTY MINNESOTA

**Hazard Mitigation Planning Meeting #2**

2

## About your Project Team

U-SPATIAL
University of Minnesota Duluth
Driven to Discover

- **U-Spatial at the University of Minnesota Duluth** was contracted by MN HSEM to facilitate the development of this plan and to conduct spatial analysis, mapping and research for the plan.
- U-Spatial@UMD has worked on 30 MHMP's (2011-2019), working with both Minnesota counties and tribes.
- Working with U-Spatial@UMD is **Bonnie Hundrieser**, who specializes in Emergency Management planning.

3

## Overview of Plan Update & Purpose

- Blue Earth County is updating its **Multi-Hazard Mitigation Plan (MHMP)** to fulfill a state & federal requirement. The plan must be updated every 5 years. The last plan was adopted in 2013. This plan update will cover **2020-2025**.
- The purpose of the plan is to identify & assess natural hazards that pose risk to the County and it's jurisdictions and **develop long-term strategies and mitigation actions** that will help to reduce or eliminate the impact of future hazard or disaster events.

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## Who the Plan Covers

This is a **multi-jurisdictional plan** that covers Blue Earth County, including the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, Skyline, St. Clair, and Vernon Center.

- The County and Cities are required to adopt the final plan. Townships are covered under the umbrella of the County.
- Two cities partially-located within Blue Earth County are covered by other plans: Minnesota Lake (Faribault County) & North Mankato (Nicollet County).

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## Who Needs to Participate

**Stakeholder Participation**

It is required to provide an opportunity for local county & municipal government, related agency stakeholders and neighboring jurisdictions to participate in the plan update.

- 2 Planning Team Meetings
- Local Mitigation Survey
- Provision of key data
- MAC Review & Feedback
- Review of Draft Plan

**Public Participation**

It is required to provide an opportunity for the public to learn about the plan update, ask questions and provide input that may be incorporated into the plan update.

- 2 News Releases
- Outreach conducted via websites, social media and local media
- Online public review & comment period for draft plan

6

## Prioritization of Hazards for Blue Earth County

Prioritization of hazards by the Blue Earth County Planning Team included consideration of:

- Probability and Severity of natural hazard events
- Observed increase or decrease in risk since 2013
- Jurisdictional variations in risk (i.e., local vulnerabilities, changes in development)

| Natural Hazards | Risk Severity |
|---|---|
| Severe Winter Storms (Blizzards, Heavy Snow, Ice Storms) | High |
| Severe Summer Storms (Thunderstorms, Lightning, Hailstorms, Windstorms, Tornadoes) | High |
| Flash Flooding & Riverine Flood | High |
| Erosion/Landslides | High |
| Extreme Heat/Extreme Cold | Moderate |
| Drought | Low |
| Dam Failure | Low |
| Wildfire | Low |

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## Hazards Risk Assessment

- Validate prioritization
- Provide probability and severity of future events as possible
- Identify vulnerable populations and structures at risk as possible
- Consider variable jurisdictional vulnerability
- Inform Mitigation Actions in the HMP

8

## U-Spatial@UMD – County Coordination

U-Spatial@UMD Team has worked closely with personnel from the County to collect key information for the plan update.

- County Emergency Management Director
- County GIS Specialist
- County Assessor
- County Departments (i.e. Highway, Planning & Zoning, SWCD, others).

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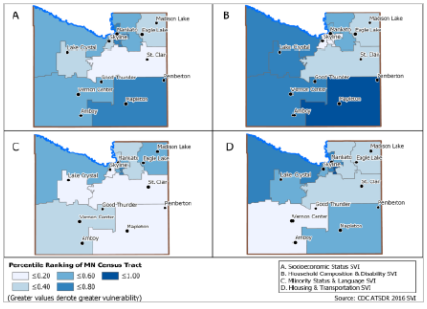
## All Hazards – Critical Infrastructure

- Chemical
- Communications
- Correctional
- Critical Manufacturing
- Cultural Resources
- Dams
- Emergency Services
- Energy (Power Plants)
- Schools
- Transportation
- Water


10

## All Hazards – Population Vulnerability

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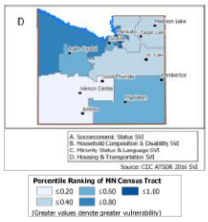
## All Hazards – Population Vulnerability

Housing and Transportation





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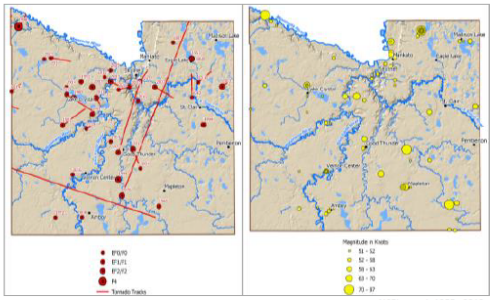
## Severe Summer Storms

(Lightning, Hailstorms, Windstorms, Tornadoes)



NCEI records 1955 - 2019

13

## Winter Storms

(Blizzards, Heavy Snow, Ice Storms)

| | | |
|---|---|---|
| 2/7/2019 | Blizzard | Blizzard conditions occurred with 40 mph winds and visibility of 1/4-mile or less. Various roads in the county were nearly impassible and travel was not advised by the MN Department of Transportation. |
| 4/13/2018 | Winter Storm | Prolonged winter storm conditions in April resulted in snowfall of 9-12 inches, along with hail, thunder and sleet. |
| 1/22/2018 | Blizzard | 10-14 inches of snow was reported across the county, with wind speeds over 35 mph at times. |

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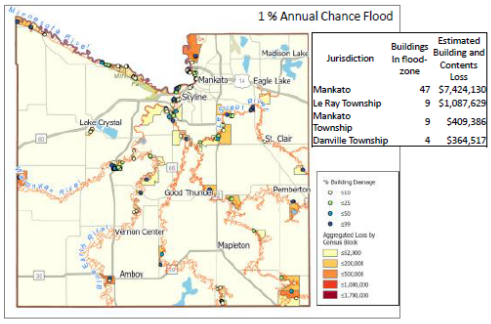
## Flash Flooding & Riverine Flood

- Obtained building and parcel values from County
- Used statewide building footprint data
- Obtained FEMA Flood Insurance Rate Maps
- Ran flood model to estimate economic loss
- Identified Critical Infrastructure in flood zone

15

## Flash Flooding & Riverine Flood




| Jurisdiction | Buildings in flood-zone | Estimated Building and Contents Loss |
|---|---|---|
| Mankato | 47 | $7,424,130 |
| Le Ray Township | 9 | $1,087,629 |
| Mankato Township | 9 | $409,386 |
| Danville Township | 4 | $364,517 |

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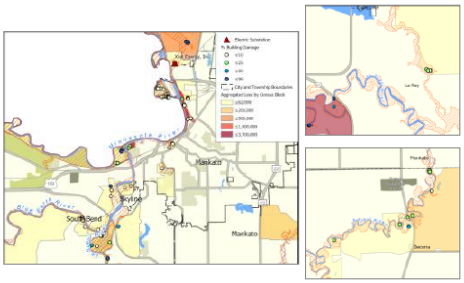
## Flash Flooding & Riverine Flood

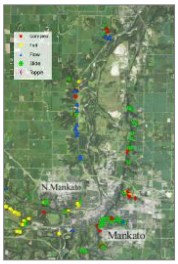



17

## Erosion/Landslides

Phil Larson, University of Minnesota Mankato

- Threats or damage to public and private property
- Culverts replaced in LeRay township due to erosion
- FEMA funds used to purchase three residences

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## Development of Mitigation Actions

- Mitigation Actions (MA's) are informed by the Risk Assessment and Vulnerability Analysis.
- MA's are also developed based on an assessment of local capability strengths or deficiencies.
- MA's should reflect efforts to reduce or eliminate risk to life safety, critical infrastructure and systems, property and the environment.
- Any hazard prioritized as high or moderate must have MA's to address them.
- Each jurisdiction must have MA's specific to their own identified local risks & vulnerabilities.
- Any future FEMA grant projects must be identified.

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## FEMA HMA Grant Funding

FEMA Hazard Mitigation Assistance (HMA) grant programs provide funding with the aim to reduce or eliminate risk to property and loss of life from future natural disasters.

HMA programs are typically a 75%/25% cost share program.

Projects must be identified in the local mitigation action chart to support future application.

***Example Eligible Activities:***

- Property Acquisition (repetitive flooding / erosion imminent risk of failure)
- Tornado Safe Room Construction/Retrofit
- Infrastructure Retrofit (utility systems, roads & bridges)
- Wildfire Mitigation
- Soil Stabilization
- Flood Reduction Projects
- Green Infrastructure
- Additional Projects difficult to conduct a standard BCA

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## Overview of Mitigation Action Charts & Discussion

- The MHMP results in **Mitigation Action Charts** for the County and each city jurisdiction with targeted activities to implement over the next 5 years.
- All MACs have been reviewed and initially approved prior to this meeting.
- Please consider any final additions or changes to include based on information provided today and overview of the MAC.

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## Next Steps (Dec 2019 - Jan 2020)

- The full draft plan will be posted online for public review & comment. Public outreach will be conducted for the open review period.
  - Local jurisdictions and partner agencies are encouraged to help promote review & feedback.
  - Public input received will be reviewed for incorporation into the plan.
- Any resulting revisions will be made, and the plan will be submitted to HSEM and FEMA for review and approval.

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# Mitigation Strategies & Action Types

Following are the five types of mitigation strategies that will be used in the update of the Multi-Hazard Mitigation Plan with examples of related mitigation actions. Minnesota HSEM recommends the use of these mitigation strategies to be in alignment with the State plan and those recommended by FEMA. The first four strategies listed are taken from the FEMA publications *Local Mitigation Planning Handbook* (2013) and *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* (2013). The fifth strategy type was determined by Minnesota HSEM for use within the state.

These strategies will provide the framework for identification of new jurisdictional-level mitigation actions for implementation over the next 5-year planning cycle.

| Mitigation Strategy | Description | Example Mitigation Actions |
|---|---|---|
| **Local Planning and Regulations** | These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built. | • Comprehensive plans<br>• Land use ordinances<br>• Planning and zoning<br>• Building codes and enforcement<br>• Floodplain ordinances<br>• NFIP Community Rating System<br>• Capital improvement programs<br>• Open space preservation<br>• Shoreline codes<br>• Stormwater management regulations and master plans<br>• Mobile home park compliance for storm shelters |
| **Structure and Infrastructur e 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.<br>This type of action also involves projects to construct manmade structures to reduce the impact of hazards. | • Property Acquisitions and elevations of structures in flood prone areas<br>• Utility undergrounding<br>• Structural retrofits (i.e., metal roofs)<br>• Floodwalls and retaining walls<br>• Detention and retention structures<br>• Culvert Installation/Modification<br>• Roads & Bridge risk reduction<br>• Safe Room (New construction or facility retrofit)<br>• Green Infrastructure Methods<br><br>*Many of these types of actions are projects eligible for funding through FEMA HMA grant programs.* |

| 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. | • Soil stabilization for sediment and erosion control<br>• Floodplain and Stream corridor restoration<br>• Slope management<br>• Forest management (defensible space, fuels reduction, sprinkler systems)<br>• Conservation easements<br>• Wetland restoration and preservation<br>• Aquifer Storage & Recovery<br>• Flood Diversion and Storage<br><br>*Many of these types of actions are projects eligible for funding through FEMA HMA grant programs.* |
| **Education and Awareness Programs** | These are actions to inform and educate citizens, 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 that support life safety and lessen property damage. | • Radio or television spots<br>• Websites with maps and information<br>• Social media outreach<br>• Promotion of sign-up for emergency warnings<br>• Real estate disclosure<br>• Promotion of NFIP insurance to property owners<br>• Presentations to school groups or neighborhood organizations<br>• Mailings to residents in hazard-prone areas.<br>• NWS StormReady Program<br>• Firewise Communities<br><br>*Some of these types of actions may be projects eligible for funding through the FEMA HMA "5 Percent Initiative Program".* |
| **Mitigation Preparedness and Response Support** | This is a State of Minnesota mitigation strategy with the intent of covering emergency preparedness actions that protect life and property prior to, during, and immediately after a disaster or hazard event. These activities are typically not considered mitigation, but support reduction of the effects of damaging events. | • Emergency Operations Plan<br>• Flood fight plans and preparedness measures<br>• Dam emergency action plans<br>• Emergency Warning Systems (i.e., CodeRed, warning sirens)<br>• Generator backup power<br>• NWS Storm Spotter Training<br>• Training and education for local elected officials and key partners. |

# Appendix F
# Public Outreach & Engagement Documentation

# Record of Public Input & Incorporation

**News Release #1 – January 3, 2019, "Public Feedback and Participation Invited for Blue Earth County 2019 Multi-Hazard Mitigation Plan Update"**
On January 3, 2019, Blue Earth County Emergency Management put out a news release announcing the start of the County's Multi-Hazard Mitigation Plan. The news release was shared via numerous channels to reach the public, including the Blue Earth County website and distribution to local media. The news release provided information on the purpose and content of the plan, who the plan covers, stakeholders involved in the plan update and examples of hazard mitigation activities.

Blue Earth County used the news release to gather feedback from residents and businesses from across the County to incorporate into the plan, inviting feedback to the following:

- What are the natural hazards you feel pose the greatest risk to your community?
- Have you experienced a previous disaster event?
- What concerns do you have, and what sorts of mitigation actions or projects do you feel would help to reduce the damages of potential future events for your personal property, your community, or the County as a whole?

The public was strongly encouraged contact Blue Earth County Emergency Management to submit comments, concerns, or questions regarding natural disasters and potential mitigation actions to be included into the plan update process.

Appendix F contains documentation of the means of public outreach for News Release #1.

***Record of Public Input & Incorporation:***

Blue Earth County Emergency Management did not receive any public input following News Release #1.

**News Release #2 – January 9, 2020, "Public Review and Feedback Invited for Blue Earth County's Multi-Hazard Mitigation Plan"**
On January 9, 2020 Blue Earth County Emergency Management put out a news release announcing the completion of the draft Blue Earth County Multi-Hazard Mitigation Plan and invitation for public review and comment. The news release was shared via numerous channels to reach the public, including the Blue Earth County website, Blue Earth County Sheriff's Office Facebook and local news media (KEYC Mankato, News 12) and other news sources (www.newsbreak.com). The Blue Earth County Emergency Management Director also sent an email directly to all planning team members inviting their review, feedback and confirmation of plan review. The news release informed the public that a copy of the draft MHMP and a survey for public feedback was available online at https://sites.google.com/d.umn.edu/blueearthcounty/home. The public feedback period for the draft plan was open from January 9, 2020 to January 24, 2020, for a total of 16 days.

Appendix F contains documentation of the means of public outreach for News Release #2.

***Record of Public Input & Incorporation:***

Public input was received via use of the online comment form and via direct response to the Blue Earth County Emergency Management Director. Following is a record of public input received and description of how the feedback was incorporated into the plan, and if not, why.

- **Online Comments -** Only one comment was submitted via the online comment form for Blue Earth: *"Update for Amboy – We did pass the Flood Ordinance on 1/6/2020."* This correction was made in the City of Amboy Mac (#4) in Appendix G.

- **Comments Submitted to Blue Earth County** - The cities of Pemberton and Mankato submitted minor revisions to content in their local mitigation action charts (i.e., typos) directly to Blue Earth County Emergency Management Director Mike Maurer. These things were corrected within the final draft of the plan.

**Blue Earth County Sheriff's Office**

*Brad Peterson*
*Sheriff*

*Michael J. Maurer*
*Chief Deputy*

BLUE EARTH COUNTY NEWS RELEASE
(January 3, 2019)

## Public Feedback and Participation Invited for Blue Earth County 2019 Multi-Hazard Mitigation Plan Update

The Blue Earth County Office of Emergency Management is currently working with the University of Minnesota Duluth – Geospatial Analysis Center (GAC) to prepare an update of the County's 2013 "Multi-Hazard Mitigation Plan" (MHMP). The plan is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000) and must be updated every five years in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs.

Development of the plan is under direction of the County's Emergency Manager in cooperation with a planning team of representatives from County departments, local municipalities, school districts, and other key stakeholders such as utility providers. The planning team is responsible to provide feedback required for the plan update, including the review and ranking of hazards and identification of strategic, cost-effective mitigation activities that may reduce future losses for the County and individual jurisdictions. Some mitigation activities may be eligible for future FEMA Hazard Mitigation Assistance (HMA) grant funding, such as: localized flood reduction measures, property acquisition and relocation/conversion to open space, infrastructure retrofits, wildfire mitigation, and safe room construction or retrofits to provide immediate life-safety protection for people vulnerable to tornado and severe wind events.

**About the Plan**
The Blue Earth County MHMP is a multi-jurisdictional plan that covers Blue Earth County, including the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, Skyline, St. Clair, and Vernon Center. The Blue Earth County MHMP also incorporates the concerns and needs of townships, school districts, and other stakeholders participating in the plan.

Blue Earth County is vulnerable to a variety of potential natural disasters, which threaten the loss of life and property in the county. Hazards such as tornadoes, flooding, wildfires, blizzards, straight-line winds, erosion, ice storms, and droughts have the potential for inflicting vast economic loss and personal hardship.

According to Blue Earth County Emergency Management Director, Mike Maurer, "Hazard mitigation planning is a central part of our emergency management program. Understanding the natural hazards that can cause serious impact to our communities and taking action to reduce or eliminate the impact of future disasters makes us more resilient. Hazard mitigation helps us to break the cycle of damage and repair caused by things like flooding, erosion, ice storms, and severe wind events that can damage property, stress economies, and threaten life safety in our county."

401 Carver Road, P.O. Box 228, Mankato, MN 56002-0228, (507) 304-4800, FAX (507) 304-4818
www.co.blue-earth.mn.us

Blue Earth County does not discriminate on the basis of race, color, creed, religion, national origin, sex, marital status, status with regard to public assistance, membership or activity in a local commission, disability, sexual orientation or age in employment or the provision of services.

**Blue Earth County Sheriff's Office**

*Brad Peterson*
*Sheriff*

*Michael J. Maurer*
*Chief Deputy*

Examples of hazard mitigation include actions such as improvement of roads and culverts that experience repetitive flooding; construction of safe rooms at campgrounds, parks, or schools to protect lives in the event of tornados or severe wind events; burying powerlines that may fail due to heavy snow, ice or wind storms; ensuring timely emergency communication to the public through warning sirens and mass notification systems, and conducting public awareness and education campaigns to help people to be prepared to take safe action before, during, or following a hazard event.

**Public Feedback and Participation**

As part of the planning process, gathering input from the public is an important and required step. Blue Earth County seeks to gather feedback from residents and businesses from across the County to incorporate into the plan:

- What are the natural hazards you feel pose the greatest risk to your community?
- Have you experienced a previous disaster event?
- What concerns do you have, and what sorts of mitigation actions or projects do you feel would help to reduce the damages of potential future events for your personal property, your community, or the County as a whole?

The public is encouraged to submit your comments, concerns, or questions regarding natural disasters and potential mitigation actions to be included into the plan update process. Please submit your feedback to Blue Earth County Emergency Management Director, Mike Maurer at Mike. Maurer@blueearthcountymn.gov

The public will have a continued opportunity to participate in the MHMP update in the coming months. A draft of the plan will be posted on the County website for public review prior to submission of the plan to the State of Minnesota. Future news releases will be shared with the media to notify the public of these opportunities.

**Contact**

Mike Maurer
Blue Earth County Chief Deputy/Emergency Management Director
Phone: 507-304-4808
Email: Mike. Maurer@blueearthcountymn.gov

401 Carver Road, P.O. Box 228, Mankato, MN 56002-0228, (507) 304-4800, FAX (507) 304-4818
www.co.blue-earth.mn.us

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***Blue Earth County MHMP News Release #1 - Public Outreach***
**Blue Earth County Website posting of News Release**
**January 4, 2019**

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Importance of Hazard Mitigation
Hazard Mitigation Plan Update Feedback
Hazard Mitigation Planning Process
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## Hazard Mitigation Plan Update Feedback

### Public Feedback and Participation Invited for Blue Earth County 2019 Multi-Hazard Mitigation Plan Update

The Blue Earth County Office of Emergency Management is currently working with the University of Minnesota Duluth – Geospatial Analysis Center (GAC) to prepare an update of the County's 2013 "Multi-Hazard Mitigation Plan" (MHMP). The plan is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000) and must be updated every five years in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs.

Development of the plan is under direction of the County's Emergency Manager in cooperation with a planning team of representatives from County departments, local municipalities, school districts, and other key stakeholders such as utility providers. The planning team is responsible to provide feedback required for the plan update, including the review and ranking of hazards and identification of strategic, cost-effective mitigation activities that may reduce future losses for the County and individual jurisdictions. Some mitigation activities may be eligible for future FEMA Hazard Mitigation Assistance (HMA) grant funding, such as localized flood reduction measures, property acquisition and relocation/conversion to open space, infrastructure retrofits, edifice mitigation, and safe room construction or retrofits to provide immediate life-safety protection for people vulnerable to tornado and severe wind events.

#### About the Plan

The Blue Earth County MHMP is a multi-jurisdictional plan that covers Blue Earth County, including the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Mapleton, Pemberton, Skyline, St. Clair, and Vernon Center. The Blue Earth County MHMP also incorporates the concerns and needs of townships, school districts, and other stakeholders participating in the plan.

Blue Earth County is vulnerable to a variety of potential natural disasters, which threaten the loss of life and property in the county. Hazards such as tornadoes, flooding, wildfires, blizzards, straight-line winds, erosion, ice storms, and droughts have the potential for inflicting vast economic loss and personal hardship.

According to Blue Earth County Emergency Management Director, Mike Maurer, "Hazard mitigation planning is a central part of our emergency management program. Understanding the natural hazards that can cause serious impact to our communities and taking action to reduce or eliminate the impact of future disasters makes us more resilient. Hazard mitigation helps us to break the cycle of damage and repair caused by things like flooding, erosion, ice storms, and severe wind events that can damage property, stress economies, and threaten life safety in our county."

Examples of hazard mitigation include actions such as improvement of roads and culverts that experience repetitive flooding; construction of safe rooms at campgrounds, parks, or schools to protect lives in the event of tornadoes or severe wind events; burying power lines that may fail due to heavy snow, ice or wind storms; ensuring timely emergency communication to the public through warning sirens and mass notification systems; and conducting public awareness and education campaigns to help people to be prepared to take safe action before, during, or following a hazard event.

#### Public Feedback and Participation

As part of the planning process, gathering input from the public is an important and required step. Blue Earth County seeks to gather feedback from residents and businesses from across the County to incorporate into the plan.

- What are the natural hazards you feel pose the greatest risk to your community?
- Have you experienced a previous disaster event?
- What concerns do you have, and what sorts of mitigation actions or projects do you feel would help to reduce the damages of potential future events for your personal property, your community, or the County as a whole?

The public is encouraged to submit your comments, concerns, or questions regarding natural disasters and potential mitigation actions to be included into the plan update process. Please submit your feedback to Blue Earth County Emergency Management Director, Mike Maurer at Mike.Maurer@blueearthcountymn.gov

The public will have a continued opportunity to participate in the MHMP update in the coming months. A draft of the plan will be posted on the County website for public review prior to submission of the plan to the State of Minnesota. Future news releases will be shared with the media to notify the public of these opportunities.

#### Contact

Mike Maurer
Blue Earth County Chief Deputy/Emergency Management Director
Phone: (507) 304-4808
Email: Mike.Maurer@blueearthcountymn.gov

Contact Us



Mike Maurer
Emergency Management Director
Email
More Information

***Blue Earth County MHMP News Release #1 - Public Outreach***
**Mankato Free Press Website posting**
**January 4, 2019**

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# County seeks public input on hazard plan

The Free Press Jan 4, 2019


Mankato Free Press

MANKATO — The Blue Earth County Sheriff's Office is asking the public to propose road projects and other improvements to reduce the impact of severe weather in the county.

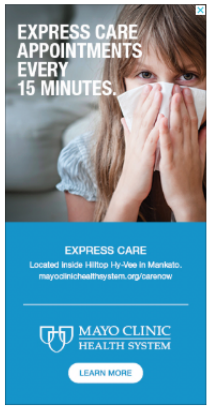
The Sheriff's Office is beginning the process of updating the county's hazard mitigation plan and is inviting citizens to give input.

The plan identifies the county's risks for natural disasters and other hazards such as fires, hazardous waste spills and disease outbreaks. The plan proposes infrastructure upgrades and education programs to help prevent those hazards or reduce their effects.

Every county is required to have a plan and update it every five years to be eligible for federal funding for disaster responses and mitigation projects.

"Hazard mitigation planning is a central part of our emergence management program," Mike Maurer, chief deputy and emergency management director, said in a press release. "Hazard mitigation helps us to break the cycle of damage and repair caused by things like flooding, erosion, ice storms and severe wind events that can damage property, stress economies and threaten life safety in our county."

Examples o
measures t

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***Blue Earth County MHMP News Release #1 - Public Outreach***
**Mankato Free Press Facebook Posting**
**January 4, 2019**

**From:** Mike Maurer
**To:** Bonnie Hundrieser
**Cc:** Dan Davidson; Paul Barta; Brenda Olmscheid
**Subject:** FW: 2019 Multi-Hazard Mitigation Plan Update Media Release
**Date:** Thursday, January 3, 2019 3:03:24 PM
**Attachments:** Hazard Mitigation Plan Media Release 01.03.19.pdf

The media release was sent just minutes ago. Below is a list of the outlets.

Michael J. Maurer
Chief Deputy
Blue Earth County Sheriff's Office
507-304-4808
507-317-7002

**From:** Paul Barta
**Sent:** Thursday, January 03, 2019 3:01 PM
**To:** All SO Supervisors <AllSOSupervisors@blueearthcountymn.gov>; All Deputies <AllDeputies@blueearthcountymn.gov>; Abby Berg <abby@knuj.net>; Alpha Radio Mankato <somnnews@gmail.com>; Amy Forliti <aforliti@ap.org>; Amy Holst <Amy.Holst@blueearthcountymn.gov>; Annette Weston <annette@ktoe.com>; Beth Crosby <mltrib.news@yahoo.com>; Bob Meyer <Bob.Meyer@blueearthcountymn.gov>; Dick Maryhew <richm@startribune.com>; Elizabeth Sawyer <elizabeth.sawyer@startribune.com>; Fox 9 <fox9news@foxtv.com>; Free Press Editor <editor@mankatofreepress.com>; Jessie Anderson <Jessie.Anderson@blueearthcountymn.gov>; Joe Steck <mankatotimes@gmail.com>; John Reinan <John.Reinan@startribune.com>; KAAL TV 6 <news@kaaltv.com>; KARE 11 <news@kare11.com>; Karen Lundegard <DatelineMN@startribune.com>; KEYC <keycnews@keyc.com>; KEYC Gustafson <tvgustafson@keyc.com>; KIMT <news@kimt.com>; Kristin Wagner <kwagner@kare11.com>; KTOE <news@ktoe.com>; KTTC Rochester <news@kttc.com>; Laura Grossmann <laura.grossmann@alphamediausa.com>; Leah Buletti <lbuletti@mankatofreepress.com>; MPR <newsroom@mpr.org>; New Ulm Journal <news@nujournal.com>; Pam Miller <pmiller@startribune.com>; Pat McDermott <Pat.McDermott@blueearthcountymn.gov>; Paul Walsh <pwalsh@startribune.com>; Rob Olson <robolsonfox9@gmail.com>; Sam Wilmes - Albert Lea Tribune <sam.wilmes@albertleatribune.com>; Southern Minnesota Today <somntoday@gmail.com>; WCCO <tips@wcco.com>
**Cc:** Brenda Olmscheid <Brenda.Olmscheid@blueearthcountymn.gov>
**Subject:** 2019 Multi-Hazard Mitigation Plan Update Media Release

A media release regarding public feedback for Blue Earth County's 2019 Multi-Hazard Mitigation Plan Update is attached.

Please contact Chief Deputy Mike Maurer with additional questions by email at: Mike.maurer@blueearthcountymn.gov or by phone at: (507) 304-4808.

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| | |
|---|---|
| **From:** | Paul Barta |
| **To:** | All SO Supervisors; All Deputies; All Dispatch; Pam Hermanson; Justin Neumann; Patty Smith; Jennifer Bromeland; Good Thunder City Clerk; Lake Crystal City Administrator (lccity@hickorytech.net); Dan Bunde; motn@hickorytech.net; Darla; "citystc@hickorytech.net"; Vernon Center - Diane Roelofs; clerk@cityofskyline.com; Ryan Thilges; Abby Berg; al@ktoe.com; Alpha Radio Mankato; Amy Forliti; Amy Holst; Annette Weston .; Beth Crosby; Bob Meyer; Brett Hoffland; Dick Maryhew; Elizabeth Sawyer; Fox 9; Free Press Editor; jennifer austin .; Jessie Anderson; Joe Steck; John Reinan; KAAL TV 6; KARE 11; Karen Lundegard; KEYC; KIMT; Kristin Wagner; KTOE; KTTC Rochester; Laura Grossmann; maple river messenger .; MPR; New Ulm Journal; Pam Miller; Pat McDermott; Paul Walsh; Reid Forgrave - Star Tribune; Rob Olson; Sam Wilmes - Albert Lea Tribune .; Southern Minnesota Today .; Tim Harlow; Tim Nelson; Vincent Tuss; WCCO |
| **Cc:** | Mike Maurer; Dan Davidson; Brenda Olmscheid; Bonnie K Hundrieser |
| **Subject:** | Media Release - Draft Multi-Hazard Mitigation Plan |
| **Date:** | Thursday, January 9, 2020 2:39:59 PM |
| **Attachments:** | Multi-Hazard Mitigation Draft Plan Media Release 1.9.20.pdf |

A media release regarding availability of Blue Earth County's draft multi-hazard mitigation plan is attached.

The following link will take you to the draft plan.

https://sites.google.com/d.umn.edu/blueearthcounty/home

Please contact Chief Deputy Mike Maurer with additional questions by email at: mike.maurer@blueearthcountymn.gov or by phone at (507) 304-4808.

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**Blue Earth County Sheriff's Office**

*Brad Peterson*
*Sheriff*

*Michael J. Maurer*
*Chief Deputy*

BLUE EARTH COUNTY NEWS RELEASE
January 9, 2020

## Public Review and Feedback Invited for Blue Earth County's Multi-Hazard Mitigation Plan

Blue Earth County has completed an updated draft of the of the County's Multi-Hazard Mitigation Plan (MHMP) as required by the Federal Disaster Mitigation Act of 2000 (DMA 2000). Local jurisdictions are required to update the plan every five years to remain eligible for federal hazard mitigation grant programs.

Community involvement and feedback are vital to the success of the plan. Blue Earth County invites public review and feedback of the draft plan prior to submitting it to the State of Minnesota and the Federal Emergency Management Agency (FEMA) for review. A copy of the draft MHMP and a survey for public feedback is available online at https://sites.google.com/d.umn.edu/blueearthcounty/home. The plan review and comment period will be open until Friday, January 24, 2020.

**About the Plan**
The Blue Earth County MHMP is a multi-jurisdictional plan that covers Blue Earth County, including the cities of Amboy, Eagle Lake, Good Thunder, Lake Crystal, Madison Lake, Mankato, Mapleton, Pemberton, Skyline, St. Clair, and Vernon Center. The Blue Earth County MHMP also incorporates the concerns and needs of townships, school districts, and other stakeholders participating in the plan.

Blue Earth County is vulnerable to a variety of potential natural disasters, which threaten the loss of life and property in the county. The plan addresses how to mitigate against hazards such as tornadoes, flooding, wildfires, blizzards, straight-line winds, ice storms, and droughts which have the potential for inflicting vast economic loss and personal hardship.

Update of the plan has been under direction of Blue Earth County Emergency Management in cooperation with U-Spatial at the University of Minnesota Duluth and representatives from County departments, city and township governments, school districts, and other key stakeholders. Together, the planning team worked to identify cost-effective and sustainable actions to reduce or eliminate the long-term risk to human life or property from natural hazards. Some examples include improvement of roads and culverts that experience repetitive flooding; construction of safe rooms at campgrounds, public parks, mobile home parks or schools to protect lives in the event of tornados or severe wind events; burying powerlines that may fail due to heavy snow, ice or wind storms; ensuring timely emergency communication to the public through warning sirens and mass notification systems, and conducting public awareness and education campaigns to help people be prepared to take safe action before, during, or following a hazard event.

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# Blue Earth County Sheriff's Office

*Brad Peterson*
*Sheriff*

*Michael J. Maurer*
*Chief Deputy*

**The Benefits of Hazard Mitigation Planning**

Hazard mitigation planning ultimately helps us protect Blue Earth County residents. By working with local communities, we can identify vulnerabilities and develop strategies to reduce or eliminate the effects of a potential hazard. In addition, increasing public awareness of local hazards and disaster preparedness helps to create a community that is resilient to disaster, and breaks the cycle of response and recovery. Update of the plan will further allow the County and its jurisdictions to apply for eligible projects under future Hazard Mitigation Assistance (HMA) grant funding from FEMA for projects that are cost-effective and will help to reduce or eliminate impacts of future natural disaster events.

**Contact:**

Mike Mauer
Blue Earth County Emergency Management Director
Phone: 507-304-4808
Email: Mike.Maurer@blueearthcountymn.gov

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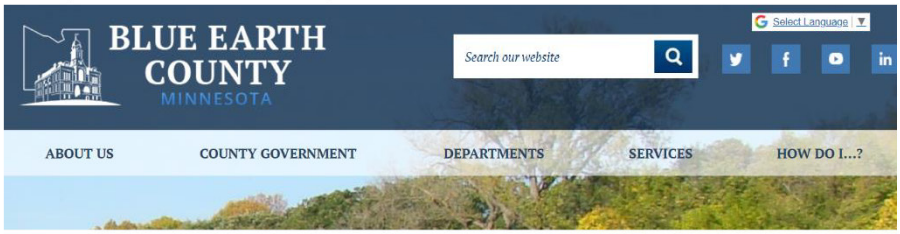
**Blue Earth County MHMP News Release #2 - Public Review & Comment Period**
**Documentation of News Release Postings**

**January 9, 2020 - Blue Earth County Website**

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Posted on: January 9, 2020

## We Need Your Input


Blue Earth County has completed an updated draft of the of the County's Multi-Hazard Mitigation Plan (MHMP) as required by the Federal Disaster Mitigation Act of 2000 (DMA 2000). Local jurisdictions are required to update the plan every five years to remain eligible for federal hazard mitigation grant programs.

Community involvement and feedback are vital to the success of the plan. Blue Earth County invites public review and feedback of the draft plan prior to submitting it to the State of Minnesota and the Federal Emergency Management Agency (FEMA) for review. A copy of the draft MHMP and a survey for public feedback is available online at https://sites.google.com/d.umn.edu/blueearthcounty/home. The plan review and comment period will be open until Friday, January 24, 2020.

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## About the Plan

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**Contact:**
Mike Mauer

Blue Earth County Emergency Management Director

Phone: 507-304-4808

**January 9, 2020 - Blue Earth County Sheriff's Office Facebook Page**


**January 13, 2020 - KEYC News 12**


COMMUNITY

**Blue Earth County seeking public feedback regarding updated MHMP**



Blue Earth County recently announced that it has completed an updated draft of the county's Multi-Hazard Mitigation Plan (MHMP) and is now inviting the public to review and give feedback of the drafted plan. (Source: Blue Earth County, Associated Press/Blue Earth County)

By Jake Rinehart | January 13, 2020 at 8:54 PM CST - Updated January 13 at 8:54 PM

BLUE EARTH COUNTY, Minn. (KEYC) — Blue Earth County recently announced that it has completed an updated draft of the county's Multi-Hazard Mitigation Plan (MHMP), as required by federal law, and is now inviting the public to review and give feedback of the drafted plan before it is submitted to the State of Minnesota and the Federal Emergency Management Agency (FEMA) for review.

**The plan review and commenting period will be open to the public until Jan. 24.**

The Blue Earth County MHMP is a multi-jurisdictional plan that covers Blue Earth County, including the

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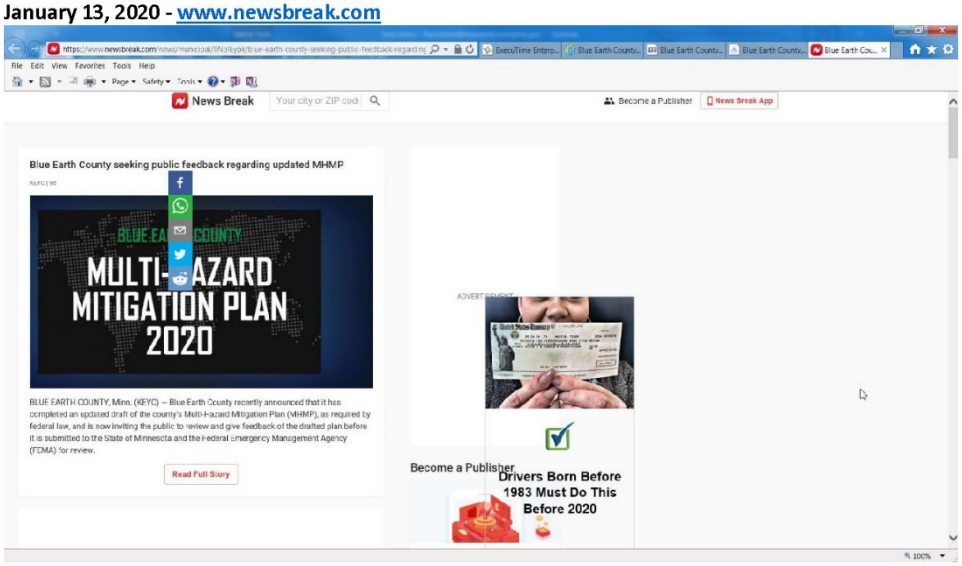


**Blue Earth County 2020 MHMP Update Public Review Website & Comment Form**
**URL:** https://sites.google.com/d.umn.edu/blueearthcounty/home

The Blue Earth County 2020 MHMP Update was made available for public review online with a website hosted by U-Spatial at the University of Minnesota Duluth (U-Spatial@UMD). The website provided a full draft of the 2020 MHMP update and individual excerpts of the Mitigation Action Charts for the County and each city jurisdiction. A "quick form" comment form was also provided for the submission of online comments or questions.

**Public Review Website**


Blue Earth County is currently in the process of updating its Multi-Hazard Mitigation Plan. Before the plan is submitted to the State of Minnesota and FEMA for approval, we need your feedback! Please review the draft plan, in particular the mitigation actions for your jurisdiction, and then fill out this quick form.

- Blue Earth County MHMP 2020 draft
- Blue Earth County Mitigation Actions
- Amboy Mitigation Actions
- Eagle Lake Mitigation Actions
- Good Thunder Mitigation Actions
- Lake Crystal Mitigation Actions
- Madison Lake Mitigation Actions
- Mankato Mitigation Actions
- Mapleton Mitigation Actions
- Pemberton Mitigation Actions
- Skyline Mitigation Actions
- St. Clair Mitigation Actions
- Vernon Center Mitigation Actions

For more information, please contact Stacey Stark at slstark@d.umn.edu or visit https://research.umn.edu/units/uspatial/services/hazard-mitigation-planning

**Blue Earth County MHMP Feedback & Comment Form**
The "quick form" provided an opportunity for reviewers to submit feedback on the plan. Feedback submitted was collected by U-Spatial@UMD and reviewed for incorporation into the plan. The form included the following:

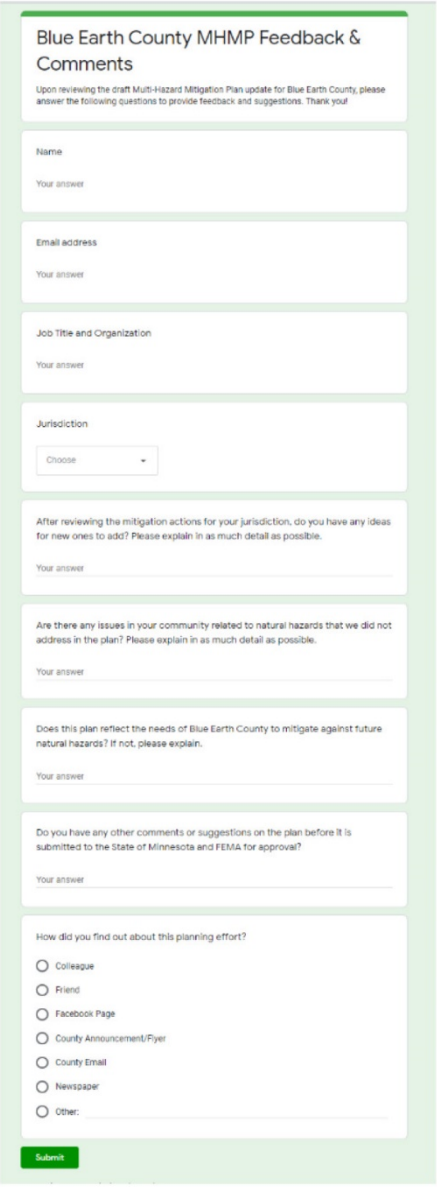
**Instructions**
Upon reviewing the draft Multi-Hazard Mitigation Plan update for Blue Earth County, please answer the following questions to provide feedback and suggestions. Thank you!

**Reviewer Information**

- Name
- Email
- Job Title and Organization
- Jurisdiction (drop down menu)

**Questions**

- After reviewing the mitigation actions for your jurisdiction, do you have any ideas for new ones to add? Please explain in as much detail as possible.
- Are there any issues in your community related to natural hazards that we did not address in the plan? Please explain in as much detail as possible.
- Does this plan reflect the needs of Blue Earth County to mitigate against future natural hazards? If not, please explain.
- Do you have any other comments or suggestions on the plan before it is submitted to the State of Minnesota and FEMA for approval?
- How did you find out about this planning effort? (Selection menu)



# Appendix G
# Mitigation Actions by Jurisdiction

*Table G - 1. City of Amboy Mitigation Action Chart (2020-2025)*

| City of Amboy Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the county's CodeRED emergency notification system. | n/a | **New (2020)** | High | 2020-2025 | City Admin. in cord. with BEC Emergency Mgmt. | The city of Amboy's website home page will provide a link to the Blue Earth County website for residents to sign up for CodeRED. | City funding |
| 2 | All-Hazards | Mitigation Preparedness & Response Support | Maintain an updated Emergency Operations Plan (EOP) for the city. | n/a | Ongoing | High | 2020-2025 | City Admin. & City EM | The city has an EOP in place and continues to keep it updated. | City funding |
| 3 | Flood | Structure & Infrastructure Systems | Complete the televising of the city sewer system to help with Inflow & Infiltration (I&I). | Yes *(Sewer System Infrastructure)* | Ongoing | High | 2020-2025 | City Public Works Dept. | This is an ongoing effort of the city's Public Works department. As of spring, 2019 we have done ½ of the town. We are doing a section each year. Excessive I&I may cause sanitary sewer overflows during high rain events. | City funding |
| 4 | Flood | Local Planning & Regulations | Adopt and enforce the city's updated Floodplain Ordinance. | Yes *(New Buildings)* | In Progress | High | Spring 2020 | City Admin. | On 9/3/19 the city held a public hearing to adopt the ordinance, and the ordinance was passed on 1/6/2020. The city will continue to enforce this ordinance under city code. | City funding |
| 5 | Severe Winter & Summer Storms | Mitigation Preparedness & Response Support | Maintain generator backup power for our water tower and city office in the event of a power failure. | Yes *(Water Supply Infrastructure, Gov't Buildings)* | Ongoing | High | 2020-2025 | City Public Works Dept. | The city recently installed a generator for our water tower with a grant from the MDH. The generator will also power our city offices and provide a shelter location for our residents. | City funding |

*The mitigation activities listed in the **City of Amboy Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation*

*efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 2. City of Eagle Lake Mitigation Action Chart (2020-2025)*

| City of Eagle Lake Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | **New (2020)** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Eagle Lake has a website where information on the County's CodeRED system with a link could be posted. The city can also utilize our email distribution list, our website and Facebook page to promote this information. | City funding |
| 2 | All-Hazards | Local Planning & Regulations | Update the city's 2006 Land Use Plan to address considerations for future hazard events. | n/a | **New (2020)** | Mod. | 2020-2025 | City Admin. | The city's last Land Use Plan was adopted in April 2006. An update was done to the land use map in 2016. When the plan is updated we will assess and seek to incorporate planning considerations for risk reduction to natural hazards. | City funding |
| 3 | All-Hazards | Mitigation & Preparedness Support | Evaluate the need for one or more portable backup generators to provide power to city buildings and services in the event of a power outage. | n/a | **New (2020)** | High | 2020-2025 | City Admin. & Public Works Dept. | This effort will be undertaken by city Administration in cord with our Public Works dept. The city needs additional funding to purchase a generator. | City funding, Other funding (TBD) |

| City of Eagle Lake Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 4 | Flood | Structure & Infrastructure Projects | Evaluate the need for the purchase of pumps to help in the event of flooding. Purchase pumps as determined necessary. | Yes *(Transportation Infrastructure)* | **New (2020)** | High | 2020 | City Public Works Dept. | This effort is currently under the direction of the city's Public Works Dept. Installation and maintenance would be done on a determined schedule if purchased. The city needs additional funding to purchase a generator. | City funding, Other funding (TBD) |
| 5 | Flood | Structure & Infrastructure Projects | Maintain the city's system of over 400 catch basins to help mitigate against localized flooding. | Yes *(Stormwater System Infrastructure)* | Ongoing | High | 2020-2025 | City Public Works Dept. | The city's Public Works Dept. has a regular schedule of monitoring and maintenance on the city's system of catch basins to ensure they are functioning properly. | City funding |
| 6 | Flood | Local Planning & Regulations | Enforce the city's Restrictive Floodplain Ordinance and maintain eligibility in the National Flood Insurance Program. | Yes *(New Development)* | Ongoing | High | 2020-2025 | City Admin. | This ordinance is located in Chapter 6 of the City Code (Planning & Zoning Regulations), section 6.500. This ordinance regulates development in the flood hazard areas of the city of Eagle Lake and helps fulfill the city's compliance to participate in the NFIP. | City funding |
| 7 | Flood | Structure & Infrastructure Projects | Purchase and install a pump to the storm drain outlet to reduce the impacts of heavy rain or flood events to the stormwater system. | Yes *(Stormwater System Infrastructure)* | **New (2020)** | High | 2020-2025 | City Public Works Dept. | The public works department would like to purchase a portable pump to be able to use in areas with standing water that is problematic. The city currently rents a pump on an as needed basis. | City funding, other funding TBD |
| 8 | Flood | Local Planning & Regulations | Create a maintenance schedule to dredge the creek along 598th to promote the free-flow of water. | Yes *(Drainage System Infrastructure)* | **New (2020)** | High | 2020-2025 | City Public Works Dept. | The public works department will monitor annually and recommend dredging on an as needed basis. The creek was most recently dredged in 2018. | City funding |

| City of Eagle Lake Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 9 | Erosion | Local Planning & Regulations | Enforce the city's Erosion and Sediment Control ordinance to reduce erosion from local land disturbance activities, permitted new development, wind or water and potential impacts to surface water and stormwater systems. | Yes *(Stormwater System Infrastructure)* | Ongoing | High | 2020-2025 | City Admin. | This is addressed through City Code, Chapter 18 – Storm Water Drainage Utility, Section 18.020 "Erosion and Sediment Control" The purpose of this ordinance is to establish standards and requirements for conservation practices and planning activities designed to control or reduce point and non-point source stormwater pollution, soil erosion and sedimentation from entering surface waters. | City funding |
| 10 | Severe Winter & Summer Storms | Mitigation Preparedness & Response Support | Obtain a generator for the city well for backup power in the event of a power outage. | Yes *(Water System Infrastructure)* | **New (2020)** | High | 2020-2025 | City Admin., City Public Works | The city will work to purchase a generator as our budget allows or seek possible supportive funding from the MN Dept. of Health. | City funding, MDH |
| 11 | Severe Summer Storms | Structure & Infrastructure Projects | Construct or retrofit a storm shelter or safe room for the City Hall. | n/a | **New (2020)** | High | 2020-2025 | City Admin., City Public Works | The city will evaluate the feasibility of this project as part of its annual planning for facilities improvements. Significant outside funding would be needed for this project. If a tornado safe room is built, we will seek to apply for FEMA HMA grant funds. | City funding, FEMA HMA grant funding |

*The mitigation activities listed in the **City of Eagle Lake Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 3. City of Good Thunder Mitigation Action Chart (2020-2025)*

| City of Good Thunder Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system and the city's Text Alert system. | n/a | **New (2020)** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Good Thunder has a website and Facebook page where information on the county's CodeRED system with a link can be posted. The city also promotes our Text Alert option to keep residents informed. | City funding |
| 2 | All-Hazards | Local Planning & Regulations | Update the city's Comprehensive Plan to include considerations for hazard mitigation in new development and land use. | Yes *(New Buildings)* | **New (2020)** | Mod. | 2020-2025 | City Admin | The city plans to update our Comp Plan in 2023. The plan will include considerations for mitigating against flooding and severe storms through measures such as zoning and building codes as deemed appropriate. | City funding |
| 3 | Severe Summer Storms / Tornado | Mitigation Preparedness & Response Support | Ensure the functionality of the city's outdoor warning sirens. | n/a | Ongoing | Mod. | 2020-2025 | City Fire Chief in coor. with BEC Emergency Mgmt. | Blue Earth County Sheriff's Office Dispatch conducts a monthly test on the first Wednesday of every month, but it is the local jurisdiction's responsibility to verify their respective sirens are working properly. In 2017 the city updated our o warning siren in the community. The city will continue to address maintenance as needed. | City funding, County funding |
| 4 | Severe Winter / Summer Storms | Structure & Infrastructure Projects | Trim or remove trees that may pose risk to property or power lines due downed branches or falling of trees during severe winter or summer storms. | Yes *(Homes, City Park)* | Ongoing | Mod. | 2020-2025 | City Maint. Dept. | When requested, the City Maintenance will assist residents with the removal of trees that are of concern. The city also continues to manage vegetation within the city right of way and at the city park, removing trees that may cause damage to property, roads or power lines. | City funding |

| City of Good Thunder Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 5 | Flood | Education & Awareness Programs | Encourage residents to keep yard clippings and debris free from clogging street gutters. | Yes *(Stormwater Infrastructure)* | Ongoing | Mod. | 2020-2025 | City Admin, Water & Sewer Dept. | The city sends out newsletters that remind residents about keeping yard clippings, leaves and other debris out of the road to avoid blocking the gutter. | City funding |
| 6 | Flood | Structure & Infrastructure Projects | Research and implement installation of gutter guards so debris does not clog street gutters. | Yes *(Stormwater Infrastructure)* | **New (2020)** | Mod. | 2020-2025 | Water & Sewer Dept. | The city is looking into the purchase of storm gutter guards. Installation will take place based on ability to purchase and locations of need. | City funding |
| 7 | Flood | Structure & Infrastructure Projects | Upgrade the city's storm sewer system to reduce impacts to I&I system. | Yes *(Stormwater Infrastructure)* | **New (2020)** | Mod. | 2020-2025 | Water & Sewer Dept. | The city's Water & Sewer Dept. continues to work on measures to reduce water flow during high rain events. The city will upgrade our storm system infrastructure based on highest areas of need and financial ability. | City funding |
| 8 | Flood | Structure & Infrastructure Projects | Address improvement measures for roads and alleys that repetitively wash out due to high rain events. | Yes *(Transportation Infrastructure)* | **New (2020)** | High | 2020-2025 | City Admin, City Maint. Dept. | The city works to address roads and alleys that are in need of improvement due to washouts. The city will seek outside funding in order to implement many projects. | City funding, other funding TBD |
| 9 | Flood / Erosion | Structure & Infrastructure Projects | Research and implement water control & drainage improvement measures to reduce flooding and erosion at the ballfield and near the tennis courts. | Yes *(Community Resources)* | **New (2020)** | High | 2020-2025 | City Admin, City Maint. Dept., City Water & Sewer Dept. | The city will work to identify and implement mitigation measures for these areas to reduce impacts due to high rain events. | City funding, Other funding TBD |

*The mitigation activities listed in the **City of Good Thunder Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 4. City of Lake Crystal Mitigation Action Chart (2020-2025)*

| City of Lake Crystal Mitigation Action Chart (2020-2025) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | **New (2020)** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Lake Crystal has a website where information on the county's CodeRED system with a link could be posted. The city also utilizes its Facebook page to get information out to our residents. | City funding |
| 2 | Severe Winter & Summer Storms | Structure & Infrastructure Projects | Identify "at-risk" power lines and bury them underground. | Yes *(Power System Infrastructure)* | Ongoing | Mod. | 2020-2025 | Lake Crystal Municipal Utilities Commission | Since 2013 the city has moved some aboveground power lines to underground. The Lake Crystal Municipal Utilities Commission oversees the Electric Utility Dept. | LCMUC funding |
| 3 | Severe Winter & Summer Storms | Structure & Infrastructure Projects | Evaluate potential to update the power plant for creating a new micro-grid for power redundancy. | Yes *(Power System Infrastructure)* | **New (2020)** | Low | 2020-2025 | Lake Crystal Municipal Utilities Commission | The city has completed several maintenance projects to our power plant. An assessment of this project effort and implementation would be under the direction of the Lake Crystal Municipal Utilities Commission. | LCMUC funding |
| 4 | Severe Summer Storms / Tornado | Structure & Infrastructure Projects | Inspect/construct storm shelters or tornado safe rooms for Rambush Estates. | n/a | **New (2020)** | High | 2020-2025 | City P&Z Dept in cord with MHP Operator | The city seeks to provide assistance as appropriate to the MHP operator to fulfill a sheltering need to protect the residents living there. FEMA HMA grant funding would be necessary to complete a tornado safe room project. | City funding, MHP Operator, FEMA HMA grant funding |

| City of Lake Crystal Mitigation Action Chart (2020-2025) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 5 | Flood | Structure & Infrastructure Projects | Increase the capacity of the city's storm sewer system in order to handle increased flow during high precipitation events. | Yes *(Storm Sewer Infrastructure)* | **New (2020)** | High | 2020-2025 | LC Street & Maint. Dept. in cord. with Lake Crystal Municipal Utilities Commission | In 2019/20 the city is working on a street reconstruction project that includes an increase to our storm sewer facilities. | City funding |
| 6 | Flood | Local Planning & Regulations | Update and enforce the city's Floodplain Ordinance to restrict new development in flood prone areas. | Yes *(New Development)* | Ongoing | High | 2020-2025 | City P&Z Dept. | Chapter 153 of the City Code (Floodplain Management) is updated and enforced by the city's Planning and Zoning Dept. | City funding |
| 7 | Erosion | Local Planning & Regulations | Update and enforce the city's Shoreland Ordinance to prevent erosion and seek grants to implement shoreline stabilization projects. | n/a | **New (2020)** | High | 2020-2025 | City P&Z Dept. | Chapter 154 of the City Code (Shoreland Provisions) is updated and enforced by the city's Planning and Zoning Dept. As projects are identified we will seek funding to assist with implementation. | City funding, BEC SWCD Cost Share Program |

*The mitigation activities listed in the **City of Lake Crystal Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 5. City of Madison Lake Mitigation Action Chart (2020-2025)*

| City of Madison Lake Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system and the city's text alert system. | n/a | **New** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Madison Lake has a website where information on the County's CodeRED system with a link could be posted. The city also will promote its own Text Alert System to increase public sign up. | City funding |
| 2 | Severe Wind / Tornado | Structure & Infrastructure Projects | Ensure functionality of the city's system of warning sirens. | n/a | Ongoing | High | 2020-2025 | City Emergency Mgmt. | The city has an updated siren system for the city, including one added siren at our water tower site. The sirens are tested monthly and maintained as needed. | City funding |
| 3 | Severe Wind / Tornado | Mitigation Preparedness & Response Support | Work with Mobile Home Park and Campground operators to inspect shelter facilities and advise on severe weather procedures. | n/a | Ongoing | High | 2020-2025 | City Emergency Mgmt. | This is an ongoing effort of the city Emergency Management Program. | City funding |
| 4 | Severe Wind / Tornado | Mitigation Preparedness & Response Support | Participate in annual National Weather Service SKYWARN training for local storm spotters. | n/a | Ongoing | Mod. | 2020-2025 | City Emergency Mgmt. | The city's Police Department has officers that participate each year to be trained storm spotters. This is a part of the city's emergency preparedness activities. | City funding, NWS |

| City of Madison Lake Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 5 | Severe Wind / Tornado | Structure & Infrastructure Projects | Construct storm shelters or tornado safe rooms at city-owned parks and campgrounds to protect day users and campers during severe storm, tornado or high wind events. | n/a | **New** | High | 2020-2025 | City Admin, City EM & City Public Works | The city of Madison Lake would like to build a storm shelter/tornado safe room Restroom facility at two city parks. The first location would be at Lindbergh Park on the northwest side of town, with construction on the west side of the park. The second location would be at the North Shore Park. This could be a remodel of the existing bathroom to make it Storm Safe. (Specific locations subject to adjustment to provide best shelter). | City funding, HSEM HMA Grant funding, other grant funding TBD |
| 6 | Flood | Structure & Infrastructure Projects | Improve drainage systems throughout the city to reduce localized flooding during high rain events. | Yes *(Transportation Infrastructure)* | Ongoing | High | 2020-2025 | City Public Works | The city meets and discusses drainage systems throughout the city, not only for flooding but for water quality to our lakes. Drainage improvements are identified and implemented as needed. | City funding |
| 7 | Flood | Structure & Infrastructure Projects | Identify and implement mitigation measures for areas in the city where over-the-road flooding regularly occurs. | Yes *(Transportation Infrastructure)* | **New** | High | 2020-2025 | City Public Works | This is a regular effort of roads maintenance by the city's Public Works Dept. Over the road flooding and erosion to the base of roads has increased with more high rain events. The city will seek additional funding as needed to implement critical projects. | City funding, FEMA HMA grant funding, MN DNR flood program grant funding |

*The mitigation activities listed in the **City of Madison Lake Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard*

*Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 6. City of Mankato Mitigation Action Chart (2020-2025)*

| City of Mankato Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | Ongoing | Mod. | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Mankato website has an Emergency Services page which includes a link to the Blue Earth County website for residents to sign up for the CodeRED system. | City funding |
| 2 | Flood / Erosion | Structure & Infrastructure Projects | Implement large-scale drainage improvements to improve bank stabilization for areas where erosion continues to threaten critical infrastructure and private property. | Yes *(Existing Buildings & Infrastructure)* | Ongoing | Mod. | 2020-2025 | City Engineering Div. & Public Works Dept. | The city of Mankato has created a Grading and Drainage manual to address the design of stormwater facilities for both new and reconstruction work. The city has an Engineering Division and Public Works Dept. that lead the study, development and implementation of flood/erosion mitigation projects. | City funding, FEMA HMA grant funding, other state programs (TBD) |
| 3 | Flood / Erosion | Structure & Infrastructure Projects | Implement rate and velocity reduction measures to reduce the impact on natural and constructed surface water conveyances. | Yes *(Stormwater Infrastructure)* | Ongoing | Mod. | 2020-2025 | City Engineering Div. & Public Works Dept. | A Surface Water Management Policy has been developed and implemented to address issues of drainage in natural channels and conveyances to reduce erosion and protect improvements. The Surface Water Mgmt. Policy has sections that allow for cost sharing and financing for improvements along water conveyances. | City funding, FEMA HMA grant funding, other state programs (TBD) |

| City of Mankato Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 4 | Flood / Erosion | Local Planning & Regulations | Update the city's comprehensive Stormwater Plan to deal with critical issues and leverage the partnerships that are being developed through the regional MS4. | Yes *(Stormwater Infrastructure)* | Ongoing | High | 2020-2025 | City Engineering Div. & Public Works Dept. | The City's Stormwater Plan will help to provide guidance for implementation of items 2, 3 & 5. The plan helps to direct sound hazard-resistant development. | City funding |
| 5 | Flood / Erosion | Structure & Infrastructure Projects | Relocate improvement such as trails, campsites and other associated infrastructure away from active waterways and areas of erosion. | Yes *(Existing Infrastructure)* | Ongoing | Mod. | 2020-2025 | City Engineering Div. & Public Works Dept. | The City of Mankato Stormwater Plan will include recommendations for implementation (see #4). | City funding, FEMA HMA grant funding, other state programs (TBD) |
| 6 | Flood | Education & Awareness Programs | Provide outreach & education to homeowners on the benefits of sump pump installation to improve drainage. | Yes *(Existing Infrastructure)* | Ongoing | Low | 2020-2025 | City Admin. | The city's website includes a Flood Preparedness page with information on sump pumps for homeowners to download. | City funding |
| 7 | Severe Summer Storms | Education & Awareness Programs | Provide education and outreach to the public on the city's use of warning sirens for extreme wind/tornado events. | n/a | Ongoing | Low | 2020-2025 | City Public Safety / Emergency Mgmt. | This is an ongoing part of the city's Emergency Management program. A video and additional information is provided on the city's EM website. | City funding |

| City of Mankato Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 8 | Severe Summer Storms | Local Planning & Regulations / Structure & Infrastructure Projects | Determine populations in the city without access to a safe room and evaluate the need for shelters or safe rooms. Implement retrofit or new construction projects as needed and feasible. | Yes *(Existing Buildings)* | **New (2020)** | High | 2020-2025 | City Public Safety / Emergency Mgmt. | The city of Mankato will work to assess areas within the city where populations may be more vulnerable to severe wind storms or tornadoes such as at mobile home parks and the Land of Memories Campground and evaluate need & feasibility to construct new facilities. Outside funding will be required to complete any projects. One funding source may be a Community Development Block Grant (CDBG). | City funding, FEMA HMA grant funding, USDA Comm. Facilities Grant , CDBG |
| 9 | Severe Winter / Summer Storms | Education & Awareness Programs | Encourage the public to obtain and use NOAA weather radios as a means to receive sever weather updates from the NWS. | n/a | Ongoing | High | 2020-2025 | City Emergency Mgmt. Dept. | This is an ongoing part of the city's Emergency Management program. A video and additional information is provided on the city's EM website. | City funding |
| 10 | Severe Winter / Summer Storms | Local Planning & Regulations / Structure & Infrastructure Projects | Evaluate utility undergrounding to critical infrastructure and implement undergrounding projects as needed and feasible. | Yes *(Power Supply Infrastructure)* | **New (2020)** | High | 2020-2025 | City Public Utilities Dept. | The city of Mankato Public Works Dept. will work with local utility providers to determine if they have vulnerable infrastructure that needs mitigation against severe storms, and provide support as appropriate in implementing protective measures. | City Municipal Utility funding, FEMA HMA grant funding |

*The mitigation activities listed in the **City of Mankato Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 7. City of Mapleton Mitigation Action Chart (2020-2025)*

| City of Mapleton Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | **New (2020)** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Mapleton participates in the County's CodeRED emergency alert system. The city has a website where information on the County's CodeRED system with a link could be posted. The city can also use its Facebook page to provide outreach. | City funding |
| 2 | Flood | Structure & Infrastructure Projects | Complete televising all sanitary sewer and lines within the city within the next five years to remove foundation drains out of the sanitary sewer system. | Yes *(Sewer System Infrastructure)* | Ongoing | High | 2020-2025 | City Public Works Dept. | Our City Engineer, Public Works Supervisor and City Council have approved a five-year utility plan to update utilities and streets. This is an ongoing project of the city. In 2014 and 2017 we had street projects that included televising homes. Our plan is to televise the entire city within the next five years. | City funding |
| 3 | Flood | Education & Awareness Programs | Educate homeowners on the importance of having a personal generator to avoid sump pump failure during heavy rain events coupled with a power outage. | Yes *(Existing Buildings)* | **New (2020)** | High | 2020-2025 | City Public Works Dept. | The city can use its Facebook page to encourage to homeowners to acquire generator backup power before big storms occur. | City funding |

| City of Mapleton Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 4 | Flood | Local Planning & Regulations | Enforce the City's new Floodplain Ordinance and encourage residents to purchase personal flood insurance. | Yes *(New Buildings)* | Ongoing | High | 2020 | City P&Z Dept. | In July, 2019 the city of Mapleton adopted a new Floodplain Ordinance which is enforced. The city encourages local property owners to purchase personal flood insurance through National Flood Insurance Program (NFIP) and will continue to do so. | City funding |
| 5 | Flood | Natural System Protection | Conduct regular maintenance to the city stormwater drains. | Yes *(Stormwater System Infrastructure)* | Ongoing | High | 2020-2025 | City Public Works Dept. | Every fall the city's Public Works Dept. uses a leaf vacuum to clean the leaves off of the city boulevards to the storm drains to avoid clogging the system with debris. | City funding |
| 6 | Severe Summer Storms | Mitigation Preparedness & Response Support | Conduct regular maintenance on the city's warning siren to ensure its functionality. | Yes *(Warning System Infrastructure)* | Ongoing | High | 2020-2025 | City Public Safety Dept. | The city works with Blue Earth County Emergency Management on a monthly basis to test the warning siren in our community to ensure that it is in proper working order. The city owns the siren and is responsible for any required improvements or replacement. | City & County funding |
| 7 | Severe Summer Storms | Local Planning & Regulations / Structure & Infrastructure Projects | Work with the city's mobile home park (MHP) operator to evaluate and address the construction of a storm shelter or tornado safe room. | n/a | **New (2020)** | High | 2020-2025 | City Public Safety Dept. in cord. with Blue Earth County Emergency Mgmt. | The city's MHP does not have a storm shelter on site. The city's Public Safety Dept will work with the MHP operator and BEC Emergency Mgmt. to explore options. Application for a FEMA HMA grant for safe room construction may be pursued to assist with funding if a safe room is desired. | City funding, FEMA HMA grant funding |

*The mitigation activities listed in the **City of Mapleton Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 8. City of Pemberton Mitigation Action Chart (2020-2025)*

| City of Pemberton Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | Ongoing | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of Pemberton website has a link for the County's CodeRed system located on the city's homepage. | City funding |
| 2 | Extreme Winter & Summer Storms | Mitigation Preparedness & Response Support | Acquire & install a generator for the city's water tower. | Yes *(Water Supply Infrastructure)* | **New (2020)** | High | 2020-2025 | City Public Works. | The city does not have any backup power for the city's water tower. This project will be evaluated an implemented by the city's Public Works Dept. as financially feasible. | City funding, Other funding (TBD) |
| 3 | Flood | Local Planning & Regulations | Enforce the city's Floodplain Ordinance for new building permits. | Yes *(New Buildings)* | Ongoing | High | 2020 | City Admin. | The City adopted a new Floodplain Ordinance in 2019 as recommended by Blue Earth County. The ordinance will be used to enforce new building permits. | City funding |

*The mitigation activities listed in the **City of Pemberton Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 9. City of Skyline Mitigation Action Chart (2020-2025)*

| City of Skyline Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | **New (2020)** | High | 2020-2025 | City Admin. in cord. with BEC Emergency Mgmt. | The city of Skyline has a website where information on the County's CodeRED system with a link could be posted. Announcements could also be made at City Council meetings to remind the public to opt-in to the system. | City funding |
| 2 | All-Hazards | Local Planning & Regulations | Maintain strong working relationships with the City of Mankato and Blue Earth County for emergency response support in the event of disasters or storm events that cause damage to the city. | n/a | Ongoing | High | 2020-2025 | City Admin. | The city of Skyline is a small city with a population of 289. We do not have extensive resources for local planning or project implementation. We work closely with the city of Mankato and Blue Earth County and will continue to do so. | City funding, County funding as needed |

*The mitigation activities listed in the **City of Skyline Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 10. City of St. Clair Mitigation Action Chart (2020-2025)*

| City of St. Clair Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | **New (2020)** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | The city of St. Clair has a website where information on the County's CodeRED system with a link could be posted. The city can also use its Facebook page to encourage residents to sign up. | City funding |
| 2 | All-Hazards | Education & Awareness Programs | Promote severe weather awareness and emergency preparedness among residents. | n/a | Ongoing | High | 2020-2025 | City Admin. | The city posts information on the city website regarding the annual Severe weather awareness weeks on the city website and Facebook page. The city website also provides numerous "Disaster Info" links under the "Useful Links" page. The city also regularly posts articles regarding emergency preparedness in the city's monthly newsletter | City funding |

| City of St. Clair Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 3 | Flood | Structure & Infrastructure Projects | Construct a holding area for stormwater entering the Le Sueur River to slow flood potential following a heavy rain event. | Yes *(Transportation Infrastructure & Existing Buildings)* | **New (2020)** | High | 2020-2025 | City Public Works Dept. in cord. with MN DNR | The LeSueur River is approx.. 111 miles long, of which approx.. 2 miles is located within the St. Clair city limits. The City of St. Clair is located far downstream on the LeSueur River, only about 10 miles from where the LeSueur empties into the Blue Earth River. The LeSueur River is located in a predominately rural agricultural area, which has been extensively tiled, with St. Clair being the only city on the LeSueur. Given these facts, the idea of a potential holding area(s) to slow flood waters would be a huge undertaking, encompassing a far greater area than just that area in and around the City of St. Clair. Such an undertaking would also be at far greater expense than a small city like St. Clair could possibly afford. | City funding, MN DNR, FEMA HMA grant funding |
| 4 | Flood | Local Planning & Regulations | Update and adopt a new Floodplain Ordinance for the city and enforce it for new building permits. | Yes *(New Buildings)* | Ongoing | High | 2020-2025 | City Admin. | The city is in the process of adopting its Floodplain Ordinance. The ordinance will be reviewed and enforced with new building permits. | City funding |
| 5 | Flood | Local Planning & Regulations | Update the city's Comprehensive Plan to better address land use planning for flood mitigation. | Yes *(New Buildings & Storm/Sewer Infrastructure)* | **New (2020)** | High | 2020-2025 | City Admin. | As the City Comprehensive Plan is updated flood planning and flood related information will be included. | City funding |

| City of St. Clair Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 6 | Flood | Education & Awareness Programs | Educate residents on the importance of keeping storm sewers and storm drains clear of leaves, grass clippings and other yard debris to reduce flooding and damage to those systems. | Yes *(Storm/Sewer Infrastructure)* | Ongoing | High | 2020-2025 | City Admin. | The city uses communication channels such as the city's website, monthly newsletter and Facebook page to convey this information to residents on an annual basis. | City funding |
| 7 | Severe Summer Storms | Structure & Infrastructure Projects | Work with the St. Clair Public School to construct a safe room to be built onto the school in order to protect students, staff and the community in the event of a severe wind or tornado event. | n/a | **New (2020)** | Mod. | 2020-2025 | City Admin., School District | This project is of interest to the city and the St. Clair Public School and will be evaluated for feasibility in upcoming planning efforts for school improvements. Significant outside funding would be needed and a FEMA HMA grant for safe rooms would be pursued. | City funding, School funding, FEMA HMA grant funding |
| 8 | Severe Winter & Summer Storms | Mitigation Preparedness & Response Support | Obtain a generator for City Hall to provide backup power in the event of a power outage. | n/a | **New (2020)** | High | 2020-2025 | City Admin. | The city will work to cover the expenses for a generator or will seek to obtain possible supportive funding from the MN Dept. of Health. | City funding, MDH |

*The mitigation activities listed in the **City of St. Clair Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

*Table G - 11. City of Vernon Center Mitigation Action Chart (2020-2025)*

| City of Vernon Center Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 1 | All-Hazards | Education & Awareness Programs | Encourage city residents to sign-up for the County's CodeRED emergency notification system. | n/a | **New** | High | 2020-2025 | City Admin in cord. with BEC Emergency Mgmt. | This will be done via means such as announcements at City Council meetings. The city does not have a website or Facebook page. | City funding |
| 2 | Severe Winter & Summer Storms | Mitigation Preparedness & Response Support | Purchase backup generators for servicing the water treatment plan, Fire Dept. and City Hall. | n/a | **New** | High | 2020-2025 | City Admin, City Public Works | The city will seek to purchase new generators or acquire existing generators from another source as possible (i.e., MN Dept of Health). | City Funding, USDA RD Community Facilities Grant |
| 3 | Flood | Local Planning & Regulations | Enforce the city's new ordinance requiring residents to upgrade any non-compliant sanitary sewer service lines on their property by Nov. 15, 2022. | Yes *(Sewer System Infrastructure)* | **New** | High | 2020-2025 | City Admin. | This ordinance was put into place to help the city address Inflow & Infiltration problems due to privately owned, non-compliant sewer service lines. The ordinance will be enforced by the City of Vernon Center City Council. | City funding |
| 4 | Flood | Structure & Infrastructure Projects | Complete renovations of the remaining sewer, water and streets in the city, including upgrades to the existing wastewater treatment plan and water treatment facility. | Yes *(Stormwater & Sewer System Infrastructure)* | **New** | High | 2021-2022 | City Admin, City Public Works | This is a multi-faceted project being planned for implementation in 2020-2021 by the city of Vernon Center, but it is highly depended on funding. Renovating these systems will include resiliency in design to reduce the impacts of heavy rain and flood events to our stormwater and sewer system infrastructure. | City Funding, USDA Rural Develop-ment (RD) |

| City of Vernon Center Mitigation Action Chart (2020-2025) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K |
| # | Hazard | Mitigation Strategy | Mitigation Action | Reduces Risk to New / Existing Buildings or Infrastructure | Status | Priority | Expected Time-frame | Responsible Party | Comments on Implementation, Administration & Integration into Local Planning Mechanisms | Possible Funding |
| 5 | Flood | Natural Systems Protection | Identify and implement measures to reduce the risk of flood-related erosion to the city's Wastewater Treatment Plant (WWTP). | Yes *(Wastewater Treatment Plant)* | **New** | High | 2020-2025 | City Public Works Dept. & WWTP in cord. with USDA-NRCS and other possible partners | The city of Vernon Center has noted an increased rate in flood-related erosion along the Blue Earth River that is posing future risk to the city's WWTP. The city will explore partnerships from outside agencies that may be able to provide technical assistance and supportive funding to mitigate this risk. Assistance from the USDA Natural Resources Conservation Service (NRCS) and Army Corps of Engineers are possible agencies to help identify and implement soil stabilization measures to reduce the impacts of river flooding and erosion. City funding will not be available as the City does not own the property. | Possible USDA NRCS or ACOE funding, WWTP funding, Other funding TBD |

*The mitigation activities listed in the **City of Vernon Center Mitigation Action Chart** were identified for inclusion in the Blue Earth County 2020 Multi-Hazard Mitigation Plan Update through city staff participation in the planning process and mitigation action chart development. Mitigation activities are based upon existing mitigation efforts that are incorporated into local planning mechanisms and determination of new, cost-effective and sustainable activities that will support long-term risk reduction to the people, property and environment of our city.*

# Appendix H
# Past Mitigation Action Review
# Status Report (2013-2019)

# Blue Earth County MHMP Update

## Past Mitigation Action Review (2013-2019)

**Following is a report on the status of mitigation actions listed natural hazards listed in Section 6: Mitigation Strategies of the Blue Earth County All-Hazard Mitigation Plan Update 2013. This report describes those actions that have been completed, are being deleted, or are on-going and carried over into the 2019 plan update.**

Taken from Figure 6-11: County and Township Mitigation Actions

| Hazard | Mitigation Action | Status | Comments |
|---|---|---|---|
| All-Hazards | Continue to adequately fund emergency Response staff. | Ongoing | In conjunction with the EMPG grant, Blue Earth County continues to provide funds needed for operations. Blue Earth County has also committed $1.6 million toward a disaster relief fund. |
| All Hazards | Evaluate and maintain mutual aid agreements between fire departments in adjoining communities and between townships and cities. | Complete | Currently, we have mutual aid agreements in place, along with the statewide mutual aid agreement. |
| All Hazards | Collaborate with local, state, and federal agencies to maximize efficiency and coordination in the event of a hazard incident. | Ongoing | We continue to work diligently with our local partners. We conduct bi-monthly meetings with members of the business community, utilities, hospital and college. We also conduct regular safety meetings with representatives from our local schools. |
| All Hazards | Enforce and update all County hazard regulations as needed in order to protect the health, safety, and general welfare of the County. | Delete | Continuous and ongoing efforts among all agencies and departments throughout the county. |
| All Hazards | Provide continual training for emergency response personnel that are likely to be involved with the immediate effects of a hazard event. | Ongoing | Developed Active Violence/Active Shooter curriculum for the county and region and conducted several training events for law enforcement, fire and EMS. Numerous tabletop exercises for emergency personnel: tornado, plane crash, ice storm and prior to airshows. Local fire departments do annual hazardous material response training. Sheriff's Office holds routine training, including highly contagious infectious disease/PPE awareness. Emergency Management participates in Healthcare Coalition annual communication exercises and separate functional exercises. |

| Hazard | Mitigation Action | Status | Comments |
|---|---|---|---|
| All Hazards | Continue to provide public outreach and education regarding disaster preparedness to all Blue Earth County communities. | Ongoing | Bi-monthly community partner meetings coordinated by Emergency Management attended by Law Enforcement, ambulance and fire representatives, along with other county departments and key community stakeholders. Emergency Management led city clerk meetings and educational opportunities, including Fusion Center led discussion on the importance of water supply security. |
| All Hazards | Continue to seek out funding for the creation of a brochure for the public detailing how to survive on your own in the event of a large scale disaster. | Delete | No need to seek funding. |
| All Hazards | Ensure the Blue Earth County residents whose primary language is not English have easy access to critical hazard information. | Complete | With the addition of CodeRed and access to Language Line, we have bridged this gap. |
| All-Hazards | Assure availability of information for non-English speaking residents throughout Blue Earth County. | Complete | With the addition of CodeRed and access to Language Line, we have bridged this gap. |
| All-Hazards | Encourage the public to listen to local news sources, including television and radio broadcasts. | Ongoing | We continue to direct our citizens to the Blue Earth County website, local media and social media for updates on any events occurring within the county. |
| All-Hazards | Utilize easements of right of way for ease of utility management. | Delete | Local municipalities take care of their easements. |
| All-Hazards | Provision of proper equipment for all Blue Earth County fire departments. | Delete | Fire departments utilize local funding and grant funding to secure proper equipment. |
| All-Hazards | Participation by all Blue Earth County cities in MNWARN resource sharing program. | Ongoing | Nearly all Blue Earth County cities participate in MNWARN. |
| All-Hazards | Continue to distribute educational material to the public via websites, handouts, and public presentations. | Ongoing | Blue Earth County Environmental Services, in conjunction with Blue Earth County Emergency Management, will continue to publish public notices in the press, county website and on social media to educate the public. |
| All-Hazards | Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors. | Complete | Blue Earth County has an emergency management team that ensures there are multiple personnel able to carry out emergency management functions, ensuring expertise is passed on to successors. |

| Hazard | Mitigation Action | Status | Comments |
|---|---|---|---|
| All-Hazards | Continue reviewing the Emergency Operations Plan to ensure it adequately details the needed steps to respond to all potential hazards. | Ongoing | Blue Earth County's EOP is reviewed annually. Emergency Management staff assures all of the requirements in the MNWALK are implemented into the EOP. The EOP update is presented to the County Board every year. |
| All-Hazards | Encourage all agencies to evaluate their exposure to a cyber attack and plan data backups appropriately. | Ongoing | Blue Earth County conducts regular backup on all systems. The county has installed multiple firewalls with encryption that meets BCA and NCIC standards. Blue Earth County conducts bi-annual security training, requires multi-factor authentication and ongoing staff training to combat phishing e-mails. |
| Animal and Crop Disease | Ensure County staff is prepared for a disease outbreak concerning livestock. | Ongoing | Environmental Services has studied and is prepared to work with the Board of Animal Health to address. Board of Animal Health is lead for disease outbreaks. Now have access to City View program allowing us to see locations of livestock and feedlots. |
| Animal and Crop Disease | Review current zoning ordinances to ensure they are designed to reduce the risk of disease spreading from livestock. | Ongoing | Plans to review current ordinance and desire to regulate fatality box placement away from roadways and ditches. No current feedlot setback, but generally self-regulated because owners do not want to contribute to or experience the spread of disease. |
| Drought, Fire | Utilization of water conservation strategies in city ordinances, such as use restrictions in times of drought. | Delete | Water conservation strategies are under local jurisdictional control. |
| Fire | All Blue Earth County cities should adopt and maintain building and fire codes if they have not already done so. | Ongoing | Many Blue Earth County cities are in the process of, or have already adopted, building and fire codes. |
| Fire | Participate in state Fire Prevention Week. | Delete | Each of the local volunteer fire departments participate as they see fit. |
| Flood | Continue to administer the National Flood Insurance Program (NFIP). | Ongoing | We continue to recommend our local communities and county residents who have been affected, or potentially could be affected by flood, to educate themselves and subscribe to NFIP. |

| Hazard | Mitigation Action | Status | Comments |
|---|---|---|---|
| Flood | Work to get FEMA approval for a letter of Map amendment removing structure determined by staff to be out of the floodway designated as such instead of mistakenly identified by FIRM maps as existing within the floodway. | Delete | Qualified engineering firms prepare and submit Letters of Map Amendment (LOMA's) to property owners. Blue Earth County Environmental Services staff will provide assistance whenever possible to the engineer and/or property owner. |
| Flood | Publish public notices and educational information to inform citizens of the purpose and content of regulations, as well as the need for flood insurance. | Ongoing | Blue Earth County recently conducted a public meeting regarding the updated flood insurance rate maps. The public meeting was held at the Blue Earth County Government Center. FEMA personnel were present. |
| Flood | Maintain or replace levees, storm water drains or other flood reduction structures to prevent damage to structures/utilities due to flooding. | Ongoing | We continuously maintain our local levee system. An additional levee has been constructed in the City of St. Clair to prevent flooding of their wastewater treatment plant. |
| Flood | Have items readily available for victims and responders in all Blue Earth County communities and areas. Flood responders should have proper equipment available to assist those who need help in times of a flood. | Completed | We have a baseline stock of sandbags at each of our local communities. We maintain a stockpile of additional sandbags on hand for our rural residents, along with plastic and access to sand, as needed. |
| Flood | Ensure County floodplain maps accurately reflect the most up to date data available. | Ongoing | We are still waiting for FEMA to provide us with the updated floodplain mapping. |
| Flood | Encourage development of parks and open space areas along floodplain areas that consistently flood. | Ongoing | Blue Earth County, in conjunction with FEMA and MN DNR, have bought out four (4) residences since 2010. All four properties are now publicly-owned open spaces. |
| Flood, Infrastructure Failure | Improve township roads to make them more resistant to flooding. | Ongoing | Several township roads have been upgraded with FEMA disaster relief funds since 2010. |
| Flood, Infrastructure Failure | Ensure bridges on township roads are well maintained. | Ongoing | The Blue Earth County Public Works Department performs routine inspections every two years and more frequently for bridges designated higher risk, in conjunction with MNDOT and FHWA administration. |

| Hazard | Mitigation Action | Status | Comments |
|---|---|---|---|
| Infectious Disease | Provide health education to private businesses where the risks of infectious diseases are a concern. | Ongoing | Blue Earth County Public Health conducts frequent public health education programs to educate public and private businesses on the risk of infectious diseases and tracks the county population to maintain awareness of infectious disease issues. |
| Infectious Disease | Continue collaborating with the Mayo Health System to encourage participation in vaccination programs for all Blue Earth County residents. | Ongoing | Public Health has face-to-face trainings with IMMTRAC programs to help track required inoculations, thus helping to ensure infectious diseases do not readily spread. |
| Infrastructure Failure | Inspect all Blue Earth County dams and reservoirs to ensure structural integrity and safety. | Ongoing | Blue Earth County's dam operations are managed by Ontario Power Generation. OPG conducts annual inspections with the Federal Energy Regulatory Committee. |
| River and Streambank Erosion, | Ensure township roads are resistant to erosion. | Ongoing | Since 2010, many of the township roads in Blue Earth County have been upgraded. This occurred in conjunction with five Presidential disaster declarations. |
| Riverine and Ravine Erosion | Conduct rock rip rap along county roads that are susceptible to erosion damage, such as CSAH 10, CSAH 16, and CSAH 8. | Completed | Blue Earth County applies for permits and completes all work necessary to protect public infrastructure from erosion damage. It does not conduct erosion control on private property. |
| Terrorism | Annual review of security measures at government buildings throughout Blue Earth County to ensure current practices are adequate. | Ongoing | The Blue Earth County Safety Committee completed a formal review and update of the Emergency Procedure Manual. AVAS (active violence active shooter) awareness training has been conducted with several departments, including Human Services, Highway, Courts, County Attorney and Probation. |
| Terrorism | Purchase new response vehicle for the River Valley Tactical Team. | Completed | This vehicle was regionally purchased in September of 2014. |
| Tornado, Severe Summer Weather | Continue to utilize severe storm spotter network in all Blue Earth County cities. | Ongoing; revise as needed for Plan update. | We have a large contingency of local volunteer firefighters/law enforcement officers who provide a storm spotter network, along with yearly Skywarn training. Blue Earth County will continue to work with the NWS to schedule and promote annual Skywarn training with the public, firefighters and law enforcement. |
| Tornado, Severe Winter/Summer Weather | Work with hospitals, nursing homes, schools and civic centers to see that adequate shelter areas are designated. | Ongoing; revise as needed for Plan update. | Facilities of this nature require their own policies and procedures with respect to shelter designation. Blue Earth County Emergency Management will aid in providing guidance if requested. |

| Hazard | Mitigation Action | Status | Comments |
|---|---|---|---|
| Tornado, Severe Winter/Summer Weather | Enforce the County requirement that all manufactured home parks include a storm shelter and/or Evacuation Plans. | Ongoing | MDH sets regulations for mobile home parks in local communities and the County. These entities are required to review these regulations. |
| Tornado, Severe Winter/Summer Weather | Undertake community education and drills to prepare residents for severe weather storm events. | Ongoing; revise as needed for Plan update. | The Emergency Management Team created a PSA with our local television station on how our outdoor warning system works. Winter weather talks with third grade students are conducted annually in all of our local schools. Annual Skywarn training is provided to any community member wishing to attend. |
| Tornado, Severe Winter/Summer Weather | Utilize city ordinances to discourage placement of trees near powerlines. | Delete | Local municipalities take care of their ordinances. |
| Tornado, Severe Winter/Summer Weather | Continue to assure development, improvement and maintenance of early warning systems in all Blue Earth County communities. | Ongoing | We have updated seven warning sirens throughout Blue Earth County. Monthly warning siren tests are conducted to ensure functionality. We also have a severe weather warning notice through CodeRed for those residents who subscribe to it. |
| Tornado, Severe Winter/Summer Weather | Continue to ensure placement of severe weather radios in schools and county buildings. | Ongoing; revise as needed. | We have added 800 MHz radios in all of the schools. All school administrators have access to CodeRED weather alerts. Blue Earth County Emergency Management will continue to encourage the use of NOAA weather radios in schools, county buildings and by the public. |
| Tornado, Severe Winter/Summer Weather | Ensure safety of elderly residents throughout Blue Earth County communities in times of extreme heat and cold. | Ongoing | If a citizen needs long-term shelter, it is coordinated jointly by Blue Earth County Public Health and Blue Earth County Human Services. Blue Earth County Public Health and Blue Earth County Human Services continue to be prepared with temporary sheltering plans in the event of extreme temperatures. |
| Water Supply Contamination | Develop increased protection measures for residential water supplies and systems throughout Blue Earth County. | Ongoing | Blue Earth County Environmental Services continues to work with well contractors to drill wells which meet the requirements of the State well code. |
| Water Supply Contamination | Continue engaging in well head protection best management practices throughout all Blue Earth County communities. | Ongoing | Blue Earth County Environmental Services continues to work diligently with homeowners to cap unused wells. |

# Appendix I
# Works Cited

Works Cited

(2013). *Adapting to Climate Change in Minnesota: 2013 Report of the Interagency Climate Adaptation Team.*

American Meteorological Society. (2004, October 8). *Mobile Homes and Severe Windstorms*. Retrieved December 28, 2018, from American Meteorological Society: https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/archive-statements-of-the-ams/mobile-homes-and-severe-windstorms/

Anderson, G., & Bell, M. (2011). Heat Waves in the United States: Mortality Risk during Heat Waves and Effect Modification by Heat Wave Characteristics in 43 U.S. Communities. *Environmental Health Perspectives*, 210-218.

ATSDR. (2018, September 12). *CDC's Social Vulnerability Index (SVI)*. Retrieved from ATSDR: https://svi.cdc.gov/

ATSDR. (2018). *CDC's Social Vulnerability Index (SVI)*.

Blue Earth County. (2018). *Blue Earth County Land Use Plan.*

Blue Earth County. (n.d.). *Blue Earth County Highway Map.* 2013.

Blue Earth County. (n.d.). *Blue Earth County Sheriff's Office*. Retrieved from http://www.blueearthcountymn.gov/1349/Sheriffs-Office

CDC. (2019, May 8). *CDC's Social Vulnerability Index (SVI).* Retrieved from ATSDR: https://svi.cdc.gov/Documents/Data/2016_SVI_Data/SVI2016Documentation.pdf

Census of Agriculture. (2017). *2017 Census of Agriculture County Profile.* United States Department of Agriculture.

City of Mankato. (n.d.). *Airport*. Retrieved from https://www.mankatomn.gov/city-services-a-z/city-services-a-m/airport

Code of Federal Regulations. (n.d.). *33 CFR § 329.4 - General definition*. Retrieved June 14, 2019, from Legal Information Institute: https://www.law.cornell.edu/cfr/text/33/329.4

Dai, A. (2011). Drought under global warming: a review. *WIREs Climate Change*, 45-65.

Del Genio, A., Yao, M., & Jonas, J. (2007). Will moist convection be stronger in a warmer climate? *Geophys. Res. Lett.*

Douglas, P. (2011, July 20). *"Heat Storm" (record-setting dew point of 82 at MSP, heat index tied all-time record at 119!).* Retrieved from StarTribune: http://www.startribune.com/blogs/125847178.html

ENRTF. (2017). *Environment and Natural Resources Trust Fund Projects.* Retrieved from Legislative-Citizen Commission on Minnesota Resources: https://www.lccmr.leg.mn/projects/2017/work_plans_june/_2017_03i.pdf

FEMA. (2004, April). *Federal Guidelines for Dam Safety.* Retrieved July 2, 2019, from Federal Energy Regulatory Commission: https://www.ferc.gov/industries/hydropower/safety/guidelines/fema-333.pdf

FEMA. (2013, March). Local Mitigation Planning Handbook. Retrieved April 1, 2019, from https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf

FEMA. (2013, January). *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.* Retrieved from http://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf

FEMA. (n.d.). *Critical Facilities and Higher Standards.* Retrieved May 10, 2019, from FEMA: https://www.fema.gov/media-library-data/1436818953164-4f8f6fc191d26a924f67911c5eaa6848/FPM_1_Page_CriticalFacilities.pdf

FEMA. (n.d.). *Step 3: Inventory Assets.* Retrieved June 14, 2019, from FEMA: https://www.fema.gov/pdf/plan/prevent/hazus/fema433_step3.pdf

Fu, X., Svoboda, M., & Tang, Z. (2013, December). An overview of US state drought plans: crisis or risk management? *Natural Hazards, 69*(3), 1607-1627. doi:https://doi.org/10.1007/s11069-013-0766-z

Georgakakos, A., Fleming, P., Dettinger, M., Peters-Lidard, C., Richmond, T., Reckhow, K., . . . Yates, D. (2014). *Climate Change Impacts in the United States: The Third National Climate Assessment, Ch. 3: Water Resources.* Washington, D.C.: U.S. Global Change Research Program.

High Plains Regional Climate Center. (2014). *Current Climate Summary Maps - Powered by ACIS*. Retrieved from http://www.hprcc.unl.edu/maps/current/index.php?action=update_userdate&daterange=Feb&year=14

Huttner, P. (2017, March 7). Retrieved from MPR News: http://blogs.mprnews.org/updraft/2017/03/extreme-minnesota-tornado-and-ice-out-records-shattered/

ICAT, I. C. (2017). *Adapting to Climate Change in Minnesota.* St Paul: Minnesota Pollution Control Agency.

International Climate Adaptation Team. (2013). Adapting to Climate Change in Minnesota.

Kunkel, K., Stevens, L., Stevens, S., Sun, L., Janssen, E., Wuebbles, D., & ... Dobson, J. (2013). Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. *NOAA Technical Report NESDIS*, 142-3, 95.

Meador, R. (2013, February 27). *Climate change comes to Minnesota: Three experts outline the impacts*. Retrieved from MinnPost: http://www.minnpost.com/earth-journal/2013/02/climate-change-comes-minnesota-three-experts-outline-impacts

Mewes, T. (2018, November 18). Slippery slopes: Study details Mankato's landslide risks. *Mankato Free Press*, pp. https://www.mankatofreepress.com/news/local_news/slippery-slopes-study-details-mankato-s-landslide-risks/article_d7da35f6-cd8c-11e8-8670-fb0aad30029c.html.

Minnesota Climatology Working Group. (2010, October 6). *HydroClim Minnesota - October 2010*. Retrieved from http://www.climate.umn.edu/doc/journal/hc1010.htm

Minnesota Department of Health. (2018). *Planning for Climate & Health Impacts in Metro Minnesota.* MDH Minnesota Climate & Health Program.

Minnesota Department of Health. (2018). *Summary of General Requirements for Manufactured Home Parks*. Retrieved from http://www.health.state.mn.us/divs/eh/mhprca/mhpgenreq.html

Minnesota Legistlature - Office of the Revisor of Statutes. (2008, June 11). *Warning Systems and Emergency Procedures*. Retrieved from Minnesota Legislature: https://www.revisor.mn.gov/rules/6115.0490/

Minnesota Pollution Control Agency. (2017). *Adapting to Climate Change in Minnesota.* St. Paul: Minnesota Pollution Control Agency. Retrieved September 13, 2018, from https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf

*Minnesota Pollution Control Agency*. (2018). Retrieved from http://pca-gis02.pca.state.mn.us/eda_surfacewater/

MN Department of Public Safety. (n.d.). *About Emergency Communication Networks*. Retrieved June 14, 2019, from Minnesota Department of Public Safety: https://dps.mn.gov/divisions/ecn/about/Pages/default.aspx

MN DNR. (2004). *Heavy Rains Drench Southern Minnesota September 14-15, 2004*. Retrieved from http://www.dnr.state.mn.us/climate/journal/ff040914_15.html

MN DNR. (2007). *Heavy Rains Fall on Southeastern Minnesota: August 18-20, 2007*. Retrieved from http://www.dnr.state.mn.us/climate/journal/ff070820.html

*MN DNR*. (2011). Retrieved from http://files.dnr.state.mn.us/forestry/wildfire/historialcharts/firesbyyear.pdf

MN DNR. (2014, March 3). *Coldest Winters in Twin Cities History: 1873-2014*. Retrieved from http://www.dnr.state.mn.us/climate/journal/coldest_winters.html

MN DNR. (2015). *Drought Monitor Overview*. Retrieved from http://www.dnr.state.mn.us/climate/journal/140814_drought.html

MN DNR. (2019, July 9). *Minnesota Department of Natural Resources Infested Waters List*. Retrieved from http://www.eddmaps.org/midwest/tools/infestedwaters/

MN DNR. (n.d.). *Minnesota Climate Trends*. Retrieved from https://arcgis.dnr.state.mn.us/ewr/climatetrends/#

MN Environmental Quality Board. (2014). Minnesota and Climate Change: Our Tomorrow Starts Today.

Mueller, B., & Seneviratne, S. (2012). Hot days induced by precipitation deficits at the global scale. *Proceedings from the National Academy of Sciences*, 12,398-12,403.

*National Climate Assessment Development Advisory Committee*. (2013). Retrieved from http://ncadac.globalchange.gov/

National Climate Assessment Development Advisory Committee. (2013). National Climate Assessment.

National Drought Mitigation Center. (2018). *U.S. Drought Monitor*. Retrieved from National Drought Mitigation Center: https://droughtmonitor.unl.edu/CurrentMap.aspx

National Drought Mitigation Center. (n.d.). Drought Impact Reporter. Lincoln, Nebraska, USA. Retrieved from https://droughtreporter.unl.edu/map/

National Drought Mitigation Center. (n.d.). *Drought Impact Reporter Help - Impacts and Reports*. Retrieved August 2, 2019, from Drought Impact Reporter: https://droughtreporter.unl.edu/help/dir/impactsandreports.aspx

National Institute of Building Sciences. (2017). *Natural Hazard Mitigation Saves: 2017 Interim Report.*

National Weather Service Weather Forecast Office. (2014). Retrieved from http://www.crh.noaa.gov/mkx/?n=taw-part4-tornado_stats

Natural Resources Defence Council. (2015). *The Need for Flood Protection Standards*. Retrieved from http://www.nrdc.org/water/fema-assistance-grants.asp

NCEI. (2018, June). *Climate at a Glance: Statewide Mapping*. Retrieved from NOAA National Centers for Environmental information: https://www.ncdc.noaa.gov/cag/

NOAA National Severe Storms Laboratory. (n.d.). *Severe Weather 101*. Retrieved May 12, 2014, from https://www.nssl.noaa.gov/education/svrwx101/lightning/faq/

NOAA. (n.d.). *National Weather Service: Storm Data and Unusual Weather Phenomena*. Retrieved from http://www.crh.noaa.gov/images/mpx/StormData/stormApril2001.pdf

Perera, E. M., Sanford, T., White-Newsome, J. L., Kalkstein, L. S., Vanos, J. K., & Weir, K. (2012). Heat in the Heartland. *Climate Change and Your Health*.

Phillips, A. (2014, March 24). *Landslide Kills 8 People In Washington As Climate Change Makes Them More Likely In The Future.* Retrieved from Climate Progress: http://thinkprogress.org/climate/2014/03/24/3418117/climate-change-landslides-washington/

Pryor, S., Scavia, D., Downer, C., Gaden, M., Iverson, L., Nordstrom, R., . . . Robertson, G. (2014). *Climate Change Impacts in the United States: The Third National Climate Assessment, Ch. 18: Midwest.* Washington, D.C.: U.S. Global Change Research Program.

Region Nine Development Commission. (2013). *Blue Earth County, Minnesota All-Hazard MItigation Plan.* Mankato. Retrieved August 9, 2019, from file:///Y:/HAZARD_MP/HMP_BlueEarth/Docs/2013_BlueEarth_Hazard_Mitigation_Plan.pdf

Schoof, J. (2012). Scale Issues in the Development of Future Precipitation Scenarios. *Journal of Contemporary Water Research and Education*, 8-16.

Seeley, M. (2013). Current status of climate change in Minnesota. *Preparing Minnesota for Climate Change: A Conference on Climate Adaptation.* St. Paul.

Seeley, M. (2015). *Minnesota Weather Almanac.* St. Paul: Minnesota Historical Society Press.

Sepic, M. (2017, June 14). *In storm season, mobile home park tenants seek better shelter*. Retrieved from MPR News: https://www.mprnews.org/story/2017/06/14/in-storm-season-mobile-home-park-tenants-seek-better-shelter

The National Drought Mitigation Center. (2018). *Background*. Retrieved from United States Drought Monitor: https://droughtmonitor.unl.edu/AboutUSDM/Background.aspx

The Weather Channel. (2014, March 13). *NOAA: Winter 2013-2014 Among Coldest on Record in Midwest; Driest, Warmest in Southwest*. Retrieved from http://www.weather.com/news/news/winter-ncdc-state-climate-report-2013-2014-20140313

The White House. (2015, January 30). *FACT SHEET: Taking Action to Protect Communities and Reduce the Cost of Future Flood Disasters*. Retrieved from https://www.whitehouse.gov/administration/eop/ceq/Press_Releases/January_30_2015

U.S. Department of Energy. (2015). *State of Minnesota Energy Sector Risk Profile.* Retrieved from http://www.energy.gov/sites/prod/files/2015/06/f22/MN_Energy%20Sector%20Risk%20Profile.pdf

Union of Concerned Scientists. (2009). *Confronting Climate Change in the U.S. Midwest.*

US Army Corps of Engineers - New Orleans District. (n.d.). *Levee Safety Action Classification (LSAC)*. Retrieved July 2, 2019, from US Army Corps of Engineers: https://www.mvn.usace.army.mil/LSAC/

US Army Corps of Engineers. (2008, April). *National Inventory of Dams Methodology - State & Federal Agency Manual.* Retrieved July 3, 2019, from https://www.nc.gov/: https://files.nc.gov/ncdeq/Public%20Records%202/DEMLR/NIDmanual2008.pdf

US Army Corps of Engineers. (n.d.). *National Levee Database - Minnesota*. Retrieved October 2018, from National Levee Database: https://levees.sec.usace.army.mil/#/levees/search/in=@state:Minnesota

USDM. (n.d.). *Drought Classification*. Retrieved from United States Drought Monitor: https://droughtmonitor.unl.edu/AboutUSDM/AbouttheData/DroughtClassification.aspx

# Appendix J
# Plans & Programs in Place

*Planning & Regulatory*

| *Plans/Programs* | *Yes/No* |
|---|---|
| Comprehensive/Master Plan | Yes |
| Capital Improvements Plan | Yes |
| Economic Development Plan | Yes |
| Emergency Operations Plan | Yes |
| Climate Adaptation Plan | No |
| Continuity of Operations Plan | Yes |
| Transportation Plan | Yes |
| Stormwater Management Plan | Yes |
| Community Wildfire Protection Plan | No |
| FireWise Program | No |
| Water Conservation/Emergency Preparedness Plan | No |
| Wellhead Protection Plan | Yes |
| Database of dry hydrants/well access | Yes |
| Burning permits/restrictions | Yes |
| Water Management Plan | Yes |
| Zoning ordinance | Yes |
| Subdivision ordinance | Yes |
| Floodplain ordinance | Yes |
| Natural hazard specific ordinance (stormwater, steep slope, wildfire) | No |
| Flood insurance rate maps | Yes |
| Acquisition of land for open space and public recreation uses | Yes |
| School closing policy/communications plan in event of inclement weather/temperatures | Yes |
| Storm shelters (list all locations) | No |
| Warning sirens (list all locations) | Yes |
| SKYWARN Program | Yes |
| CodeRED Mass Notification System | Yes |
| Severe Weather Awareness Week | Yes |
| Winter Weather Awareness Week | Yes |
| NOAA Weather Radios | Yes |
| THIRA | Yes |

*Administrative & Technical*

| ***Administration*** | ***Yes/No*** |
|---|---|
| Planning Commission | Yes |
| Mitigation Planning Committee | Yes |
| Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems) | Yes |
| Mutual aid agreements | Yes |
| ***Staff*** | ***Yes/No*** |
| Chief Building Official | Yes |
| Floodplain Administrator | No |
| Emergency Manager | Yes |
| Community Planner | No |
| Civil Engineer | Yes |
| GIS Coordinator | Yes |
| ***Technical*** | ***Yes/No*** |
| Warning systems/services (Reverse 911, outdoor warning signals) | Yes |
| Hazard data and information | Yes |
| Hazus analysis | No |

*Education & Outreach*

| ***Program/Organization*** | ***Yes/No*** |
|---|---|
| Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc. | Yes |
| Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education) | Yes |
| Natural disaster or safety related school programs | Yes |
| Storm Ready certification | Yes |
| Firewise Communities certification | No |
| Public-private partnership initiatives addressing disaster-related issues | Yes |
| *Other:* School Safety Committee | Yes |

# Appendix K
# Local Mitigation Survey Report

As part of Blue Earth County's 2019 Multi-Hazard Mitigation Plan update, participating jurisdictions and county personnel were asked to participate in filling out a two-part "Local Mitigation Survey" form. The purpose of the survey was to gather information needed to support update of the plan and development of local-level mitigation actions the next 5-year planning cycle. Following are the responses from the county departments and jurisdictions that participated in the survey.

## BLUE EARTH COUNTY

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes, we have experienced heavy rain, wind, hail, and flooding events, as well as power outages. Blue Earth County experienced severe storms and/or major flooding events in June 2014, June 2016, September 2016, July 2017 and June 2018. These incidents reached either state or federal level declarations. These events caused damage to city and county infrastructure such as: roads, bridges, parks, and public drainage systems including underground tile, ditch banks, and erosion control systems. Private property and power lines also sustained significant damage. There are multiple public and private campgrounds in Blue Earth County without on-site storm shelters. During these events the safety of campers is at risk without proper shelters.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Yes, the City of St. Clair used mitigation funds from FEMA to build an earthen berm around their water treatment plant to prevent flooding. They are also pursuing FEMA funding to construct a concrete flood wall around the perimeter of their lift station at the southwest corner of CSAH 28 (Park St.) & Fitzloff Ave.

   Blue Earth County used FEMA mitigation funds along with DNR Flood Damage Reduction funding to purchase 3 residences in the Riverhills Subdivision that were in jeopardy of sliding into the Le Sueur River.

   Blue Earth County has been replacing older intake structures with newer designs that are stronger and able to temporarily store water reducing peak flows to downstream rivers and lakes.

   Blue Earth County has also been rip-rap armoring vulnerable bridge abutments, roads and other public infrastructure to protect flood damage.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** Blue Earth County is seeing continued development in areas that are vulnerable to erosion, bluff failure and lake shore sluffing. Lake shore sluffing adds impervious

surfaces that impact vulnerable areas. This is due to an increased number of torrential rain events as opposed to multi-day or soaking rains.

Construction of the Walmart Distribution Center has added a significant number of people in one area if a severe weather event were to strike that location. It also brings many trucks to the area, that are staged in the parking lot or alongside the roadway, that could be vulnerable to severe weather events.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Potential hazards within the parks and especially in the campgrounds should be identified in the renewed HMP. County Officials have started discussing the addition of storm shelters, protocols, and emergency notification in our county parks with campgrounds. The county desires to construct storm shelter-rated facilities as it replaces restrooms and comfort stations within the park system. Priorities will be given to parks with campground facilities.

   Blue Earth County has many roads that historically flood in the same location during weather events. Increasing culvert size and road height would help eliminate water topping at these locations.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** The County Board recently approved a new 20-year Land Use Plan. This plan includes a Community Resilience Chapter with objectives to accomplish over the next several years. These objectives include: Community Resilience Actions, Flooding Actions, Erosion and Erosion Hazard Actions, Stormwater Management Actions, Wastewater Actions and Water Supply Actions.

   Blue Earth County has a Floodplain Ordinance. The ordinance is being updated and will be presented before the County Board upon receipt of the final floodplain maps from FEMA.

   Blue Earth County currently works with one mobile home park to ensure the storm shelter is open and functional prior to the beginning of each tornado season.

   Blue Earth County adopted a Water Management Plan in 2017. The plan addresses near-channel erosion, ravines/bluffs/landslides, stormwater management, ground water and drinking water protection, proper wastewater treatment, water storage and wetlands, proper feedlot manure management and flooding.

   There is an Emergency Action Plan (EAP) for the Rapidan Dam and the adjacent Park/ Campground that is annually renewed by Ontario Power Generation. The EAP is annually submitted to the Federal Energy Regulatory Committee as well as Blue Earth County.

Additional buyouts of homes and properties that are at an enhanced risk of damage or destruction due to their proximity to rivers and areas of erosion.

Ordinances to prevent the construction of homes and buildings in proximity to rivers and areas of erosion.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** We have an emergency management team that works directly with our governmental and community partners. Environmental Services, County Highway and the County Board work in unison to provide these services.

   The County has a part-time GIS Coordinator position that can support the emergency management team, plus additional GIS resources available in various county Departments.

   Mankato is the largest municipality within our county and has assigned Emergency Management staff to our team. Mankato's EM staff represent their jurisdiction and work alongside Blue Earth County's EM members during events that occur outside the city.

   Blue Earth County' s EM Group has representation from Law Enforcement, Fire, PSAP and Support staff.

3. **What programs are in place to help accomplish mitigation in your community?** The county has adopted CODE RED as the emergency alert system. There is a link on the county web site to sign up for CODE RED.

   Blue Earth County is a Weather Ready Community, offers annual SKYWARN training and provides winter weather talks to the 3rd Graders in the county.

   Members of the Emergency Management team conduct safety meetings with our rural school administrators.

   Blue Earth County uses Social Media; specifically, Facebook, Twitter and the Blue Earth County website to communicate information to our local constituents.

   Blue Earth County expanded IPAWS capabilities to strengthen our ability to communicate critical messages in a timely manner.

   We have prepared Public Service Announcements to spread awareness and educate the public about severe weather.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Blue Earth County has set aside money in a disaster relief fund if needed. County agencies have worked directly with FEMA, FHWA, MN DNR and NRCS on several mitigation projects and home buyouts.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?**

Blue Earth County needs to work at increasing their social media following. This is the most direct route to notifying a large group of people in a short period of time.

Not all residents in Blue Earth County are signed up for CODE RED, in fact some have opted out. We need to develop a protocol on when to implement IPAWS for major events.

We struggle to effectively engage people to convince them of danger. Many ignore early warnings and travel advisories that put themselves and emergency personnel at risk.

Blue Earth County is looking for additional funding to build expensive storm shelters. To receive FEMA mitigation funds for storm shelters it needs to be outlined in the HMP.

## Part C: Contributors & Time

Michael Maurer, Chief Deputy/ EM Director, 3 hours

Brenda Olmscheid, Asst. EM Coordinator, 1 hour

Craig Austinson, Drainage Manager, 30 minutes

George Leary, Zoning Administrator, 1 hour

Jessica Anderson, County Administration, 30 minutes

Michael Stalberger, Environmental Services and Taxpayer Services Departments, 30 minutes

Paul Barta, Captain/EM member, 30 minutes

Chad Wilde, Assistant Public Works Director, 30 minutes

# CITY OF AMBOY

## Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** No.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** We have started televising our sewer systems to help with I & I. We have half of the town done; we are doing a quarter section each year.

We have also recently installed a generator for our water tower through a grant with MDH. The generator runs on natural gas and will also power our city offices as a backup safe place for residents to come to in an emergency.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** No.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** (yet to be determined)

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We have an emergency operations plan. We are working on adopting an ordinance for floodplain. Waiting for update information from George Leary (Blue Earth County Land Use Administrator) on some pending changes.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** We have an emergency plan in place. Our Public Works would coordinate what help we need from Blue Earth County or AWAIR. Our Mayor would be in charge of public notifications.

3. **What programs are in place to help accomplish mitigation in your community?** We work with Blue Earth County to coordinate help if we have a larger disaster.

4. **What funding or other resources are available to help accomplish mitigation in your community?** (no answer)

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** (no answer)

## Part C: Contributors & Time

Patty Smith, Administrator, Clerk-Treasurer, 30 minutes

# CITY OF EAGLE LAKE

## Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Not that I'm aware of. There have been incidents of localized flooding on private property as a result of significant rain events.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** In the fall of 2018, the city hired a contractor to dredge a creek to prevent localized flooding for homes located along the creek when significant rain events occurred. The city has over 400 catch basins throughout the community.

   We use a city email distribution list, our website and Facebook to relay important information to our community residents.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** Not that I'm aware of.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** The city has contemplated the purchase of pumps to help in the event of flooding.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We have a Comprehensive Plan (needs update).

   We have a restrictive flood plain ordinance.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Our Fire Chief is the City's designated Emergency Manager.

   Our Public Works Director addresses road maintenance issues for flooding.

3. **What programs are in place to help accomplish mitigation in your community?** (no answer)

4. **What funding or other resources are available to help accomplish mitigation in your community?** (no answer)

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** We need to update our Comprehensive Plan to address considerations for future hazard events.

   The City needs funding to purchase equipment such as a pump and possibly a backup generator.

   If we have a county emergency alert system, we are not sure how many people in our community are signed up and if we should employ efforts to encourage residents signing up for alerts.

## Part C: Contributors & Time

Jennifer Bromeland, City Administrator, 15 minutes

## CITY OF GOOD THUNDER

## Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** We experienced thunderstorms that caused power outages, damage to some vehicles and homes, as well as causing downed power lines and trees. The ballfield washed out with loss of lyme and gravel-erosion due to heavy rain. Flooding streets washed corn out of Protein Sources Milling. We also had water erosion out at the treatment pond, causing us to put in rip-rap. Mulch has washed away out of our playgrounds in the parks due to heavy rain. Playgrounds have had equipment damaged due to falling limbs from trees. The gravel road has also washed out by the tennis court. Tremendous amounts of overtime were incurred because of these storm damages.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?**

   - We added a backup generator for the tractor lift station.
   - Working on I & I to reduce flow continuously and during heavy rain events.
   - Generators installed for the pumphouse at the water tower and water treatment plant.
   - 2019 we put power line underground at the City park to protect it from all the trees and put new lighting/electoral in the park bathrooms for our residents.
   - Added an intake by the school for storm sewer to mitigate some of the water flow during rain events.
   - Currently checking into drainage tiles around the ballfield and park to control the water.
   - We have conducted sump-pump inspections to reduce I & I.
   - Lining of several pipes to fix cracks to reduce I & I, and replacing manholes.
   - Removal of trees for residents that they are worried about, and removed potentially hazardous trees at the city park that may cause damage to property or power lines.
   - Snow Fencing has been put up in areas.
   - City hall has installed security cameras at the City Shop and inside and outside of City Hall.
   - We are currently working on a "safe passage" type of program to replace sidewalks in town for kids going to and from school.
   - We have updated our outdoor emergency weather sirens.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** We constructed a concession stand at our ball park, with this, the city has a higher cost of loss during a storm.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Our City still has a need for more storm sewer upgrades.

   Our residents would greatly benefit from more information on how to be better prepared in case of an emergency or storm, also to know if we have a storm shelter for our residents if they need one.

   Looking at extension of the pond to hold more rain water from heavy rain events.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** The city has a 5-10 year plan to buy land to develop for roughly 6-10 homes and maybe a business or two.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?**

   - Our Water Operator helps us with I & I and keeping water related issues at a minimum.
   - Our City Council, Clerk and City Maintenance worker are the Public Safety Committee.
   - Fire Chief & Mayor are the Emergency Managers for our city.
   - City Maintenance worker addresses all road and pond flooding issues dues to high rains and flooding.

3. **What programs are in place to help accomplish mitigation in your community?**

   - County alert system – Code Red
   - We post awareness information on our City website, Facebook Page and have a new Text Alert option for residents to sign up for to stay informed.
   - Our Fire Department does Fire Safety/Prevention week with the schools.
   - Newsletters also go out to remind residents about keeping yard clippings and debris from the road to avoid blocking the gutter. Looking into sewer gutter guards so debris can't clog.
   - The School does yearly tornado drills with the kids.
   - We have educated the public on Phosphates, and how to lower it.

4. **What funding or other resources are available to help accomplish mitigation in your community?** We worked with FEMA at our treatment pond and installed rip-rap when the river washed away part of the pond.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** We need to Update Comprehensive plan for future hazards, etc.

   Roads and alleys are washing out. We need funding assistance to improve the roads.

   Need to educate residents on the County's Code Red system and get them signed up.

**Part C: Contributors & Time**

Ashney Helleksen, Clerk-Treasurer, 6.5 hours

Sarah Karels, Councilor, 6.5 hours

Robert Anderson, Mayor, 1 hour

Brian Beckel, City Maintenance, 1.5 hours

Phil Klammer, Fire Chief, 30 minutes

## CITY OF LAKE CRYSTAL

**Part A: Past Events & Vulnerability Assessment**

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes. We have experienced heavy rain with localized flooding (nothing major), wind damage to trees and hail damage. In August 2016, we experienced a severe storm that brought widespread damage to trees and some structures, a 10-hour long City-wide power outage, street flooding and hail damage.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Yes. The City has moved some overline power lines to underground and completed several maintenance projects to our power plant.

   We completed an addition to City Hall that can be used for an EOC.

   We have increased the use of our website and Facebook pages.

   The City will be completing a street reconstruction project in 2019/20. As part of this project, the designed capacity of our storm sewer facilities will be increased.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** No. However, in general, we have noticed an increase in more frequent high-rain events in the last 5 years.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Need to upgrade storm sewer capacity.

   Public education.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Floodplain Ordinance & NFIP, Wellhead Protection Plan, Emergency Management Ordinance.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?**

   City Administrator

   3 office staff

   3 FT police officers

   Street Superintendent+ 3 FT employees

   Water Superintendent + 2 FT employees

   Electric Superintendent + 2 FT employees

   Engineer contracted out

   Fire Department

   Ambulance Service

   Recreation Center staff

3. **What programs are in place to help accomplish mitigation in your community?** All of the above examples.

4. **What funding or other resources are available to help accomplish mitigation in your community?** None.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Need to promote the emergency alert system.

   Need to increase storm sewer system capacity.

   Need to update our Emergency Management Plan and practice scenarios.

   Need to update our Floodplain Ordinance and practice enforcement.

**Part C: Contributors & Time**

Taylor Gronau, City Administrator, 30 minutes

## CITY OF MADISON LAKE

**Part A: Past Events & Vulnerability Assessment**

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Flooding after storms has been the main issue. Any time there is a rain fall with several inches of rain, the city has areas of high water. Damage has occurred to some of the roads. This is due to high levels of water running above and below the surface, eating away at the base of the roads. We have also utilized sandbags and large water pumps on several occasions to protect homes in the low areas.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** The City of Madison Lake has the TEXT alert system that we can send out text messages regarding any type of information. Also, the use of social media has worked to advise on road conditions.

   The City meets and discusses drainage systems throughout this city, not only for flooding but also water quality for our lakes.

   We have also re-routed a water way, this makes a more direct route to the lake. We also dug out another ditch that had filled in over the years, this increases water flow. Warning sirens have been updated and added where needed.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** Increased rainfall and rapid spring thaw have been noticed in the last five years. This can increase the risk of flooding and rapid increases to lake levels.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** (yet to be determined)

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Meetings with department heads to go over our Emergency Management plan.

   Meet and inspect shelters at our mobile home park and campgrounds.

   Use of our City Hall for stranded travelers which includes air mattresses and blankets, with a kitchen and bathrooms available.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** We have our Emergency Management Coordinator (Police Chief) that will work to coordinate with all department heads and council. Administer will stay at command site and help with logistics.

3. **What programs are in place to help accomplish mitigation in your community?** Our city is very pro-active when it comes to the safety of our residents. We have an updated siren system, which includes one added siren at our water tower site.

   Our fire department does an open house during fire prevention week and an open house during out town event.

   We have storm spotters on our department that help during severe weather.

   We meet with mobile home and campground owners and inspect and advise of procedures in the event of severe weather.

   Police and Fire departments will go out and speak with the children at daycares about weather safety.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Past administers have worked in the aftermath of an event to secure repair funding. Not sure if there have been grants applied for.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Not all residents are signed up for the text alert system.

## Part C: Contributors & Time

Daniel Bunde, Police Chief, Emergency Manager, 2 hours.

## CITY OF MANKATO

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes. We have experienced heavy rain, wind damage to trees, hail damage to City structures, street flooding and power outages. The City experienced major flooding in September of 2014, June of 2015, and September of 2016 and June 2018 that caused damage to city roads and culverts as well as to private properties. A local campground experienced damages due to flooding. Numerous locations of erosion and sediment deposition have occurred threatening or damaging public and private property and reducing the function of public drainage facilitates.

   Damage to embankments is threatening critical water supply infrastructure.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Yes. The City has modified and performed heavy maintenance and restoration activities on several stormwater ponds. This is to reduce the impact to the property and infrastructure immediately adjacent to the ponds, within the watershed, and to reduce erosion and flooding downstream of the facility. In locations that are within or adjacent to a floodplain, improvements are being moved away from active waterways and areas of erosion. These improvements include relocation of trails, campsites and other associated infrastructure.

   The City has also started modifying operations of the drainage facilities and flood control system to minimize the impact of sediment and reduce pump run times and wear.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** Expansion of the community would be the only increase in vulnerability. The City of Mankato continues to take steps to improve land usage and prevent damage from the typical (flooding river and high intensity rain events) disasters that we experience.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Large-scale drainage improvements. These projects will need to accomplish two goals: 1) Stabilization will need to be performed in areas where erosion continues to threaten critical infrastructure and private property and 2) Additional rate and velocity reduction measures are needed to reduce the impact on natural and constructed surface water conveyances.

### Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** The City of Mankato has created a Grading and Drainage manual to address the design of stormwater facilities for both new and reconstruction work.

   A Surface Water Management Policy has been developed and implemented to address issues of drainage in natural channels and conveyances to reduce erosion and protect improvements.

   Additionally, high-level projects are in the development stage to address these issues on the sub-watershed level. Project specific plans are being developed to address critical areas.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?**

   The City of Mankato has an Engineering Division that allows for the study, development and implementation of projects that can mitigate various issues in critical locations. The Public Works Department is able to operate and mitigate many of the improvements that allow for mitigation of issues.

3. **What programs are in place to help accomplish mitigation in your community?** The Surface Water Management Policy has sections that allow for cost sharing and financing for improvements along water conveyances.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The City of Mankato has a stormwater utility and sales tax authorization that will address some of the planed, foreseen issues. Issues that have developed in the last couple of years due to the disaster-sized events need assistance through FEMA recovery and HSEM hazard mitigation. Additional projects may be funded through various other state infrastructure improvement programs.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** The comprehensive stormwater plan needs to be updated to deal with critical issues and to leverage the partnerships that are being developed though the regional MS4.

   Funding continues to be an issue as unnecessary compliance uses funding that could be dedicated to impact full improvements.

**Part C: Contributors & Time**

Michael McCarty, Assistant City Engineer, 1 hour

## CITY OF MAPLETON

## Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** In 2014 we had a severe storm with straight line winds, tree damage, downed power lines and water in homeowners' basements. We have had a few other thunderstorms that have damaged several trees in our city park.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** The City put in a new forced main in 2014. This is to allow the water in the sewer system to get to the stabilization ponds faster. We still have I & I issues and our sanitary sewer line has backed up into homeowners' basements. It is hoped the new force main will avoid water backups in homeowners' basements. The Waste Water Treatment facility was also updated.

   We have had additional street projects in 2014 and 2017 where sanitary sewers lines and storm lines were replaced. Some sanitary sewer lines were lined. Homeowners on these projects have had their sanitary sewer lines televised and any foundation drains connected to the sanitary sewer were disconnected and rerouted to the storm sewer during the projects.

   We are working on televising all properties within the city within the next 5 years to remove foundation drains out of the sanitary sewer.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** From 2013 until now the city had added 11 new homes in a city-owned subdivision. This would increase the cost of damage due to storms, tornadoes, wind and/or hail.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Public Education is a need in our community to explain to homeowners why they need to remove storm water out of the sanitary sewer systems. Also, we have many homeowners that have sump pumps that work continuously during and after heavy rains. If the power goes out and the sump pumps stop, homeowners face backups in their basement. More education is needed for the public on having a generator to hookup when the power goes out.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We just began the process to adopt a Floodplain Ordinance. The City of Mapleton is not in a floodplain, but it has been recommended that we adopt a floodplain ordinance. We are developing a map to show areas of standing water. This will be reviewed when people apply for a building permit.

In 2019 we purchased a new camera to televise property owner's sanitary sewer lines. This one has a smaller camera and will allow us to televise more properties. We do this to require home owners to remove foundation drains from the sanitary sewer. Currently we do this when a property goes up for sale and when we do a street project. Our plan is televise the entire city within the next five years.

Our City Engineer, Public Works Supervisor and City Council have approved a 5-year utility plan to update utilities and streets.

We have an emergency plan.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** City Engineer, Public Works Supervisor and City Council.

3. **What programs are in place to help accomplish mitigation in your community?** The City participates in the County's Code Red emergency alert system.

   The City gets continuing updates on weather-related issues throughout the year from Blue Earth County Emergency Management.

   Every fall we have our leaf vacuum out to clean the leaves off the boulevards and to the storm drains.

   Our school practices tornado drills on a regular basis.

   Our fire department goes to the school each fall during fire prevention week.

   The County sets off the tornado siren each month in our community.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The City of Mapleton has worked with the state and federal agency when we have had a disaster event such as in 2010 and 2014. Blue Earth County is excellent at bringing all the organizations together when we need to submit applications for funding.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Not all residents in our community are signed up for Code Red. More advertising should be done to have people aware of this program.

   The mobile home park does not have a storm shelter on the site.

## Part C: Contributors & Time

Patty Woodruff, City Administrator- 2 hour

## CITY OF PEMBERTON

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** None.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** None.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** None.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Our community center is a designated emergency shelter, however, we have no generator for it or our water tower.

### Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We are going to adopt Floodplain Ordinance recommended by the County.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Our Fire Chief is the City' s designated Emergency Manager.

3. **What programs are in place to help accomplish mitigation in your community?** The City participates in the County's Emergency alert system. We have a link on our website for residents to sign up for the system.

   Our local school practices tornado drills on an annual basis.

4. **What funding or other resources are available to help accomplish mitigation in your community?** None.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Not all residents are signed up for the County's emergency alert system.

### Part C: Contributors & Time

Darla Ward, City Clerk/Treasurer, 30 minutes

## CITY OF SKYLINE

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** We have experienced heavy rain and wind damage to trees.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** We have updated our severe weather alert system.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** N/A

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** None at this time.

### Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Our city is fully developed. We are located on a bluff and experience minor flooding. We are not in a floodplain. We maintain several tile lines and drains which are adequate for our surface water.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** We have a council member responsible for public safety and another council member responsible for road maintenance.

3. **What programs are in place to help accomplish mitigation in your community?** We participate in Blue Earth County's emergency alert system. We participate in the "Night to Unite" which involves contact with the Mankato Police and Fire Departments with whom we contract for services. We clean all city drains each spring.

4. **What funding or other resources are available to help accomplish mitigation in your community?** None

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** None at this time.

## Part C: Contributors & Time

Paige Attarian, Mayor, 1 Hour

## CITY OF ST. CLAIR

## Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes. We experienced heavy rains and flooding of the Le Sueur River in September 2010, June 2014, and September 2016. The flooding caused damage to City infrastructure (Wastewater Treatment Plant and Lift Station), as well as private properties.

   In 2010 and 2016 the entire population of St. Clair was without sewer service for seven (7) days following the flood events.

   We have also experienced thunderstorms with accompanying wind and hail that have caused damage to private property.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** In 2011, the City constructed an earthen berm to the north and west of the City Wastewater Treatment Plant. The 2016 flood breached the berm. In 2018, the City did a mitigation project which added three (3) feet of sheet piling on top of the earthen berm in an effort to protect the Wastewater Treatment Plant from future flooding.

   In 2018, the City purchased a very large 8" pump.

   In 2019, the City is planning a mitigation project to protect the Lift Station at 120 Park Street North. The project involves building concrete wall around the Lift Station.

   The City utilizes the City website and Facebook page to communicate emergency messages to the residents.

   The City has a good relationship with the St. Clair Public School and in times of flooding the School uses their alert system to send out messages for the City (i.e.: call for sandbagging help, etc.)

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** While the City recognizes that there has been a change in weather patterns, bringing more frequent heavy rains and storms, which has increased our vulnerability to

flooding, we feel the major factor is the change in farming practices … sloughs and holding areas have been eliminated, much larger tile is being utilized and there is less space between tile lines. The outlets (tile, culverts, etc.) carrying the water to the river are much larger and are running at capacity after a rain event.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Some type of holding area for stormwater entering the Le Sueur River following heavy rain events.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We have a Comprehensive Plan and a Zoning Ordinance.

   The City participates in the National Flood Insurance Program (NFIP).

   The City is updating its Floodplain Ordinance.

   The City participates in 'Active 911' to notify Fire Dept. members of emergency situations.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Mayor and City Council.

   Fire Chief and Fire Dept.

   Blue Earth County Emergency Management and Sheriff's Dept.

   City Engineer (Bolton and Menk) and UC Lab (City Wastewater Treatment Plant Operator)

   to help with Wastewater Treatment Plant and Lift Station issues during flooding.

3. **What programs are in place to help accomplish mitigation in your community?** The City participates in the Blue Earth County CodeRED Emergency Alert System.

   The City posts information regarding the annual Severe Weather Awareness Week on the City website and Facebook page.

   Each fall, the St. Clair Fire Department hosts a day-long Fire Prevention and Safety Program to area pre-school, Kindergarten and 1st graders in conjunction with Fire Prevention Week.

   The St. Clair School practices tornado and fire drills on a routine basis.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The City has worked with FEMA and HSEM following the 2010 and 2016 flood events.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** We need to update our Comprehensive Plan to address flood events and the aftermath.

**Part C: Contributors & Time**

Catherine Seys, City Clerk-Treasurer, 1 hour

## CITY OF VERNON CENTER

**Part A: Past Events & Vulnerability Assessment**

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes. We have experienced heavy rains causing very high inflow and infiltration through our sewer system.

   We have had storms go through with damage to tree branches resulting in repair of a power line.

   In 2015, downed power lines at the wastewater plant as well as another 3 phase at the Water treatment plant caused outages without a backup generator.

   Snow storms resulted in 6-8 hour power outages 2 times within the last 5 years.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Yes. In 2015, the City completed an infrastructure project. The project included upgrades to 18% of the City's sewer, water and street infrastructure and also included replacement of the old water tower with a new refurbished Water Tower. All non-compliant sewer services of the residents on the project route had their private sewer service lines replaced to become complaint.

   To help with the inflow and infiltration problems, the City currently has approved/passed an ordinance requiring residents to upgrade any non-compliant sanitary sewer service lines on their property by Nov. 15, 2022.

   The City has also implemented another infrastructure project to complete renovation of the remaining sewer, water and streets in the City. The project would also include upgrades to the existing wastewater plant and a new Water Treatment facility. This project is highly dependent on funding.

   In 2018, the City put in a SCADA system to monitor the water tower levels from water operator's cell phone.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** In general, we have noticed an increase in more frequent high-rain events in the last 5 years.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Purchase of a backup generator for servicing the water treatment plant, Fire Dept. for emergencies and storm shelter, and City Hall for operations.

   Public education is always a need and homeowners would benefit from more information on how to be prepared for bad storms and outages.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** As stated earlier, the City is working on a huge infrastructure project for 2021-22 that would update the remaining needs of the city.

   The City continues to educate citizens on the importance of having sewer lines that are complaint so they are not adding to inflow and infiltration problems; thus, overloading our wastewater treatment plant resulting in by-passing. The project does include updated storm sewers to aid in high-rain events.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Our Fire Chief is the City's designated Emergency Manager.

   We have a City Engineer and a Public Works Director that address road maintenance issues for flooding and sewer issues.

3. **What programs are in place to help accomplish mitigation in your community?** The City has a siren system through the Blue Earth County warning system.

   The City does what they can to help homeowners clear leafy and woody debris from roadside gutters to prevent clogging and over the road flooding.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The City is applying for a USDA Rural Development application to help fund the 2021-22 infrastructure project.

   The Dept. of Health is a source for grants for generator purchases if needed.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Extra manpower and equipment are needed in small towns like ours that have both a State highway and County roads within the City. In the winter of

2019, the City considered the high snowfall events as hazardous because of blind spots at intersections and private driveways on these state and county roads.

Our City will be contracting with Blue Earth County for police patrol and protection and will no longer have a police department; therefore, more resources may be necessary.

### Part C: Contributors & Time

Diane Roelofs, Clerk-Treasurer, 1. 5 hours

Mark Willette, Public Works Supervisor, 1 hour

Mayor Dana Ziegler, Mayor of Vernon Center, 30 minutes

## BEAUFORD TOWNSHIP

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** No.
2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** No.
3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** No.
4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** None.

### Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We do not have a plan in place at this time.
2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** No staff.
3. **What programs are in place to help accomplish mitigation in your community?** None.
4. **What funding or other resources are available to help accomplish mitigation in your community?** No funding in place.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** N/A.

**Part C: Contributors & Time**

Kim Krengel, Clerk, 15 minutes

## DANVILLE TOWNSHIP

**Part A: Past Events & Vulnerability Assessment**

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Heavy rainfall; ag land heavily tiled and tile runoff exceeds capacity of natural waterways.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Have spoken with Highway Department and MNDOT; one township road is consistently flooding, but it's connected with county and state road adjacently.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** Increase in tiled land.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?**

   Larger culvert replacement and rip rap rather than smaller rock.

**Part B: Local Mitigation Capabilities Assessment**

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** (no answer)

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** (no answer)

3. **What programs are in place to help accomplish mitigation in your community?** (no answer)

4. **What funding or other resources are available to help accomplish mitigation in your community?** (no answer)

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Getting all involved agencies to the table to discuss solutions (i.e. Highway, Ditch, MNDOT, etc.)

**Part C: Contributors & Time**

Laurie Stenzel, Clerk, 30 minutes

## DECORIA TOWNSHIP

**Part A: Past Events & Vulnerability Assessment**

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes, we had severe river erosion on the Le Sueur River adjacent to our township roads.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Yes, we did river stabilization on the Le Sueur River.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** No.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** (no answer)

**Part B: Local Mitigation Capabilities Assessment**

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Severe events will cause us to apply for FEMA funds.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Blue Earth County.

3. **What programs are in place to help accomplish mitigation in your community?** (no answer)

4. **What funding or other resources are available to help accomplish mitigation in your community?** (no answer)

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** (no answer)

## Part C: Contributors & Time

Lyle Femrite, Chair, 1 hour

Charles Fredrickson, Supervisor, 1 hour

Bruce Levos, Vice Chair, 1 hour

## GARDEN CITY TOWNSHIP

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** In Oct/Nov of 2016 we had road damage due to excess rain.

   In June/July of 2017 we had road damage due to excess rain.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** We continue to grade, gravel and repair ditches & culverts to help with excess rain or when flooding occurs.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** I cannot think of anything or changes that would affect the township for events. We currently have a very good warning system by the county.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** We are currently doing everything needed for upkeep on roads & ditches. We maintain the township roads on a regular basis.

### Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** The township does road inspections 2-3 times per year identifying any possible issues for repair.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Elected Township Board, Supervisors & contracted vendors for repair.

3. **What programs are in place to help accomplish mitigation in your community?** The township has a regular township meeting monthly residents can attend. In cases of disasters, special meetings are held to survey or report any damage or concerns.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Township funds are paid through property taxes, state funding, past FEMA funding.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** We don't currently see any gaps or deficiencies at this time.

### Part C: Contributors & Time

Liz Thiesse, Clerk – Garden City Township, 30 minutes

## JAMESTOWN TOWNSHIP

### Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** No.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** No.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** No.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** None.

### Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** None. We defer to Blue Earth county on these matters.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** None. We defer to Blue Earth county on these matters.

3. **What programs are in place to help accomplish mitigation in your community?** None. We defer to Blue Earth county on these matters.

4. **What funding or other resources are available to help accomplish mitigation in your community?** None that we are aware of.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** None that we are aware of.

## Part C: Contributors & Time

Fred Friedrichs, Township Supervisor, 5 minutes

## LE RAY TOWNSHIP

## Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Le Ray Township has experienced heavy rain events and high wind events. Several trees (3-6) have blown down which crossed roadways and had to be removed. No structures have been damaged.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** We are in the process of replacing a CMP culvert on 210th Street because recent high water levels and flows during heavy rain events have damaged the culvert. It is scheduled to be replaced with a concrete box culvert in 2019.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** None.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** None.

## Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** None.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** None.

3. **What programs are in place to help accomplish mitigation in your community?** Le Ray Township does an annual road inspection each spring where we drive all of the township roads looking for damage from a variety of sources. If damage is found, it is prioritized and repairs are completed based on available funds.

4. **What funding or other resources are available to help accomplish mitigation in your community?** We have worked with Blue Earth County Public Works Department to help with culvert replacements needed due to erosion.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** None.

## Part C: Contributors & Time

Paul Baer, Le Ray Township Chair, 30 minutes

# Appendix L
# Minnesota Department of Health Climate & Health Report

# Planning for Climate & Health Impacts in Southeast Minnesota

## Emergency Management Considerations for HSEM Region 1

Published by the Minnesota Climate & Health Program in August 2018

# ABOUT THE REGIONAL PROFILE

## EXTREME WEATHER IS A FAMILIAR CONCERN FOR MINNESOTANS

While experience has helped Minnesotans adapt to historical weather patterns, climate change trends are pushing us to adapt even further to weather patterns and extreme events that pose major threats to our health, homes, environment, and livelihood. Over 50 years of storm data on record document that Minnesota has experienced an increase in the number and strength of weather-related natural disasters, particularly those related to rising temperatures and heavy downpours. These events cost our state millions in property loss, damaged infrastructure, disrupted business, medical care and support services, and put residents and responders at risk. Understanding how our weather is changing now and into the future will help planners and decision-makers in emergency management and supporting fields extend our progress in climate adaptation and lead to more resilient communities.

## CLIMATE PROJECTION DATA AS A TOOL

Climate projections can help us prepare for the future. These data result from highly sophisticated global climate models and provide a general idea of trends in temperature and precipitation many decades into the future at ever-increasing time and spatial scales. Like every dataset, there are limitations to our understanding and application of the information to real-life decision-making. Yet despite limitations, climate projection data offer a crucial glimpse into our potential futures, and allow us to start considering the best way to allocate our preparedness dollars and management resources to reduce the severe impacts of extreme weather.

*Money Creek, Southern Winona County (National Weather Service, 2007)*

REGION 1 /2

## PUTTING CLIMATE CHANGE INTO CONTEXT

Sometimes, climate change and extreme weather events and the impact on our communities appear distant and abstract. That is why the Minnesota Department of Health's Minnesota Climate & Health Program teamed up with state and local emergency management and preparedness professionals as well as state climatologists to develop a custom climate profile for each of the six Homeland Security and Emergency Management (HSEM) regions across the state. Each regional profile includes a description of climate change trends along with a summary of climate projection data to illustrate these trends. Regional climate data are presented alongside population projection data, as it's important to consider both our climate future and population future as we plan to minimize risk and build resilience against climate impacts.

Additionally, each regional profile provides a local case study, a "focusing event," to illustrate the links between extreme weather and natural disasters and what climate projection data can (and cannot) signify for similar events in the future. Each case study features a recent natural disaster that impacted the HSEM region and provides a comparison between temperature and precipitation measures related to that event alongside historical baseline trends and future projection estimates. Taken together, the six HSEM regional profiles provide an extensive overview of climate change trends for Minnesota and describe the potential impact of these trends for emergency management and preparedness professionals and their partners.

## FOR MORE INFORMATION

A long form report, including all six profiles, individual county data, and a more comprehensive description of climate change trends and supporting research will be available at:
Minnesota Climate & Health Planning Tools & Data
*(www.health.state.mn.us/divs/climatechange/data.html)*

# REGION 1 OVERVIEW

**REGION 1:** Southeast Minnesota

**COUNTIES**

- Blue Earth
- Dodge
- Fairbault
- Fillmore
- Freeborn
- Goodhue
- Houston
- Le Sueur
- Mower
- Nicollet
- Olmsted
- Rice
- Steele
- Wabasha
- Waseca
- Winona

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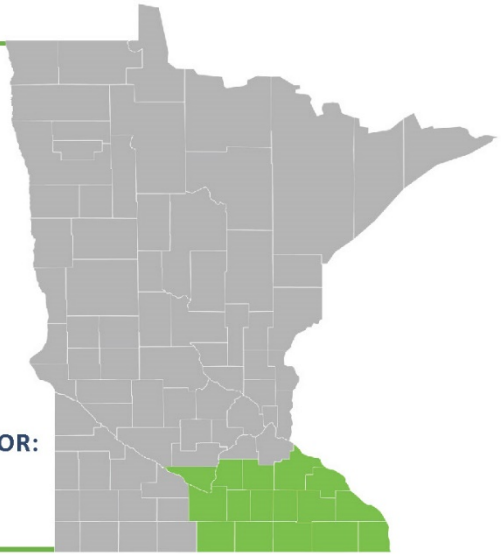


# MINNESOTA CLIMATE & POPULATION TRENDS

## OUR KNOWLEDGE OF CLIMATE CHANGE IS EXPANDING RAPIDLY

Climate records show that across the Midwest and here in Minnesota we are experiencing an increase in warmer, wetter conditions as well as an increase in extreme weather events and related natural disasters. Experts expect these conditions to continue well into the future. By mid-century, Minnesotans can expect much warmer winters, more severe summer heat waves, a higher frequency of very heavy rain events and a higher frequency of late growing season drought conditions.

Many communities in Minnesota rely on economies rooted in agriculture and outdoor recreation, such as wintertime tourism, including snowmobiling, ice fishing, and skiing. Future climate conditions may stress agricultural economies by delaying planting and fieldwork, increasing disease and pest pressure, and reducing crop yields due to cycles of flooding and dry spells. Rapidly warming winter temperatures will turn snowfall into rain and reduce the depth and timing of lake ice cover, affecting winter recreation.

Extreme rainfall events will increase flood risk, particularly in floodplain areas, disrupting transportation and utility service, and damaging property and infrastructure. In addition, surface runoff may lead to soil erosion, lake pollution, and reduced drinking water quality. Nutrient runoff in particular, along with warmer temperatures, are likely to contribute to a larger occurrence of harmful algal blooms on waters, many valued for recreation. Changing climate conditions are likely to strain the viability of native species, including popular recreational fish, invite encroachment by invasive species, and increase the geographic range and types of ticks and mosquitoes.

Some of these trends are evident in the current climate projection data that are available. However, because these data are often averaged or summarized for large areas over large time periods, they can mask the local peaks in temperature and precipitation that can trigger disasters. Until more finely-scaled climate projection data become available to Minnesota planners and decision-makers, the current data still remain useful for exploring the future ahead and establishing a baseline understanding of what our weather challenges may be moving forward.

# REGION 1 CLIMATE PROFILE

*Use the following information on temperature, precipitation, and vulnerable populations to help plan for future weather-related incidents.*

## TEMPERATURE

**There has been an increase in winter and summer temperatures.** Our average winter lows are rising rapidly, and our coldest days of winter are now warmer than we have ever recorded. In fact, Minnesota winters are warming nearly 13 times faster than our summers. The continued rise in winter temperatures will result in less snow pack, which will increase chances for grassland/wildfires as well as drought. The warmer winter temperatures will also have major consequences for our ecosystems, including native and invasive species, whose growth, migration, and reproduction are tied to climate cues. The increase in Lyme disease across Minnesota is also likely influenced in part by the loss of our historical winters, due to a longer life-cycle period for ticks. Freeze-thaw cycles are likely to increase as well, damaging roads, power lines, and causing hazardous travel conditions. By mid-century our average summer highs will also see a substantial rise, coupled with an increase in more severe, prolonged heat waves that can contribute to drought and wildfires and pose a serious health threat, particularly to children and seniors. Here are temperature trends for HSEM Region 1:

| Average Summer Maximum Temperature for HSEM Region 1 | | |
|---|---|---|
| 1981-2010 | 2050-2075 | Change |
| 81.4 °F | 89.1 °F | +7.7 °F |

| Average Winter Minimum Temperature for HSEM Region 1 | | |
|---|---|---|
| 1981-2010 | 2050-2075 | Change |
| 8.9 °F | 18.0 °F | +9.1 °F |

## PRECIPITATION

**There has been an increase in total average as well as heavy precipitation events, with longer periods of intervening dry spells.** Our historical rainfall patterns have changed substantially, giving rise to larger, more frequent heavy downpours. Minnesota's high-density rain gauge network has captured a nearly four-fold increase in "mega-rain" events just since the year 2000, compared to the previous three decades. Extreme rainfall events increase the probability of disaster-level flooding. However, there is also an increased probability that by mid-century heavy downpours will be separated in time by longer dry spells, particularly during the late growing season. Over the past century, the Midwest hasn't experienced a significant change in drought duration. However, the average number of days without precipitation is projected to increase in the future, leading Minnesota climate experts to state with moderate-to-high confidence that drought severity, coverage, and duration are likely to increase in the state. Modeling future precipitation amounts and patterns is less straight-forward compared to temperature. Some climate models do a better job than others representing rainfall for the Midwest, and available data sources only provide average estimates on a monthly scale, masking the spikes in extremes that trigger flood and drought disasters. Trend data provided here for HSEM Region 1 are summarized for early summer, when historically Minnesota receives most of its rainfall, and for early fall when rainfall scarcity may threaten crop harvests and local agricultural economies:

| Average Early Summer Precipitation for HSEM Region 1 | | |
|---|---|---|
| 1981-2010 | 2050-2075 | Change |
| 4.5" | 5.1" | +0.6" |

| Average Early Fall Precipitation for HSEM Region 1 | | |
|---|---|---|
| 1981-2010 | 2050-2075 | Change |
| 2.9" | 3.0" | +0.1" |

## VULNERABLE POPULATIONS

**There has been an increase in the older adult population.** Extreme weather events cause a range of health impacts and disruptions that vary across population groups. The vulnerability of a group is a function of its sensitivity to a hazard, exposure to risks, and capacity for responding or coping with the impacts. Children and older adults are often identified as groups vulnerable to climate change threats, including extreme weather and natural disasters. For example, physiologically these groups have a lower capacity to tolerate extreme heat and are often dependent on others for transportation to cooling centers. These groups are also often critically dependent on others during a disaster, such as needing help to evacuate during a flood or wildfire, or to find alternative housing if displaced. Planning for the specific needs of vulnerable populations strengthens local efforts to reduce the impact of extreme weather-related events. Population trend data provided here for HSEM Region 1 are intended to highlight the changes in two key demographic groups for the region, but planners and managers should also consider future changes in other populations of concern, such as those with low incomes, immigrant groups, indigenous peoples, persons with disabilities, or vulnerable occupational groups (such as outdoor workers):

| Childhood Population (0-14) Projection Estimates for HSEM Region 1 | | |
|---|---|---|
| 2015 | 2050 | Change |
| 123,987 | 101,405 | 18.2% |

| Elder Population (65+) Projection Estimates for HSEM Region 1 | | |
|---|---|---|
| 2015 | 2050 | Change |
| 108,389 | 170,325 | +57.1% |

# REGION 1 CASE STUDY

The following case study is intended to illustrate the links between climate and weather and natural disasters. Acting as a "focusing event," the case study demonstrates how a previous weather-related event (i.e., flood) impacted important economic drivers, environmental resources, and population health. Then, the Climate Projection Data section compares weather data from the case study with baseline and projected weather data to show the possibilities of future disaster events. This case study highlights the relevancy of climate projection data for understanding future climate and weather risks in Minnesota.

**EVENT: FLOOD** **DATE: 2007**

Beginning on August 18th, a series of intense thunderstorms dropped heavy rain on much of southern Minnesota. Over the course of just three days, all or portions of 28 counties received at least four inches of rain, far above historical averages for the entire month. Six-inch totals were common, and some areas in southeastern Minnesota reported record-breaking amounts ranging from eight to 18 inches. The heaviest rainfall occurred in Winona, Fillmore, and Houston counties. An official National Weather Service (NWS) reporting location in Houston County measured 15.10 inches in the 24-hour period ending at 8 am on Sunday, August 19th, setting a new state record.

The combination of rainfall totals and large geographic area affected made this episode one of the most significant "mega-rain" events in Minnesota's climate history. This historic extreme rainfall event triggered widespread catastrophic flooding in many areas of the Upper Mississippi River Valley and across HSEM Region 1. River and flash flood warnings were issued for nearly two days given the scope of the heavy rain, massive flooding, and infrastructure damage.

# REGION 1 CASE STUDY: KEY IMPACTS

It is nearly impossible to capture all the various impacts from a natural disaster. These impacts broadly include costly infrastructure damage, disrupted utility service, prolonged work and school absences, acute physical injury, and persistent strains on mental health, on scales ranging from the community to the household to the individual.

The extensive damage associated with the August 2007 flood is difficult to capture in a single cost estimate. Federal assistance allocated to Dodge, Fillmore, Houston, Olmsted, Steele, Wabasha, and Winona counties to address flood damages exceeded 31 million dollars. The NWS estimated that damage costs for flood impacted areas exceeded 200 million dollars.

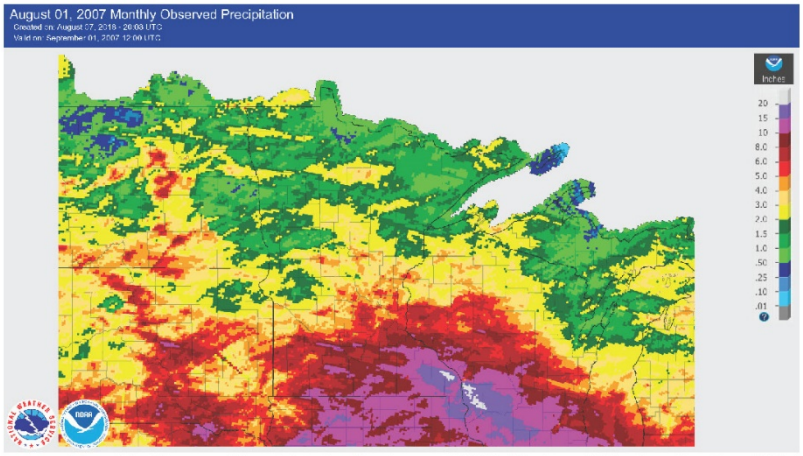
The following are just a few examples of the adverse impacts on HSEM Region 1 communities from the August 2007 extreme rainfall event:

**PUBLIC SAFETY:** Flooding was tied to seven fatalities and numerous injuries, many associated with individuals attempting to drive vehicles through high water. There were reports of at least a dozen boat rescues of individuals from cars and homes.

**DRINKING WATER QUALITY:** Fallen trees and mudslides severely damaged power lines. Many municipal wastewater plants were overwhelmed and forced to bypass untreated sewage. Nearly 50 public water supplies (PWS) were damaged or destroyed. While nearly all community PWS systems were restored within a few days, five non-community PWS were destroyed and 10 experienced significant damage and persistent bacteria problems.

**DISPLACEMENT & DISRUPTED COMMUNITY NETWORKS:** Evacuations were widespread, ranging from individual residences and businesses to mobile home parks, campgrounds, and nursing homes, which were flooded or collapsing due to mudslides. Extensive sand bagging efforts were required in many areas, and the Red Cross set up evacuation shelters.

**INFRASTRUCTURE FAILURES:** Many railroad beds, county roads, state highways, bridges, and retaining walls were washed out, buckled, or damaged by mudslides. At least 30 significant petroleum spills occurred requiring response by the Minnesota Pollution Control Agency.




*Monthly Observed Precipitation for August 2007 (National Weather Service, 2007)*

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*Over the course of just three days, all or portions of 28 counties received at least four inches of rain, far above historical averages for the entire month.*

*Top: Rushford, MN (Jeff Thompson, 2007)*
*Bottom left: Kutzky Park (Melissa Eggler, 2007)*
*Bottom right: Homeowner Pumping Water (Sea Stachura, MPR News, 2007)*

# CLIMATE PROJECTION DATA

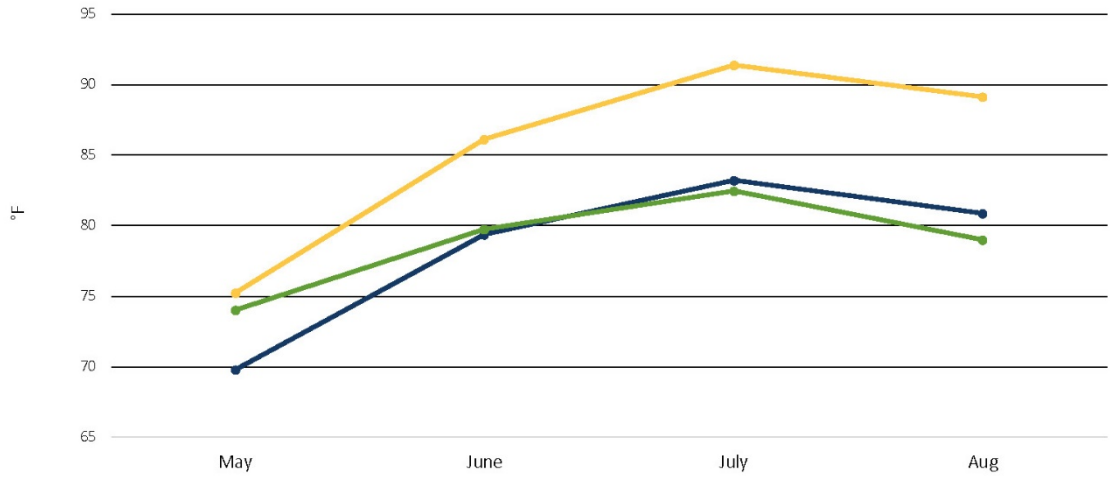
Following are visual representations of climate projection data for Region 1. Data for all counties included in Region 1 were averaged to derive regional estimates. (Data for individual counties are available in the long-form report.) The graphs below compare future temperature and precipitation projection data (in yellow) with a historical climate baseline (in blue) and climate measures from the regional case study event (in green). Because preceding conditions can influence a disaster event, data for months May, June, and July are also provided.

**LEGEND**

- **Historical:** 1981- 2010
- **Case Study:** 2007 flood
- **Projected:** 2050- 2074

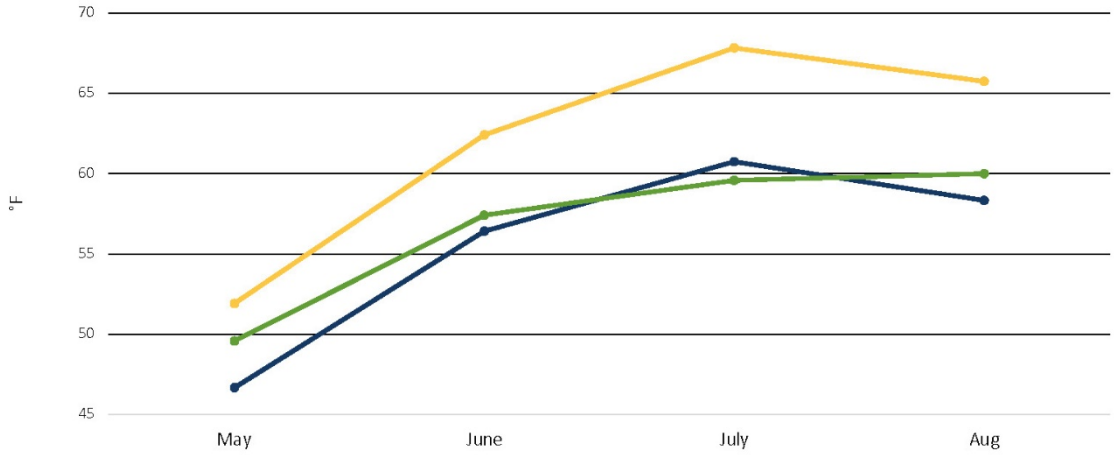
**Maximum Temperature**

Trend comparison to 2007 flood data



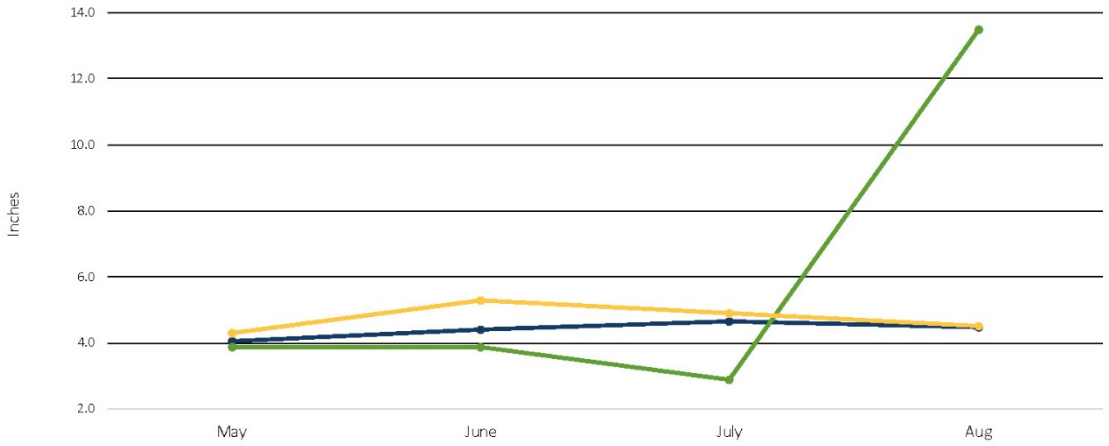

| | May | June | July | August |
|---|---|---|---|---|
| Historical: 1981- 2010 | 69.9 | 79.4 | 83.3 | 80.9 |
| Case Study: 2007 flood | 74.0 | 79.8 | 82.5 | 79.0 |
| Projected: 2050- 2074 | 75.3 | 86.1 | 91.4 | 89.1 |

**Minimum Temperature**
Trend comparison to 2007 flood data




| | May | June | July | August |
|---|---|---|---|---|
| Historical: 1981- 2010 | 46.7 | 56.4 | 60.7 | 58.3 |
| Case Study: 2007 flood | 49.6 | 57.4 | 59.6 | 60.0 |
| Projected: 2050- 2074 | 51.9 | 62.4 | 67.8 | 65.7 |

**Total Precipitation**
Trend comparison to 2007 flood data




| | May | June | July | August |
|---|---|---|---|---|
| Historical: 1981- 2010 | 4.1 | 4.4 | 4.7 | 4.5 |
| Case Study: 2007 flood | 3.9 | 3.9 | 2.9 | 13.5 |
| Projected: 2050- 2074 | 4.3 | 5.3 | 4.9 | 4.5 |

## SUMMARY

**CLIMATE DATA EXPERTS** expect that future climate conditions across the Midwest will continue to change and affect our environment, economy, and public health. Although it is difficult to attribute any single weather event to the influence of climate change, the mega-rain event that occurred in August 2007 represents the type of extreme rainfall event climate experts expect to see more of in the near future. Minnesota has experienced a four-fold increase in mega-rain events since the year 2000. These are events in which six inches of rain covers more than 1,000 square miles and the core of the event exceeds eight inches. Events of this scale and magnitude represent a substantial flood risk as demonstrated by the August 2007 rainfall. According to the NWS, 30 flash flood warnings and 31 river flood warnings were issued related to this event.

Why is climate change causing more extreme precipitation? Put simply, warming of the earth increases evaporation and warmer air can hold more water vapor. For each degree of warming, the air's capacity for water vapor goes up by about 7 percent, and an atmosphere with more moisture can produce more intense precipitation events. In addition, prolonged high heat days speed soil evaporation and coupled with extended periods of low rainfall can lead to hard soils that are less absorptive. When heavy rain events occur, these hard, dry soils can cause excessive runoff that overwhelm sewers and lead to severe flooding.

A comparison of precipitation data for the August 2007 event with past and future trends underscores how abnormal this event was historically, but provides little insight into how the probability of this event may increase in the future, particularly since average overall rainfall for August is not projected to change. However, monthly precipitation averages for May, June, and July are projected to increase. Even slight increases in average values could mean dramatic increases in extremes. It is difficult to project exactly how extreme these potential changes may become in the next few decades. Given expert consensus that extreme rainfall events will increase in the Midwest, recent historical data from Minnesota substantiating that trend, and the catastrophic potential of flood disasters support decision-making aimed at increasing community resilience to flooding. Resiliency strategies vary widely according to method of implementation and cost. Yet, many, like conservation practices, are proving highly effective at reducing flood risk. For example, the August 2007 flooding prompted an inventory of approximately 1,600 water and sediment control basins in Winona County, which not only held up well during the event, but contributed substantially to reducing peak stream and river flows and associated erosion (Kean, 2011).

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> *"Climate data is a critical tool in planning for resilient communities into the future."*

**CLIMATE DATA IS A CRITICAL TOOL** in planning for resilient communities into the future. Assessing threats from climate change and planning effective mitigation and response strategies is a key element for emergency managers and other planners to reduce future risk. It's crucial to understand the potential impacts of climate change and the associated priorities and vulnerabilities of communities, including population, the environment, critical infrastructure, and more. However, vulnerability is a nuanced concept and most effective as an indicator of risk when planners seek to understand and address vulnerability as close to the individual level as possible and in association with a specific hazard.

Population projections for HSEM Region 1 show a slight decrease in children but a substantial increase in elders. As older populations tend to have a greater need for health care services, disrupted access due to flooded roads or power outages is a major concern. Furthermore, evacuation and displacement from residences and support networks have greater adverse impacts on older individuals, making this a difficult response strategy to rising floodwaters and associated mudslides. Considering the impacts of climate change to vulnerable populations is just one example of how to prioritize mitigation and response planning.

**CLIMATE PROJECTION DATA** continues to improve and should be considered as a priority to advance for Minnesota. The precipitation projection data used for this profile were only available as monthly averages, and thus obscure the probability of daily, even hourly extremes that are the true drivers of flood risk. Minnesota would benefit from a statewide high-quality climate projection dataset that is derived using the climate and environment features unique to our state, similar to datasets developed for other states. Meanwhile, data from national resources, like the U.S. Geological Survey (USGS) and National Oceanic and Atmospheric Administration (NOAA), can still provide a powerful input to regional scenario-planning efforts by allowing planners, managers, and analysts a means of "unpacking" general climate change predictions for the Midwest by looking at potential monthly fluctuations in coarse precipitation and temperature measures for Minnesota and its counties.

# NEXT STEPS: MINIMIZE RISK & BUILD RESILIENCE

Prepare today for tomorrow's climate hazards. Emergency managers, planners, elected officials, and the public play a critical role in creating safe and healthy communities, especially in the face of extreme weather events. There are steps you can take to minimize local risk and build more resilient communities:

**BRING EVERYONE TO THE TABLE:** Build an inclusive yet nimble team to collectively identify climate hazards and potential impacts. Be sure to include members of the community; local department professionals responsible for built, natural, and health resources; planning commissioners; faith-based and cultural organizations; research centers; and commercial organizations. Including diverse perspectives throughout your process will help support more equitable planning efforts that best leverage cross-functional resources.

**INCORPORATE CLIMATE INTO PLANNING:** Incorporate climate projection data into planning efforts, such as exercise scenarios and long-range planning, to comprehensively identify future climate hazards and potential cascading effects. Explore how these interact with non-climate hazards in the community, such as aging infrastructure, to understand potential exposure to multiple threats and prioritize actions that build the community's capacity to respond.

**CHAMPION CLIMATE & HEALTH:** Be a champion for climate and health data. Seek opportunities to learn about these data and incorporate it in your work on an iterative basis. Support its application in professional networks and articulate the need to fund dynamically downscaled climate projection datasets for Minnesota. Climate data is a critical multi-discipline tool in proactively planning for resilient communities.

# RESOURCES & REFERENCES

## TOOLS & DATA

- Advanced Hydrologic Prediction Service, National Weather Service
  Data source for historical, current, and short-term future precipitation and river forecasts for all U.S. states.
  *https://water.weather.gov/precip/*
- Climate at a Glance: National Climatic Data Center, National Oceanic and Atmospheric Administration
  Source for all historical and much of the case study data presented in this profile.
  *www.ncdc.noaa.gov/cag/*
- Minnesota Climate and Health Profile Report (PDF), Minnesota Department of Health
  Profiles historic climate trends, future projections, and likely climate change impacts on the health of Minnesotans.
  *http://www.health.state.mn.us/divs/climatechange/docs/mnprofile2015.pdf*
- Minnesota Climate Change Vulnerability Assessment (PDF), Minnesota Department of Health
  Assesses five climate hazards and the populations that are most vulnerable to the hazards in Minnesota.
  *http://www.health.state.mn.us/divs/climatechange/docs/mnclimvulnreport.pdf*
- Minnesota Population Projection Data, Minnesota State Demographic Center
  Source for all population projection data presented in this profile.
  *https://mn.gov/admin/demography/data-by-topic/population-data/our-projections/*
- National Climate Change Viewer, United States Geological Survey
  Source for all climate projection data presented in this profile.
  *www2.usgs.gov/climate_landuse/clu_rd/nccv/viewer.asp*

# RESOURCES & REFERENCES

## KNOWLEDGE & CAPACITY

- Climate Change and Minnesota, Minnesota Department of Natural Resources
  Source of information on climate change trends and impacts for Minnesota, with an emphasis on natural resources.
  *https://www.dnr.state.mn.us/climate/climate_change_info/index.html*
- Five Steps Toward Enhancing Climate Resilience, Emily Wasley, DomesticPreparedness.com
  Practical action steps to help emergency managers build a path to enhance their climate resilience.
  *https://www.domesticpreparedness.com/resilience/five-steps-toward-enhancing-climate-resilience/*
- Flooding in Minnesota, Minnesota Department of Natural Resources
  Comprehensive catalog of drought information.
  *https://www.dnr.state.mn.us/climate/floods/index.html*
- U.S. Climate Resilience Toolkit, United States Global Change Research Program
  Information and tools to help communities adapt to climate change, featuring real-world case studies.
  *https://toolkit.climate.gov/*

## REFERENCES


- Kean, 2011. Brief Analysis of Flooding in Minnesota (PDF). Minnesota Board of Water & Soil Resources
  *http://www.bwsr.state.mn.us/publications/flooding_analysis-2011.pdf*


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*Front cover photo: Washout (Sea Stachura for MPR, 2007)*


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