Multi-Hazard Mitigation Plan

Beltrami County, Minnesota, 2020

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Multi-Hazard Mitigation Plan
Beltrami 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 in order to maintain eligibility for federal hazard mitigation grant funding programs. In order 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).

Beltrami 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 MHMP represents the efforts of Beltrami 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 Beltrami County Emergency Management Director and U-Spatial@UMD have combined efforts to update the 2013 Beltrami County MHMP. U-Spatial@UMD contracted with Hundrieser Consulting LLC for additional emergency management planning expertise and facilitation.

This MHMP evaluates and ranks the major natural hazards affecting Beltrami 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 Beltrami County, including the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton. The Beltrami 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 Beltrami County after final approval by FEMA, in Appendix D in the back of the plan.

Beltrami County has specified the following goals for this MHMP update:

- Include more recent data documenting the critical infrastructure and hazards faced by Beltrami 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 Beltrami 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, and 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, mass notification systems 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 Beltrami County MHMP steering committee is headed by the Beltrami County Emergency Management Director, who is the primary point of contact. Members of the Beltrami County MHMP steering committee include representatives from the public, private 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
Christopher Muller	Beltrami County Sheriff's Office	Emergency Management Director
Ernie Beitel	Beltrami County Sheriff's Office	Sheriff
Jarrett Walton	Beltrami County Sheriff's Office	Chief Deputy
Brent Rud	Beltrami County Environmental Services Dept.	Director
Bruce Hasbargen	Beltrami County Highway Dept.	County Engineer
Brent Kinn	Beltrami County Highway Dept.	Highway Maintenance Foreman
Lauren Williams	Beltrami County Highway Dept.	Administrative Support
JoDee Treat	Beltrami County Auditor's Office	Auditor
Kevin Trappe	Beltrami County GIS	Director
Cindy Borgen	Beltrami County Public Health	Director
Megan Heuer Korhonen	Beltrami County Public Health	Manager
Carrie Yavara	Beltrami County Public Health	Intern
Amy Card	Northwest Health Services Coalition	Regional Healthcare Preparedness Coordinator
Rich Riewer	Beltrami Electric Cooperative	Manager of Engineering
Holy Solo	Beltrami Electric Cooperative	Enginnering/Operations
Mike Mastin	City of Bemidji, Police Dept.	Chief of Police
Erin Morrill	Bemidji State University/NTC	Security Coordinator
Joseph Corser	Bemidji Ambulance	Quality Director
Jake Howard	Bemidji Ambulance	Personnel Director
David Hoefer	Bemidji Fire	Fire Chief
David Hansen	Bemidji Public Works	Street Superintendent
Jace Grangruth	City of Blackduck, Police Dept.	Chief of Police
Shelli Krueth	City of Kelliher	City Clerk
Brian Halbasch	Hubbard County	Emergency Management Director
Chad Emery	Cass County	Emergency Management Director
Erik Beitel	Pennington County	Emergency Management Director

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

Beltrami County and its local communities utilized a variety of planning documents to direct community development. These documents include an Emergency Operations Plan, Continuity of Operations Plan, Transportation Plan, Community Wildfire Protection Plan, etc. (see Appendix J for a full listing of plans and programs in place in Beltrami 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 Beltrami County MHMP, 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 Beltrami 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 Beltrami County's MHMP 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

In order to update the 2013 Beltrami County MHMP, UMD consultants worked in coordination with the Beltrami 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 Beltrami County residents and emergency planning officials, but also new thinking about how to best address these hazards.

2.3.1 Beltrami County Stakeholder Participation

On January 3, 2019, U-Spatial@UMD hosted a kickoff meeting online that was attended by the Beltrami 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 MHMP, planning process and projected timeline (see Appendix E for webinar slides).

On January 18, 2019, Beltrami County issued a news release inviting public feedback and participation for the Beltrami County MHMP update (for complete documentation, see *Appendix F: Public Outreach & Engagement Documentation*).

A steering committee meeting took place on June 5, 2019, at the Beltrami County Law Enforcement Center in Bemidji, which included the Beltrami 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 Beltrami County MHMP update, as well as the role and responsibilities of steering committee members. *Appendix E* provides documentation of steering committee meeting summaries, including a list of invited stakeholders, 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 May 22, 2020, members of the steering committee convened again with the UMD planning team via Zoom phone and video conferencing to conduct a review of the risk assessment presented in the plan. Consultants discussed the draft mitigation action charts developed for Beltrami County and each of the city jurisdictions participating in the plan. See *Appendix E* for a full meeting summary.

In order to provide opportunity for public input, Beltrami County issued a second news release on **, 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 Beltrami County MHMP, including excerpts of the Beltrami 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 Beltrami County and jurisdictions. The public feedback period for the draft plan was open from **, 2020 to **, 2020, for a total of ** days.

Table 2. Beltrami County Hazard Mitigation Update Meetings and Public Outreach

Meeting Type	Date	Location
Kickoff Webinar	1/3/2019	Hosted online by UMD in Duluth
Public Outreach	1/18/2019	News release inviting public feedback and participation
Steering Committee	6/5/2019	Beltrami County Law Enforcement Center, Bemidji, MN
Steering Committee	5/22/2020	Remote meeting via Zoom phone and video conferencing
Public Outreach		Public review period for draft plan

At the close of the public outreach period, the UMD consultants worked with the Beltrami County Emergency Management Director and members of the steering committee to incorporate comments from the public into the MHMP.

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

2.3.2 Overview of Jurisdictional Participation

Throughout the planning process, Beltrami 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 Beltrami 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)	6/5/2019 Planning Team Mtg. #1 (Appendix E)	Local Mitigation Action Chart Review (Section 5.3.2)	Planning Team Mtg. #2 (Appendix E)	Draft MHMP Review (Appendix F)
Beltrami County	X	X	X	X	
City of Bemidji	X	X	X	X	
City of Blackduck	X	X	X		
City of Funkley					
City of Kelliher	X	X	X		
City of Solway					
City of Tenstrike	X		X		
City of Turtle River					
City of Wilton	X		X		

Section 3 – Beltrami County Profile

This section offers a general overview of Beltrami 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

Beltrami County is located in the northwestern part of the state. It borders Clearwater, Marshall and Pennington Counties in the west, Hubbard and Cass Counties in the south, Itasca and Koochiching Counties in the east, and Lake of the Woods and Roseau Counties to the north. The county seat, Bemidji, lies approximately 230 miles north/northwest of the Minneapolis/St. Paul metropolitan area.

The eight cities in Beltrami County are Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton. Parts of the Red Lake Nation and Leech Lake Reservations are also located in the geographic boundary of the county.

Beltrami County is dominated by the education and health service industries. Trade/Transportation/ Utilities are also major components of the county's economy. The percent of the county's population living below the poverty level is 18.5%, compared to a 10.1% average for the state of Minnesota.

3.2 Environmental Characteristics

During four different glacial periods several thousand years ago, Beltrami County was covered by ice sheets that spread from centers northwest of Winnipeg. During each advance, ice brought enormous quantities of rock fragments, partly stones, but mostly finer material in the form of silt, sand, and clay. When the ice melted it dropped the transported material, known as glacial till.

The soils and topography of Beltrami County are derived from this glacial action. The glacial till is the parent material that formed the soil. The action of the glaciers moving across the landscape, carving out basins and depositing till created the complex of glacial moraines that forms the topography of Beltrami County.

Soils in Beltrami County can be characterized by describing three different areas. The northern portion of Beltrami was covered by glacial Lake Agassiz. The remnants of this lake can be seen as Upper and Lower Red Lake. The middle area of the county has clay-loamy soils resulting from organic materials. There is hilly topography created by glacial moraines. Southern Beltrami is comprised of sand and gravel soils typical of glacial moraines.

Beltrami County has a diverse topography, gradually changing from rolling hills and lakes in the south to flat, low areas in the north.

A continental divide separates the drainage between the lowest third of the county and the upper two thirds. The area below this divide is a prime amenity area, consisting of recreational lakes, mixed

conifer and deciduous forests, and most of the developed uses in the county. This area drains to the south and the Mississippi River.

Between the continental divide and Red Lake is generally flatter terrain, providing better land for cultivation, agriculture and deciduous forests. North of Red Lake is a large, flat area of peat bog and lowland coniferous forests. This area drains to the north and west, eventually heading to Hudson Bay.

The highest elevation in the county, 1,486 feet above sea level, is located in section 10 of Buzzle Township. The lowest elevation, 1,152 feet, is in the north where the Moose River flows out of the county. Generally, the northern sector is confined to elevations below 1,325 feet and the southern sector is at higher elevations.

3.3 Hydrography

Beltrami County contains numerous lakes, comprising over 116,000 acres in area (Beltrami County, 2014). The county contains portions of land located within three major drainage basins: the Mississippi River Basin flowing south towards the Gulf of Mexico, the Red River Basin flowing north towards Hudson Bay, and the Great Lakes Basin flowing east into the Atlantic (MN PCA, n.d.).

The eight major watersheds in Beltrami County are Rapid River, Roseau River, Thief River, Clearwater River, Red Lake River, Upper/Lower Red Lake, Leech Lake River, and Mississippi River Headwaters (Beltrami County, 2017).

Impaired waters are an increasing problem as Beltrami County has many rivers and creeks that are on the Minnesota Pollution Control Agency Impaired Waters lists, including the Clearwater River, Battle River North Branch, Blackduck River, Darrigans Creek, Hay Creek, Mud River, North Cormorant River, O'Brien Creek, Perry Creek, Pike Creek, Sandy River, Shotley Brook, South Cormorant River, and Mississippi River (MN PCA, 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 Beltrami County waters include E. coli, mercury in fish tissue, eutrophication, and dissolved oxygen, among others (MN PCA, 2018).

Basic hydrography in Beltrami County is mapped in Figure A - 1 in *Appendix A*.

3.3.1 Groundwater

Beltrami County's groundwater is primarily near the surface in glacial sand and gravel. Sand aquifers are thick and yield large quantities of water. When these aquifers are near the land surface, they may be vulnerable to contamination. Bedrock aquifers yield low to moderate quantities of water in areas where sand aquifers do not occur (MN PCA, n.d.).

There are two groundwater provinces in the county (a total of six are found in Minnesota). A groundwater province is defined as an area where the characteristics of the groundwater system are similar. The two provinces, Provinces 4 and 5, split the county in half with the boundary just south of Red Lake (Beltrami County, 2017).

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 is relatively shallow and has many areas of moderate to high pollution sensitivity.

Figure A - 23 in *Appendix A* maps pollution sensitivity of near-surface materials from the transmission time of water through three feet of soil and seven feet of surficial geology, to a depth of 10 feet from the land surface.

3.3.2 Lakes

Beltrami County contains approximately 276 lakes. Water covers approximately 551 square miles of the county, or 18%. According to the Minnesota DNR, there are 39 bodies of water that are 500 acres or larger (MN DNR, 2014).

The largest lake in Beltrami County is Red Lake, with an area of around 427 square miles. It is the largest freshwater lake completely within Minnesota. The two portions of the lake are often designated as Upper Red Lake and Lower Red Lake (MN DNR, 2013).

3.3.3 Rivers

Three major rivers flow through Beltrami County: the Mississippi River, Clearwater River, and Roseau River. The Mississippi River begins in Clearwater County directly west of Beltrami County, flowing eastward across the southern part of the county, and is designated as a Minnesota State Water Trail by the DNR. The Clearwater River flows briefly through the county near Buzzle and then 147 miles due west until converging with the Red Lake River. The Roseau River cuts through a corner of the county in the north and then flows 214 miles northwest converging with the Red River in Manitoba (MN DNR, 2013). Both the Clearwater and Roseau rivers are part of the Hudson Bay drainage basin (MN PCA, n.d.).

3.3.4 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 Beltrami 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 Beltrami County

Name	Owner	Waterway	Primary Type	Primary Purpose
Blackduck Lake	Township of Hines	Blackduck River	Unknown	Unknown
Buena Vista State Forest 1	MNDNR-Wildlife	Turtle River-TR	Unknown	Unknown
Erickson Lake	MNDNR	Gull River	Unknown	Unknown

Name	Owner	Waterway	Primary Type	Primary Purpose
Forster Rice Paddies	Beltrami County Natural Resource Department	Rustad Creek	Earth	Other
Fox Lake	MNDNR	Turtle River-TR	Other	Other
Knutson	USDA FS	Mississippi River	Stone	Other
Lake Bemidji	Ottertail Power Co	Mississippi River	Gravity	Hydroelectric
Little Turtle Lake	MNDNR		Unknown	Unknown
Moose River Project	WD of Red Lake	Moose River	Earth	Flood Control
Movil Lake	MNDNR	Turtle River	Gravity	Other
Mud River	Red Lake Fisheries Assoc	Mud River	Unknown	Unknown
Plantagenette Lake	MNDNR		Unknown	Unknown
Rabideau Lake	MNDNR	North Turtle River	Concrete, Gravity	Fish and Wildlife Pond
Teske Pond	Teske, Grant	Clearwater River	Unknown	Unknown
Three Island Lake	MNDNR-Trails	Turtle River	Unknown	Unknown

Levees are used to increase cultivation in agriculture and to protect population and structures from floods. However, there are no levees in Beltrami County.

3.3.5 Wetlands

Wetlands cover a total area of 2,015 square miles in Beltrami County (MN DNR, 2019). 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 (EPA, n.d.).

Wetlands in Beltrami County include eight types: bogs, deep marshes, open water wetlands, seasonally flooded basins, shallow marshes, shrub swamps, wet meadows, and wooded swamps (Figure A - 1).

Invasive plants have spread throughout many wetlands in Minnesota. These plants can take over entire native communities and threaten wetland ecosystems. Zebra mussels, faucet snails, and starry stonewort have been documented in Beltrami County (MN DNR, 2018).

3.4 Climate

Northern Minnesota is known for its seasons which contribute to the charm of the region. Each season can be characterized substantially different.

Spring is characterized by warming temperatures. With snowfall melts and under certain conditions, generally saturated soils and excess precipitation, spring riverine flooding results.

Summer brings warm, humid weather. The primary source of precipitation in summer months is derived from convection systems that deliver high-intensity, short duration rainfall over limited areas. These types of storms can also generate hail. When these thunderstorms occur over a large enough area, overland flash flooding can occur. Similarly low level tornadoes are common in the summer months with activity similar to severe thunder storms.

Fall experiences cooling temperatures transitioning into winter.

Winter is markedly colder than the other seasons, typically with deep snow conditions.

Drought, lack of precipitation over a long period that results in drier than normal soil conditions, lower than normal surface water levels, and slower rates of groundwater recharge may occur in all seasons.

3.4.1 Climate Change

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 (MDH, 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 change 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 Northwest Minnesota: Emergency Management Considerations for HSEM Region 3." 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 change 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 3 profile. *Appendix L* provides the full MDH profile for Region 3, which includes Beltrami 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 climate change.

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 (MDH, 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 (MDH, 2018).

3.5 Demographics

Bemidji is the largest city in Beltrami County and the designated county seat (U.S. Census Bureau, 2010). There are eight cities and 42 townships within the county (Beltrami County, n.d.).

Table 5 summarizes the population by community according to the 2010 U.S. Census. Figure 1 shows Beltrami County population density by census block.

Table 5. Beltrami County Population by Community, 2010

Community	2010 Population	% of County
Alaska Township	217	0.49
Battle Township	46	0.1
Bemidji	13,431	30.22
Bemidji Township	3,134	7.05
Benville Township	86	0.19
Birch Township	118	0.27
Blackduck	785	1.77
Brook Lake UT	233	0.52
Buzzle Township	310	0.7
Cormant Township	158	0.36
Durand Township	209	0.47
Eckles Township	1,516	3.41
Frohn Township	1,433	3.22
Funkley	5	0.01
Grant Valley Township	2,029	4.57
Hagali Township	372	0.84
Hamre Township	13	0.03
Hines Township	689	1.55
Hornet Township	232	0.52
Jones Township	277	0.62
Kelliher	262	0.59
Kelliher Township	130	0.29
Lammers Township	592	1.33
Langor Township	213	0.48
Lee Township	51	0.11
Liberty Township	730	1.64
Lower Red Lake UT	5,790	13.03
Maple Ridge Township	104	0.23
Minnie Township	26	0.06
Moose Lake Township	226	0.51
Nebish Township	290	0.65
North Beltrami UT	34	0.08
Northern Township	4,657	10.48
O'Brien Township	58	0.13
Port Hope Township	673	1.51

Community	2010 Population	% of County
Quiring Township	70	0.16
Roosevelt Township	225	0.51
Shooks Township	189	0.43
Shotley Township	35	0.08
Shotley Brook UT	25	0.06
Solway	96	0.22
Spruce Grove Township	55	0.12
Steenerson Township	23	0.05
Sugar Bush Township	247	0.56
Summit Township	251	0.56
Taylor Township	104	0.23
Ten Lake Township	1,026	2.31
Tenstrike	201	0.45
Turtle Lake Township	1,195	2.69
Turtle River	77	0.17
Turtle River Township	1,085	2.44
Upper Red Lake UT	14	0.03
Waskish Township	118	0.27
Wilton	204	0.46
Woodrow Township	73	0.16
Total	**44,442**	

Source: U.S. Census Bureau, 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, Beltrami County had a population of 44,442, averaging 17.7 persons per square mile of land area (U.S. Census Bureau, 2010). Bemidji, the largest city in the county and the county seat, had a population of 13,431 (U.S. Census Bureau, 2010).

Beltrami County's population is steadily increasing, rising 15.3% between 1990 and 2000, and rising another 12.1% from 2000 to 2010. Historically, the population of Beltrami County has increased significantly. Since 1940, the population has increased by 70.2%. Table 6 below shows the population change in Beltrami County between 1940 and 2010. Population change by township from 2000 to 2010 is mapped in *Appendix A*.

Table 6. Beltrami County Population Change (1940-2010)

1940	1950	1960	1970	1980	1990	2000	2010	Change 1940-2010	Change 2000-2010

26,107	24,962	23,425	26,373	30,982	34,384	39,650	44,442	+ 70.2%	+ 12.1%

Source: Population.us

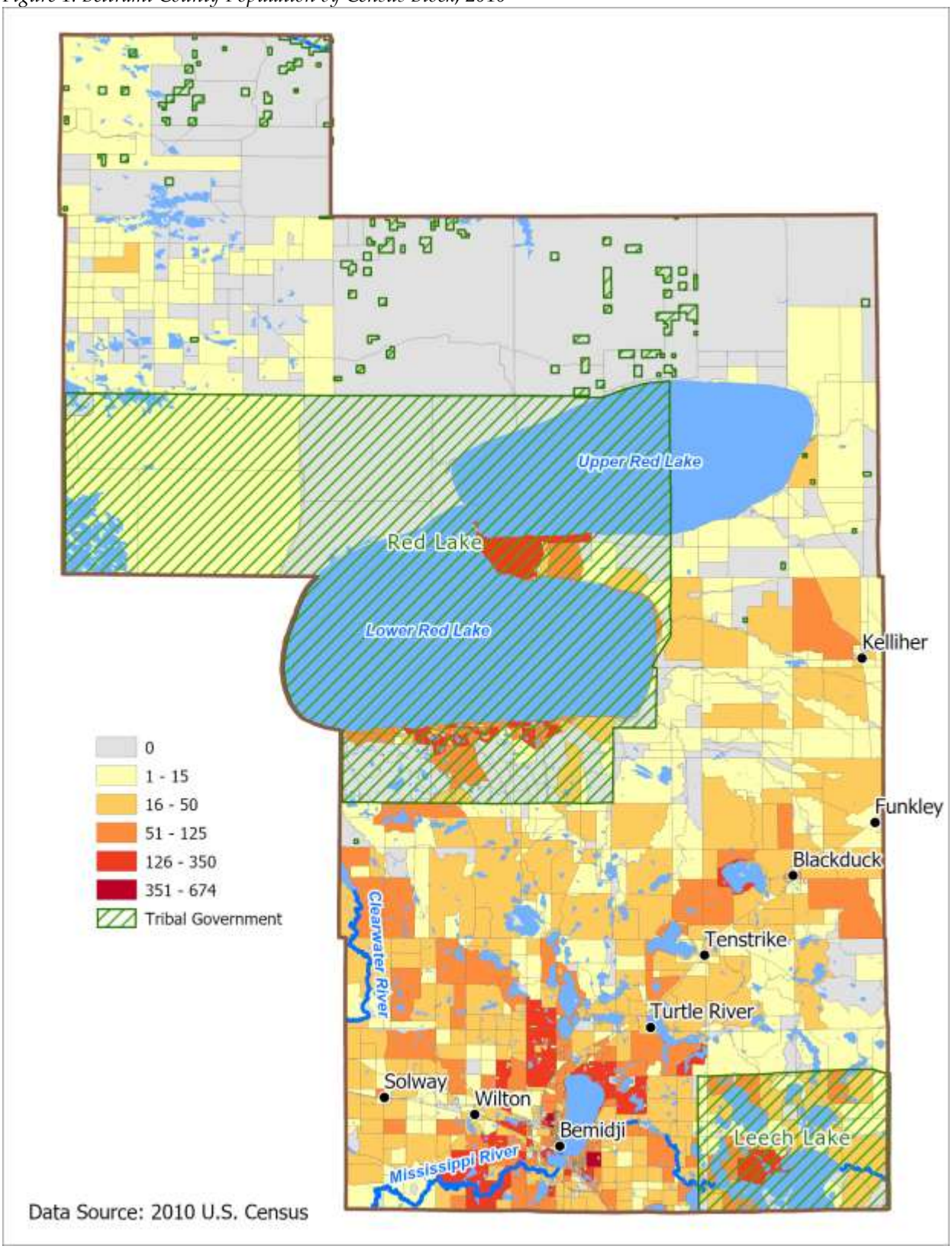
In 2015, Beltrami County's population was projected to increase by 11% between 2015 and 2050. Table 7 below shows population projections for Beltrami County until 2050.

Table 7. Beltrami County Population Projections (2015-2050)

2015	2020	2025	2030	2035	2040	2045	2050	Projected Change 2015-2050
46,169	47,604	48,723	49,526	50,158	50,604	50,930	51,270	11%

Source: Minnesota State Demographic Center, Minnesota Planning, 2017

Figure 1. Beltrami County Population by Census Block, 2010



3.5.1 Population Vulnerability

The degree to which a person is vulnerable to the impacts of a hazard depends on how well he/she is able to 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). These stressors now increasingly include the more extreme weather events and longer-term impacts of Minnesota's changing climate.

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 ATSDR SVI ranks census tracts on 15 social factors which are grouped into four themes (Table 8).

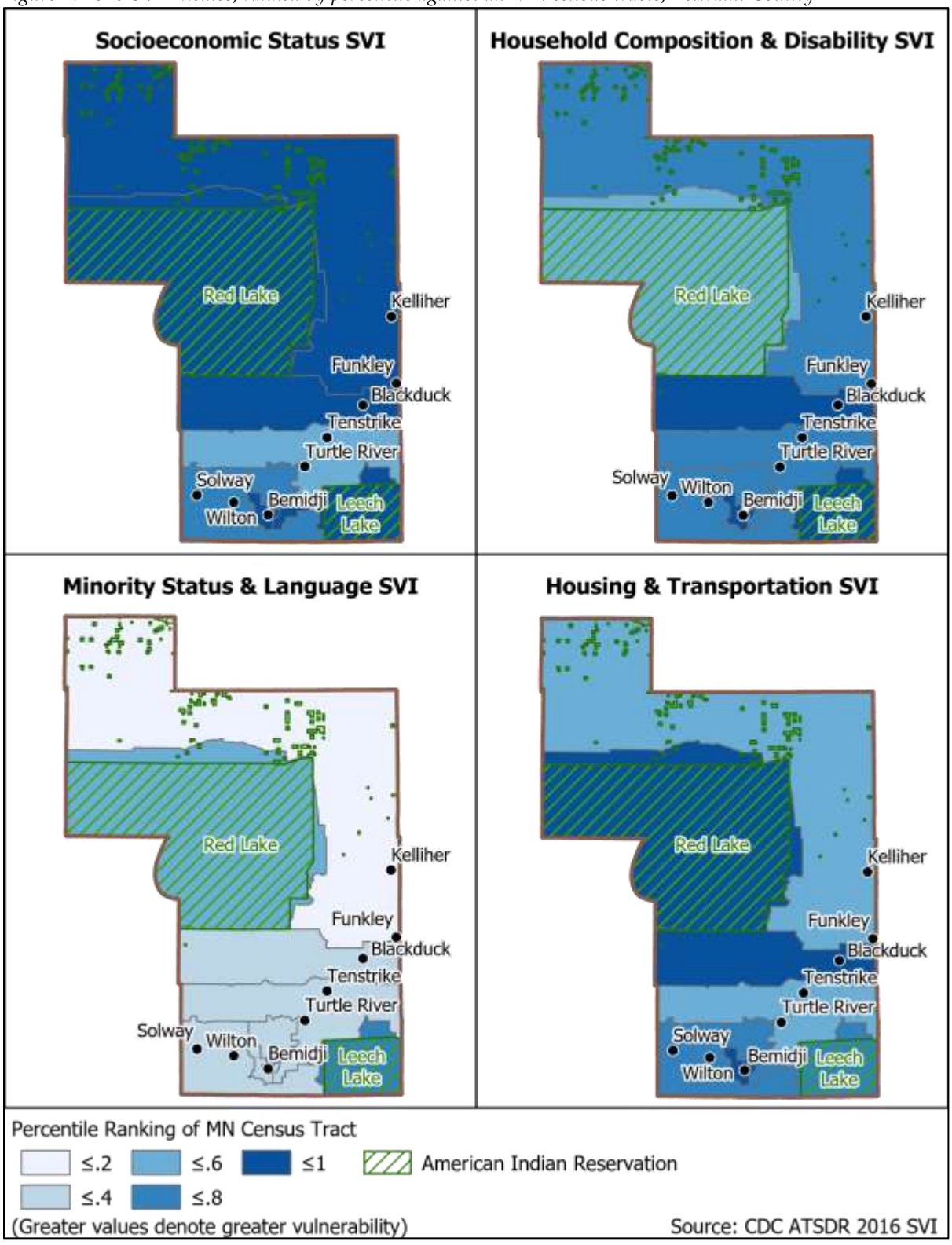
Table 8. Social Vulnerability Index (SVI) Variables

Theme	Social Factors
Socioeconomic Status	• Proportion individuals below poverty level • Proportion civilians unemployed 16+yrs • Per capita income in 1999 • Proportion persons with no high school diploma 25+yrs
Household Composition & Disability	• Proportion persons 65 years or older • Proportion persons 17 years or younger • Proportion persons with disability 5+yrs • Proportion single-parent HH with children under 18 yrs
Minority Status & Language	• Proportion minority • Proportion persons 5+yrs who speak English less than 'well'
Housing & Transportation	• Proportion housing with 10+units • Proportion mobile home • Proportion HH with more people than rooms • Proportion HH with no vehicle access • 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/. A map of each SVI theme for Beltrami County is displayed in Figure 2.

Figure 2. 2016 SVI Themes, ranked by percentile against all MN census tracts, Beltrami County



3.6 Economy

Beltrami County is dominated by the education and health service industries. Trade/Transportation/ Utilities are also major components of the county's economy.

The number of jobs in the county rose by 13% between 2008 and 2018. Table 9 provides an overview of the annual average employment by major industry sector in Beltrami County.

Table 9. Annual Average Employment by Major Industry Sector, Beltrami County

Industry	Number of Jobs (2008)	Number of Jobs (2018)
Natural Resources and Mining	63	143
Construction	1,117	1,332
Manufacturing	1,237	1,017
Trade, Transportation, Utilities	3,982	4,140
Information	407	354
Financial Activities	521	538
Professional /Business Services	765	687
Education and Health Services	5,508	6,893
Leisure and Hospitality	1,916	2,462
Public Administration	1,661	1,994
Other Services	558	456
Total Number of Jobs:	**17,737**	**20,018**

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 2014-2018 American Community Survey five-year estimates, the median household income in Beltrami County was $47,410, compared to a Minnesota average of $68,411. The percent of the county's population living below the poverty level was 18.5%, compared to a 10.1% average for the state of Minnesota.

3.7 Critical Infrastructure

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

Critical infrastructure have been identified based on FEMA guidelines (FEMA, 2013) as well as input from Beltrami County. Critical infrastructure 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 infrastructure in Beltrami County, see *Appendix B*.

3.7.1 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 - 5 and Figure A - 6 display the locations of the emergency and shelter facilities within Beltrami County.

3.7.1.1 Healthcare Facilities

Beltrami County is serviced by Sanford Bemidji Medical Center, which is located in Bemidji as well as having other clinics in Kelliher and Blackduck. The Bemidji Ambulance service operates in the county responding to over 4,200 calls per year. Additionally, there are two clinics specializing in behavioral health and mental support, both of which are located in Bemidji. Five nursing homes and four assisted living facilities provide senior care and aid to individuals needing day-to-day supervision. The majority of these facilities are in Bemidji with nursing homes in Blackduck and Kelliher.

3.7.1.2 Emergency Services

Law Enforcement

The Beltrami County Sheriff's Office provides law enforcement throughout the county. Located in Bemidji, the County Sheriff provides professional services through field patrol deputies, criminal investigators, civil process officers, 911 communications officers, bailiffs, corrections officers, records technicians, boat and snowmobile patrol officers, and emergency management (Beltrami County, 2014). There are additional police departments in Bemidji and Blackduck. Leech Lake Tribal Police Department has a cooperative law enforcement agreement with Beltrami County for the shared jurisdiction for the reservation boundary in Beltrami County.

Beltrami County is also patrolled by 31 officers of the Minnesota State Patrol, primarily for traffic enforcement and highway safety on the state trunk highway system as well as providing statewide law enforcement. Beltrami County is served by the 3200 district, headquartered in Thief River Falls.

The one Emergency Operations Center in Beltrami County is located in the Beltrami County Sheriff's Office in Bemidji. Duties of the EOC include, but are not limited to, hazard response coordination, volunteer help, communication with government agencies on all levels, and the production of information suitable for public viewing and education.

Fire & Rescue Services

Structure fires are served by local fire districts and fire departments. Each district is responsible for fires within their district boundaries; however, they can work together on larger fires. Fire departments are located in Bemidji, Blackduck, Kelliher, Alaska Township, and Solway.

These local resources work with other regional, statewide, and federal assets to provide support. Bemidji is the site for many of these regional assets, such as an air ambulance base, regional MN DNR

offices, and the regional FBI offices. It should also be noted the neighboring and overlapping jurisdictions, such as the Leech Lake and Red Lake Tribal Governments, have responsibilities for law enforcement, EMS, and fire within the county.

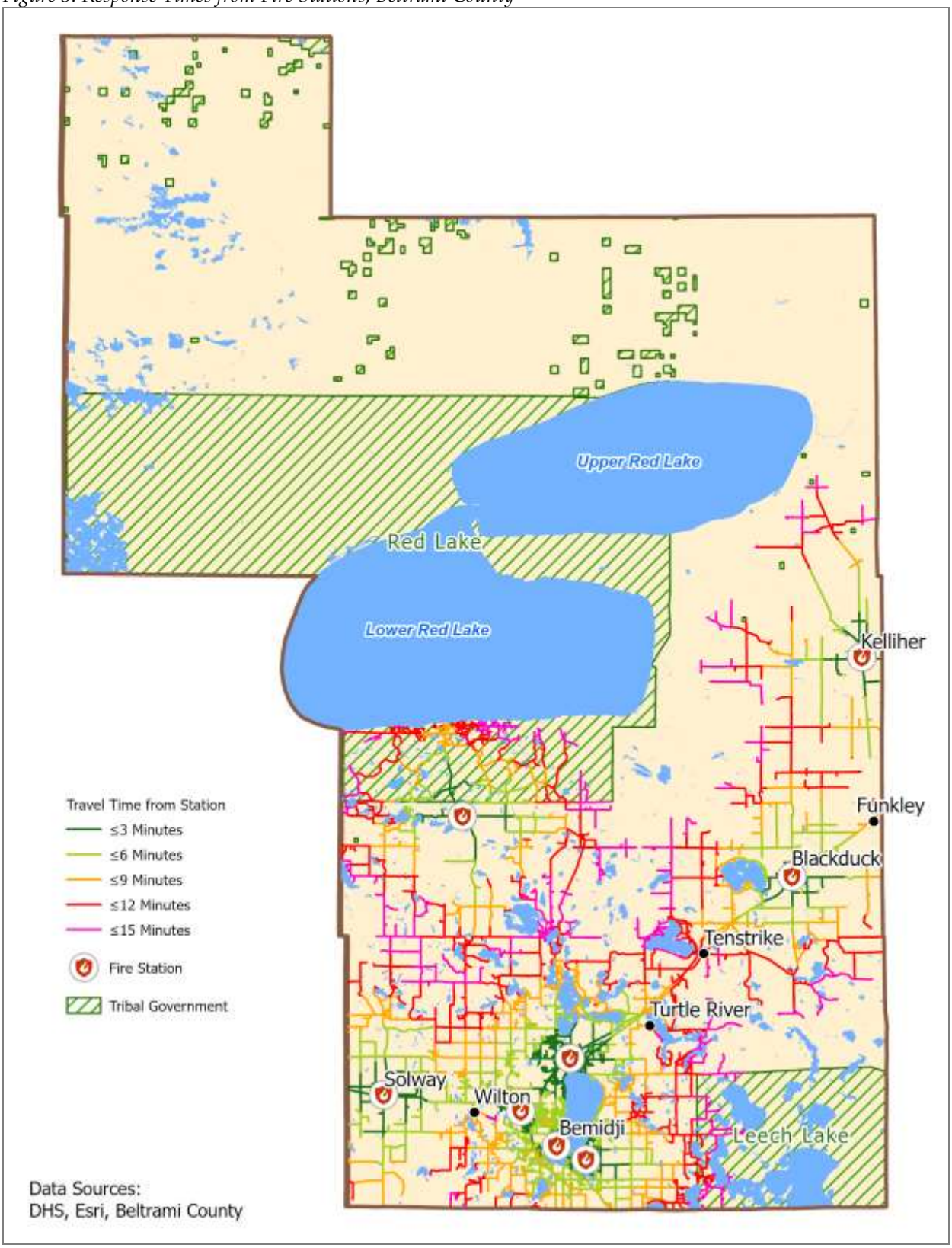
Figure 3 shows fire response drive times from fire stations in Beltrami County. These drive times are created using data from Esri's Business Analyst and running the ArcGIS Network Analyst extension. The user may note discrepancies between MnDOT road data and this map; Network Analyst requires a seamlessly-connected 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 residents in the county are within 15 minutes of a fire department.

3.7.1.3 Schools & Evacuation Centers/Shelters

The Bemidji Public School District is made up of eight elementary schools, a middle school, two high schools and five additional academic programs providing education and resources to 5,081 students. Blackduck School District consists of an elementary and high school for 620 students. Both schools are located in Blackduck. Cass Lake-Bena School District and Grygla-Gatzke School District serve Beltrami County in the SE and NW corners.

FEMA and the American Red Cross have designated 26 facilities within Beltrami County as shelters to be used in the event of an issued evacuation. Schools, churches and government buildings make up a majority of these shelters. Fourteen of the shelters are located in Bemidji with others located in all other major towns in the county.

Figure 3. Response Times from Fire Stations, Beltrami County



3.7.2 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.

3.7.2.1 Transportation Systems

The infrastructure of transportation systems facilitates the movement of individuals, goods, and services. Figure A - 8 displays Beltrami County's transportation systems.

Roadways

The primary roadways in Beltrami County are MN State Highway 89 in the northwest of the county and continuing south to Wilton. US Highway 2 intersects Bemidji as it passes across the southwest corner of the county. US Highway 71 passes from Bemidji towards Blackduck where it meets up with MN State Highway 72, which runs north-south in eastern Beltrami County.

The Minnesota Department of Transportation uses a functional classification to group the streets and highways into classes or systems according to the character of service they are intended to provide. Table 10 lists the total miles of road for each route system within Beltrami County.

Table 10. Road Miles by Route System

Route System Defined	Miles
County Road	246
County State Aid Highway (CSAH)	464
MN Highway	168
Municipal	100
Municipal State Aid Street (MSAS)	18
National Forest Road	242
Private Road-Public Access	56
Ramp or Connector	5
State Forest Road	87
State Park Road	3
Township Road	833
Tribal Road	258
Unorganized Territory Road	122
US Highway	85
Total	**2,687**

Source: (MnDOT, 2012)

The Beltrami County Highway Department is responsible for the survey, design, construction, inspection, maintenance and repair of the Beltrami County road and bridge system which consists of the 465 CSAH miles, 255 county road miles, and 127 bridges.

Railways

The one railway in Beltrami County passes through Bemidji and Solway in the southwest corner of the county. The railway is operated by the Grand Forks subdivision of the Twin Cities BNSF.

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 Beltrami County.

Airports

There are two public airports in Beltrami County; Bemidji Regional Airport (located west of downtown Bemidji), and Waskish Municipal Airport (located south of Waskish). In addition, the Moberg Air Base Seaplane Base, located one mile south of Bemidji Regional Airport, is a privately-owned seaplane base available to the public.

3.7.2.2 Utility Systems

The infrastructure of utility system networks facilitates the process of providing essential utilities to consumers. A map of the major utilities systems in Beltrami County is displayed in Figure A - 9.

Water & Sewer

According to data from the Minnesota Pollution Control Agency, there are nine wastewater facilities in Beltrami County. The local governments of Bemidji, Blackduck and Kelliher own and operate plants in their respective cities; several other private companies own and operate the other facilities.

Energy

Fifteen electric substations and numerous electric lines are located in Beltrami County, operated by the Otter Tail Power Company, Minnkota Power Corporation, Inc., and Xcel Energy.

There are several pipelines crossing the county which carry natural gas, petroleum and crude oil. The pipelines are operated by Enbridge and the Great Lakes Gas Transmission Company.

There is one power plant in Beltrami County, Solway CT, owned by Otter Tail Power Co.

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 eight ARMER towers in Beltrami County.

3.7.3 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. A map displaying the locations of these structures is in Figure A - 10.

3.7.3.1 Dams & Levees

As previously mentioned in section 3.4.4, there are 15 dams and no levees in Beltrami County.

3.7.3.2 Hazardous Materials Facilities

Hazardous materials facilities contain extremely hazardous materials that would threaten the public if released. The inventory of these facilities in Beltrami County includes those required to register with the EPA due to the type and quantity of hazardous materials being stored or produced at the facility. There is one such facility in the county, located north of Blackduck.

3.7.4 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 Beltrami County's significant county assets are listed in *Appendix B*.

3.7.4.1 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. Twenty of these employers were identified in Beltrami County.

3.7.4.2 Government Buildings

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

3.7.4.3 Cultural Resources

Cultural resources are cultural or historic assets that are unique or irreplaceable, or any asset that is important to a community. Eleven cultural resources have been identified in the county: six buildings, two districts, one object, and two structures.

3.8 Land Use and Ownership

Beltrami County covers a total of 3,056 square miles. Land cover in the county is characterized by a regionally typical mix of deciduous, coniferous, and wetland vegetation. Upland forest cover is more prominent in the southern sector of the county below Red Lake. Conversely, wetlands and lowland forests dominate much of the northern section of the county above the lake.

In 2017, there were 583 farms in the county, covering 168,667 acres. Of this farming land, 47% is cropland, 22% is pastureland, 21% is woodland, and the rest is classified as "other." The number of farms in the county increased by 2% between 2012 and 2017, while the number of acres farmed decreased by 7%. The average size of each farm decreased by 8% (Census of Agriculture, 2017).

According to Minnesota DNR data, the number of feedlots in Beltrami County is 87. Feedlots in Beltrami County are mapped in Figure A - 22 in *Appendix A*.

Land ownership categories from the 2008 U.S. Geological Survey GAP (Gap Analysis Program) are shown in Figure A - 12 (*Appendix A: Beltrami County Maps*). Land cover is mapped in Figure A - 11.

Structure Replacement Costs

Beltrami County building-specific 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 Beltrami County is shown in Table 11.

Table 11. Beltrami County Total Building Exposure

General Occupancy	Parcels Containing Structures	Total Building Exposure
Residential	22,950	$2,159,583,463
Commercial	222	$90,047,446
Other	4,036	$230,886,458
Total	**27,208**	**$2,480,517,367**

Section 4 – Risk Assessment

The goal of mitigation is to reduce or eliminate the future impacts of a hazard that could include 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 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 relevant and visual 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 12 lists the natural hazards included in the 2019 Minnesota State Hazard Mitigation Plan.

Table 12. 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 Beltrami County, updated the existing mitigation actions published in the 2013 MHMP, 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 MHMP (Table 13). The natural hazards that pose risk to Beltrami 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 Beltrami County were categorized the same way as the priority hazards established by the State of Minnesota.

Table 13. Natural hazards identified in the 2013 Beltrami County Multi-Hazard Mitigation Plan

Natural Hazards			
Flooding	Wildfire	Severe Summer Weather	Severe Winter Weather

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 Beltrami County MHMP update Table 14 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 June 5, 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 their prioritization of hazards had not changed. Severe winter storms, severe summer storms and wildfire continued to be high priority hazards to address as in 2013. Flooding continued to be of moderate priority. Natural hazards not addressed in the last plan but discussed were erosion/landslides, extreme heat and extreme cold, deemed to be of moderate priority, and drought and dam failure, deemed to be of low priority. *Appendix E, Steering Committee Meetings* provides the planning team discussion notes from the June 5, 2019 meeting.

Table 14. Prioritization of Hazards for Beltrami County

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

Vulnerability Assessment by Jurisdiction

Jurisdictions in Beltrami 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 five 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 14, and to assist local governments in development of related local mitigation actions. Cities not listed did not note any change in risk or local vulnerability to hazard events.

Beltrami County

- Construction in fire prone areas – rapid development in the southern part of the county, especially for residential areas. Additional people are moving into forested areas.

City of Bemidji

- Residential construction has significantly increased the number and location of new housing. This has increased the need for emergency shelters and notices. Over the past five years, a total of 166 new homes were constructed within the Greater Bemidji Area. A majority of these new homes are built on the outskirts of the city within the north woods, which could be potentially prone to wildfires.

City of Blackduck

- We have a new Dollar General and additional single-family housing which has created more snow removal and storage on Brandl and Union Ave. filling and blocking culverts. Two new apartment buildings increased impermeable surfaces on Oscar Ave and additional vehicle traffic will force the city to widen and improve the road which is currently a rural section.

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 generated 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 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 events in Beltrami County between 1950 and 2019. However, some weather event categories only had available data going back to 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*. NCEI hazard categories used in this plan are listed in Table 15.

Table 15. 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

Another historical perspective is derived from FEMA-declared disasters. Sixteen major disaster and two emergency declarations in Beltrami County have been made through 2019 (Figure 4).

Figure 4. FEMA Disaster Declarations by County

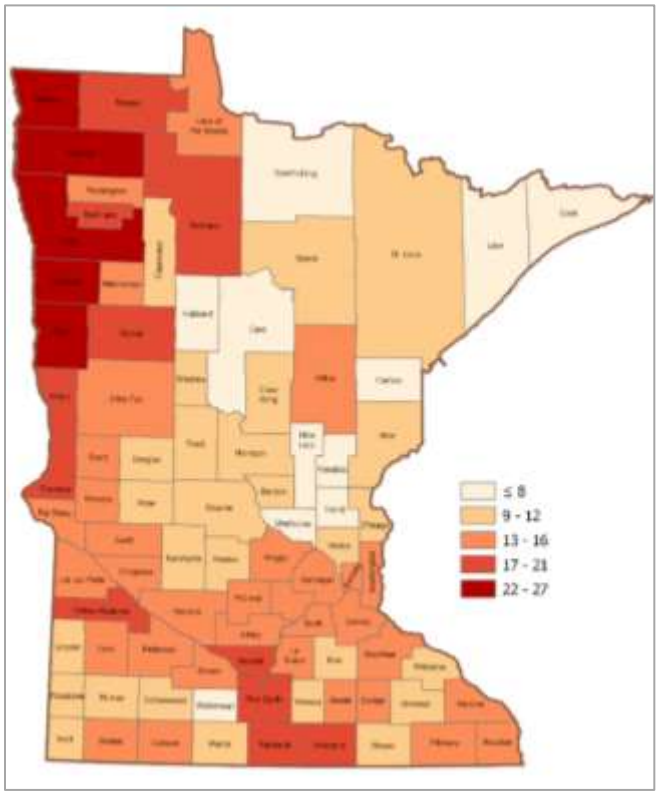


Table 16 and Table 17 show the details of the disasters including payments for Public Assistance (PA) and Individual Assistance (IA), listed under the flooding and severe storm profiles. No declarations were made for the other storms listed in the NCEI database. Reviewing the federal payments for damages from the declared disasters is a way of correlating the impact from the NCEI report.

Table 16. FEMA-Declared Major Disasters in Beltrami County (1953-2019)

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 Beltrami County	Individual Assistance in Minnesota	Individual Assistance in Beltrami County
Severe Storms, Tornadoes, Straight-Line Winds, Flooding	9/5/2018 DR-4390	6/15/2018 – 7/12/2018	$21,622,657*	Yes, amount unknown	None	None
Severe Storms, Straight-Line Winds, Flooding, Landslides, Mudslides	7/21/2014 DR-4182	6/11/2014 – 7/11/2014	$40,681,101*	Yes, amount unknown	None	None
Severe Storms, Flooding	5/10/2011 DR-1982	3/16/2011 – 5/25/2011	$20,249,390*	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 Beltrami County	Individual Assistance in Minnesota	Individual Assistance in Beltrami County
Severe Storms, Flooding	4/9/2009 DR-1830	3/16/2009 - 5/22/2009	$29,675,993*	Yes, amount unknown	None	None
Severe Storms, Flooding, Tornadoes	6/14/2002 DR-1419	6/9/2002 – 6/28/2002	$26,435,703*	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown
Severe Winter Storms, Flooding, Tornadoes	5/16/2001 DR-1370	3/23/2001 – 7/3/2001	$36,227,572*	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown
Severe Storms, Winds, Flooding	7/28/1999 DR-1283	7/4/1999 – 8/2/1999	$11,679,939*	Yes, amount unknown	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	None
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 Thunderstorms, Winds, Flooding, Tornadoes, Heat	8/18/1995 DR-1064	7/9/1995 – 7/14/1995	Yes, amount unknown	Yes, amount unknown	None	None
Severe Storms, Tornadoes, Flooding	8/6/1987 DR-797	7/20/1987 – 8/5/1987	Yes, amount unknown	Yes, amount unknown	None	None
Severe Storms, Tornadoes, Flooding	7/17/1975 DR-476	7/17/1975	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown
Heavy Rains, Flooding	7/22/1970 DR-291	7/22/1970	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown
Flooding	4/18/1969 DR-255	4/18/1969	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown
Flooding	3/22/1966 DR-215	3/22/1966	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown

** Data downloaded from https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1 on 2/11/2020. Values are estimates collected at the time of the disaster. *Values downloaded from https://www.fema.gov/disasters/state-tribal-government/o/MN on 4/8/2020.*

Table 17. FEMA-Declared Emergencies in Beltrami County (1974-2019)

Incident	Declaration Date and Disaster Number	Incident Period	Individual Assistance in Minnesota	Public Assistance (all affected areas)
Hurricane Katrina Evacuation	9/13/2005 EM-3242	8/29/2005 – 10/1/2005	None	Yes, Amount Unknown
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 February of 2020. Values are estimates collected at the time of the disaster.*

Beltrami County was also part of a State Disaster Declaration in 2016 (SD-010), due to severe thunderstorms, high winds, and flooding. A total of $199,236 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 18 depicts the historical projects in Beltrami County resulting from hazard mitigation funding.

Table 18. Historical Hazard Mitigation Funding (HMGP and PDM) in Beltrami County

Year	Project Description	Sub-Grantee	Funding Type	Federal Share
2010	*Unknown*	*Unknown*	PDM	$45,000
2001	Local Multi-hazard mitigation plan	Headwaters Regional Development Commission	HMGP	$38,000
2000	Utility protective measures	Beltrami Electric Co-op	HMGP	$150,000
1997	Overhead to underground power line conversion	Beltrami Electric Co-op	HMGP	$337,500
Total HMGP/PDM Funding – Beltrami County				**$570,500**

** Data provided by MN HSEM in March 2019.*

4.2 Future Development

Because Beltrami 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. Beltrami 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 Beltrami County Emergency Management Director will work to keep the jurisdictions covered by the MHMP 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 Beltrami 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 climate change, 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 Beltrami County

According to the NCEI, 36 tornadoes were reported in Beltrami County between 1950 and 2019. *Appendix C, Table C-1* lists all tornadic events recorded in the county. While no deaths or injuries were reported due to these tornadoes, they did result in a total of over $767,000 in property damage. All tornadoes recorded in the county have been rated F1/EF1 or less.

On July 11, 2018, an EF1 tornado began over open water on Lower Red Lake, before tracking onshore for five miles, crossing Highway 23 approximately four miles north of Saum. Peak winds were 100 mph, and large poplar and pine trees were snapped in its wake. Property damage was reported at $100,000. Three tornadic events were recorded on this day in Beltrami County.

On July 4, 2018, an EF1 tornado occurred near Bemidji State University. Trees, garages, windows and roofs were damaged. Light poles and street signs were also damaged from flying debris. Total property damage was estimated at $250,000.

Another EF1 tornado occurred on July 21, 2017. The tornado had intermittent touchdowns along a three-mile track, toppling trees and grain bins. Pole sheds and calving sheds were severely damaged. The property damage recorded was $100,000.

To determine the probability of future tornadoes in Beltrami County, we considered all past-observed tornadoes. Based on NCEI records from 1950-2019, the relative frequency of tornadoes in Beltrami County is 0.52 events per year, which we infer to represent the probability of these events occurring in the future.

Figure 5 below shows EF0 and F0 tornado touchdown points and tracks in Beltrami County from 1950-2019. Historic tornadoes in the county are listed in Table 19.

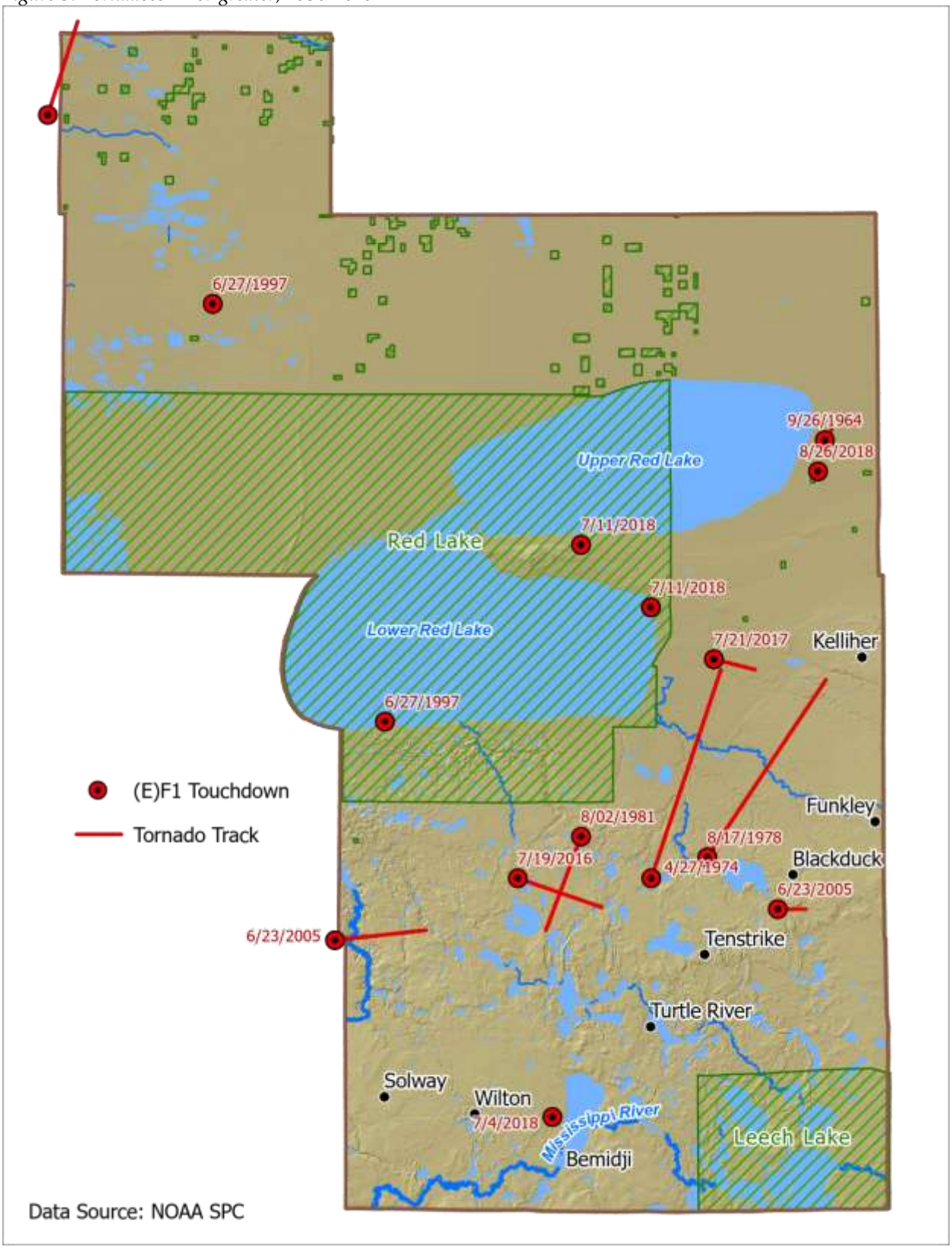
Table 19. Tornadoes in Beltrami County, 2013-2019

Location or County	Date	Magnitude	Deaths	Injuries	Property Damage
Malcolm	7/17/2019	EF0	0	0	*Unknown*
Waskish Muni Airport	8/26/2018	EF1	0	0	*Unknown*
Saum	7/11/2018	EF1	0	0	$100,000
Ponemah	7/11/2018	EF1	0	0	$20,000
Ponemah	7/11/2018	EF0	0	0	$20,000
Bemidji	7/4/2018	EF1	0	0	$250,000
Saum	7/21/2017	EF1	0	0	$100,000
Redby	9/9/2016	EF0	0	0	*Unknown*
Puposky	7/19/2016	EF1	0	0	*Unknown*

Source: National Centers for Environmental Information

To determine the probability of future tornadoes in Beltrami County, we considered all past-observed tornadoes. Based on NCEI records from 1950-2019, the relative frequency of tornadoes in Beltrami County is 0.52 events per year, which we infer to represent the probability of these events occurring in the future.

Figure 5. Tornadoes F1 or greater, 1950-2019



Tornadoes and Climate Change

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 one 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 Paul Huttner, chief meteorologist for Minnesota Public Radio, "Those records fit seasonally and geographically with longer term climate trends pushing weather events earlier in the season and further northward" (Huttner, MPR News, 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 Beltrami County. However, certain populations may be more vulnerable and less resilient to the impacts of a tornado. Because communication is so important before a tornado, citizens that are 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 2, citizens with social factors that make up the household composition and disability theme may be greatest around Bemidji, Blackduck, and Leech Lake Reservation. 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 24 mobile home parks in Beltrami County (see Figure A - 13).

Beltrami County Emergency Management identified that there are existing program gaps and deficiencies that should be addressed with new mitigation efforts to reduce the vulnerability of its citizens who are more vulnerable to summer storms (including tornadoes). These gaps and deficiencies include:

Equipment – In large events where there are lots of trees blocking roads, it can take a lot of manpower and equipment to clear them. The Highway Department has front-end loaders and a backhoe, but could use grapple attachments to handle the debris more efficiently.

Gaps in Warning Siren Coverage – Several communities in Beltrami County (including cities and residential developments) lack outdoor warning capabilities in the form of outdoor warning sirens. The cities of Solway and Wilton would like sirens, but to date they have been cost prohibitive. There are also many resort areas, county recreational areas/parks, state parks and state recreation areas that do not have outdoor warning sirens. While the county has implemented CodeRED, many of these locations attract visitors that are not enrolled in our community notification system. Outdoor warning sirens are the most effective way of warning these populations.

Gaps in Radar Coverage – Beltrami County is located almost exactly in the middle of the two radars (Duluth and Mayville) that provide coverage to northern Minnesota. Severe spring and summer weather events are under-represented by radar. This results in many severe weather events going undetected – including tornadoes.

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 city facilities have backup power in the event of a severe spring or summer storm that takes out power.

Communications – Not all Beltrami 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 Beltrami County Emergency Management Facebook page to receive important messages. Continued public education needs to be done to encourage people to utilize these resources.

Storm Shelters / Community Safe Rooms – We do not have any public access emergency shelters (storm shelters) in Beltrami County. We have one volunteer shelter partner in the Nymore neighborhood in Bemidji. This is the Mt. Zion Church at 4th and Central SE. There are many areas throughout the county that do not have safe rooms or storm shelters to protect vulnerable populations from severe storm and tornado/extreme wind events (i.e., mobile home parks, campgrounds or schools). The data from FEMA & Red Cross about designated shelters is about designated facilities for temporary sheltering.

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.

Wind speeds that are not measurable are estimated. Part of the process to determine wind speed is observing the damage. Table 20 lists the expected effects of increasing wind speeds.

Table 20. 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 Beltrami County

Beltrami County frequently experiences winds blowing over 50 knots (Figure 6). According to NCEI records, there were 199 thunderstorm/high wind events reported between 1955 and 2019, with wind speeds of up to 80 knots. These winds can inflict damage to both property and crops. However, no deaths or injuries have been reported in the county due to windstorms.

On July 2, 2012 and July 4, 2012, Beltrami County was impacted by destructive windstorms with large hail and winds of 90 mph resulting in over a million dollars in damage.

Winds reached 55 knots on July 29, 2008. Branches with 2-3 inch diameters were blown down. Crop damages of $50,000 occurred.

On July 14, 2008, winds of up to 52 knots occurred, along with hail. Crop damage was estimated at $200,000.

On July 11, 2008, a windstorm with speeds up to 60 knots caused damage to power lines and flipped a boat on Lake Andrusia. Property damage estimates were $40,000, while crop damage estimates were $20,000.

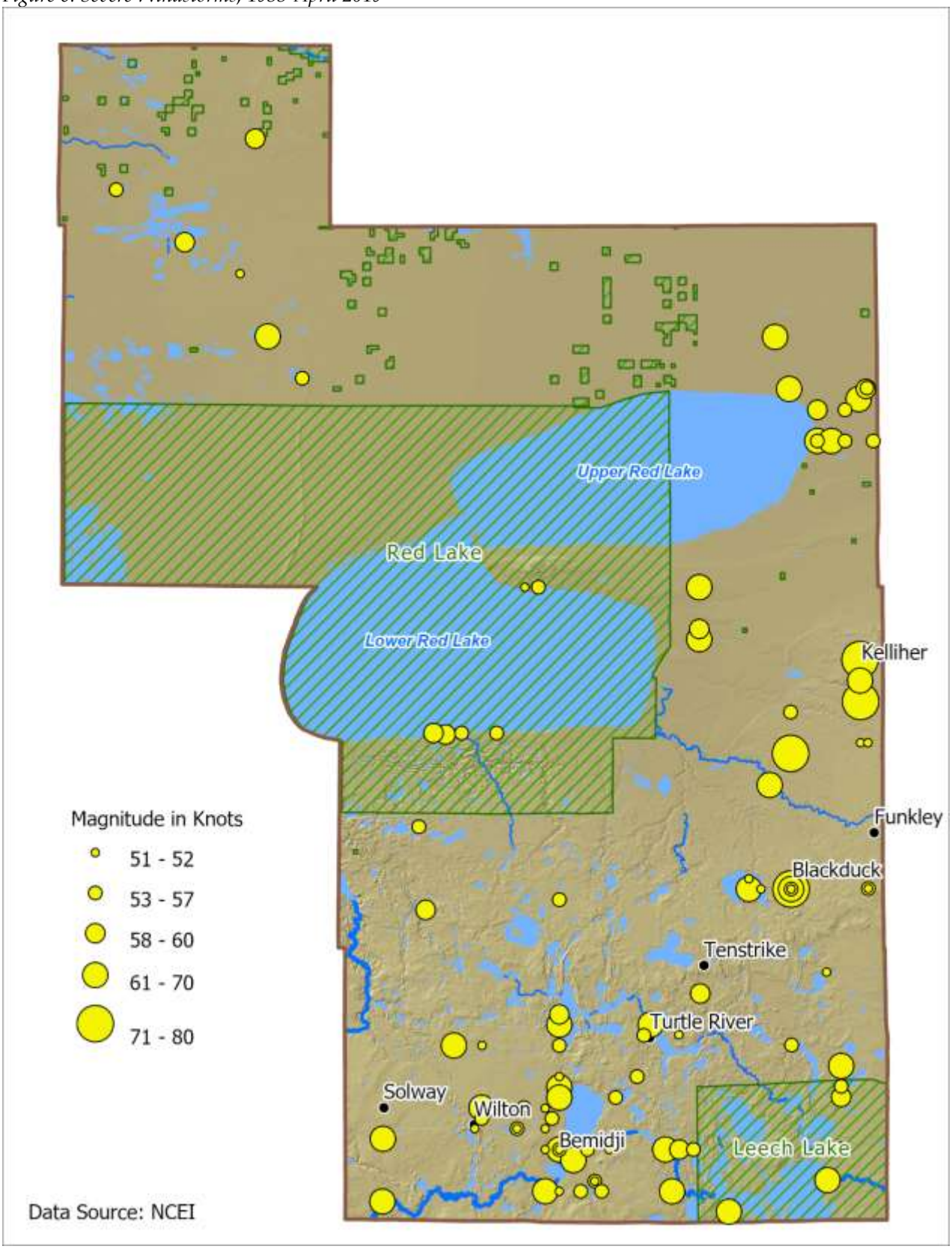
The NCEI has not recorded any damage to property or crops due to windstorms in Beltrami County during the period of 2013-2019.

To determine the probability of future windstorms in Beltrami County we look at all past-observed windstorm events (thunderstorm wind, high wind, and strong wind). Based on NCEI records from 1955 to 2019, the relative frequency of windstorm events in Beltrami County is 3.1 events per year, which we infer to represent the probability of these events occurring in the future.

Windstorms and Climate Change

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 change and severe storms (National Climate Assessment Development Advisory Committee, 2013).

Figure 6. Severe Windstorms, 1955-April 2019



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 windstorms, it is important to have a general understanding of where mobile homes are located. See *Appendix A* for a map of the 24 mobile home parks in Beltrami County.

The likelihood of a windstorm event does not vary geographically in Beltrami County. Because communication is so important before a windstorm, citizens that are 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 2, citizens with social factors that make up the household composition and disability theme may be greatest around Bemidji, Blackduck, and Leech Lake Reservation. As with all summer storms, those who work outdoors or do not have permanent housing are also at greater risk.

Beltrami County Emergency Management identified that there are existing 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:

Equipment – In large events where there are lots of trees blocking roads, it can take a lot of manpower and equipment to clear them. The Highway Department has front-end loaders and a backhoe, but could use grapple attachments to handle the debris more efficiently.

Gaps in Warning Siren Coverage – Several communities in Beltrami County (including cities and residential developments) lack outdoor warning capabilities in the form of outdoor warning sirens. The cities of Solway and Wilton would like sirens, but to date they have been cost prohibitive. There are also many resort areas, county recreational areas/parks, state parks and state recreation areas that do not have outdoor warning sirens. While the county has implemented CodeRED, many of these locations attract visitors that are not enrolled in our community notification system. Outdoor warning sirens are the most effective way of warning these populations.

Gaps in Radar Coverage – Beltrami County is located almost exactly in the middle of the two radars (Duluth and Mayville) that provide coverage to northern Minnesota. Severe spring and summer weather events are under-represented by radar. This results in many severe weather events going undetected – including tornadoes.

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 city facilities have backup power in the event of a severe spring or summer storm that takes out power.

Communications – Not all Beltrami 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 Beltrami County Emergency Management Facebook page to receive important messages. Continued public education needs to be done to encourage people to utilize these resources.

Storm Shelters / Community Safe Rooms – We do not have any public access emergency shelters (storm shelters) in Beltrami County. We have one volunteer shelter partner in the Nymore neighborhood in Bemidji. This is the Mt. Zion Church at 4th and Central SE. There are many areas throughout the county that do not have safe rooms or storm shelters to protect vulnerable populations from severe storm and tornado/extreme wind events (i.e., mobile home parks, campgrounds or schools). The data from FEMA & Red Cross about designated shelters is about designated facilities for temporary sheltering.

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 other tall object. The current may also travel through power lines, telephone lines, or plumbing pipes to damage property or cause fires.

Lightning History in Beltrami County

The NCEI has recorded three lightning events between 1996 and 2019; however, no deaths or injuries were reported.

The most recent event occurred in June of 2016 in Scribner. The bolt lit a barn on fire, causing $20,000 in damage.

In September of 2005, a lightning strike in Bemidji struck a home, causing a fire. The property damage total is unknown.

In September of 2004 a lightning strike caused an attic to start burning in Bemidji. Total damages were approximately $10,000.

To determine the probability of future lightning events in Beltrami County we look at past-observed events. Based on the NCEI period of record from 1996 through 2019, the relative frequency of lightning events in Beltrami County resulting in a fatality, injury, and/or damage is .01 events per year, which we infer to represent the probability of these events occurring in the future.

Lightning and Climate Change

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 Beltrami 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.

Beltrami County Emergency Management identified that there are existing 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:

Equipment – In large events where there are lots of trees blocking roads, it can take a lot of manpower and equipment to clear them. The Highway Department has front-end loaders and a backhoe, but could use grapple attachments to handle the debris more efficiently.

Gaps in Warning Siren Coverage – Several communities in Beltrami County (including cities and residential developments) lack outdoor warning capabilities in the form of outdoor warning sirens. The cities of Solway and Wilton would like sirens, but to date have been cost prohibitive. There are also many resort areas, county recreational areas/parks, state parks and state recreation areas that do not have outdoor warning sirens. While the county has implemented CodeRED, many of these locations attract visitors that are not enrolled in our community notification system. Outdoor warning sirens are the most effective way of warning these populations.

Gaps in Radar Coverage – Beltrami County is located almost exactly in the middle of the two radars (Duluth and Mayville) that provide coverage to northern Minnesota. Severe spring and summer weather events are under-represented by radar. This results in many severe weather events going undetected – including tornadoes.

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 city facilities have backup power in the event of a severe spring or summer storm that takes out power.

Communications – Not all Beltrami 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 Beltrami County Emergency Management Facebook page to receive important messages. Continued public education needs to be done to encourage people to utilize these resources.

Storm Shelters / Community Safe Rooms – We do not have any public access emergency shelters (storm shelters) in Beltrami County. We have one volunteer shelter partner in the Nymore neighborhood in Bemidji. This is the Mt. Zion Church at 4th and Central SE. There are many areas throughout the county that do not have safe rooms or storm shelters to protect vulnerable populations from severe storm and tornado/extreme wind events (i.e., mobile home parks, campgrounds or schools). The data from FEMA & Red Cross about designated shelters is about designated facilities for temporary sheltering.

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 Beltrami County

Beltrami County frequently experiences hailstorms (Figure 7). According to NCEI records, there were 264 hailstorms reported between 1955 and 2019 in Beltrami County, with hailstones up to three inches in diameter. Hail can inflict severe damage to both property and crops. However, no deaths or injuries have been reported in the county due to hailstorms.

On June 12, 2008, a severe thunderstorm dropped golf ball size hail. The NCEI reported $400,000 in property damage and $800,000 in crop damage.

Hail of two inches in diameter caused severe damage to car dealerships in Beltrami County on July 27, 1999. The reported property damage was $50,000.

On July 21, 1996, hail reaching 1.75 inches fell, causing a total of $200,000 in property damage and $500,000 in crop damage.

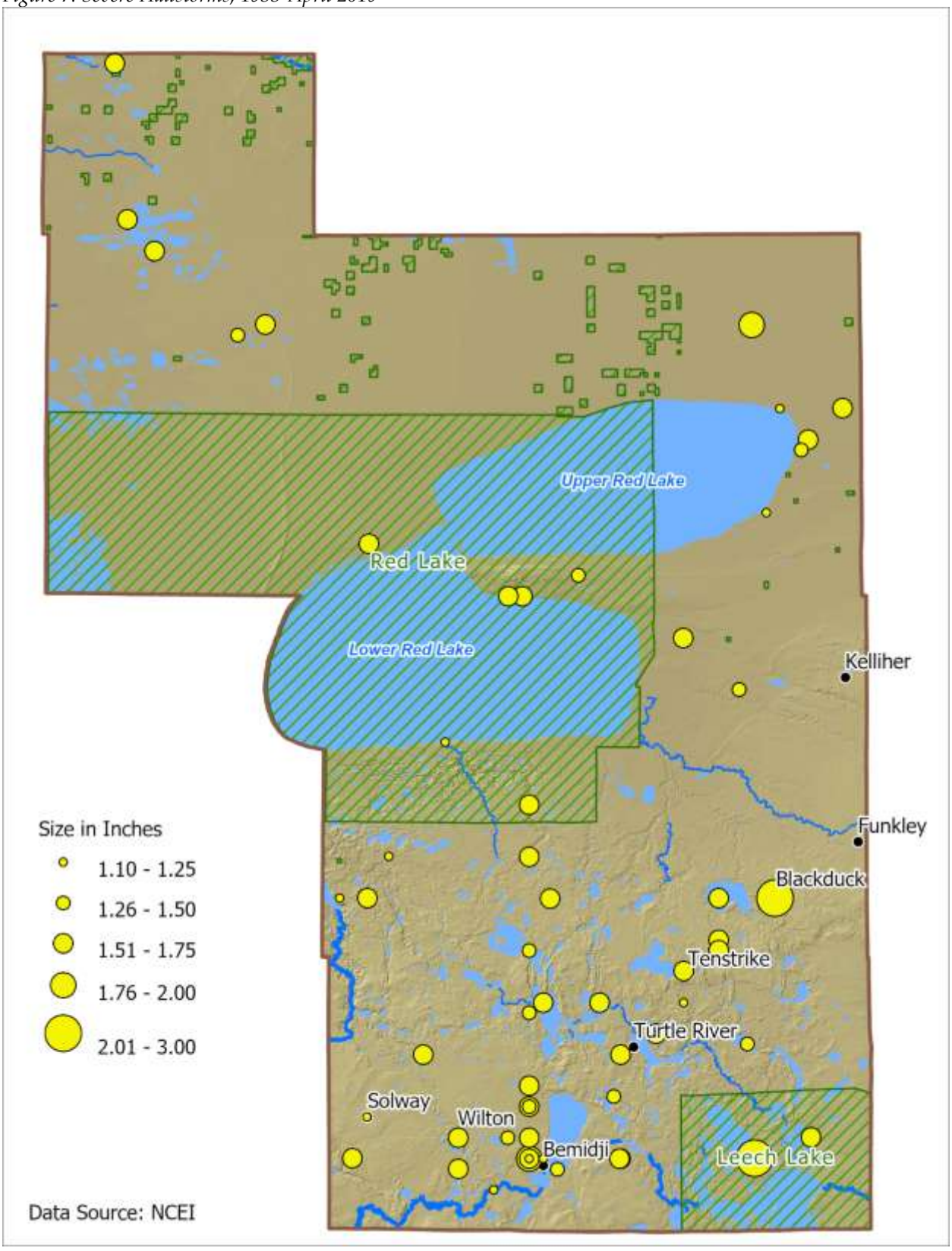
To determine the probability of future hailstorms in Beltrami County we considered past-observed events. Based on NCEI records from 1955 through 2019, the relative frequency of hailstorms in Beltrami County is 4.1 events per year. The relative frequency of events producing hail of greater than 1-inch is 1.1 events per year, which we infer to represent the probability of these events occurring in the future. Table 21 shows storms producing hail greater than 1 inch diameter in Beltrami County.

Table 21. Storms producing hail of greater than 1-inch diameter in Beltrami County, 1955-2019

Date	Hail Size (inches)	Injuries	Date	Hail Size (inches)	Injuries	Date	Hail Size (inches)	Injuries
6/30/2019	1.25	0	8/13/2007	1.75	0	7/27/1999	1.75	0
6/4/2019	2	0	8/13/2007	1.25	0	6/6/1999	1.75	0
7/4/2018	1.5	0	8/5/2006	2.75	0	6/27/1997	3	0
6/28/2018	1.5	0	7/27/2006	1.75	0	7/21/1996	1.75	0
5/29/2018	1.25	0	8/25/2003	1.75	0	7/21/1996	1.75	0
5/29/2018	1.25	0	7/6/2003	1.75	0	7/21/1996	1.75	0
7/19/2016	1.75	0	7/30/2002	1.75	0	9/16/1992	1.75	0
7/19/2016	1.25	0	6/25/2002	1.5	0	4/21/1985	1.75	0
6/25/2016	1.5	0	6/22/2002	1.75	0	7/9/1984	1.75	0
6/25/2016	1.25	0	6/22/2002	1.25	0	7/8/1984	1.75	0
6/25/2016	1.25	0	7/17/2001	2.75	0	8/7/1983	1.75	0
6/12/2016	1.75	0	7/17/2001	1.75	0	8/7/1983	1.75	0
7/5/2015	1.5	0	7/17/2001	1.75	0	8/7/1983	1.75	0
7/5/2014	1.75	0	7/17/2001	1.75	0	8/7/1983	1.75	0
8/25/2013	1.75	0	7/17/2001	1.75	0	8/18/1982	1.75	0
8/15/2012	1.75	0	7/17/2001	1.75	0	8/2/1981	1.75	0
8/19/2011	1.5	0	7/17/2001	1.5	0	6/25/1979	1.5	0
5/10/2011	1.25	0	7/17/2001	1.5	0	6/25/1979	1.5	0
5/24/2010	1.25	0	7/17/2001	1.5	0	7/12/1978	1.75	0
5/24/2010	1.25	0	6/8/2000	1.75	0	6/27/1977	1.25	0
6/12/2008	1.75	0	6/8/2000	1.75	0	6/26/1976	1.75	0
10/7/2007	1.75	0	8/15/1999	1.75	0	6/8/1964	2	0
9/28/2007	1.75	0	7/28/1999	1.75	0	8/17/1956	1.75	0
9/21/2007	1.5	0	7/27/1999	2	0			

Source: National Centers for Environmental Information

Figure 7. Severe Hailstorms, 1955-April 2019



Hail and Climate Change

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 change 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

The risk of hail events to damage property damage or cause human injury does not vary geographically in Beltrami County. 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). From 1960 through 2018 Beltrami County reported $6,276,020 in hail damages. Beltrami County's losses are primarily due to $4,414,385 in crop damages, followed by property damages reported at $1,827,509, and $34,125 in FEMA's Willingness to Pay (WTP) values for injuries.

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

Beltrami County Emergency Management identified that there are existing 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:

Equipment – In large events where there are lots of trees blocking roads, it can take a lot of manpower and equipment to clear them. The Highway Department has front-end loaders and a backhoe, but could use grapple attachments to handle the debris more efficiently.

Gaps in Warning Siren Coverage – Several communities in Beltrami County (including cities and residential developments) lack outdoor warning capabilities in the form of outdoor warning sirens. The cities of Solway and Wilton would like sirens, but to date they have been cost prohibitive. There are also many resort areas, county recreational areas/parks, state parks and state recreation areas that do not have outdoor warning sirens. While the county has implemented CodeRED, many of these locations attract visitors that are not enrolled in our community notification system. Outdoor warning sirens are the most effective way of warning these populations.

Gaps in Radar Coverage – Beltrami County is located almost exactly in the middle of the two radars (Duluth and Mayville) that provide coverage to northern Minnesota. Severe spring and summer

weather events are under-represented by radar. This results in many severe weather events going undetected – including tornadoes.

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 city facilities have backup power in the event of a severe spring or summer storm that takes out power.

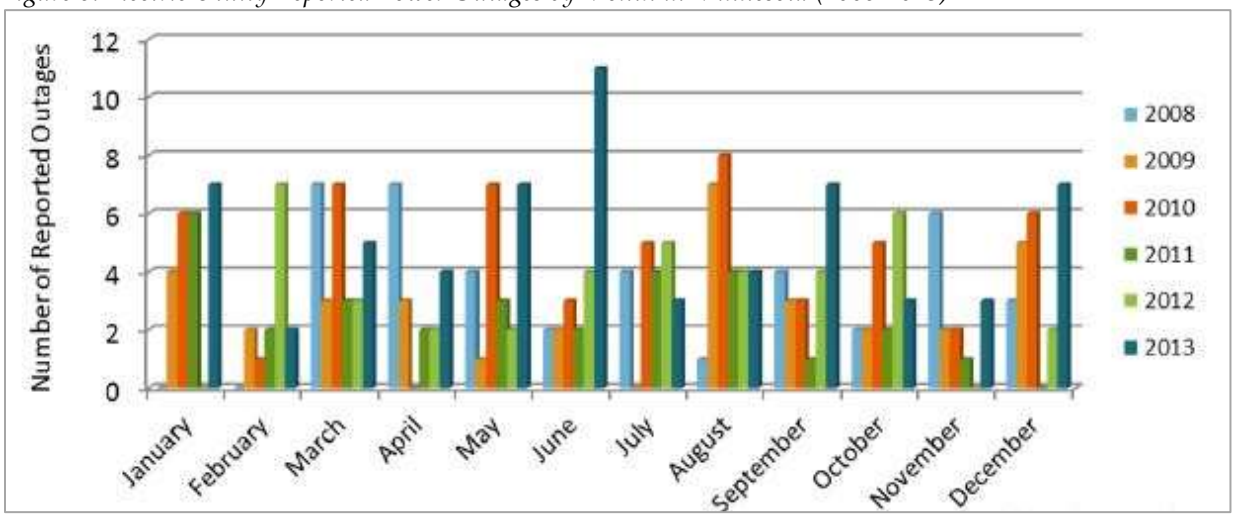
Communications – Not all Beltrami County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Beltrami County Emergency Management Facebook page to receive important messages. Continued public education needs to be done to encourage people to utilize these resources.

Storm Shelters / Community Safe Rooms – We do not have any public access emergency shelters (storm shelters) in Beltrami County. We have one volunteer shelter partner in the Nymore neighborhood in Bemidji. This is the Mt. Zion Church at 4th and Central SE. There are many areas throughout the county that do not have safe rooms or storm shelters to protect vulnerable populations from severe storm and tornado/extreme wind events (i.e., mobile home parks, campgrounds or schools). The data from FEMA & Red Cross about designated shelters is about designated facilities for temporary sheltering.

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

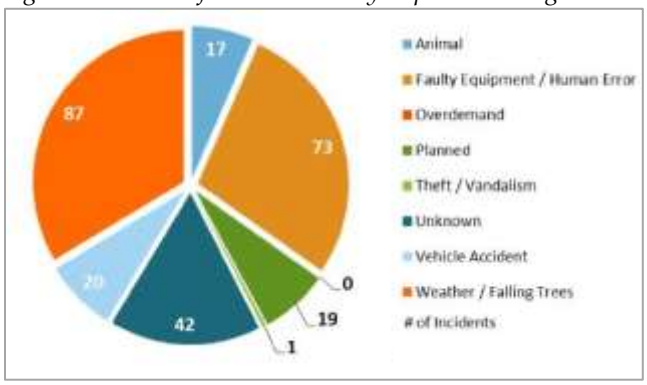
According to NOAA data, the natural hazards that caused the greatest overall property loss in Minnesota between 1996 and 2014 were thunderstorms and lightning, at $86.3 million per year. The state also experienced 23 electric transmission outages from 1992 to 2009, five of which were due to heat waves 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 8 below shows the seasonality of electric outages by month for the years 2008-2013, and Figure 9 shows the causes of outages in the state between 2008 and 2013, with the largest cause being weather/falling trees.

Figure 8. Electric Utility Reported Power Outages by Month in Minnesota (2008-2013)



Source: U.S. Department of Energy, 2015

Figure 9. 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.

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, a Presidential executive order in January of 2015 updated 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 Beltrami County

The NCEI has recorded floods in Beltrami County since 1996. While none of these floods resulted in deaths or injuries, the cumulative property damage estimate is $102,000. No floods have been recorded since 2014.

Below are brief descriptions of some of Beltrami County's worst floods:

June 19, 2014: During the most recent flood in Beltrami County, heavy rainfall during the month of June resulted in flooding around Waskish. The Tamarac River overtopped its banks, washing out multiple roads and surrounding several houses. The flooding caused a total of over $70,000 in property and crop damage. Sections of roads and culverts were eroded out. The heavy rains resulted in a Presidential Disaster Declaration.

August 19, 2011: After a period of heavy rain, several streets near downtown Bemidji had 1-2 feet of water flowing in them. At least one car was stranded. The storm and subsequent flooding caused an estimated $5,000 in property damage within Beltrami County.

March 16-19, 2009: Warm weather and a fast snow melt resulted in rising river levels and numerous road closures. More snow led to continued flooding into April. Damages were in the hundreds of thousands of dollars. Most counties across northwest Minnesota later received a Presidential Disaster Declaration.

July 31, 2001: Flash flooding surrounded several homes with water, flooding basements and roads in the process. A total of 7.5 inches of rain was reported.

Table 22 below lists Beltrami County's historical floods from 1996-2019 as recorded by the NCEI.

Table 22. Beltrami County Historical Floods, 1996-2019

Location or County	Date	Type	Deaths	Injuries	Property Damage
Waskish	6/19/2014	Flood	0	0	$20,000
Debs	5/1/2013	Flood	0	0	$5,000
Debs	4/28/2013	Flood	0	0	$5,000
Bemidji	8/19/2011	Flash Flood	0	0	$5,000
Bemidji	8/19/2011	Flash Flood	0	0	$5,000
Malcolm	3/25/2009	Flood	0	0	$5,000
Kelliher	6/19/2005	Flash Flood	0	0	*Unknown*
Kelliher	6/19/2005	Flash Flood	0	0	*Unknown*
Bemidji	6/23/2002	Flash Flood	0	0	*Unknown*
Bemidji	6/23/2002	Flash Flood	0	0	*Unknown*
North Beltrami (Zone)	6/11/2002	Flood	0	0	*Unknown*
South Beltrami (Zone)	6/11/2002	Flood	0	0	*Unknown*
Thorhult	7/31/2001	Flash Flood	0	0	$2,000
Fourtown	7/31/2001	Flash Flood	0	0	*Unknown*
Fourtown	7/31/2001	Flash Flood	0	0	$10,000
Fourtown	7/31/2001	Flash Flood	0	0	*Unknown*
Thorhult	7/17/2001	Flash Flood	0	0	*Unknown*
South Beltrami (Zone)	9/1/1999	Flood	0	0	*Unknown*
Bemidji	6/4/1999	Flash Flood	0	0	$50,000

Source: National Centers for Environmental Information

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 two active USGS gauging stations in Beltrami County that measures water level (USGS, 2020). Table 23 below shows data on its highest-recorded gauge heights.

Table 23. Historical Peak Streamflow data (in feet) for USGS gauging stations

USGS 05200445 MISSISSIPPI RIVER AT BEMIDJI, MN		
rank	date	gage height
1	Mar. 31, 2009	13.36
2	Apr. 18, 1997	13.17
3	Apr. 23, 1979	13.04
4	Jun. 24, 2002	12.98
5	May 18, 1982	12.83
8	Apr. 13, 2019	12.59
11	May 7, 2013	12.43

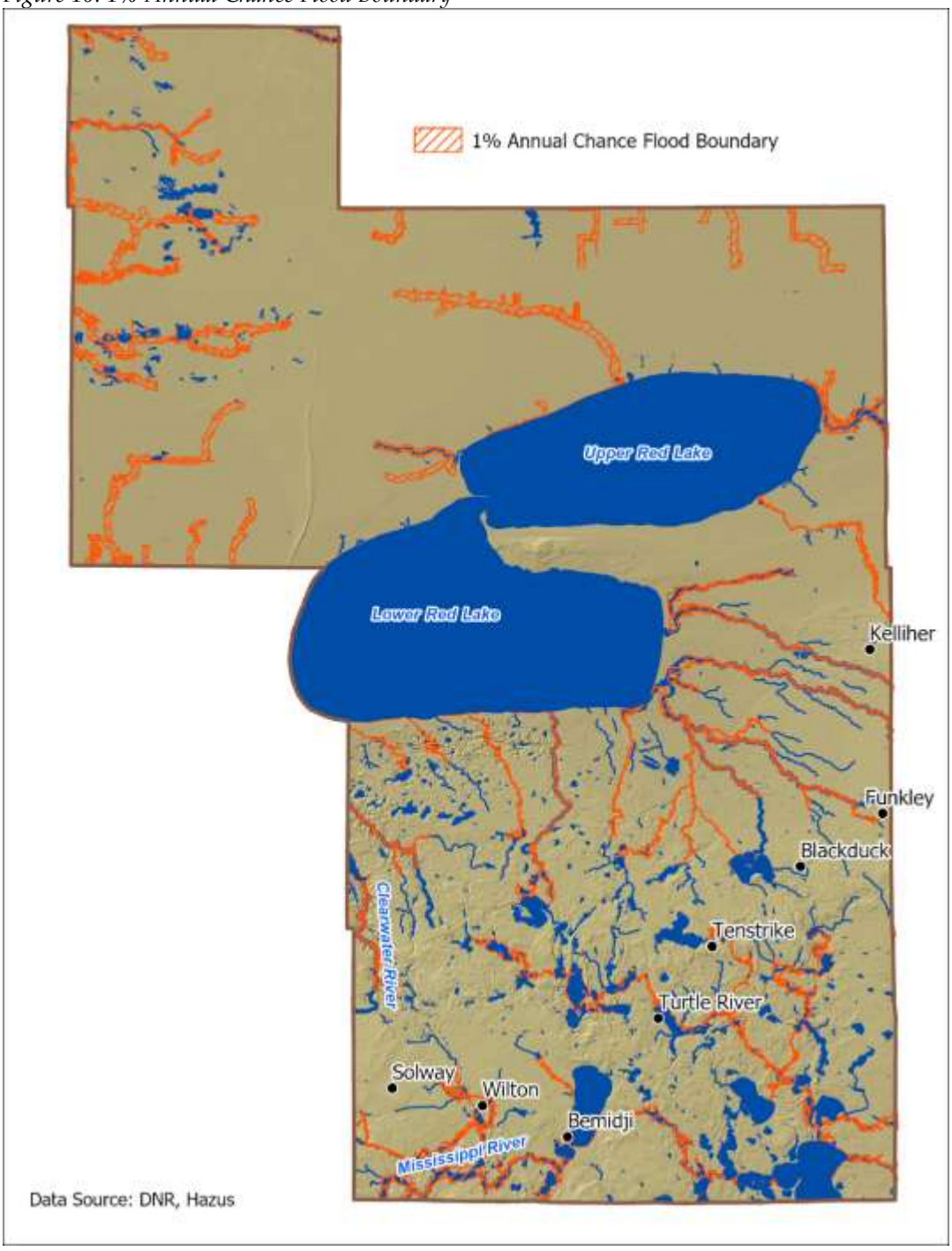
USGS 05200510 MISSISSIPPI RIVER NEAR BEMIDJI, MN		
rank	date	gage height
1	Jul. 11, 1997	5.98
2	Jul. 01, 2002	5.66
3	Apr. 02, 2009	5.35
4	Apr. 05, 1999	5.34
5	Apr. 23, 2001	5.33
8	May 2, 2019	5.18
11	May 12, 2013	4.96

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 10-meter Digital Elevation Model (DEM) was used to generate a 1% annual chance floodplain and flood depth grid using Hazus hydrology and hydraulics methods. The resulting Hazus 1% annual chance floodplain output is shown in Figure 10.

Losses were based on Beltrami-specific building data. Beltrami 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.

Figure 10. 1% Annual Chance Flood Boundary



Hazus reports the percent damage of each building in the floodplain, defined by the centroid of each building footprint. After formatting the tax and spatial data, 27,208 points were input to Hazus to represent buildings with a total estimated building plus contents value of $2.5 billion. Approximately 84% of the buildings (and 87% of the building value) are associated with residential housing.

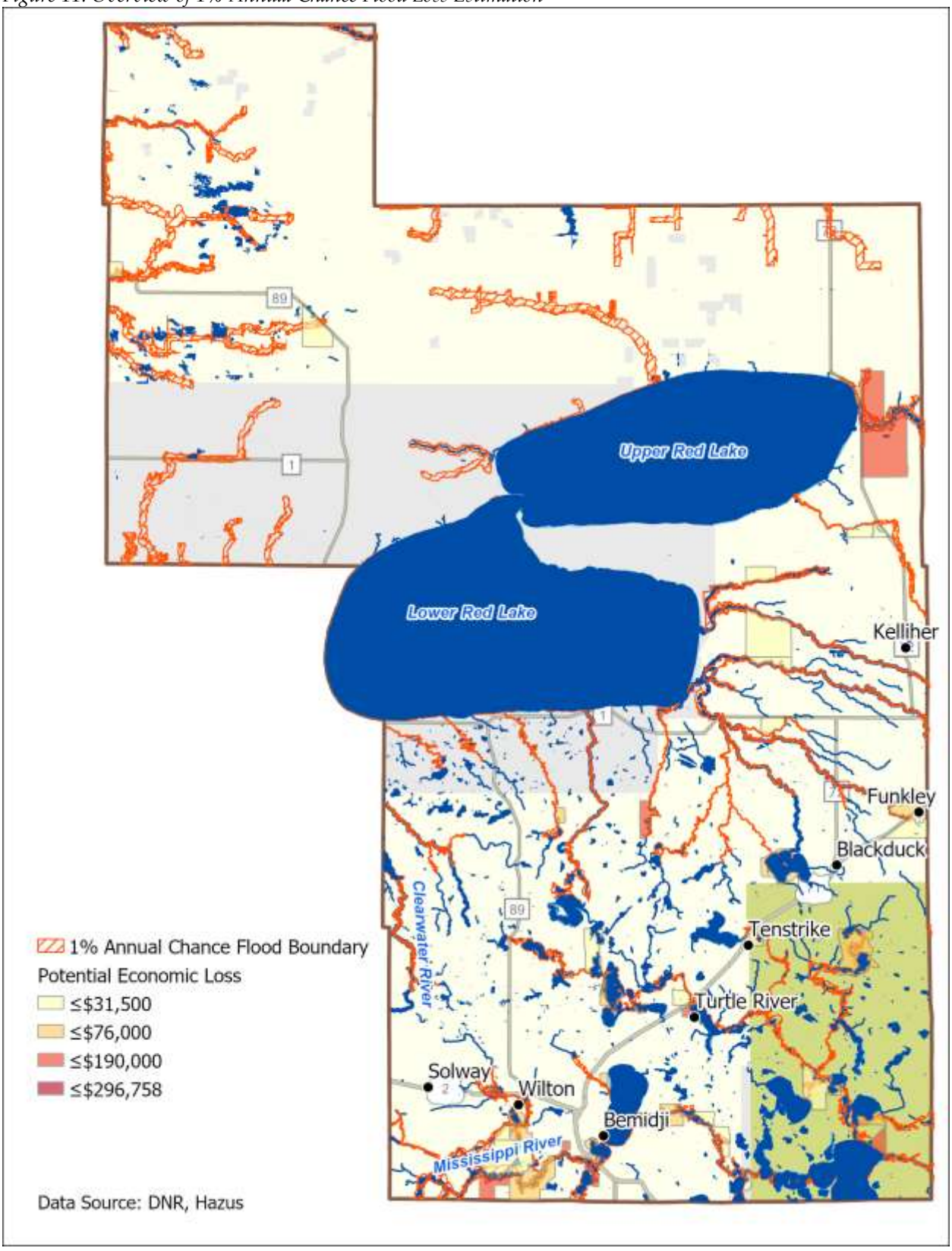
The estimated loss by occupancy class for the entire county is shown in Table 24.

Table 24. Summary of 1% Annual Chance Flood Loss Estimation by Occupancy Class

General Occupancy	County Total Buildings	County Building and Contents Value	Floodplain Total Buildings	Floodplain Building + Contents Value	Buildings with damage	Building + Contents Loss
Residential	22,950	$2,159,583,463	250	$33,935,235	172	$3,661,812
Commercial	222	$90,047,446	2	$60,992	1	$18,979
Other	4,036	$230,886,458	19	$3,138,212	3	$140,416
Totals	**27,208**	**$2,480,517,367**	**271**	**$37,134,439**	**176**	**$3,821,207**

The distinction between building attributes within a parcel was not known, so the maximum percent damage to a building in that parcel was used to calculate loss estimates for the entire parcel. The sum of all the losses in each census block were aggregated for the purposes of visualizing the loss. An overview of these results with the percent damage of buildings is shown in Figure 11. It is possible for a building location to report no loss even if it is in the flood boundary. For example, if the water depth is minimal relative to 1st-floor height, there may be 0% damage.

Figure 11. Overview of 1% Annual Chance Flood Loss Estimation



Hazus Critical Infrastructure Loss Analysis

Critical facilities and infrastructure are vital to the public and their incapacitation or destruction would have a significant negative impact on the community. These facilities and infrastructure were identified in Section 3.7 and verified by Beltrami County.

Buildings identified as essential facilities for the Hazus flood analysis include hospitals, police and fire stations, and schools (often used as shelters). Essential facilities are vulnerable to structural failure, extensive water damage, and loss of facility functionality during a flood, negatively impacting the communities relying on these facilities' services. Fortunately, none of Beltrami 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 Beltrami County, one electric substation was found to be at risk in the 1% annual chance flood. Located in Frohn Township, this substation is owned by Otter Tail Power and is mapped in Figure 14.

Losses were estimated by Census County Subdivision. The cities of Bemidji, Tenstrike and Turtle River had significant estimated losses. All jurisdictions with buildings identified in the 1% annual chance flood zone are listed in Table 25.

Table 25. 1% Annual Chance Flood Building-Related Loss Estimates by Jurisdiction in Beltrami County

Jurisdiction (county subdivision)	Count of Buildings in Floodplain	Estimated Building and Contents Loss*
Alaska township	2	$36,624
Battle township	1	$10,141
Bemidji	5	$159,765
Bemidji township	5	$499,861
Benville township	1	$12,881
Birch township	1	$49,146
Brook Lake UT	11	$166,944
Cormant township	3	$49,535
Eckles township	6	$119,321
Frohn township	17	$491,888
Grant Valley township	12	$478,358
Hines township	2	$41,411
Hornet township	2	$62,569
Nebish township	1	$103,792
Northern township	2	$47,528
Port Hope township	1	$31,220
Shotley Brook UT	1	$8,339
Steenerson township	1	$3,944
Sugar Bush township	1	$4,382

Jurisdiction (county subdivision)	Count of Buildings in Floodplain	Estimated Building and Contents Loss*
Tenstrike	1	$21,291
Turtle Lake township	7	$341,817
Turtle River	1	$141,784
Totals	**271* (176 with damage)**	**$3,821,207**

**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 Bemidji, and the surrounding Bemidji Township, is mapped in Figure 12. The communities of Grant Valley Township and Frohn Township are shown in Figure 13 and Figure 14. In addition to the aggregate economic loss by census block, the point locations used to represent flooded buildings are symbolized by percent damage to the building.

Figure 12. 1% Annual Chance Flood Building-Related Loss Estimates, Bemidji

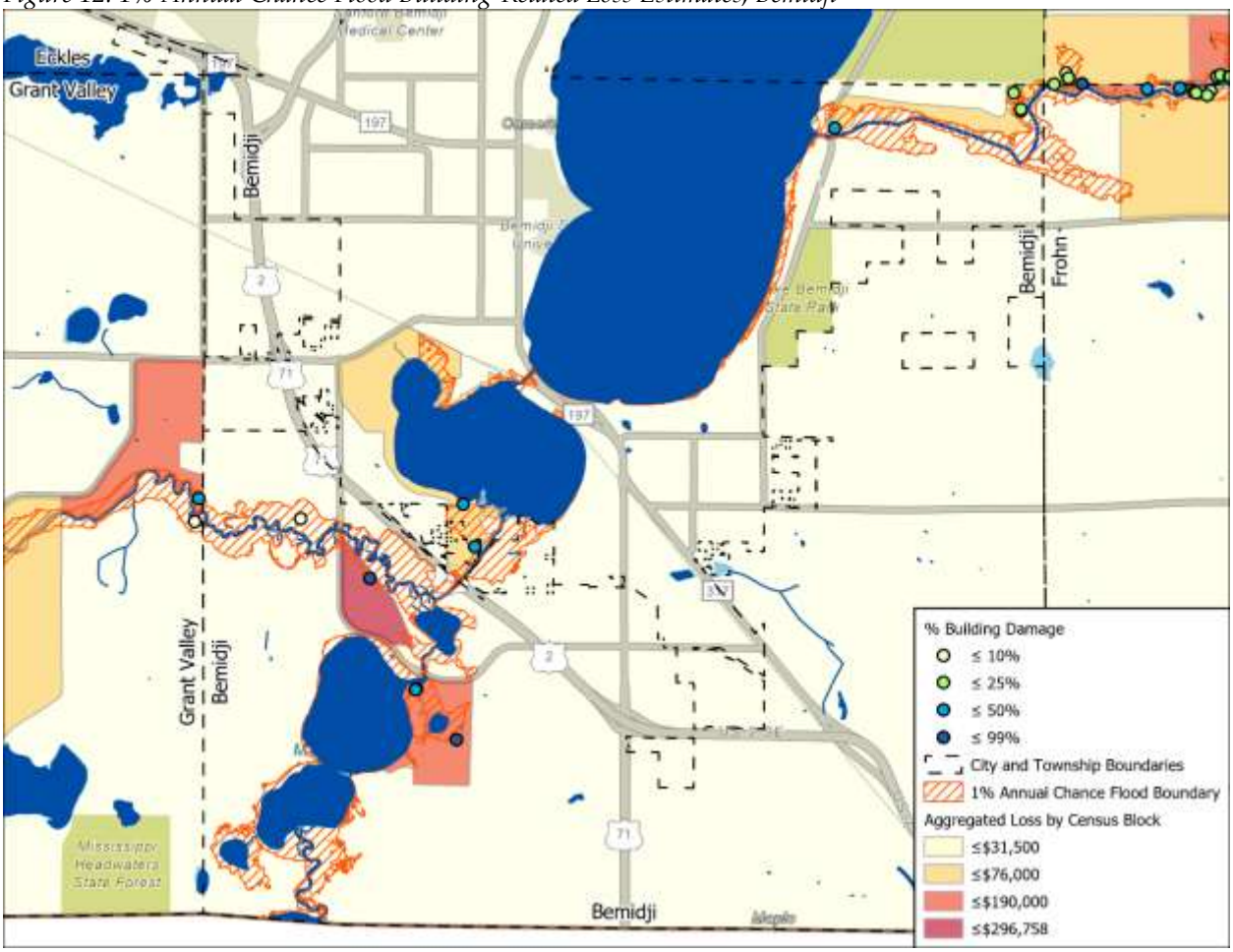


Figure 13. 1% Annual Chance Flood Building-Related Loss Estimates, Grant Valley Township

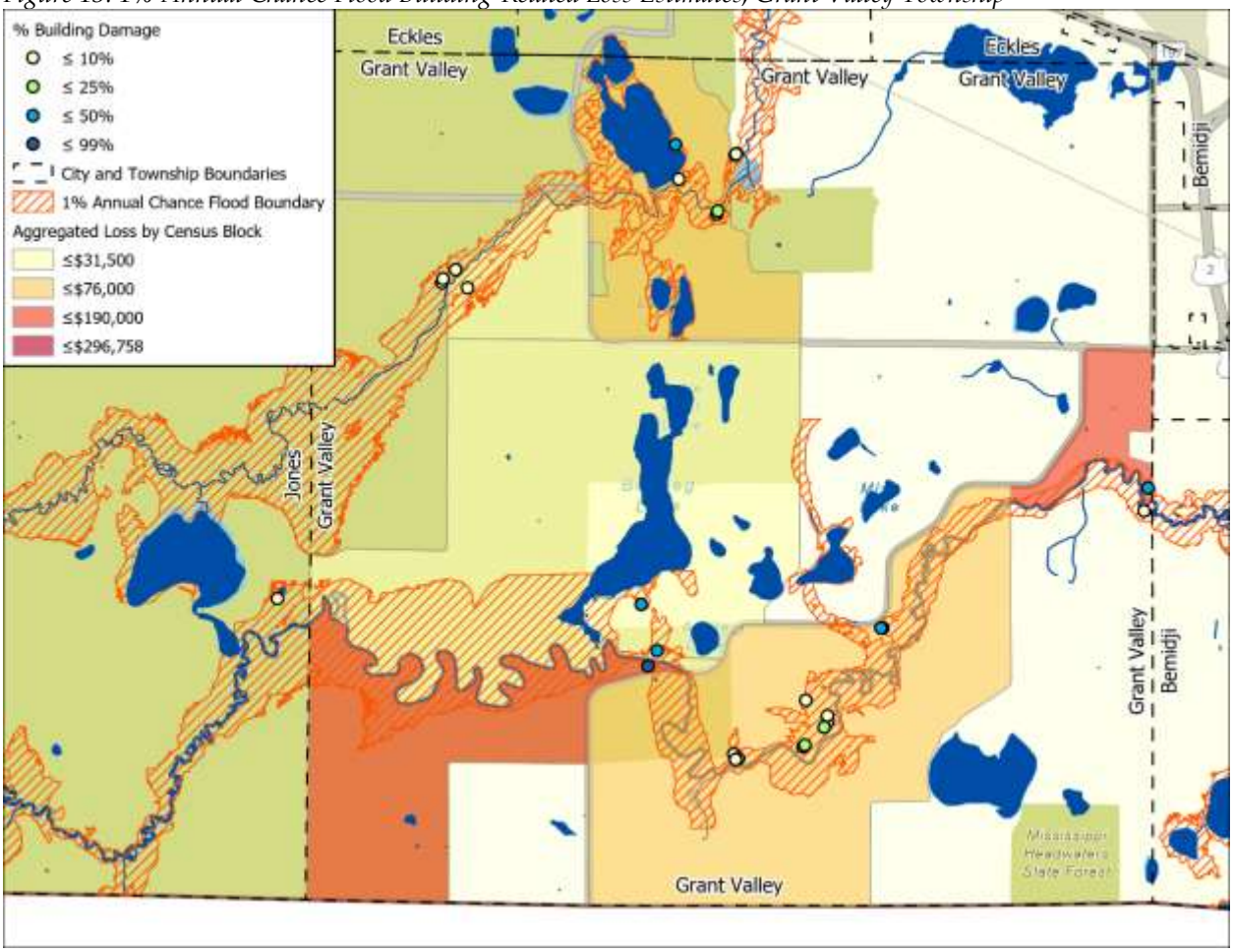
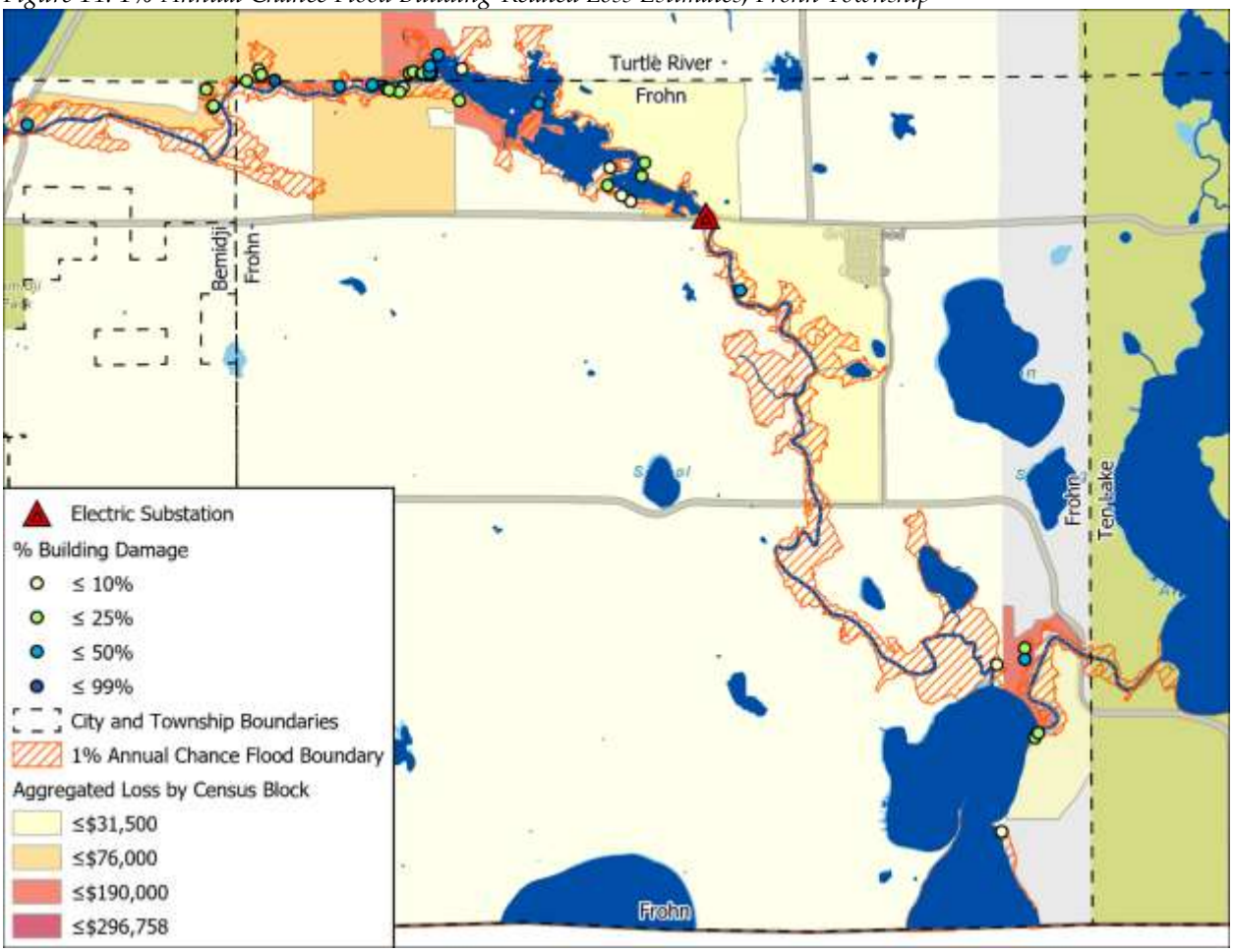


Figure 14. 1% Annual Chance Flood Building-Related Loss Estimates, Frohn Township



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

Beltrami 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:

NFIP Participation – Local-level participation in the NFIP should be encouraged, both for individual homeowners and cities that do not participate. The cities of Funkley and Turtle River do not participate in the NFIP but have FEMA mapped high risk areas.

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. Beltrami County Highway Dept. works to monitor where improvements are needed to mitigate against flood damage.

Floodplain Ordinance/Mapping – Beltrami County does not have a floodplain ordinance or updated FEMA floodplain map for the county.

Flooding and Climate Change

As Minnesota's climate changes, the quantity and character of precipitation is changing. Average precipitation has increased in the Midwest since 1900, with more increases in recent years. According to the Minnesota DNR State Climatology Office, "Since 2000, Minnesota has seen a significant uptick in devastating, large-area extreme rainstorms as well. Rains that historically would have been in the 98th percentile annually (the largest 2%) have become more common. Climate projections indicate these big rains will continue increasing into the future."

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, 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 22-23rd 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).

4.3.6 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 Beltrami 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. Beltrami County, along with all areas of Minnesota, is susceptible to blizzards.

Figure 15. 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 other 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 Beltrami 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. The NCEI has recorded three ice storms in Beltrami County: in November of 2006, February of 2009, and January of 2013. No deaths or injuries were reported.

Observing winter storm watches and warnings and adequate preparation can lessen the impact of blizzards 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. The chance that another winter storm affecting Beltrami County will occur is highly probable.

Severe Winter Storm History in Beltrami County

Beltrami County frequently experiences heavy snows, blizzards, ice storms and winter storms. An overview of some of the most notable winter storm events since the last MHMP update is provided in Table 26 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).

Table 26. Notable Winter Weather Events in Beltrami County, 2013-2019

Date	Type	Deaths	Injuries	Property Damage	Description
12/28/2019 – 12/29/2019	Winter Storm	0	0	Unknown	Snowfall totals reached up to 17 inches in the region, with the heaviest snowfall occurring over the central Red River Valley. Wind gusts of 40-50 mph caused blizzard conditions.
4/11/2019 – 4/12/2019	Heavy Snow	0	0	Unknown	The area around Bemidji received up to 18 inches of snow.
3/9/2019 – 3/10/2019	Heavy Snow	0	0	Unknown	Snowfall totals reached up to 16 inches, and the heavy, wet snow caused multiple roofs to collapse in the area.
2/6/2019 – 2/7/2019	Winter Storm	0	0	Unknown	Up to 10 inches of snow fell, along with sustained winds up to 25 mph. Many schools closed, and travel, particularly in open country, was difficult.
12/4/2017	Winter Storm	0	0	Unknown	Winter storm conditions occurred throughout the northwest corner of Minnesota, with peak wind speeds between 45 and 57 mph. Up to 11 inches of snow fell.

Date	Type	Deaths	Injuries	Property Damage	Description
1/2/2017 – 1/3/2017	Winter Storm	0	0	Unknown	Areas in the Lake of the Woods region received up to 18 inches of snow. Many schools closed.
12/25/2016 – 12/26/2016	Winter Storm	0	0	Unknown	Snowfalls of up to 18 inches occurred in the Red River Valley, along with winds gusting up to 50 mph. Various airports and schools closed as a result.
3/31/2014 – 4/1/2014	Winter Storm	0	0	Unknown	Northern Beltrami County received up to 20 inches of snow. In addition, ice accumulated across west-central Minnesota.
2/26/2014	Blizzard	0	0	Unknown	Wind gusts of 40-55 mph resulted in whiteout conditions in the region. Reports from Bemidji noted near whiteout conditions.
12/3/2013 – 12/5/2013	Winter Storm	0	0	Unknown	Eight to 14 inches of snow fell along the U.S. Highway 2 corridor. Freezing rain also occurred in areas, and winds were gusty. Many schools closed.
3/17/2013 – 3/18/2013	Winter Storm	0	0	Unknown	Following a period of mixed freezing rain and sleet, heavy snow fell, with accumulations reaching up to 15 inches. Significant drifting occurred.
2/10/2013 – 2/11/2013	Winter Storm	0	0	Unknown	Heavy snow fell from the Upper and Lower Red Lakes down through the Bagley area, reaching up to 18 inches. Visibility was less than half a mile. Many roads and schools closed.
1/11/2013	Ice storm	0	0	Unknown	An ice storm passed through southern Beltrami County, leaving between 0.25 and 0.4 inches of ice accumulation. Light snow also occurred.

Data Source: NCEI

To determine the probability of future winter-related storm events in Beltrami County, records of previous event types (blizzard, heavy snow, ice storm, and winter storm) were summed and divided by the dataset's period of record, resulting in the annual relative frequency of winter-related storms. Based on records in the NCEI Storm Events Database through April of 2019, the relative frequency of winter-related storm events in the county is 3.9 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Severe Winter Storms and Climate Change

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 climate change 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).

Vulnerability

Winter storms affect Beltrami 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 Beltrami 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.

Beltrami County Emergency Management identified that there are existing 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:

Equipment – Some areas of the county are subject to blowing snow which causes drifting and roads could end up completely closed. The Highway Department does have v-plows for breaking open roads, but does not have a large snow blower which would be useful in addressing extreme amounts of snow.

Gaps in Radar Coverage – Beltrami County is located almost exactly in the middle of the two radars (Duluth and Mayville) that provide coverage to northern Minnesota. Often winter precipitation goes undetected by the radar. There will be nothing represented on the radar, but heavy and impactful winter precipitation is occurring.

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 storms, resulting in power outages.

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

Communications – Not all Beltrami 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 Beltrami County Emergency Management Facebook page to receive important messages. Continued public education needs to be done to encourage people to utilize these resources.

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).

4.3.7 Extreme Cold

In Beltrami County, 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 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.

The National Weather Service (NWS) issues a wind chill warning when life threatening wind chill values are expected or occurring. The criteria for issuing official wind chill warnings and advisories are set by the local weather forecasting office (WFO). The Grand Forks WFO (FGF) uses a wind chill warning criteria of -40 °F or colder to issue a wind chill warning and -25 °F and colder for a wind chill advisory in Beltrami County (NWS, 2010).

Extreme cold temperatures affect the county nearly every year. 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.

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.

Extreme Cold History in Beltrami County

The history of extreme cold in Beltrami County was compiled using daily minimum temperature data from weather stations in the county which have complete datasets (< 10% missing data), as well as cold-related events reported in the NCEI Storm Events Database. To measure the frequency of extreme cold days in the county, each station's daily minimum temperature is examined with -18°F used as the benchmark - a standard used by the National Weather Service to report cold weather events (2018).

Beltrami County has five active weather stations with complete datasets reporting daily low temperatures. Since January 1, 2013, the Bemidji Minnesota weather station recorded daily low temperatures ≤ -18°F 115 times, about 4.5% of the total days. The lowest daily low temperature reported since January 2013 is -42°F, which occurred on January 31, 2019 (Midwestern Regional Climate Center).

The lowest daily low temperature ever recorded in Beltrami County is -51°F, which was reported by the Thorhult weather station on February 1 and February 2, 1996 (Midwestern Regional Climate Center).

Daily minimum temperatures mentioned above do not factor in wind chill. For this information we look to the National Center for Environmental Information (NCEI) Storm Events Database, which records "cold/wind chill" and "extreme Cold/wind chill" events. While the actual temperature limits for these events are defined locally, in general a "cold/wind chill" event is when temperatures (ambient or wind chill) are ≤ -18°F, and an "extreme cold/wind chill" event is when temperatures (ambient or wind chill) are ≤ -35°F (National Weather Service, 2018). The NCEI Storm Events Database has recorded 13 "cold/wind chill" and 33 "extreme cold/wind chill" events affecting Beltrami County since 1996. At least one death in the county has been reported due to these events.

One notable older event occurred March 8 to March 9, 2003. This cold/wind chill event was reported as causing an estimated $42,000 worth of property damage due to numerous water main breaks. Wind chill temperatures were measured from -40°F to -50°F.

Table 27 shows the 24 cold-related events in Beltrami County as reported to the NCEI Storm Events Database since January 2013.

Table 27. Extreme Cold Events in Beltrami County

Date	Event Type	Description of Event
3/2-3/3/2019	Extreme cold/wind chill	Morning temperature lows reached -15°F to -25°F, combined with steady winds, and wind chills dipped into the -40s.
2/24-2/25/2019	Extreme cold/wind chill	Northwest winds at 5-15 mph combined with temperatures as cold as -20°F to -30°F caused wind chills of -40°F to -45°F.
2/7-2/8/2019	Extreme cold/wind chill	15-25 mph winds and temperatures mainly in the -20s caused wind chills of -40°F to -60°F.
1/28-1/31/2019	Extreme cold/wind chill	A fairly rare multi-day wind chill warning was issued for northwest MN. Temperatures ranged from -15°F to -25°F on 1/29 to the -40s on 1/31. Combined with wind speeds of 5-15 mph, wind chills values were recorded from -40°F to -65°F.
1/26-1/27/2019	Extreme cold/wind chill	Temperatures as low as the -30s and winds speeds of 5-15 mph produced wind chills of -40°F to -60°F.
1/1/2019	Extreme cold/wind chill	Across the county wind chills dipped to -40°F to -50°F.
12/31/2018	Extreme cold/wind chill	Wind speeds of 5-15 mph and temperatures of -10°F to -20°F created wind chills of -40°F to -50°F.
1/12-1/13/2018	Extreme cold/wind chill	Temperatures on the morning of 1/13 dipped to -20°F to -30°F in most areas.

Date	Event Type	Description of Event
12/29/2017-1/1/2018	Extreme cold/wind chill	Several weather stations recorded temperatures of -25°F to -35°F. The coldest wind chill readings dipped to around -55°F.
12/24-12/26/2017	Extreme cold/wind chill	Temperature lows ranged from -10°F to -25°F on 1/25 and -15°F to -30°F on 1/26. Wind chill values were -40°F to -45°F at times.
12/17-12/18/2016	Extreme cold/wind chill	Temperatures of -20°F to -30°F and 5-15 mph winds created wind chill readings ranging from -40°F to -50°F.
1/16-1/17/2016	Extreme cold/wind chill	Temperatures dropped to -20°F to -35°F and wind chill readings dipped to -40°F to -50°F.
2/21-2/22/2015	Extreme cold/wind chill	Temperatures were in the -20s and wind chill readings ranged from -40°F to -50°F.
1/6-1/7/2015	Extreme cold/wind chill	Wind chill temperatures settled over the area ranging -40°F to -50°F.
1/3-1/5/2015	Extreme cold/wind chill	After a blizzard ended on 1/3, concern shifted to the wind chills which ranged from -40°F to -50°F.
3/1-3/2/2014	Extreme cold/wind chill	Steady northwest winds and subzero temperatures brought wind chills ranging from -40°F to -55°F.
2/28-3/2/2014	Extreme cold/wind chill	A cold air mass brought steady winds and subzero temperatures to create wind chills ranging from -40°F to -50°F.
2/26-2/27/2014	Extreme cold/wind chill	Wind chill temperatures dropped into the -40°F to -50°F range. Bemidji had one death as a result of the cold. A six-year-old girl died of exposure and was found dead outside her apartment complex early the morning of 2/27.
1/26-1/28/2014	Extreme cold/wind chill	Morning temperature lows were in the -20s. Wind chill values generally ranged from -40°F to -50°F.
1/22-1/23/2014	Extreme cold/wind chill	Wind chill readings dropped to -40°F to -50°F.
1/4-1/7/2014	Extreme cold/wind chill	Daytime temperature highs ranged in the teens below zero and temperature lows ranged from the -20s to -30s. Steady winds caused wind chill temperatures of -40°F to -60°F.
12/28-12/29/2013	Extreme cold/wind chill	Frigid air settling over the area resulted in wind chill temperatures from -40°F to -55°F.
1/20-1/22/2013	Extreme cold/wind chill	Following a ground blizzard on 1/19/2013, frigid air moved into the region creating morning temperature lows of -15°F to -25°F. In combination with 10-20 mph winds, wind chills read -40°F to -50°F.

Source: (NCEI Storm Events Database, 2019)

To determine the probability of future cold-related events in Beltrami County, records of previous cold/wind chill and extreme cold/wind chill events were summed and divided by the dataset's period of record, resulting in the annual relative frequency of cold-related events. Based on records in the NCEI Storm Events Database from 1996 to 2019, the relative frequency of cold-related storm events in the county is 3.8 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Extreme Cold and Climate Change

Although climate research indicates that Minnesota's average winter lows are rising rapidly, and our coldest days of winter are now warmer than we have ever recorded (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 as the climate changes 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 Beltrami 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 Beltrami 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).

Beltrami County Emergency Management identified that there are existing 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:

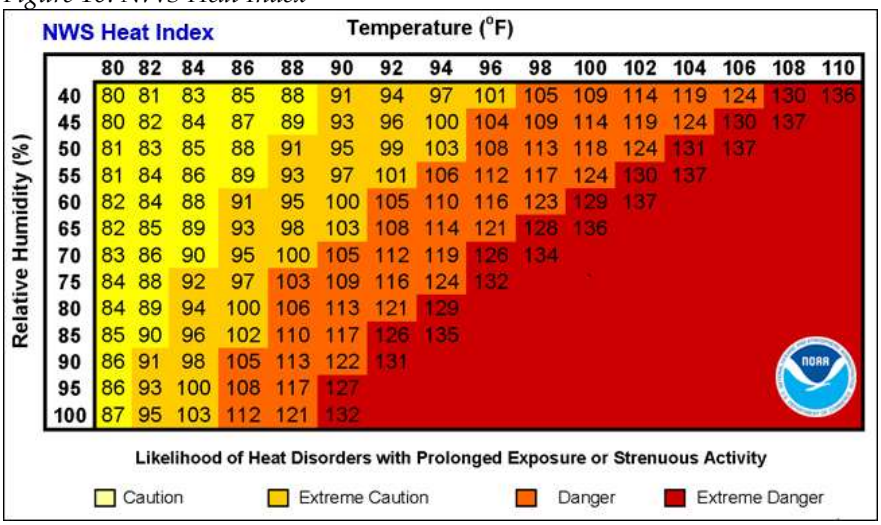
Mass Care Shelter Facilities – Beltrami County needs to work with local communities and the American Red Cross to increase the number of facilities that can serve as mass care sheltering facilities.

Generators for Backup Power – 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 16) 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 °F for at least two consecutive days (n.d.).

Figure 16. NWS Heat Index



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

Figure 17 describes the effects increasing levels of heat has on the body during prolonged exposure and/or physical activity.

Figure 17. 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 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).

Extreme Heat History in Beltrami County

According to the Midwestern Regional Climate Center (MRCC), July is the warmest month for the climate division in which Beltrami County is located, with a mean temperature of 66.9°F. There are five active weather stations in the county reporting daily temperatures. From January 1, 2013, through March 2020, these stations reported daily high temperatures ≥ 90°F an average of 12.6 days, less than

1% of the total days during the time-period. The highest daily maximum temperature reported since January 2013 is 95°F, which occurred twice in August 2013. The record daily maximum temperature ever recorded in Beltrami County is 109°F, reported by the Redby Weather Station on July 28, 1917 (Midwestern Regional Climate Center).

The National Centers for Environmental Information have only recorded one instance of severe heat in Beltrami County since 1996. The event occurred in August of 2001, when heat indices reached 115°F. No deaths or injuries were reported.

To determine the probability of future heat-related events in Beltrami County, records of previous severe heat events were summed and divided by the dataset's period of record, resulting in the annual relative frequency of heat-related events. Based on records in the NCEI Storm Events Database from 1996 to 2019, the relative frequency of heat-related storm events in the county is 0.04 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Extreme Heat and Climate Change

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°F. 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).

Vulnerability

Within Beltrami County the risk of extreme heat does not vary geographically. However, those who work outdoors or do not have permanent housing are at greater risk.

Beltrami County Emergency Management identified that there are existing 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:

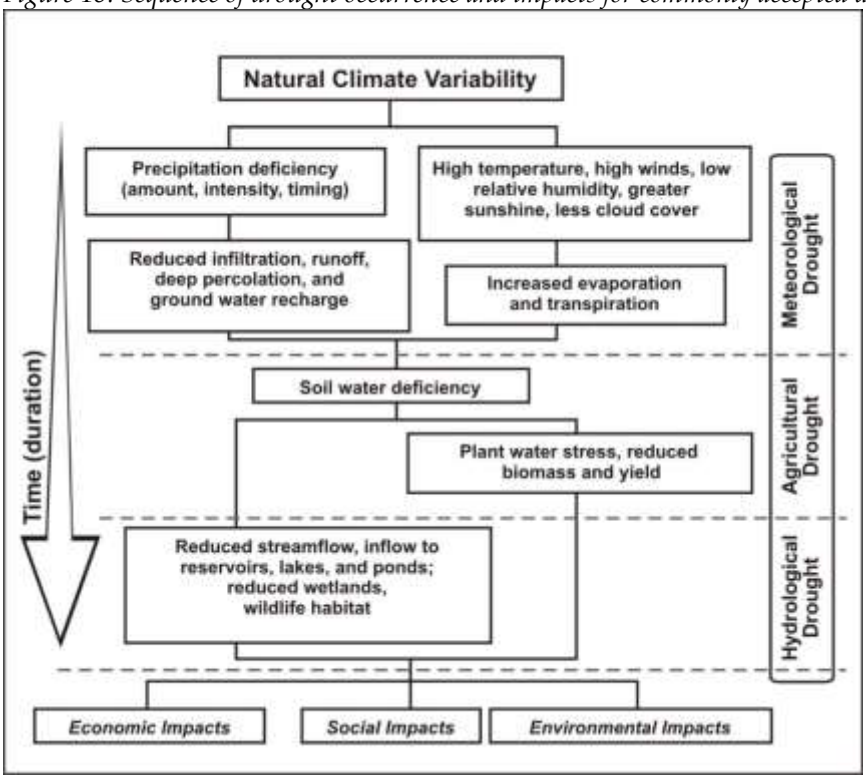
Mass Care Shelter Facilities – Beltrami County needs to work with local communities and the American Red Cross to increase the number of facilities that can serve as mass care sheltering facilities.

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 18.

Figure 18. 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. The term agricultural drought indicates an extended dry period that results in crop stress and harvest reduction. Hydrological drought is manifest in noticeably reduced river and stream flow and critically low groundwater tables. Ecological drought occurs when the combined effects of meteorological and/or hydrological drought begin to impact the delicate balance of a given ecosystem. 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 (National Drought Mitigation Center, 2018). Figure 19 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 28 displays these drought categories along with the potential impacts at each level.

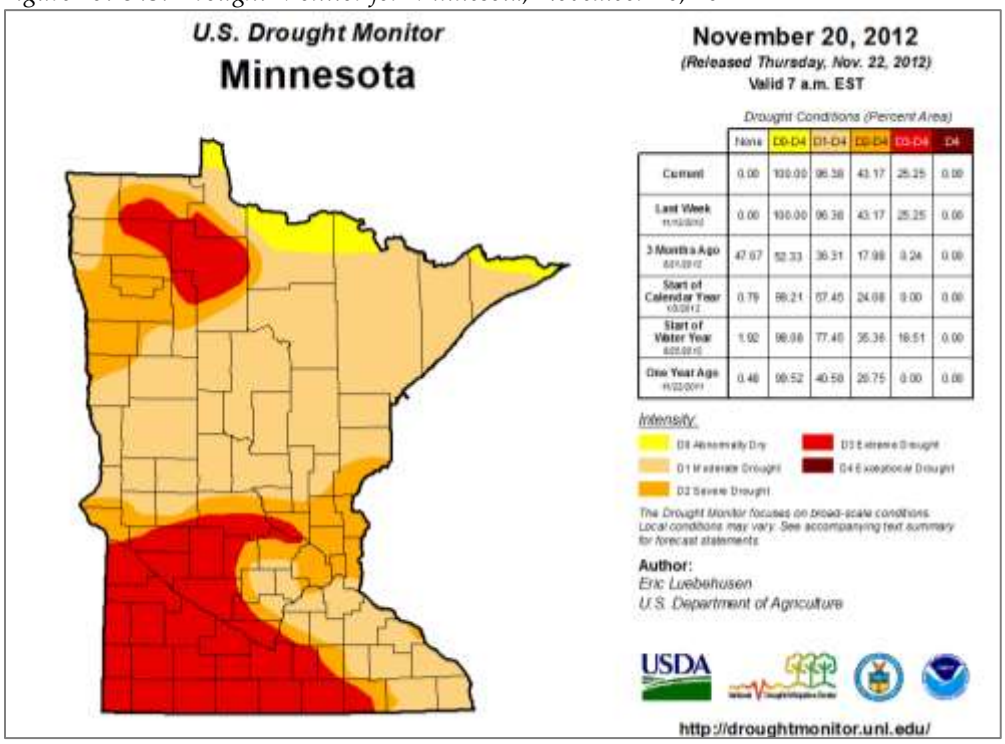
Table 28. USDM Drought Classification

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: • Short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • Some lingering water deficits • Pastures or crops not fully recovered
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • 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 19. U.S. Drought Monitor for Minnesota, November 20, 2012



Source: (National Drought Mitigation Center, 2018)

Drought History in Beltrami County

To determine the probability of future drought events in Beltrami County we look at past-observed droughts. The USDM database was examined from January 2000 – August 12, 2019 (1,023 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 33% of the weeks and drought conditions ≥ D2 13% 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 the percent of land area in each drought category, except Do which saw an increase. Table 29 shows the breakdown of this comparison.

Table 29. Average Percent of Beltrami County's Land Area by Drought Category

Timeframe	No Drought	DO	D1	D2	D3	D4
2009-2013	40.10%	27.20%	19.87%	5.37%	7.45%	0%
2014-2018	52.22%	35.45%	11.17%	1.17%	0%	0%
% Change	+30.22%	+30.33%	-43.78%	-78.21%	-100%	0%

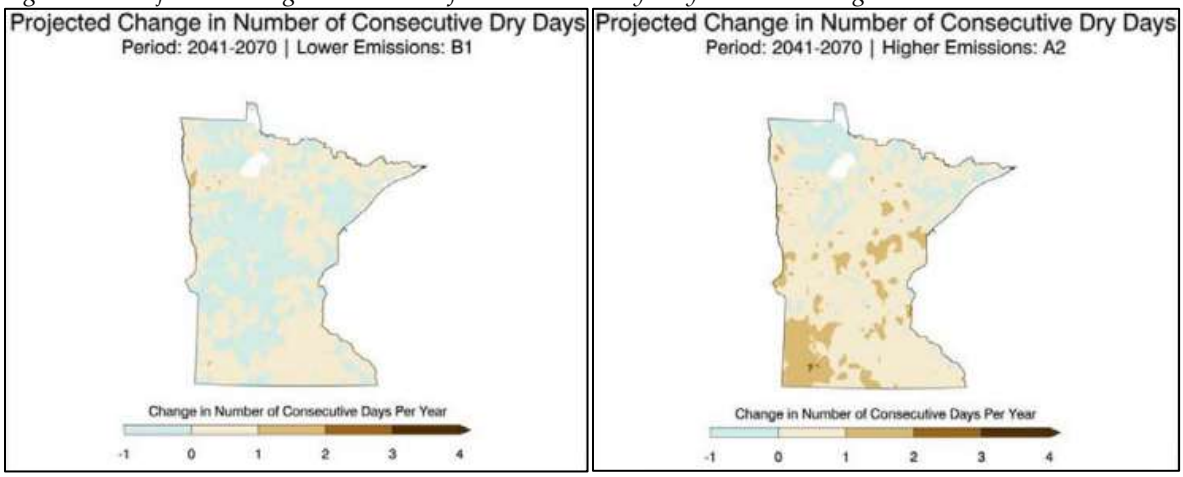
Drought and Climate Change

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 at which climate change 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 20.

Figure 20. 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 Beltrami County are vulnerable to drought, which has impacted the county numerous 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 30 incidents of drought impacting at least one sector in Beltrami County from 1976-2018. Table 30 lists the number of times each sector was impacted by these droughts.

Table 30. Reported Drought Impacts for Beltrami County, 1976-2018

Sector	# of drought impacts reported
Agriculture	4
Business & Industry	0
Energy	0
Fire	8
Plants & Wildlife	2
Relief, Response & Restrictions	13
Society & Public Health	3
Tourism & Recreation	0
Water Supply & Quality	8

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 Beltrami 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 3.5.1) is made up of these population groups and should be reviewed to better understand the vulnerability of each jurisdiction.

Areas of the county reliant on an agricultural economy may also be more severely impacted from loss of crops due to drought. From 1989-2017, Beltrami County received $2,453,718 (2017 ADJ) in crop indemnity payments due to drought, which ranks in the 6th percentile of drought-related crop indemnity payments received by other counties in Minnesota (ASU Center for Emergency Management and Homeland Security, 2018).

Beltrami County Emergency Management did not identify any existing program gaps or deficiencies that make its citizens more vulnerable to droughts.

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 forest lands. 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 occur 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 Beltrami County

The Minnesota DNR responded to 2,156 wildfires in Beltrami County between 1985 and August 2019, burning a total of 105,543 acres (Figure 21). Only 26 of these fires were caused by lightning; the rest were human-caused. 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 Beltrami County burned 25,396 acres in September 2012, in the northern part of the county. Its cause was not recorded in this dataset.

The second largest wildfire burned 5,180 acres in 1990, a relatively small fire compared with the 2012 fire.

Between 2014 and August 2019, there was a total of 224 wildfires, burning 3,464 acres.

The Beltrami County Emergency Services Committee noted that since the last MHMP update, wildfires in the county have resulted in property losses, but no known fatalities or injuries have occurred:

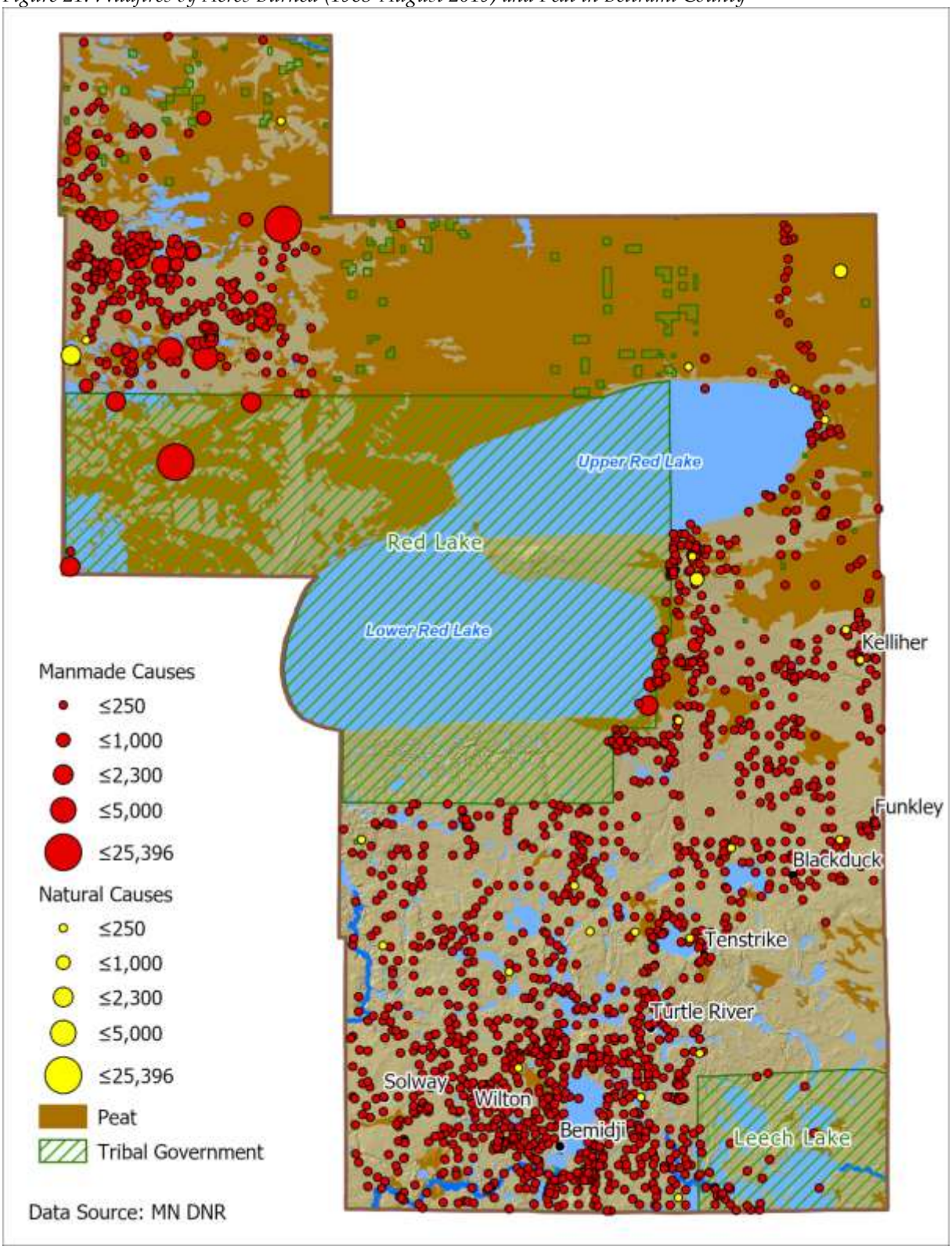
- Fire near Gene Dillon School, evacuation required.
- Wildfire: Highway 1 near reservation – no evacuations required.
- North Minnie Fire near Fourtown, required evacuation of residents.
- Brush pile spread to a residential fire near Saum.

In October 2012, the North Minnie Fire burned over 25,000 acres in duff and peat in remote areas of the Red Lake Wilderness Management Area. This was one of several peat fires in Northern Minnesota at the same time. Cooperation required the MnDNR Forestry and Wildlife Divisions, Lake of the Woods County, Beltrami County, the Red Lake Tribe, Minnesota Agency-Bureau of Indian Affairs, and local fire departments (International Falls Journal, 2012). The incident resulted in the closure of area roads and trails near the town of Fourtown (NOAA, 2012)

According to MN DNR data, there is 622,029 acres of peat in Beltrami 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.

To determine the probability of future wildfires in Beltrami County we considered past-observed events. Based on Minnesota DNR records from 1985 to August 2019, the relative frequency of wildfire events in Beltrami County is 62 events per year, which we infer to represent the probability of these events occurring in the future.

Figure 21. Wildfires by Acres Burned (1985-August 2019) and Peat in Beltrami County



Wildfire and Climate Change

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

Climate data experts project conditions leading to a higher frequency of late growing season drought conditions, elevated winter temperatures with reduced snowpack, prolonged high heat days, and extended periods of low rainfall.

Vulnerability

Blowdowns and tree mortality are also big concerns as they lead to increased fuel for wildfire. Spruce budworm and the resulting mortality from this insect outbreak increases the buildup of standing dead and down fuels, another growing concern.

An analysis of the Pagami Creek Fire and its impacts on public health was done in Lake County, a similarly forested county in northern Minnesota. The fire burned large portions of the BWCA wilderness, endangering visitors spread throughout a large area and beyond the reach of easy communication. Particulate matter from the fires posed a serious threat to respiratory health, particularly for individuals with asthma, lung disease, heart ailments, and other conditions. Air quality alerts were released across numerous states. Many county and Forest Service roads were closed. Smoke and ash from the fire made land and air travel extremely dangerous. In some areas, visibility was reduced to one-and-a-half miles (MDH, 2018).

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.

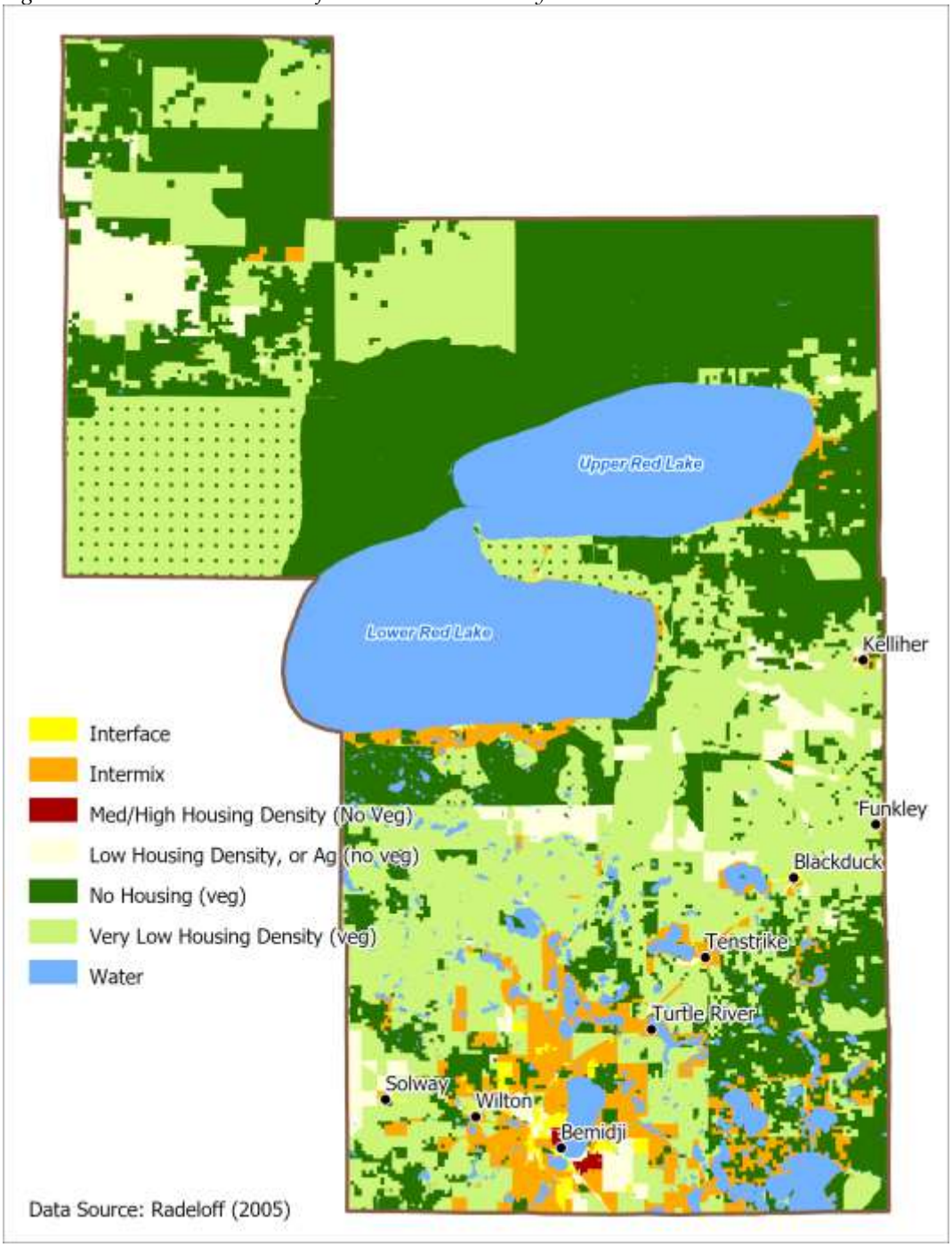
There are two types of WUI: intermix and interface. Intermix WUI are areas where housing and vegetation intermingle; interface WUI are areas with housing in the vicinity of contiguous wildland vegetation. Figure 22 below maps the WUI in Beltrami County. There are areas of interface in the Bemidji region. There are also intermix areas located throughout the county.

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

Firewise / CWPP – Beltrami County used to be active in the MN DNR Firewise program, but that has since lapsed. The City of Bemidji participated in a Community Wildfire Protection Plan (CWPP) through CPAW several years ago. The status of this plan is unknown.

Database of Dry Hydrants/Well Access – The county needs to work with local fire departments to update its database of the locations of dry hydrants and well access. Areas that are not covered by a municipal water source should be evaluated for additional dry hydrant/well access projects.

Figure 22. Wildland Urban Interface in Beltrami 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, subsidence and climate change. 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).

Landslides and Soil Erosion History in Beltrami County

According to the Beltrami County Soil and Water Conservation District (SWCD), the county regularly experiences typical shoreline erosion with high water levels or storm events, but nothing catastrophic in the recent past has been reported.

The Beltrami County Highway Department noted that the flooding in 2014 caused damage to county roads by eroding out sections of roads and culverts.

According to the NCEI database, in September of 1999 heavy rainfalls after a wet summer resulted in area flooding. High lake levels and shoreline erosion was reported in the Cass Lake area.

The Minnesota Board of Water and Soil Resources (BWSR) maintains a grant reporting system for installed Best Management Practices (BMPs) that are connected to completed and closed grants funded through BWSR. According to these data, there has been one BMP installed in the Water Erosion category in Beltrami County since 2013. The project occurred in Bemidji in 2016 and was classified as a "bioretention basin."

Current research led by the University of Minnesota is underway to acquire, analyze, and distribute new data on landslides across the state of Minnesota. 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.

To determine the probability of future landslides in Beltrami County, records of previous landslides and the period in which they occurred were examined, and the relative frequency of these events was calculated. Because there are no official records of landslides in the county and only one SWCD project

referencing water erosion, the relative frequency is less than one per year. This relative frequency can be used to infer that the probability of future landslides in the county is very low.

Landslides/Soil Erosion and Climate Change

The increased magnitude and frequency of flooding events and storm activity that may result from climate change 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

Human life and safety, structures, and infrastructure are all vulnerable to landslides. Identifying the areas more susceptible to landsliding is challenging, especially at a large scale. The USGS has performed an analysis for potential landslide of the conterminous US, and while highly generalized and not intended to be used for local planning, still provides a general overview of landslide potential.

The delineation process is based on geologic formations of the US which were classified as having high, medium, or low landslide incidence; and being of high, medium, or low susceptibility to landsliding (Radbruch-Hall, et al., 1982). While the majority of Minnesota is classified as "low incidence", including Beltrami County, areas along the Minnesota and Le Sueur Rivers, as well as the southeast corner of the state are classified as being moderately susceptible to landslides with low incidences of landslides. The only area in the state classified as having a "high incidence" of landslide is in eastern Carlton County and southeastern St. Louis County.

Beltrami County Emergency Management did not identify any existing program gaps or deficiencies that make its citizens more vulnerable to soil erosion or landslides.

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 creates 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 Beltrami County

According to the State Dam Safety Engineer at the MN DNR, there have not been any cases of dam failure in Beltrami County.

Dam Failure and Climate Change

Dams are designed based on assumptions about a river's annual flow behavior that will determine the volume of water behind the dam and flowing through the dam at any one time. Changes in weather patterns due to climate change may change the 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.

While climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures. 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. Climate change is 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 31 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 31. 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:

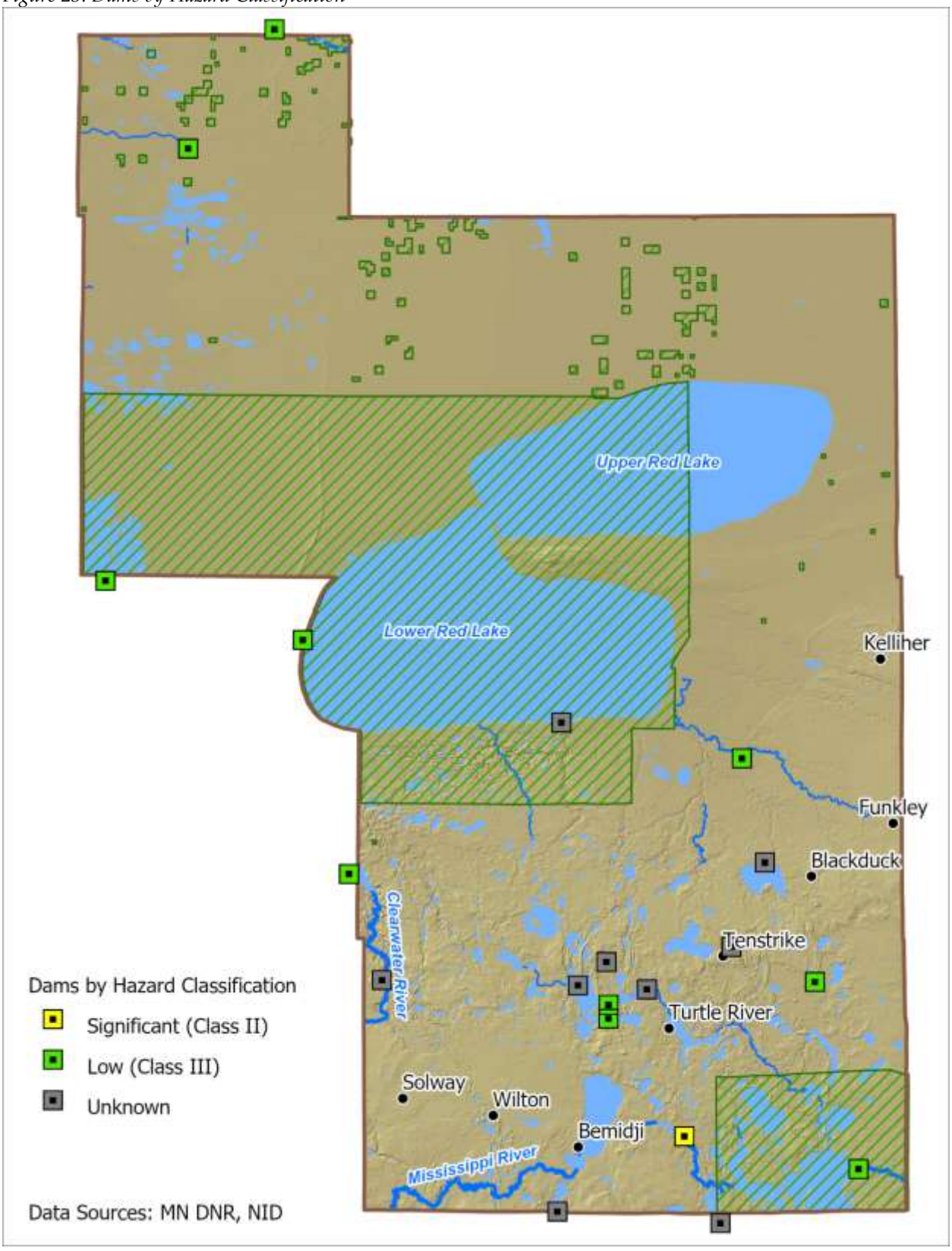
- **High (Class I)** - loss of life or potential serious hazards; damage to health, main highways, high-value industrial or commercial properties, or major public utilities; or serious direct or indirect economic loss to the public;
- **Significant (Class II)** - possible health hazard or probable loss 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 23 below maps the dams in Beltrami County by hazard classification. None of the dams in the county are listed as a high hazard. Only the Lake Bemidji Dam is listed as a "Significant" hazard dam. It is owned by Ottertail Power Company, which maintains an Emergency Action Plan for the dam that addresses response measures such as emergency public notification and evacuation in the event of a dam breach.

Figure 23. 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).

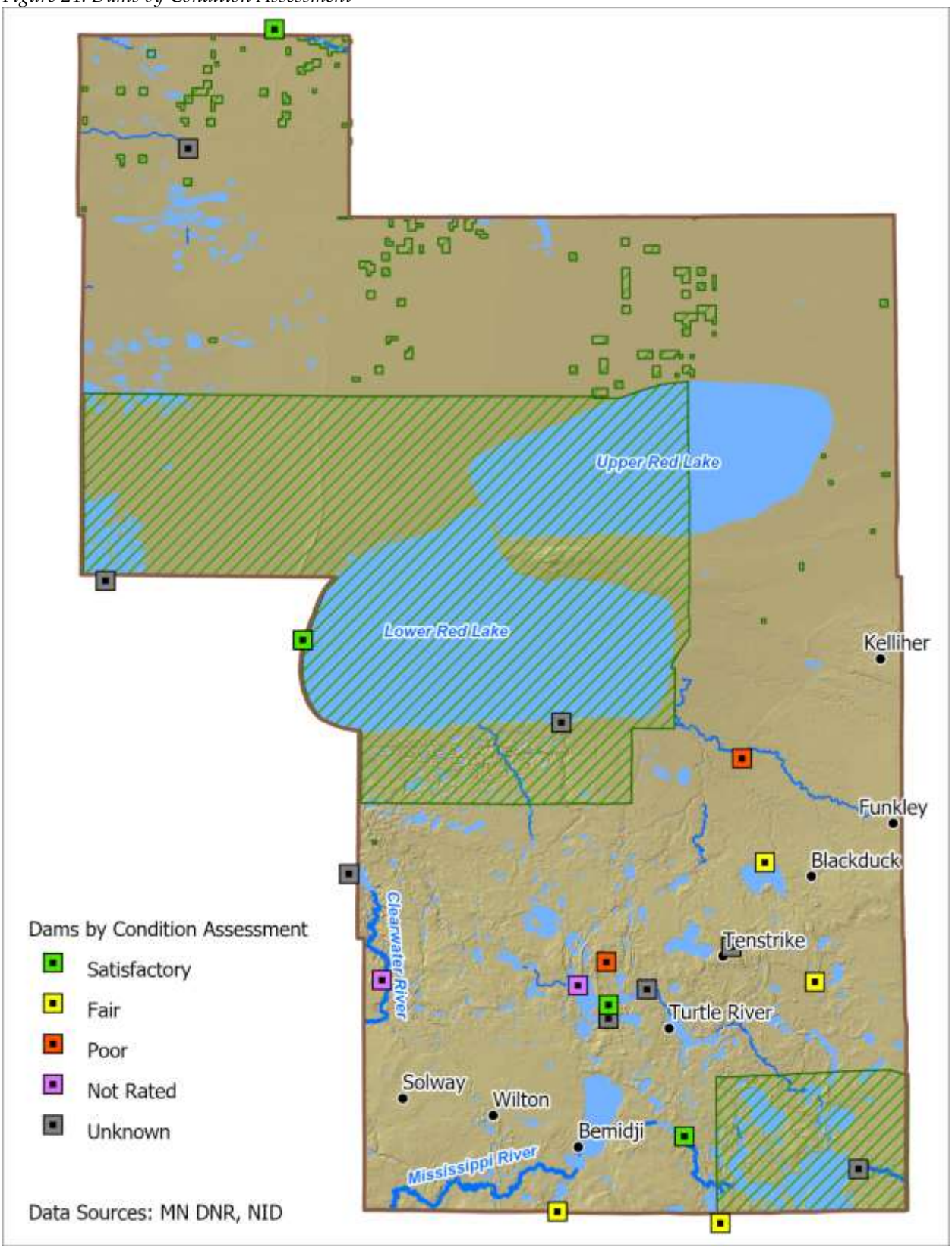
Dams in "Poor" or "Unsatisfactory" condition are more vulnerable to failure and pose a greater threat to the surrounding community and infrastructure.

There are two dams in the county with a conditional assessment of "Poor," the Forster Rice Paddies Dam and the Buena Vista State Forest 1 Dam (Figure 24). None are assigned "Unsatisfactory."

There are no levees in Beltrami County.

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

Figure 24. Dams by Condition Assessment



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 Beltrami County as related to hazard mitigation.
- *Appendix K:* As part of the Beltrami 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 Beltrami County.

Information from the capability assessments was used to support development of local mitigation actions for implementation over the next five years (see column J *Comments on Implementation, Administration & Integration into Local Planning Mechanisms).*

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 lists Beltrami County participation in the NFIP. The communities of Funkley (population: 5) and Turtle River (population: 77) both have FEMA mapped high risk areas, however these communities do not participate in the NFIP. The town of Funkley does not appear to have any

structures within the mapped flood boundary. Turtle River appears to have one structure affected in the modeled Hazus 1% annual chance flood boundary and five or more structures affected in an older non-digital flood boundary that follows the Turtle River Lake. The floodplain along the lake could not be modeled in Hazus and therefore was not included in the flood loss estimates.

Table 32. Beltrami County Participation in the NFIP

Community Name	Participation in the National Flood Insurance Program (NFIP)?		Current Effective Map Date (if applicable)	Entry Date
Beltrami County	Participating in NFIP	No FEMA Mapped High Risk Areas	NSFHA	5/15/1985
Bemidji	Participating in NFIP	No FEMA Mapped High Risk Areas	NSFHA	2/22/2010
Bemidji Township	Participating in NFIP	No FEMA Mapped High Risk Areas	NSFHA	2/22/2010
Blackduck	NOT Participating	No FEMA Mapped High Risk Areas	n/a	n/a
Funkley	NOT Participating	FEMA Mapped High Risk Areas	7/11/1975	n/a
Kelliher	NOT Participating	No FEMA Mapped High Risk Areas	n/a	n/a
Northern Township	Participating in NFIP	No FEMA Mapped High Risk Areas	NSFHA	2/22/2010
Solway	NOT Participating	No FEMA Mapped High Risk Areas	n/a	n/a
Tenstrike	NOT Participating	No FEMA Mapped High Risk Areas	n/a	n/a
Turtle River	NOT Participating	FEMA Mapped High Risk Areas	8/1/1975	n/a
Wilton	Participating in NFIP (E)	FEMA Mapped High Risk Areas	11/10/1978	11/7/2001 (E)

Source: MN DNR (data current as of 4/6/2020)

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. However, Beltrami County does not have any repetitive loss properties.

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 Beltrami County, see Section 4.3.5 *Flash Flood and Riverine Flood.*

5.1.2 Plans and Ordinances

Beltrami 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 an Emergency Operations Plan, Continuity of Operations Plan, Transportation Plan, Community Wildfire Protection Plan, and Water Management Plan.

5.1.3 Plans and Programs in Place to address Natural Hazards

Beltrami 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 – Beltrami County maintains an all-hazards Emergency Operations Plan which details key emergency management functions (i.e. public information and warning, evacuation, mass care sheltering, etc.) that may be necessary in advance of, during and following hazard events that pose risk to life safety. It is intended to assist key county/city officials and emergency organizations to carry out their responsibilities for the protection of life and property under a wide range of emergency conditions. This includes events such as severe summer and winter storms, extreme temperatures, flooding and wildfire.

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, Beltrami County utilizes the CodeRED emergency notification system, Beltrami County Emergency Management Facebook page and coordinates with local news media. The Beltrami County Public Safety Answering Point in conjunction with Emergency Management have developed a checklist to ensure that critical warning activity takes place during severe weather events. We also maintain an effective relationship with the National Weather Service in Grand Forks for the relay and dissemination of emergency weather information.

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

NWS Severe Weather Warnings – Severe storm weather warnings are issued by the National Weather Service. Beltrami County Emergency Management coordinates with the NWS in advance of and during impactful weather events.

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

Backup Power – Generator backup power is in place for the Beltrami County Highway Department, which includes the county gas/fuel system. The Beltrami County Law Enforcement Center and Beltrami County Corrections Center has backup power provided by battery and generator to ensure emergency communication resources including telephone, land mobile radio (LMR covers all radio communications equipment and infrastructure), backup mobile radio (desk-mounted) and internet are uninterrupted during power loss.

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

School Closings – School districts within Beltrami County have their own 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

Winter Roads Maintenance – During the winter season the Beltrami County Highway Department is responsible for snow plowing and ice treatments on over 700 miles of county roads and 300 miles of township roads. The Highway Department has snow plowing Standard Operating Procedures in place which are available online for the public to read and understand the county's priorities and procedures for snow and ice treatments.

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

Severe Weather Awareness Weeks – Beltrami County helps promote and participates in the National Weather Service's "Severe Weather Awareness Week" held in April each year and the "Winter Hazard Awareness Week" in November each year. Each week-long event seeks to educate residents on the dangers of severe 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

SKYWARN Program – We have a SKYWARN program in Beltrami County, comprised of the Paul Bunyan Amateur Radio Club. We also host SKYWARN training for the public each year.

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

Shelter Facilities – A severe storm or a period of extreme heat/cold coupled with a major power outage may require emergency sheltering for those in need. Beltrami County Emergency Management maintains a list of shelters and has Sheltering and Pet Sheltering Plans in place. Beltrami County Emergency Management & Beltrami County Public Health Dept. work closely with the American Red Cross and local communities to identify sheltering locations.

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

Outdoor Warning Sirens – There are outdoor warning sirens located in Bemidji, Blackduck, Kelliher and Waskish. Sirens are activated when the National Weather Service notifies dispatch of high winds or tornado conditions that pose a risk to the public.

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

Beltrami County Highway Department & Transportation Improvement Plan – Beltrami County Highway Department is responsible for the survey, design, construction, inspection, maintenance and repair of the Beltrami County road and bridge system which consists of: 455 County State Aid Highway miles, 11 County State Aid Municipal miles, 246 County Road miles, and 124 bridges (including bridges owned by townships). The Highway Department identifies, prioritizes and implements all transportation improvement projects. A Transportation Improvement Plan (TIP) is in place for 2019-2023.

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

Stormwater Management – Beltrami County Environmental Services & Soil and Water Conservation District oversees the development, maintenance and implementation of the 2017-2027 Comprehensive Local Water Management Plan. Section 3.2.1 of the plan addresses stormwater management. In

addition, the Beltrami County 2017 Priority Concerns Scoping Document lists stormwater management as a priority concern.

Summer Storms Winter Storms Floods Erosion Extreme Temps **Drought** Dam Failure **Wildfire**
Public Awareness – Raising public awareness of wildfire safety and dangerous conditions is an ongoing effort of Beltrami County Emergency Management, local fire departments, as well as MN DNR Forestry and the U.S. Forest Service.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**
Local Fire Departments – There are five fire departments located in Beltrami County and two located outside of Beltrami County that provide primary service coverage in Beltrami County. Each department is responsible for wildfires within their department boundaries along with the Minnesota Department of Natural Resources and National Forest Service; however, they often work together on larger fires, including wildfires.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**
Mutual Aid Agreements – All of the municipal fire departments in Beltrami 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**
Burning Permits/Restrictions – The MN DNR 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**
Fire Prevention Week – Fire prevention week is held annually each October. Many fire departments participate and provide an opportunity for local residents to learn fire safety with open houses or present in the local schools to educate our youth. In addition, local media assist in sharing fire safety information to the public during periods of high risk for wildfire.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure **Wildfire**
Beltrami County Forest Management Plan 2018 – The Beltrami County Natural Resource Management (NRM) Department oversees the development, update, and implementation of the county's forest management plan. This plan covers the long-term management of approximately 147,500 acres of county forest land under the management control of the NRM Department.

Summer Storms Winter Storms Floods Erosion Extreme Temps **Drought** Dam Failure Wildfire
Volunteer Rainfall Monitoring Program – Beltrami Environmental Services & SWCD manages a Volunteer Rainfall Monitoring Network program for Beltrami County. The program is part of the MnGAGE program administered by the DNR Minnesota State Climatology Office.

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
Beltrami County Soil and Water Conservation District – Beltrami County Environmental Services and Soil & Water Conservation District provides access to natural resource management and conservation

services and provides technical, financial, and educational assistance to landowners to address natural resource concerns. The Erosion Control and Water Management Program, or State Cost-Share Program, provides funds to Soil and Water Conservation Districts to share the cost of systems or practices for erosion control, sedimentation control, or water quality improvements designed to protect and improve soil and water resources. Through the cost-share program, land owners and/or occupiers can request financial and technical assistance for the implementation of conservation practices. Projects that may be eligible for cost-share funding include: critical area planting, diversions, windbreak - shelterbelt establishment, grassed waterway, livestock waste management, filter strips, sediment basins, streambank and shoreline protection, stripcropping, terraces, well decommissioning and forestry conservation practice.

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

Ottertail Power Dam Emergency Response Plan – Beltrami County Emergency Management has an emergency response and notification plan for the Ottertail Power Dam located on the Mississippi River. This plan does not address mitigation or recovery efforts.

5.2 Mitigation Goals

In Section 4 of this plan, the risk assessment identified Beltrami County as prone to a number of natural hazards. The steering committee members understand that although hazards cannot be eliminated altogether, Beltrami 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 Beltrami County Plan (Table 33). This framework will allow for integration of the mitigation actions that are listed by Beltrami 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 33. 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 34 below:

Table 34. Mitigation Strategies and Action Types

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 • Land use ordinances • Planning and zoning • Building codes and enforcement • Floodplain ordinances • NFIP Community Rating System • Capital improvement programs • Open space preservation • Shoreline codes • Stormwater management regulations and master plans
Structure and Infrastructure Projects	These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance program.	• Acquisitions and elevations of structures in flood prone areas • Utility undergrounding • Structural retrofits • Floodwalls and retaining walls • Detention and retention structures • Culverts • Safe rooms
Natural Systems Protection	These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.	• Sediment and erosion control • Stream corridor restoration • Forest management • Conservation easements • Wetland restoration and preservation

Mitigation Strategy	Description	Example Mitigation Actions
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 • Websites with maps and information • Real estate disclosure • Presentations to school groups or neighborhood organizations • Mailings to residents in hazard-prone areas. • StormReady • Firewise Communities
Mitigation Preparedness and Response Support	This is a State of Minnesota mitigation strategy with the intent of covering preparation and actions that protect life and property during a natural disaster.	• Emergency operations plan • Flood fight plans and preparedness • Dam emergency action plans • Warning • Backup power • Emergency capabilities

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 35 provides criteria that were taken into consideration in the process.

5.3.1 Hazard Mitigation Actions

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

The Beltrami County Mitigation Action Chart is provided in Table 36. *Appendix G* contains the jurisdictional mitigation action charts for the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton.

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 more than one hazard. 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 five 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 34 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 Beltrami 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 35.

Table 35. Criteria for Mitigation Action Priority Ranking

Ranking	Criteria
High Priority	• Methods for reducing risk from the hazard are technically reliable. • The county has experience in implementing mitigation measures. • Mitigation measures are eligible under federal grant programs. • There are multiple mitigation measures for the hazard.

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

Column H – Expected Timeframe

Each mitigation action identifies the anticipated timeframe for implementation of the action. Most mitigation actions fall within the next five-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 36. Beltrami County Master 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	**EMERGENCY NOTIFICATIONS** Conduct public outreach to increase awareness of and sign-up for Beltrami County's CodeRED Emergency Notification System.	n/a	Ongoing	High	2020-2025	Beltrami County Emergency Mgmt. (BCEM)	In the event of emergencies or hazardous conditions that require timely and targeted communication to the public, Beltrami County utilizes the CodeRED emergency notification system, Beltrami County Emergency Management Facebook page and coordinates with local news media. A link for residents to sign up for CodeRED is provided on the BC Sheriff's Office website.	County funding
2	All-Hazards	Mitigation Preparedness & Response Support	**SHELTER FACILITIES** Work with the American Red Cross to increase the amount of shelter facilities to care for people temporarily displaced from severe storms, power outages or other hazard events.	n/a	Ongoing	Mod.	2020-2025	BCEM in cord with BC Public Health Dept. & Red Cross	Beltrami County Emergency Management & Beltrami County Public Health Dept. work closely with the American Red Cross and local communities to identify sheltering locations and will continue to do so.	County funding
3	All-Hazards	Mitigation Preparedness & Response Support	**EOP UPDATES** Update the Beltrami 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	BCEM	The Beltrami County Emergency Manager updates the County's All-Hazards EOP on an annual basis. The EOP undergoes an annual cyclical review process that includes review by the County Board, HSEM Region 3 Regional Program Coordinator and peer EM's from HSEM Region 3.	County funding

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	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	BCEM, Beltrami Electric	Beltrami County Emergency Management participates in the NWS "Winter Hazard Awareness Week" held in November each year and the "Severe Weather Awareness Week" held in April each year. Information is shared with the public during those events as well as during periods of severe weather via our website, BC Sheriff's Office FB page and through local media. In addition, Beltrami Electric encourages residents to be prepared for power outages and offers a program to homeowners on the installation and maintenance of a generator system.	County funding, Beltrami Electric
5	Severe Winter & Summer Storms	Structure & Infrastructure Projects	**RADAR COVERAGE** Work with the National Weather Service to improve radar coverage for severe weather in Beltrami County.	n/a	**New**	High	2020-2025	BCEM in cord with NWS	Beltrami County is located almost exactly in the middle of two radars (Duluth and Mayville). Severe winter, spring and summer storms often go undetected. BCEM will work with the NWS to see how radar improvements can be addressed for the County.	County funding, NWS funding

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	Severe Winter & Summer Storms	Natural Systems Protection	**TREE MANAGEMENT** Conduct tree trimming or removal of trees in the right of way of county roads to reduce risk of road blockages and downed power lines due to falling limbs.	Yes *(Power System Infrastructure and Roads)*	Ongoing	Mod.	2020-2025	Beltrami County Hwy. Dept. & Beltrami Electric	The Beltrami County Highway Dept. and Beltrami Electric both work to maintain vegetation near power lines reduce the chances of power outages due to storms. The Beltrami County Highway Department has made improvements to roads which includes acquiring and clearing additional right of way which will help prevent trees from falling and blocking the road.	County funding, Beltrami Electric funding

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
7	Severe Winter / Summer Storms	Structure & Infrastructure Projects	**BURY/STRENGTHEN POWERLINES** Work with Beltrami Electric Co-op to identify where it is feasible and cost effective to bury or strengthen power lines to mitigate against power line failure from severe storm events such as blizzards, ice storms, thunderstorms and high winds.	Yes *(Power Supply Infrastructure)*	Ongoing	High	2020-2025	Beltrami Electric Co-op in cord. with BCEM	Beltrami Electric has taken measures to replace overhead line with underground line to reduce outages in certain areas as our budget allows. We have also installed additional protective equipment to isolate outage areas as much as possible. All of our new infrastructure is installed underground. Beltrami Electric Co-op has successfully acquired FEMA grant funding in 2003 and 2006 for converting overhead power lines to underground and will continue to apply for FEMA HMA grants for additional projects where they deem it is necessary and the best solution. Beltrami County will provide support to the Co-ops' efforts as needed.	Beltrami Electric Funding, FEMA HMA grant funding

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 Winter & Summer Storms	Mitigation Preparedness & Response Support	**GENERATOR BACKUP POWER** Identify critical infrastructure and facilities that do not have adequate backup power and obtain appropriate generators to install at those locations.	n/a	Ongoing	High	2020-2025	BCEM	Beltrami County has generator power in place for the Hwy. Dept. (gas/fuel system), Law Enforcement Center and County Corrections Center. Not all county and city facilities have backup power in the event of extended power outage. BCEM encourages local jurisdictions to acquire backup generators to support their operations. The county will work to purchase and install generators for designated shelter facilities and other buildings or infrastructure as funding allows. Outside grant funding may be necessary to acquire needed generators.	County funding, Other funding TBD

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	Severe Summer Storms / Tornado	Mitigation Preparedness & Response Support	**OUTDOOR WARNING SIRENS** Work to provide assistance to communities or other public facilities in the county that require an upgrade of their existing outdoor warning siren or purchase of a new siren.	n/a	**New**	High	2020-2025	BCEM in cord. with local gov'ts	There are warning sirens located in Bemidji (10), Blackduck (1-needs update), Kelliher (1-needs update) and Wakish (1). New warning sirens are needed in the cities of Solway and Wilton. There are also many resort areas, county recreational areas/parks, state parks and state recreational areas that do not have warning sirens. Sirens are an important notification tool for hazardous high wind events and tornadoes. The BCEM Director will seek to apply for funding (or provide assistance to cities in their application) from outside grant sources (such as USDA Rural Development or FEMA HMA 5% Initiative funding) to purchase outdoor warning sirens.	County funding, USDA Rural Dev. Grant, FEMA HMA grant funding
10	Severe Summer Storms / Tornado	Mitigation Preparedness & Response Support	**SKYWARN TRAINING** Offer SKYWARN training to local fire & law departments and the public, and utilize our system of Beltrami County storm spotters.	n/a	Ongoing	Mod.	2020-2025	BCEM in cord. with NWS	We have a SKYWARN program comprised of the Paul Bunyan Amateur Radio Club. Beltrami County Emergency Management works with the National Weather Service to host a SKYWARN training each year for local fire depts., law enforcement, the Radio Club as well as the public.	County, funding, NWS funding

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
11	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	**STORM SHELTERS / TORNADO SAFE ROOMS** Promote the construction of storm shelters or safe rooms in places where people are vulnerable to severe storms with high winds or tornado events. Examples include schools, public campgrounds, mobile home parks, high density residential development and outdoor venues.	n/a	**New**	High	2020-2025	BCEM in cord. with MN DNR, and City & Twp. Govt's	BCEM will work to assist communities/facilities that have identified a need for a storm shelter or tornado safe room. The BCEM Director will provide assistance as needed on tornado safe room projects pursued by those entities, including possible application to FEMA for HMA grant funding to support construction. BCEM encourages communities to identify vulnerable areas within their communities and address them with local planning.	County funding, Local funding, FEMA HMA Grant funding
12	Flood	Local Planning & Regulations	**LOCALIZED FLOOD RISK REDUCTION PROJECTS** Improve roads, culverts and storm water facilities to reduce future flood-related damages.	Yes *(Roads & Drainage System Infrastructure)*	Ongoing	High	2020-2025	BC Highway Dept.	The Hwy. Dept has an annual transportation plan that identifies and schedules road improvement projects that include culvert and drainage improvements to reduce over-the-road flooding. We have Public Works Director that addresses road maintenance issues and road improvement projects. The County annually prioritizes road issues and incorporates implementation strategies in capital improvement planning.	County funding, other Federal and State sources

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
13	Flood / Erosion	Natural Systems Protection	**BANK STABLIZATION** Work with the Clearwater Lake Area Association and the Red Lake Watershed District to prevent and restore identified high bank failure.	n/a	In-Progress	high	2020-2025	BC SWCD in cord with key partners	Beltrami County SWCD is currently partnering with the Clearwater Lake Area Association, Clearwater County SWCD, and the Red Lake Watershed District to install bank stabilization in identified high risk and priority areas, installation of best management practices above and adjacent to bank failures, and an education program coordinated with the Clear Water Lake Area Association. Beltrami County SWCD received an Ecofootprint Grant for $75,000 funded by Enbridge for this work.	Enbridge Grant Funding
14	Wildfire	Structure & Infrastructure Projects	**WATER ACCESS** Improve alternative water supply access for wildland firefighting in areas not served by a municipal water source.	Yes *(Existing Buildings)*	**New**	Mod.	2020-2025	BCEM in cord with local FD's	Many fire departments in the county have installed limited dry-hydrants, but there is a desire for more if funding were available. Alternative water sources are desired for fighting wildfire. Projects such as installation of dry hydrants or underground water tanks may be considered where necessary and feasible. Outside grant funding would be necessary for implementation of projects.	County funding, other funding TBD

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
15	Wildfire	Education & Awareness Programs	**PUBLIC OUTREACH & EDUCATION** Raise public awareness of wildfire risk due to dangerous high wind or dry conditions and safety measures that should be taken.	n/a	Ongoing	High	2020-2025	CWCEM in cord. with FD's, and MN DNR	All communication channels are used to help promote wildfire risk awareness, including outdoor signage, social media posts and news in local media.	County funding, MN DNR
16	Wildfire	Local Planning & Regulations	**CWPP DEVELOPMENT** Work with the MN DNR to develop a Community Wildfire Protection Plan (CWPP) for Beltrami County.	Yes *(Existing Buildings & Future Development)*	**New**	Mod.	2020-2025	BCEM in cord with MN DNR and local FDs	The County currently does not have a CWPP in place. The BCEM Director will coordinate with the MN DNR Firewise Coordinator to discuss development of a CWPP for the county and determine the process and funding needed to complete it.	County funding, MN DNR Firewise funding
17	Dam Failure	Mitigation Preparedness & Response Support	**OTTERTAIL DAM EAP** Ensure an Emergency Action Plan is in place for the Ottertail Dam on the Mississippi River.	n/a	Ongoing	High	2020-2025	BCEM	BCEM has an emergency response and notification plan in place for the Ottertail Dam.	County funding

The mitigation activities listed in the **Beltrami County Mitigation Action Chart** were identified for inclusion in the county's 2020 MHMP 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 Beltrami County.

5.3.2 Mitigation Actions by Community

This plan is a multi-jurisdictional plan that covers Beltrami County, its school districts and the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton. 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 Beltrami County 2020 MHMP Update.

Table 37. Representatives that reviewed and provided input to Mitigation Action Charts

Name of Jurisdiction	Name of Representative, Title
Beltrami County	*County Staff:* Christopher Muller, Emergency Management Director Bruce Hasbargen, County Engineer Brent Rud, Envr.Services Director/SWCD District Manager Cynthia Borgen, Public Health Division Director, Beltrami County Health and Human Services *Other Stakeholders:* Beltrami County Emergency Services Committee: Bob Cribb, Kelliher Fire Department Molly Vollbrecht, Blackduck Ambulance Rachel Myers, Blackduck Ambulance Erin Morrill, Bemidji State University Michael Schultz, Sanford AirMed Jason Riggs, Beltrami County Sheriff's Office Morris Frenzel, Kelliher Fire Department Megan Heur-Korhonen, Beltrami County Public Health David Hoefer, Bemidji Fire Department Mike Mastin, Bemidji Police Department
City of Bemidji	Michelle Miller, City Clerk Dave Hoefer, Fire Chief
City of Blackduck	Christina A. Regas, City Administrator
City of Funkley	
City of Kelliher	Shelli Krueth, City Clerk Darin Latterell, Mayor Charles Schultz, Public Works Manager
City of Solway	
City of Tenstrike	Cathy Nash, City Clerk Mike Fellows, Mayor Ron Fellows, City Councilor Greg Shogren, City Councilor
City of Turtle River	
City of Wilton	Jeff Snyder, Mayor

Mitigation actions are separated by jurisdiction in *Appendix G*.

Section 6 – Plan Maintenance

6.1 Monitoring, Evaluation, and Updating the Plan

The Beltrami County Multi-Hazard Mitigation Plan 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 Beltrami County MHMP.

The Beltrami 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 Beltrami County Emergency Management Director will work with the Beltrami County Emergency Services Committee (Local Emergency Preparedness Committee - LEPC) to serve as the committee to help monitor, review, evaluate and update the MHMP. The committee normally meets quarterly and consists of Beltrami County Emergency Management, and other county departments, as well as representatives from the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton. Additional stakeholders will be added based on need. If necessary, the Beltrami County Emergency Management Director will convene the committee to meet on a more 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 committee will meet to update pertinent mitigation strategies. Depending on Beltrami County opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

The committee will continue to review the MHMP goals and objectives to determine their relevance to changing situations in Beltrami 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 the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

Updates or modifications to the 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 as the committee deems appropriate and necessary, and as approved by county commissioners.

Throughout the five-year window of the plan, each respective county department and jurisdiction will be required to report on the status of mitigation actions in their charts to the Beltrami County Emergency Management Director so that progress notes may be maintained for the next plan update.

6.2 Implementation

Beltrami County and its included municipalities share a common MHMP and work together closely to develop, revise, and implement it. This MHMP provides a comprehensive chart of mitigation actions for Beltrami County and its jurisdictions (see Section 5.3.1, *Hazard Mitigation Actions*). The cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton 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 in order to identify what strategies are most appropriate to use. This will be part of an ongoing discussion as Beltrami 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 can aid in gaining a better understanding of threats and allow planning for mitigation strategies accordingly. As resources are limited for this part of the planning process, additional data collection is likely to be an ongoing activity as resources become available.

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

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

Regulation: Regulation is an important mitigation tool for Beltrami 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 MHMP. The Beltrami County Emergency Management Director and the Beltrami County Emergency Services Committee members 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, Beltrami County will take the following measures:

- The plan will be posted on the Beltrami County Emergency Management website for the public to read and provide feedback. Collected feedback will be reviewed and the plan will be amended as necessary.
- Following any major storms or natural disasters, Beltrami County Emergency Management will seek to gather concerns and new ideas for mitigation from local residents to include in the next update of the plan. This may be done through public meetings, outreach via social media (i.e., Sheriff's Office Facebook Page), or news releases via local media.
- 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 be required to report on the status of mitigation actions in their charts to the Beltrami County Emergency Management Director.
- Jurisdictions will use numerous means of public outreach to engage new public 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 – Beltrami County Maps
Appendix B – Beltrami County Critical Facilities
Appendix C – Beltrami 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 – Beltrami County Plans & Programs In Place
Appendix K – Local Mitigation Survey Report
Appendix L – Minnesota Department of Health Climate & Health Report

Appendix A
Beltrami County Maps

Figure A - 1. Hydrography of Beltrami County

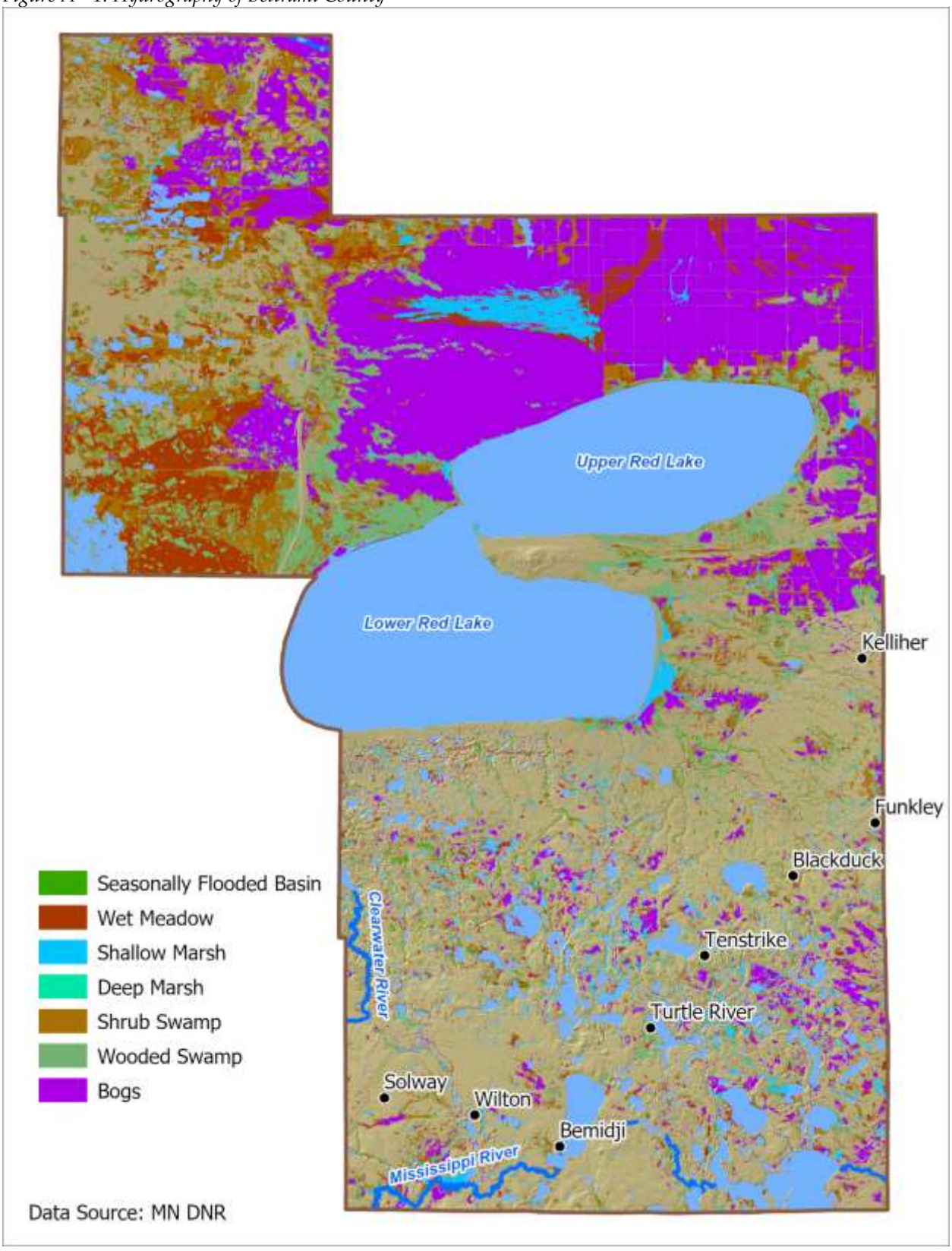


Figure A - 2. Beltrami County Population by Census Block, 2010

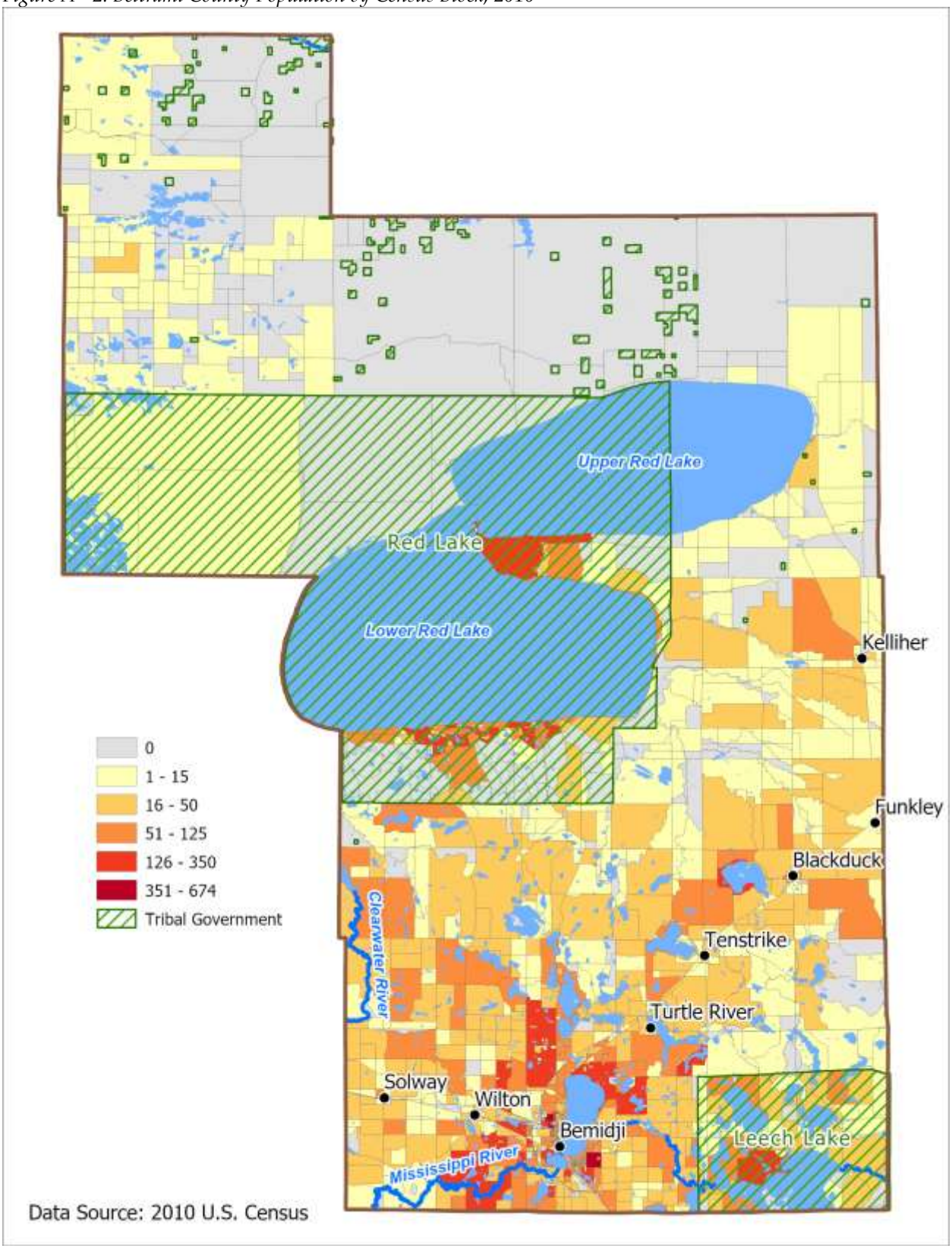


Figure A - 3. Beltrami County Population Change, 2000-2010

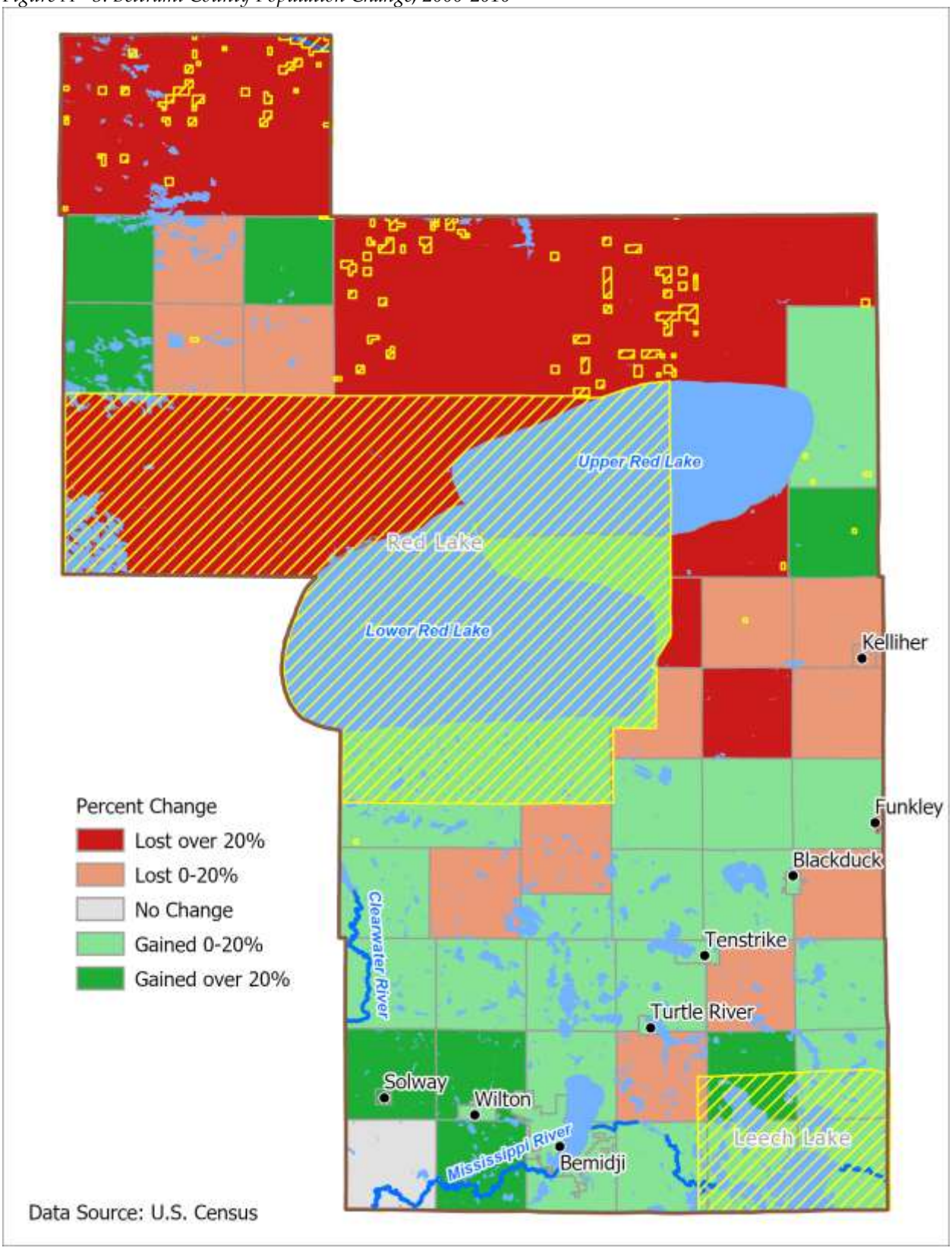


Figure A - 4. Social Vulnerability Themes, Ranked by Percentile against all MN Census Tracts

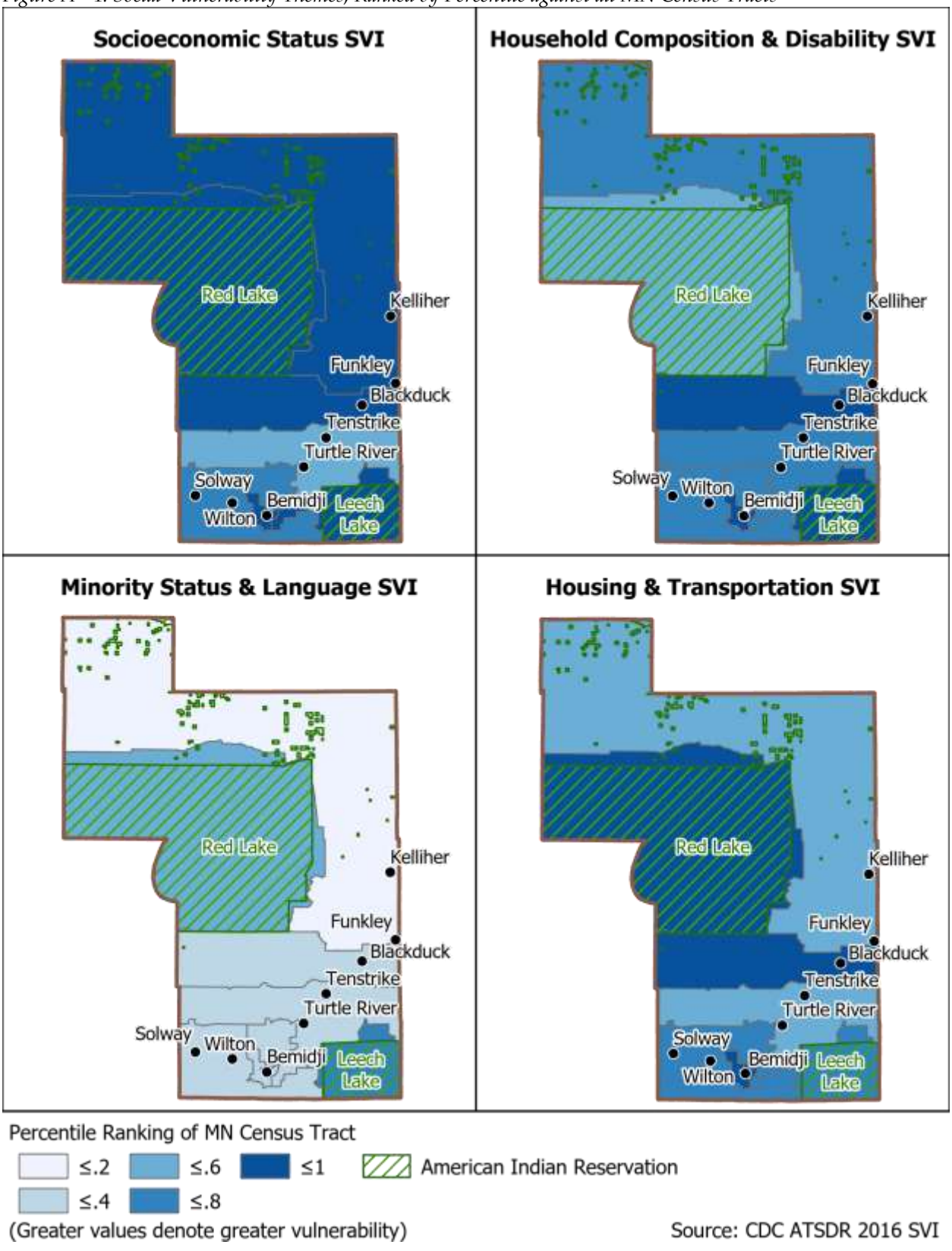


Figure A - 5. Emergency & Shelter Facilities, Bemidji

Figure A - 6. Emergency & Shelter Facilities, Blackduck, Solway, and Kelliher

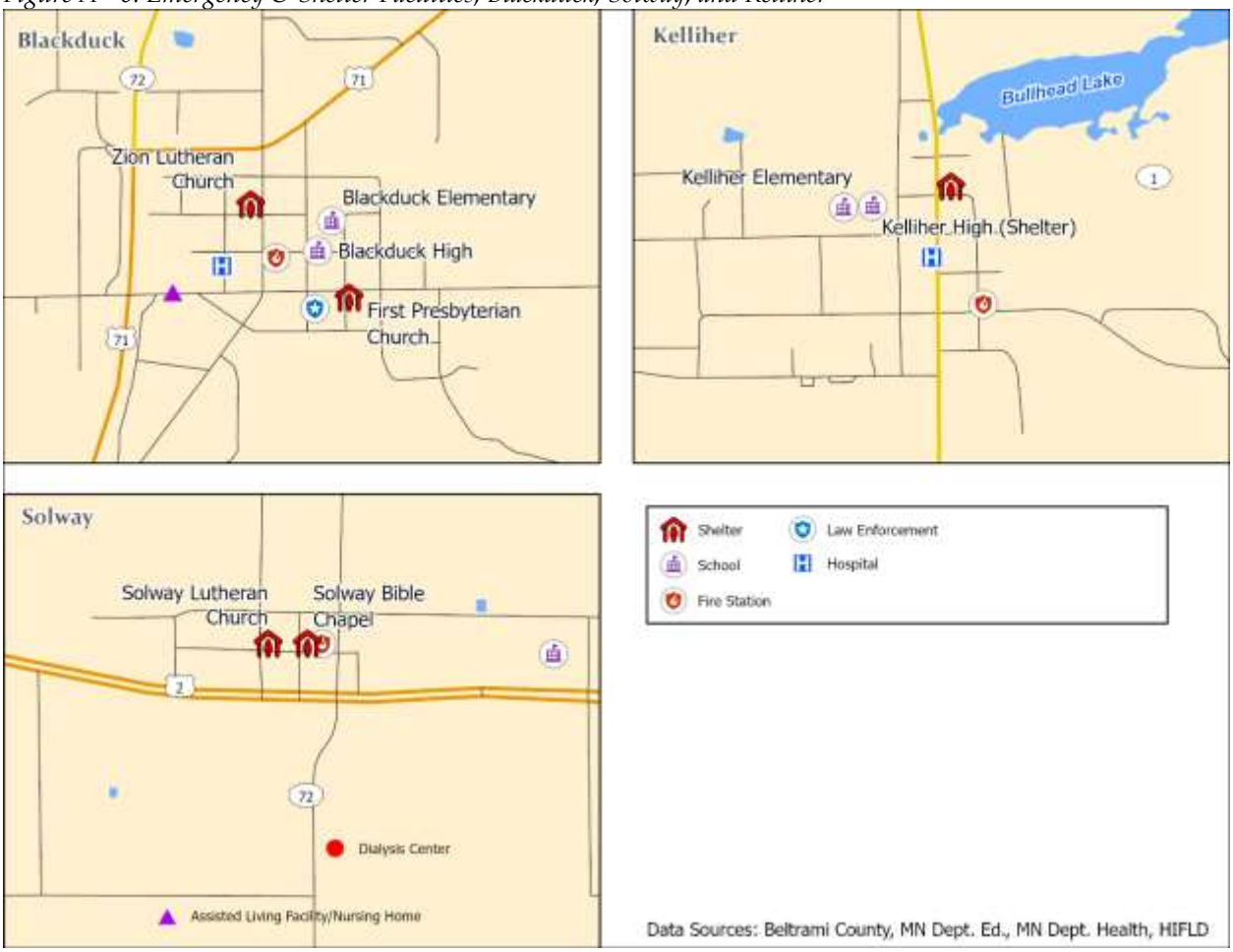


Figure A - 7. Response Times from Fire Stations, Beltrami County

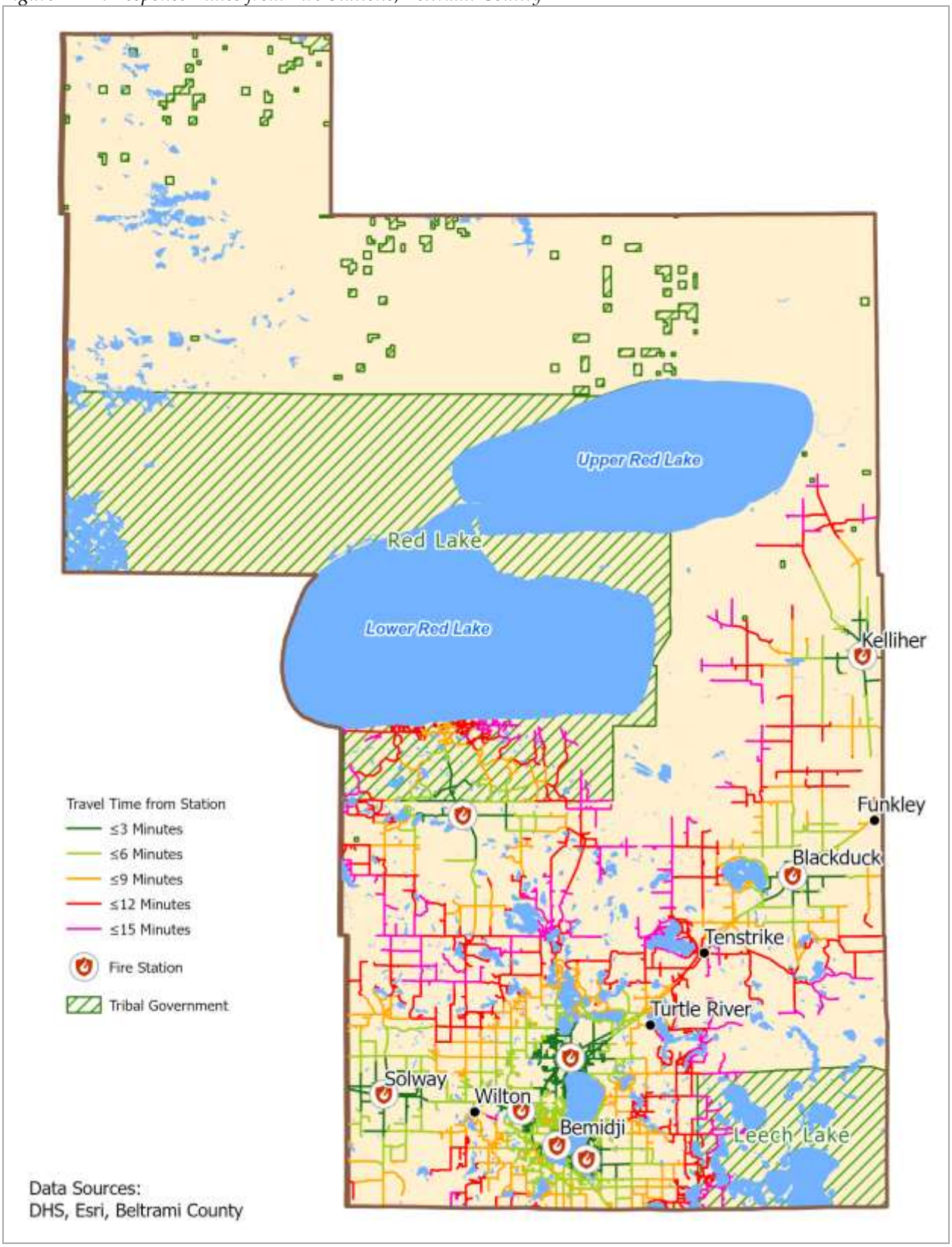


Figure A - 8. Transportation Infrastructure, Beltrami County

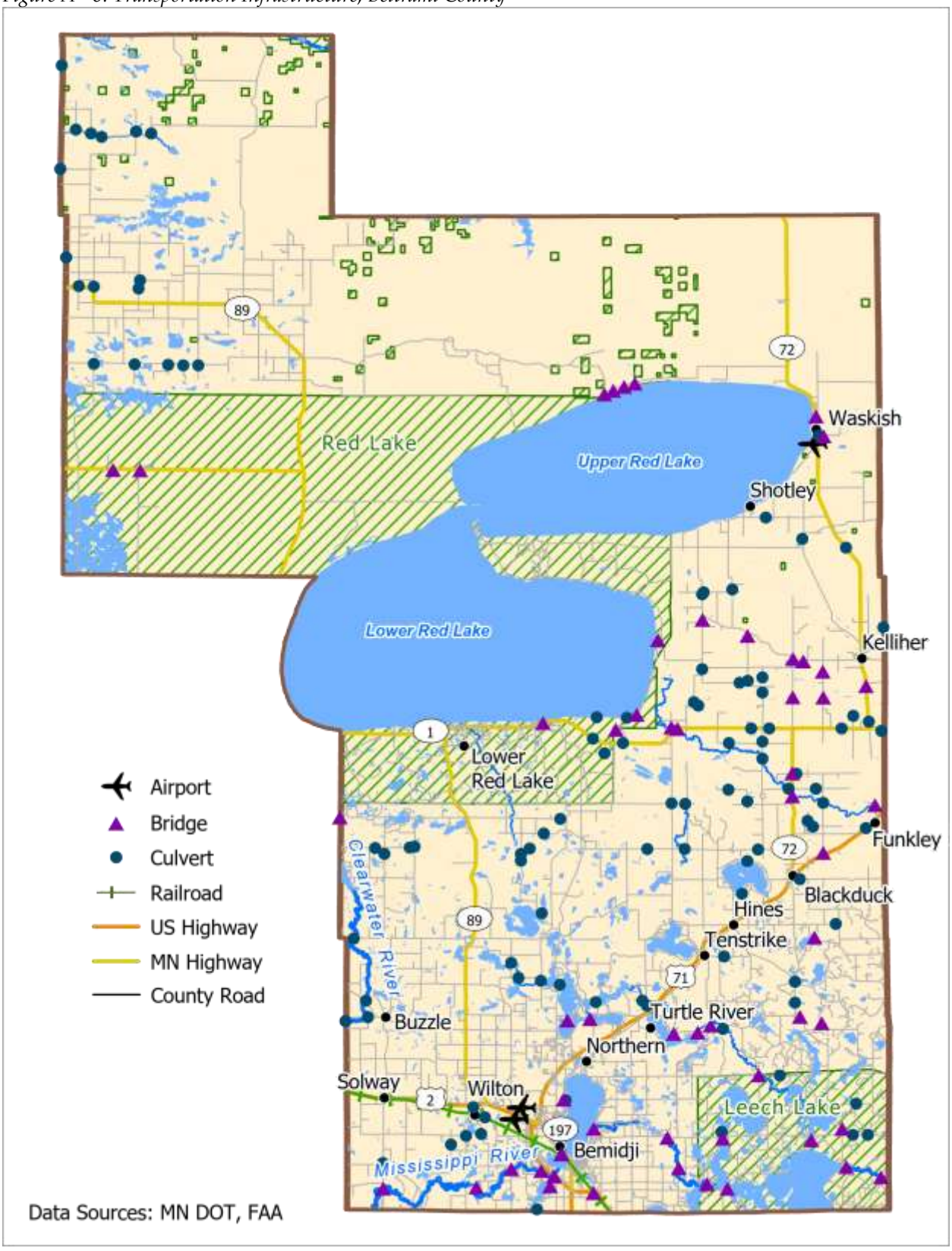


Figure A - 9. Utility Infrastructure, Beltrami County

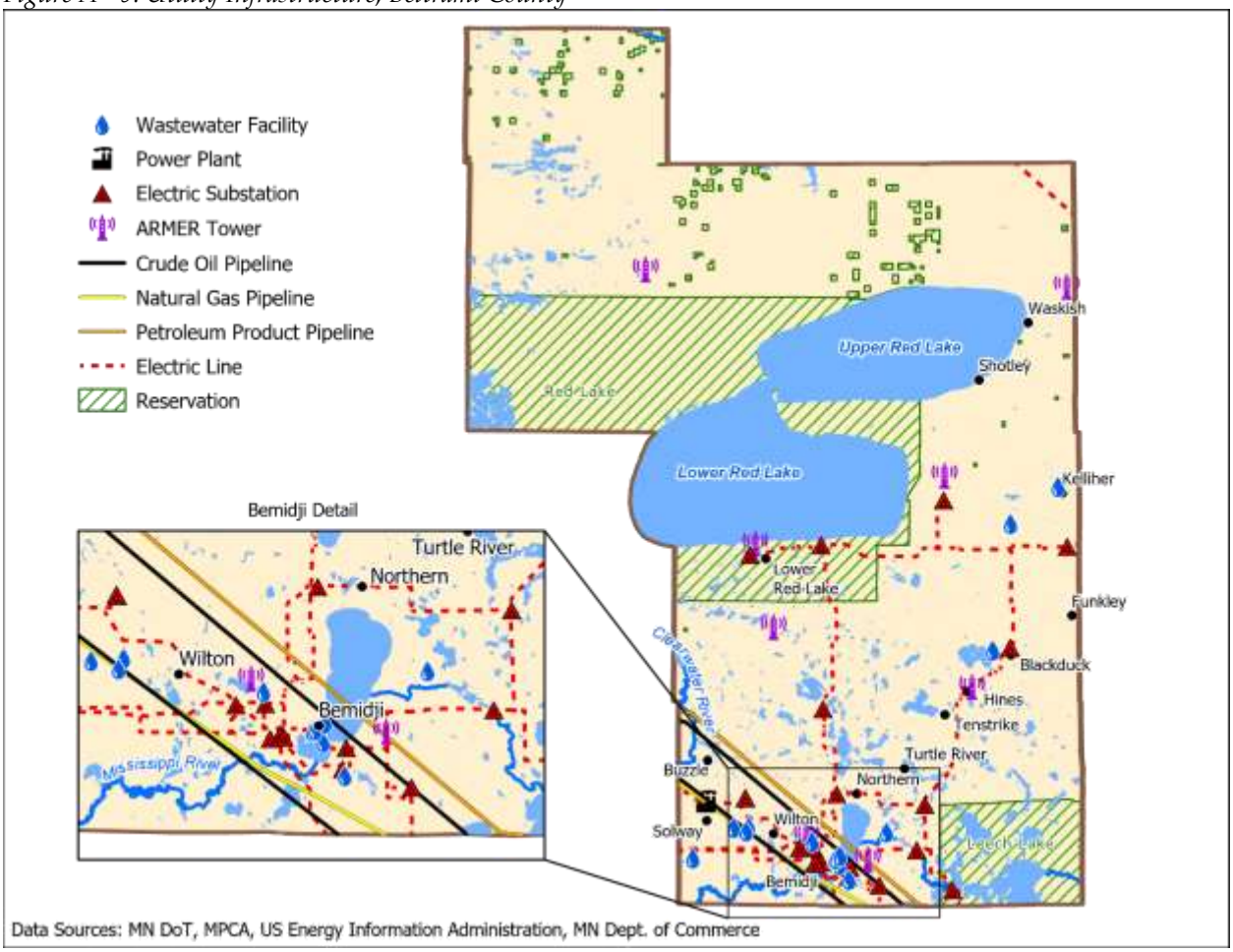


Figure A - 10. High Potential Loss Structures, Beltrami County

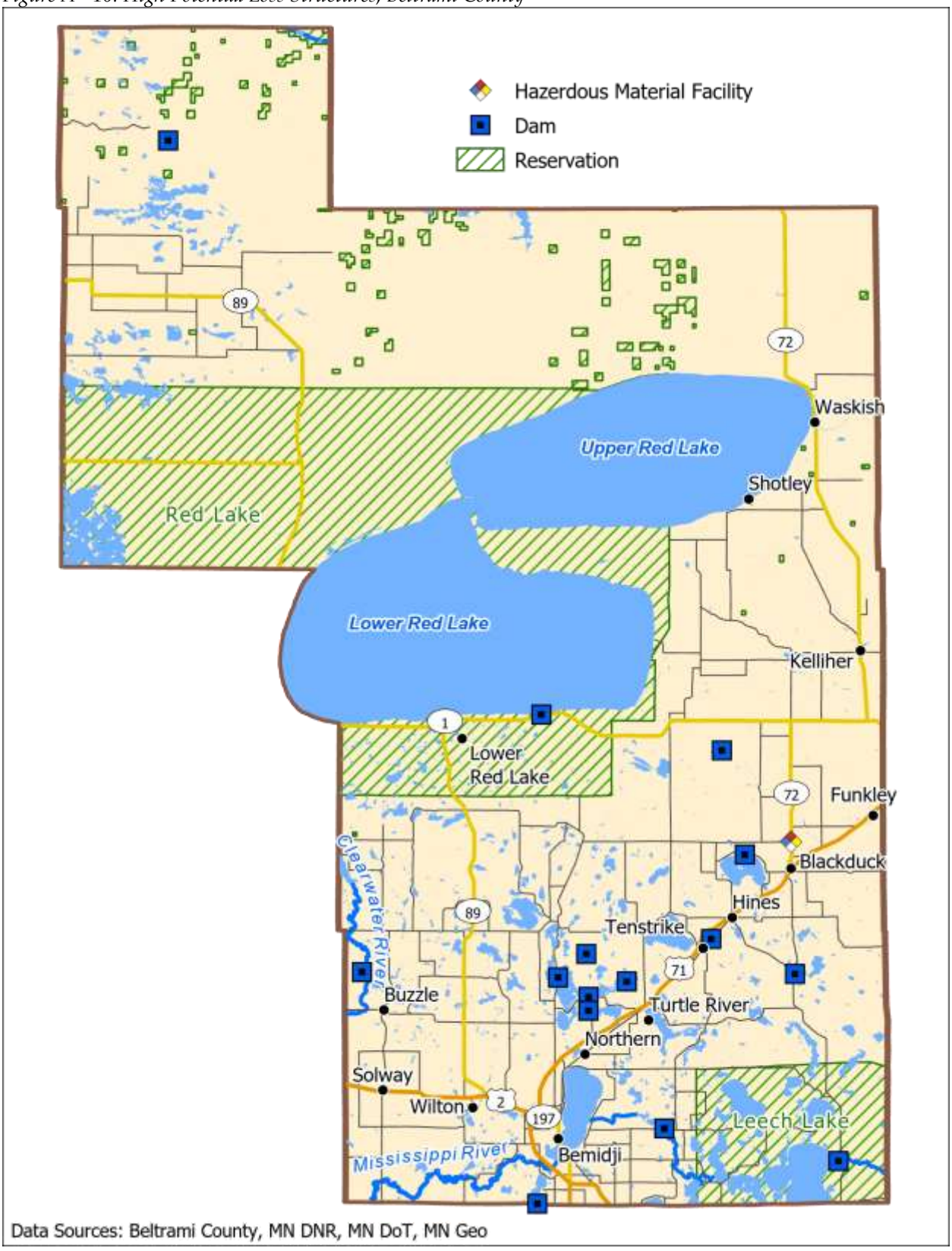


Figure A - 11. Land Cover in Beltrami County

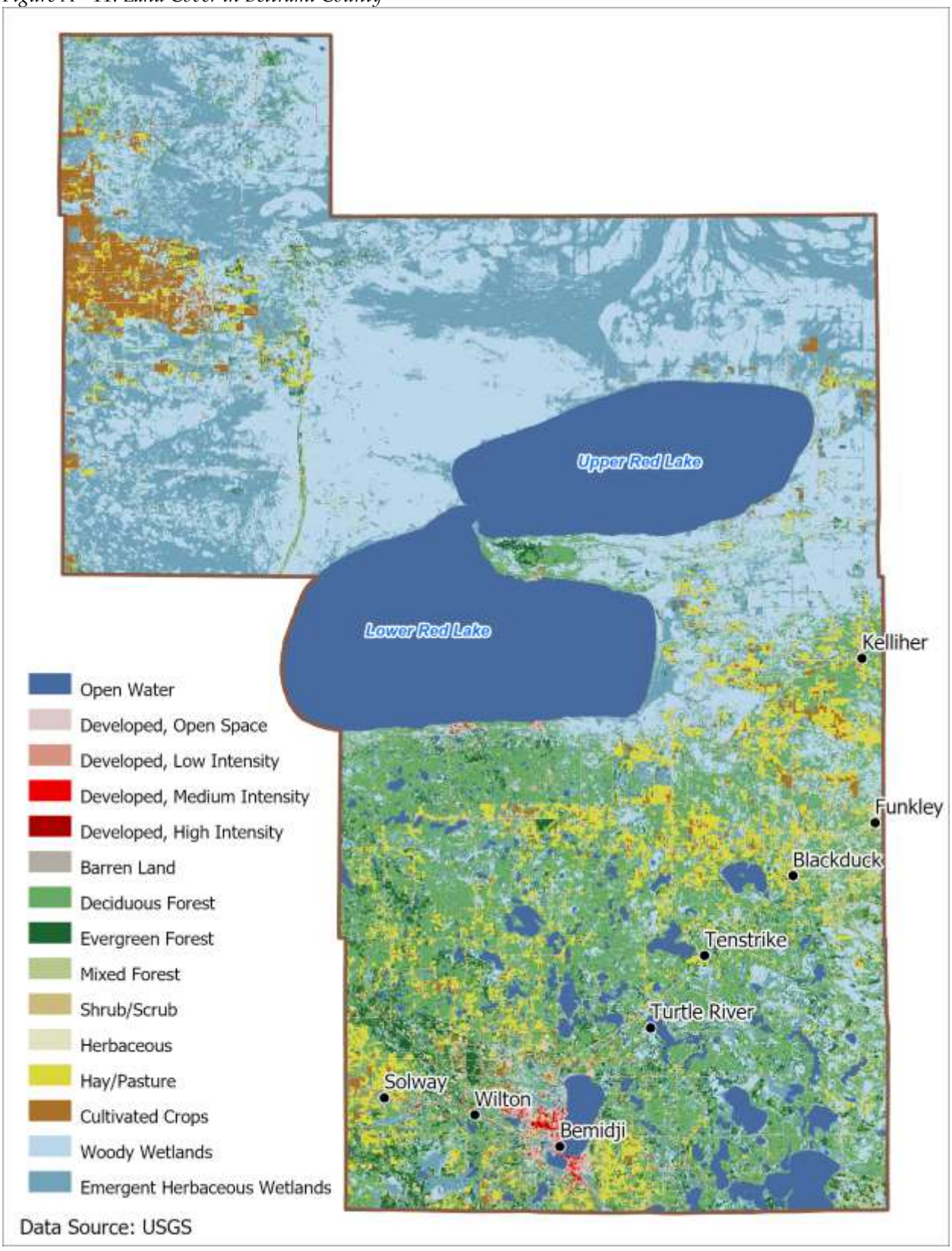


Figure A - 12. Land Ownership in Beltrami County

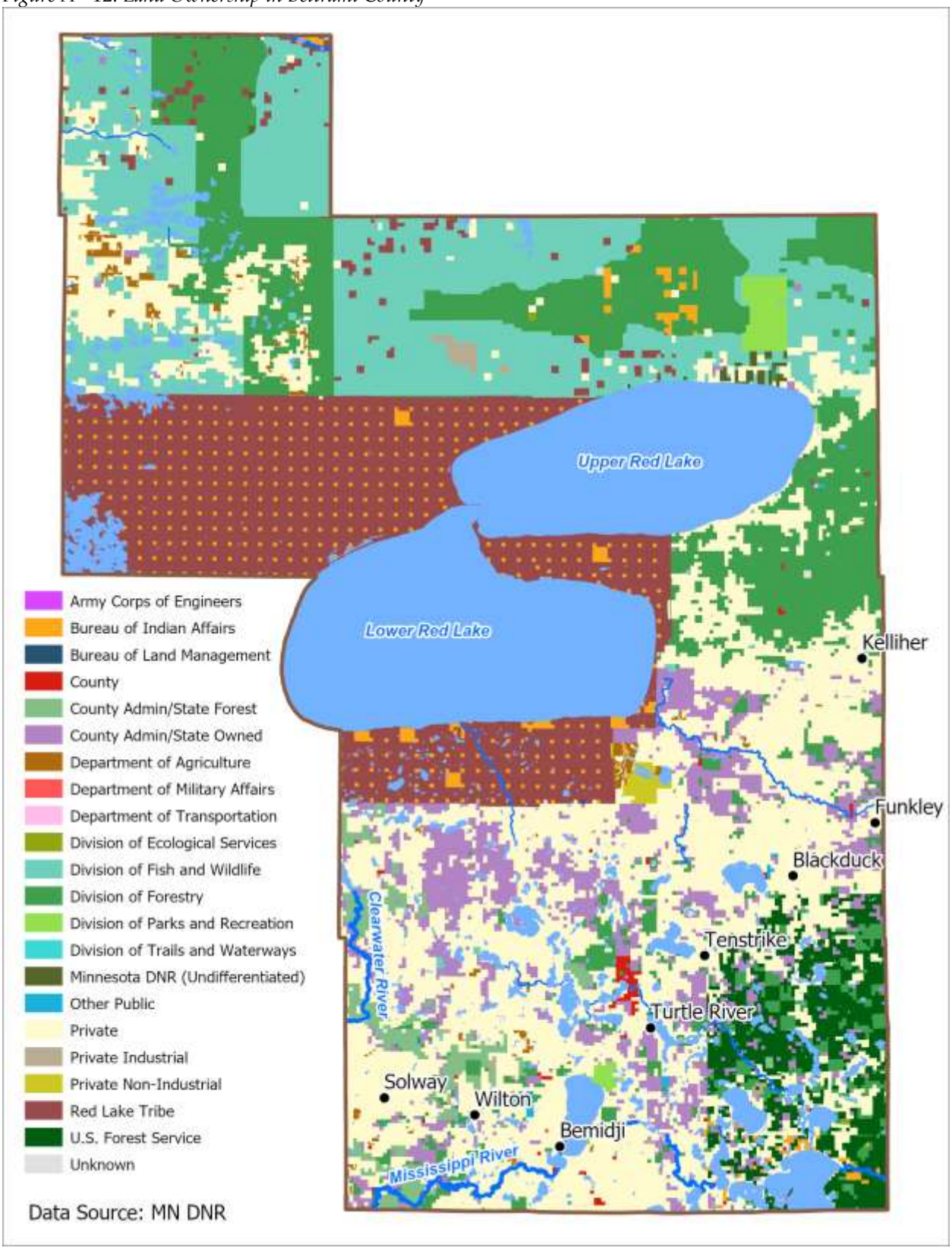


Figure A - 13. Mobile Home Parks in Beltrami County

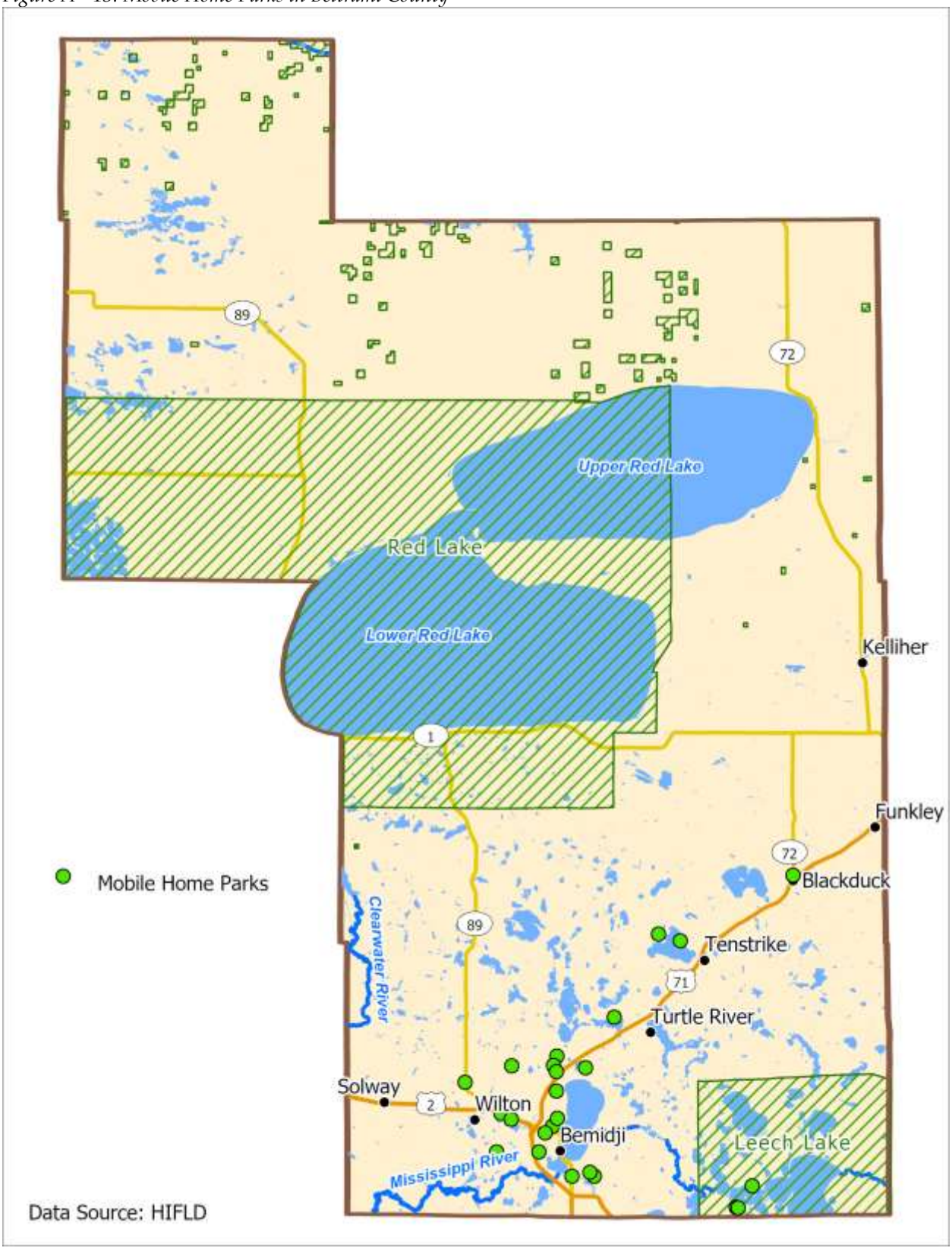


Figure A - 14. Tornadoes EF1/F0 and greater, 1950-2019

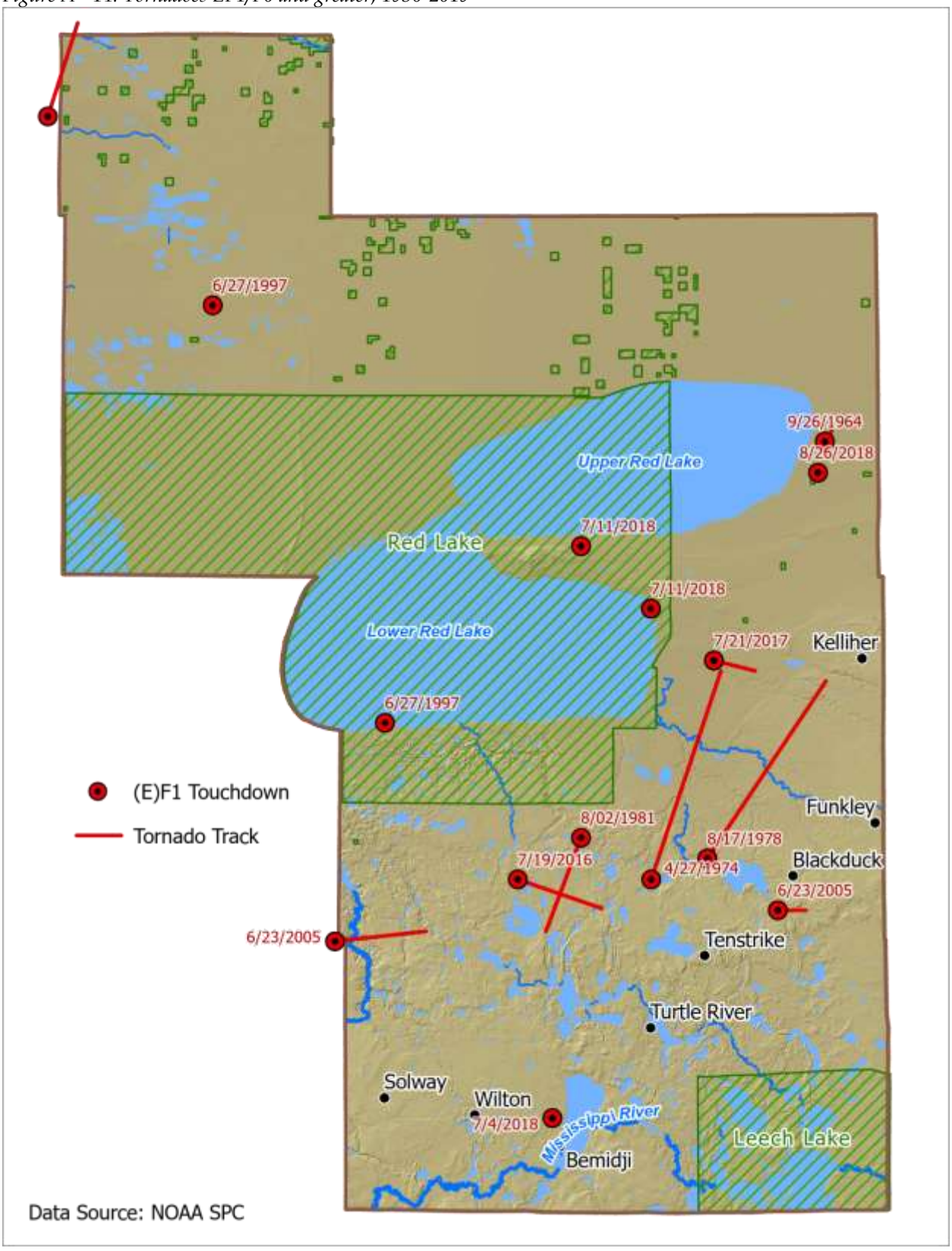


Figure A - 15. Severe Windstorms, 1955-April 2019

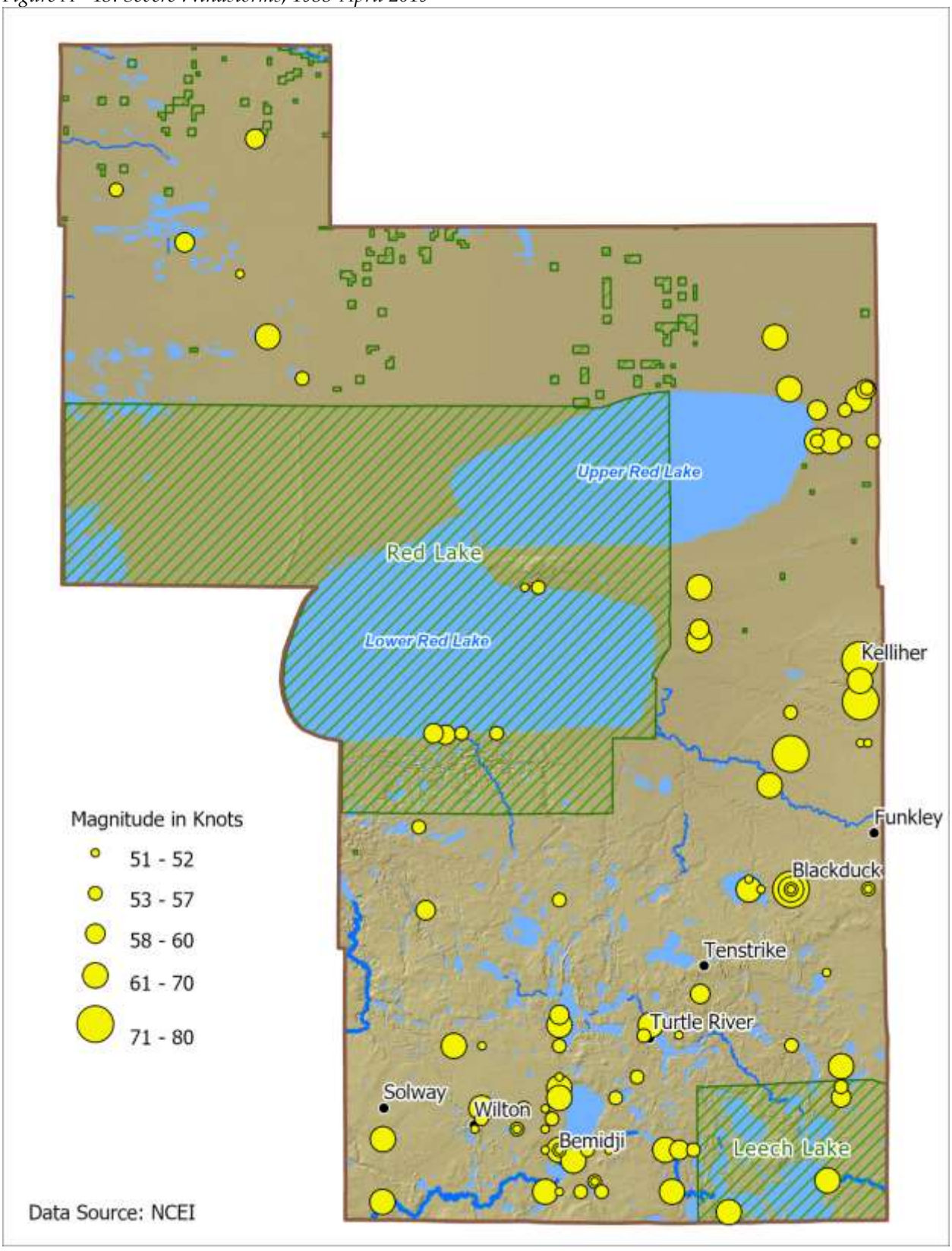


Figure A - 16. Severe Hailstorms, 1955-April 2019

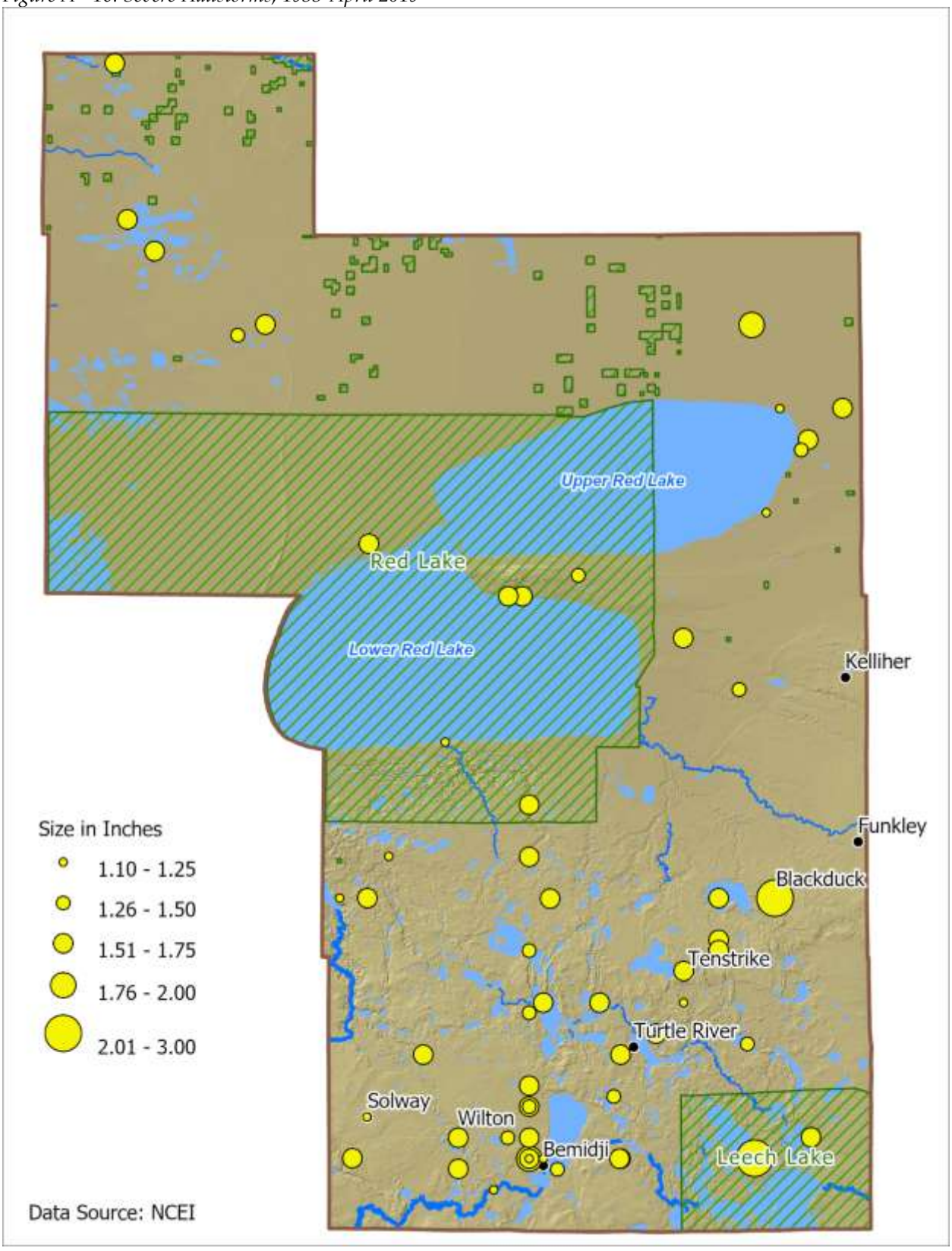


Figure A - 17. Dams by Hazard Classification

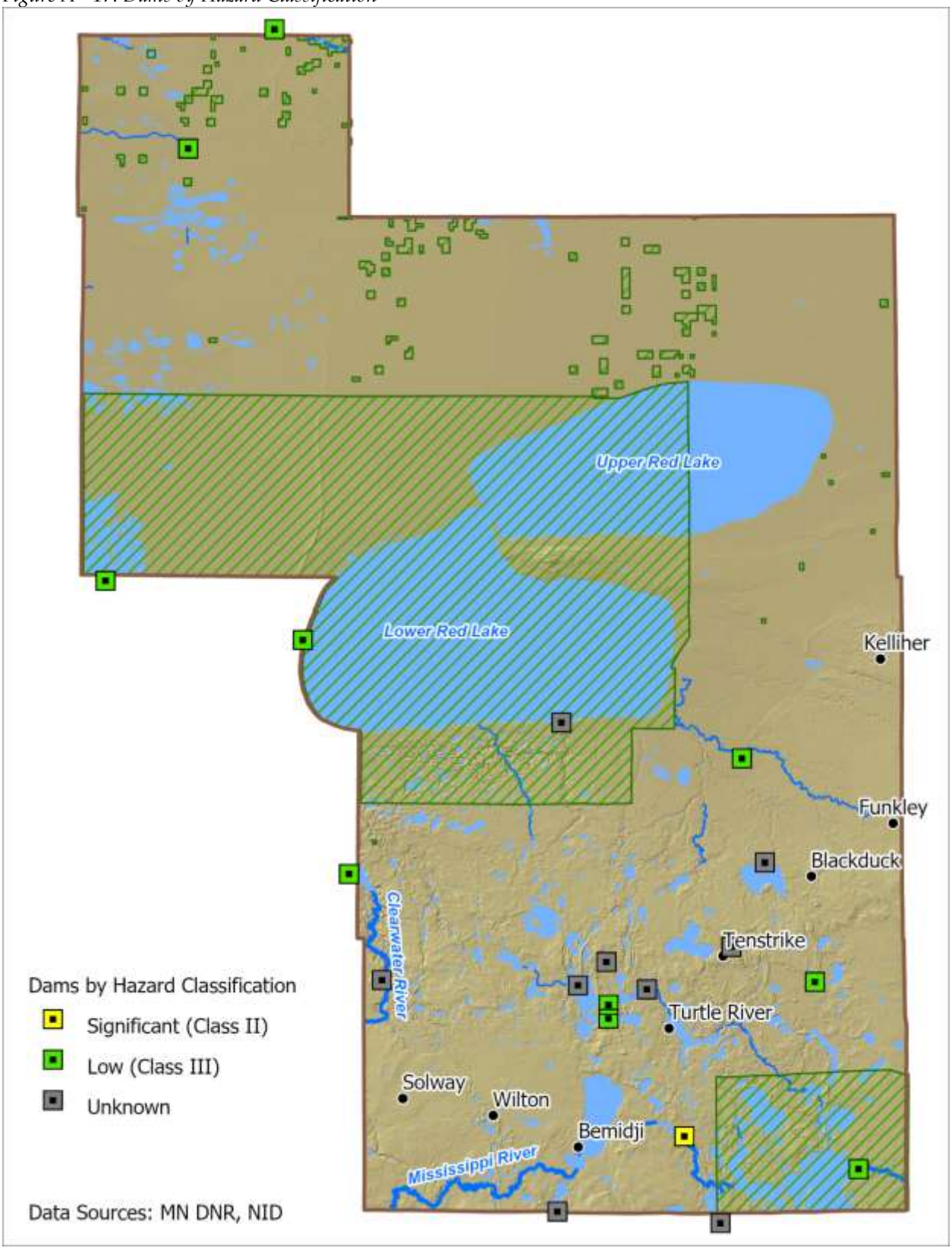


Figure A - 18. Dams by Condition Assessment

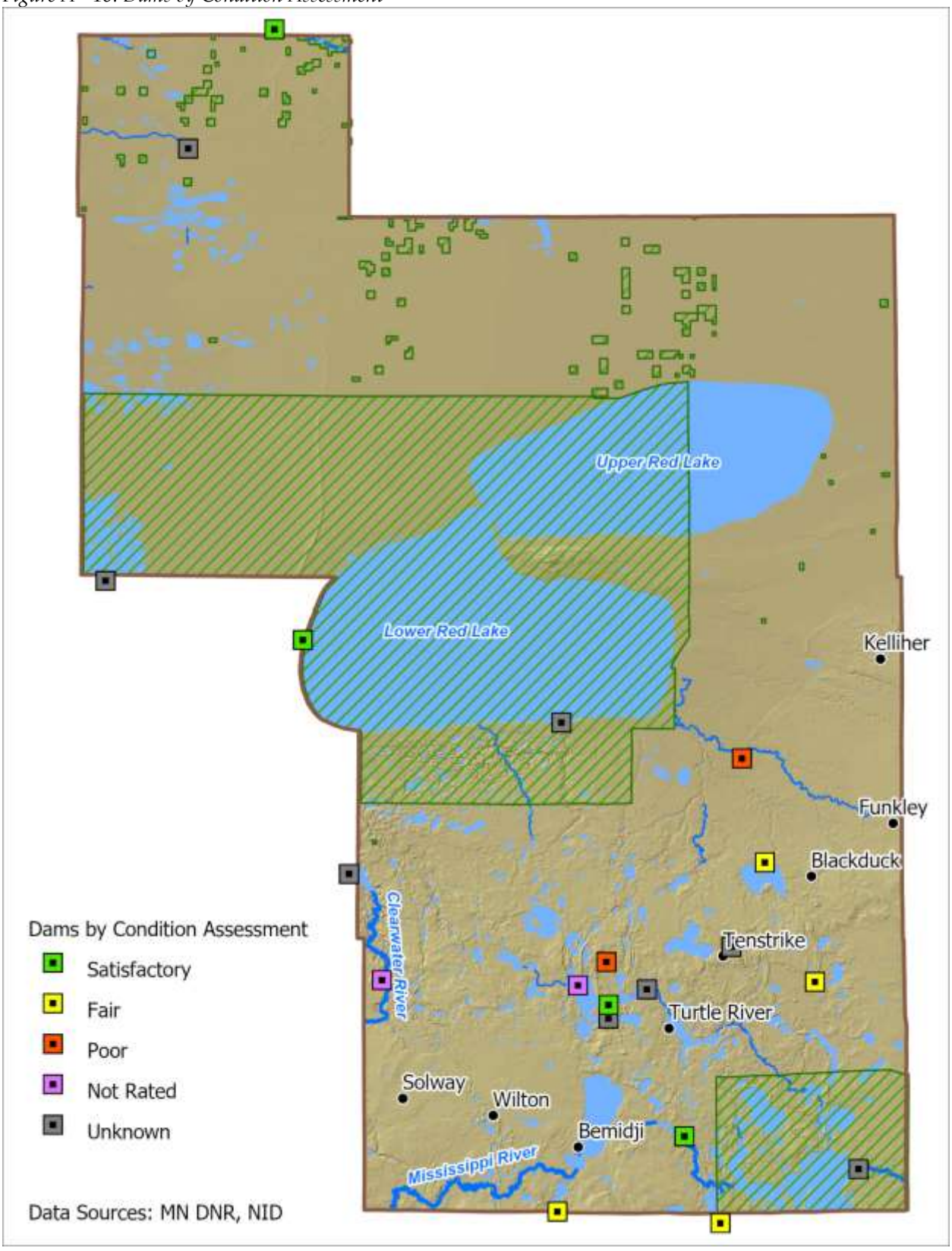


Figure A - 19. Aquifer Vulnerability in Beltrami County

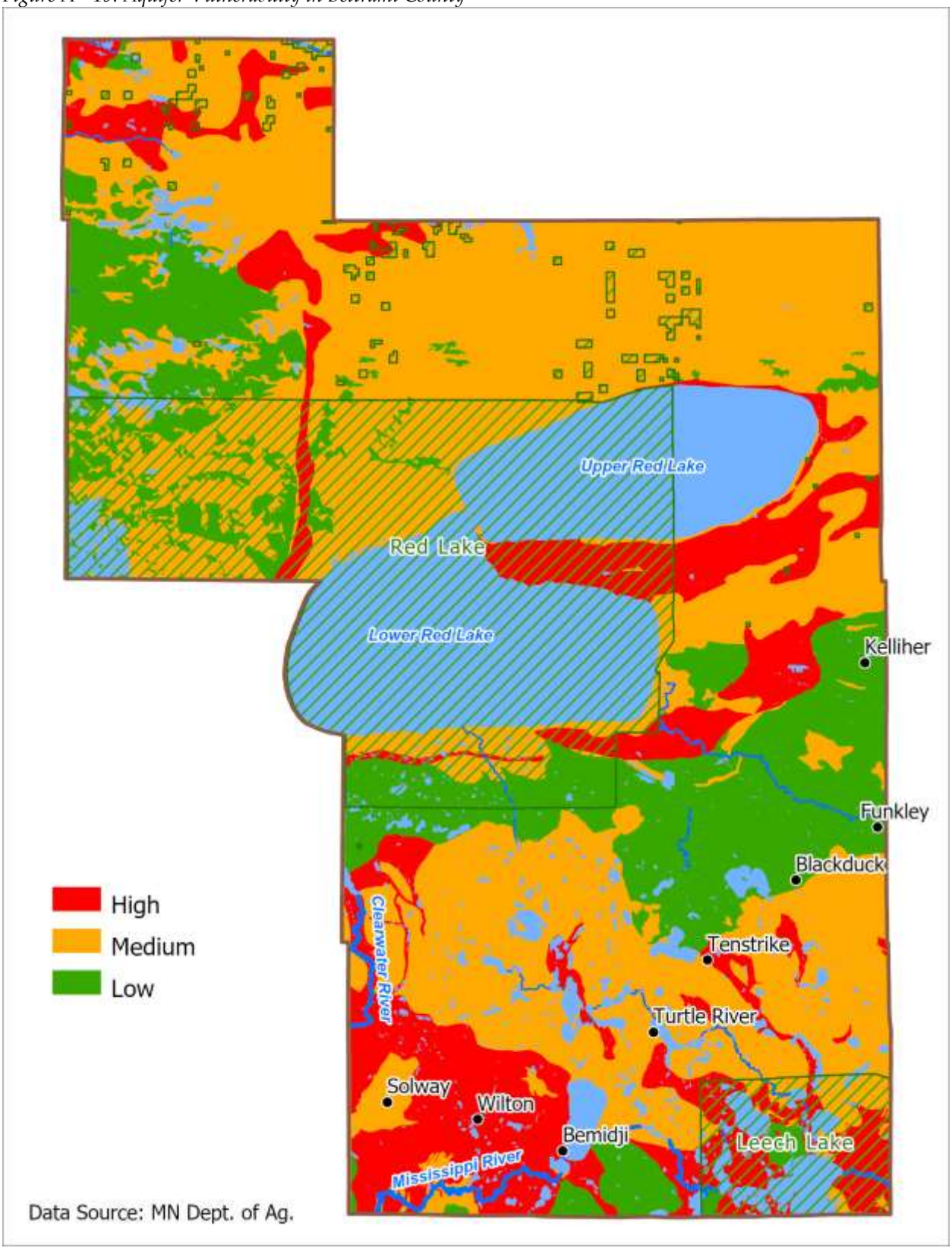


Figure A - 20. Wildfires by Acres Burned (1985-August 2019) and Peat in Beltrami County

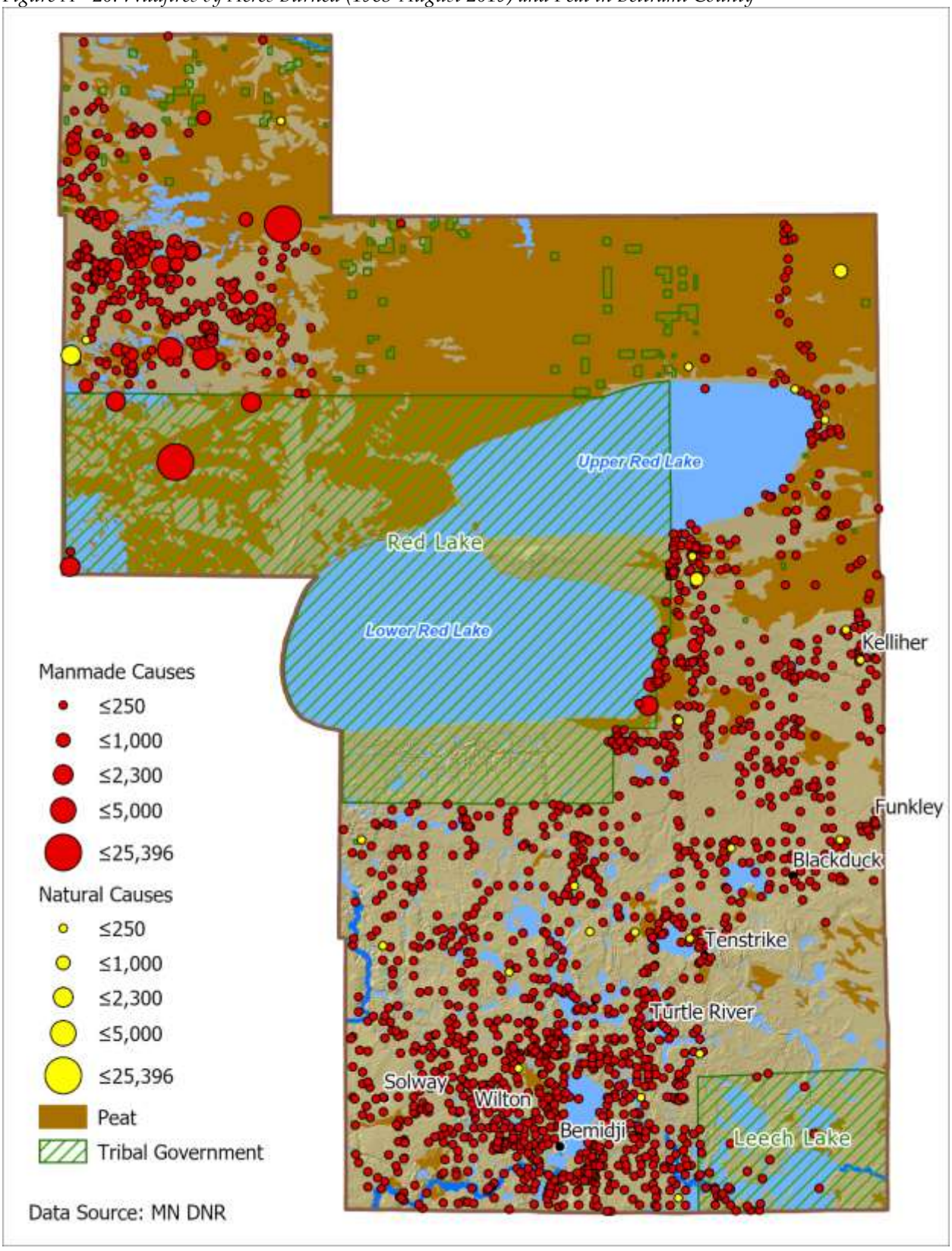


Figure A - 21. Wildland Urban Interface in Beltrami County

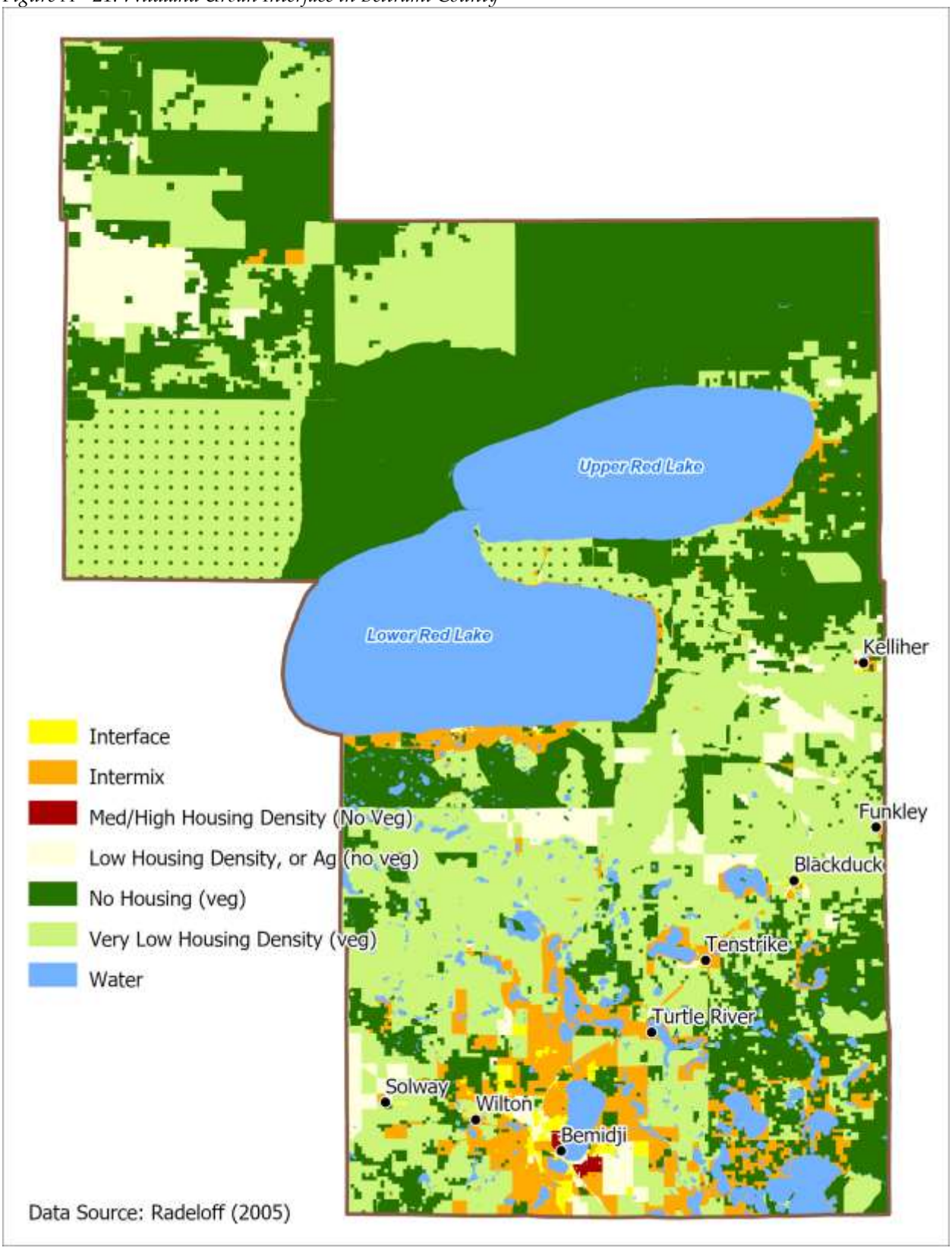


Figure A - 22. Feedlots in Beltrami County

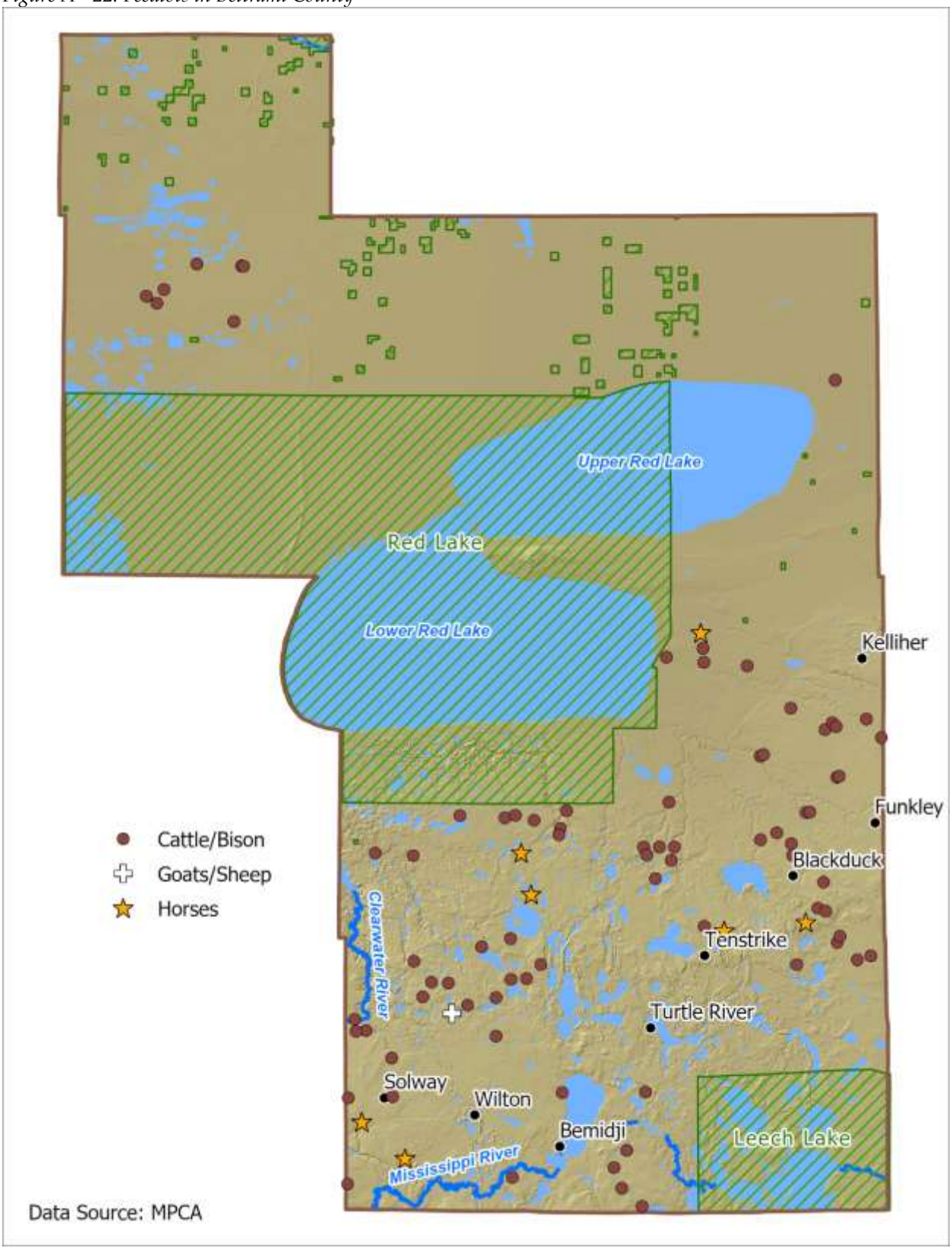


Figure A - 23. Pollution Sensitivity of Near-Surface Materials

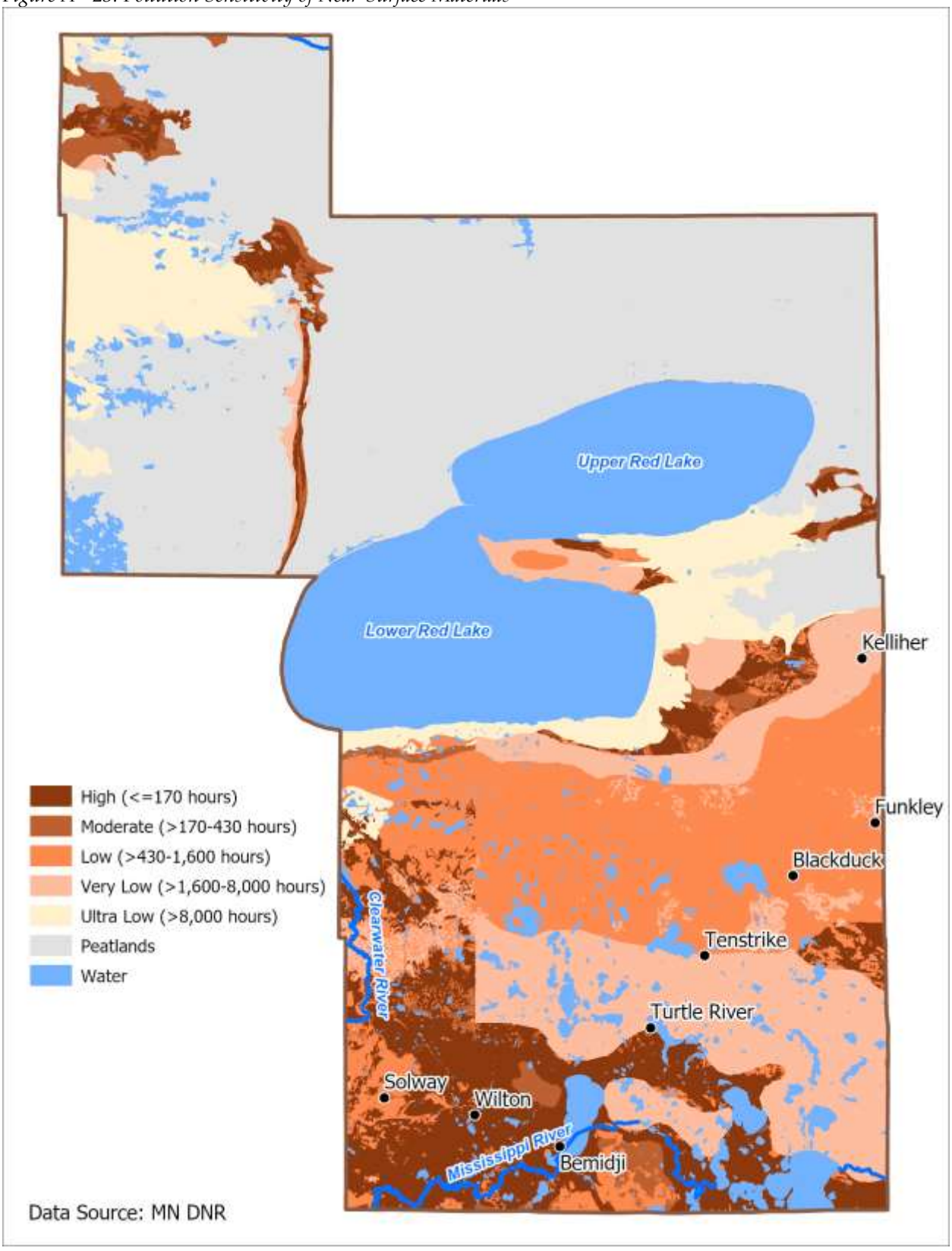


Figure A - 24. 1% Annual Chance Flood Boundary

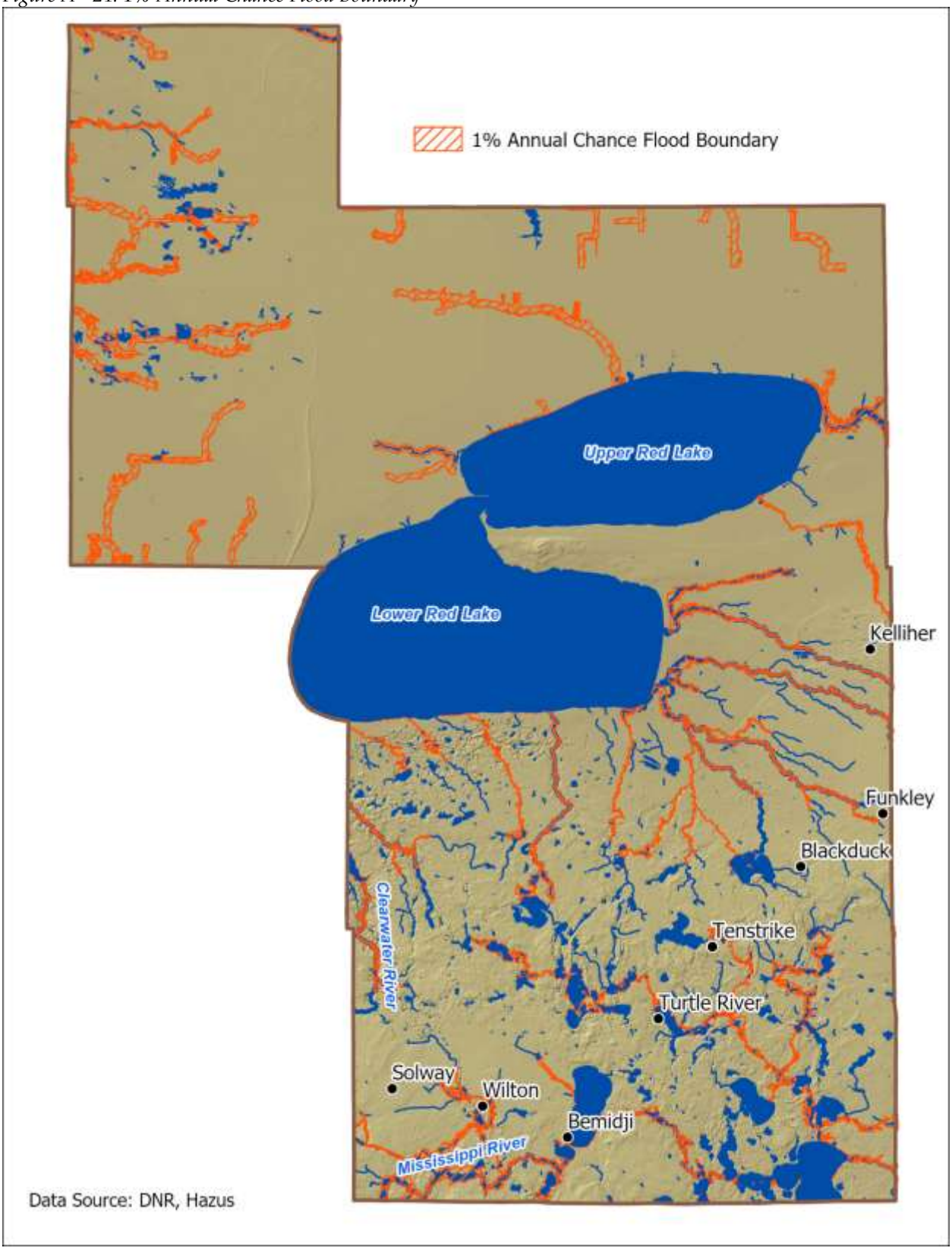


Figure A - 25. Overview of 1% Annual Chance Flood Loss Estimation

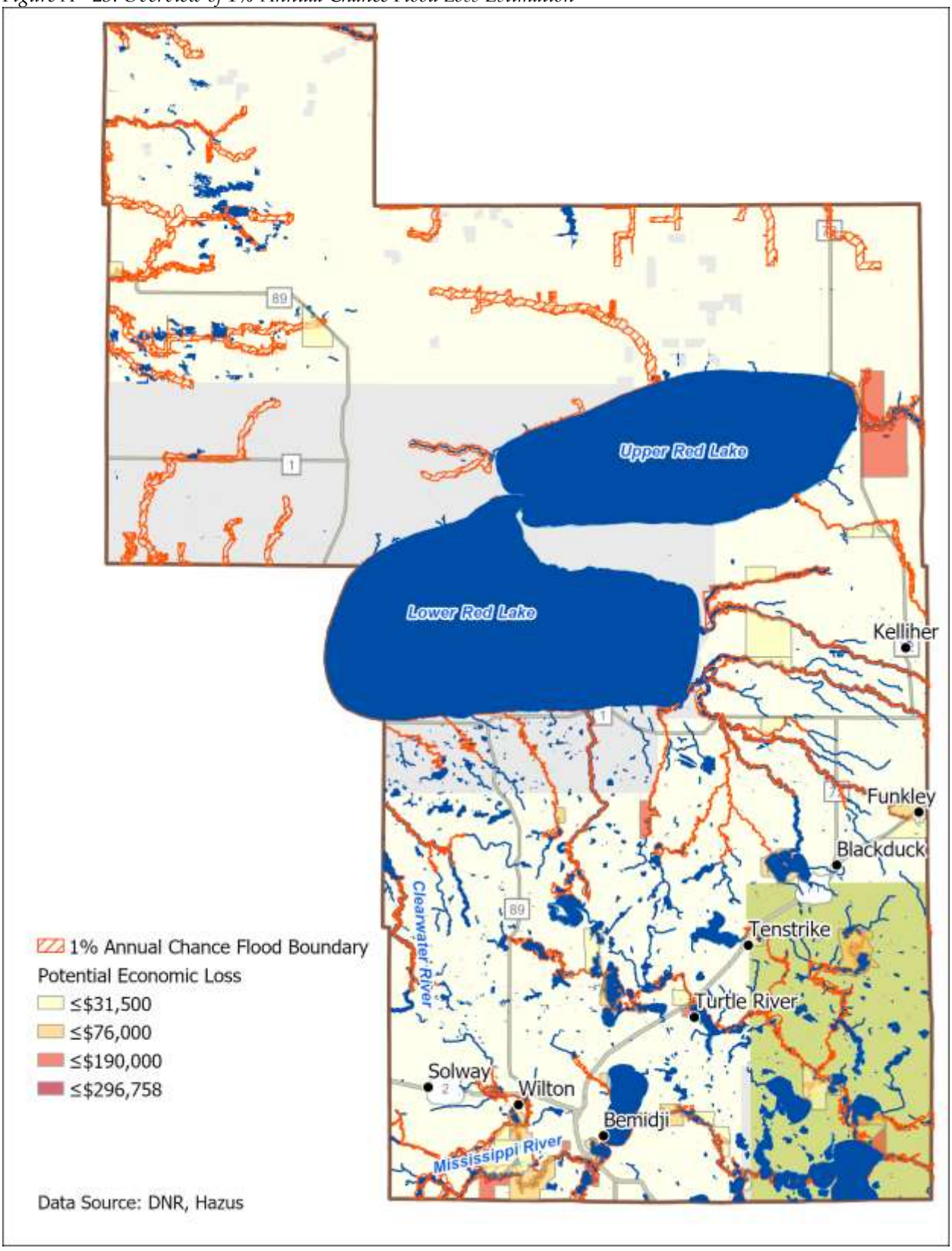


Figure A - 26. 1% Annual Chance Flood Building-Related Loss Estimates, Bemidji

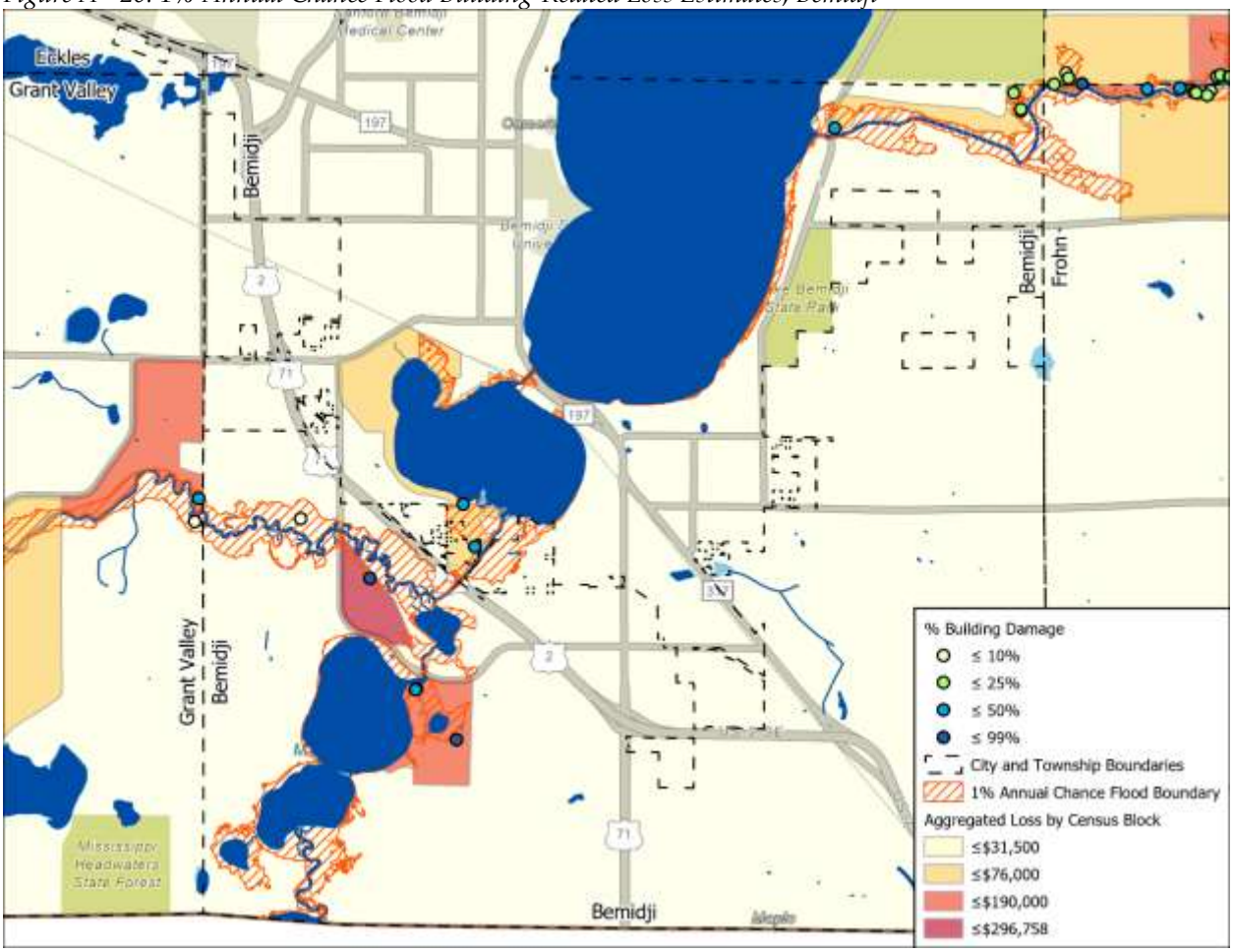


Figure A - 27. 1% Annual Chance Flood Building-Related Loss Estimates, Grant Valley Township

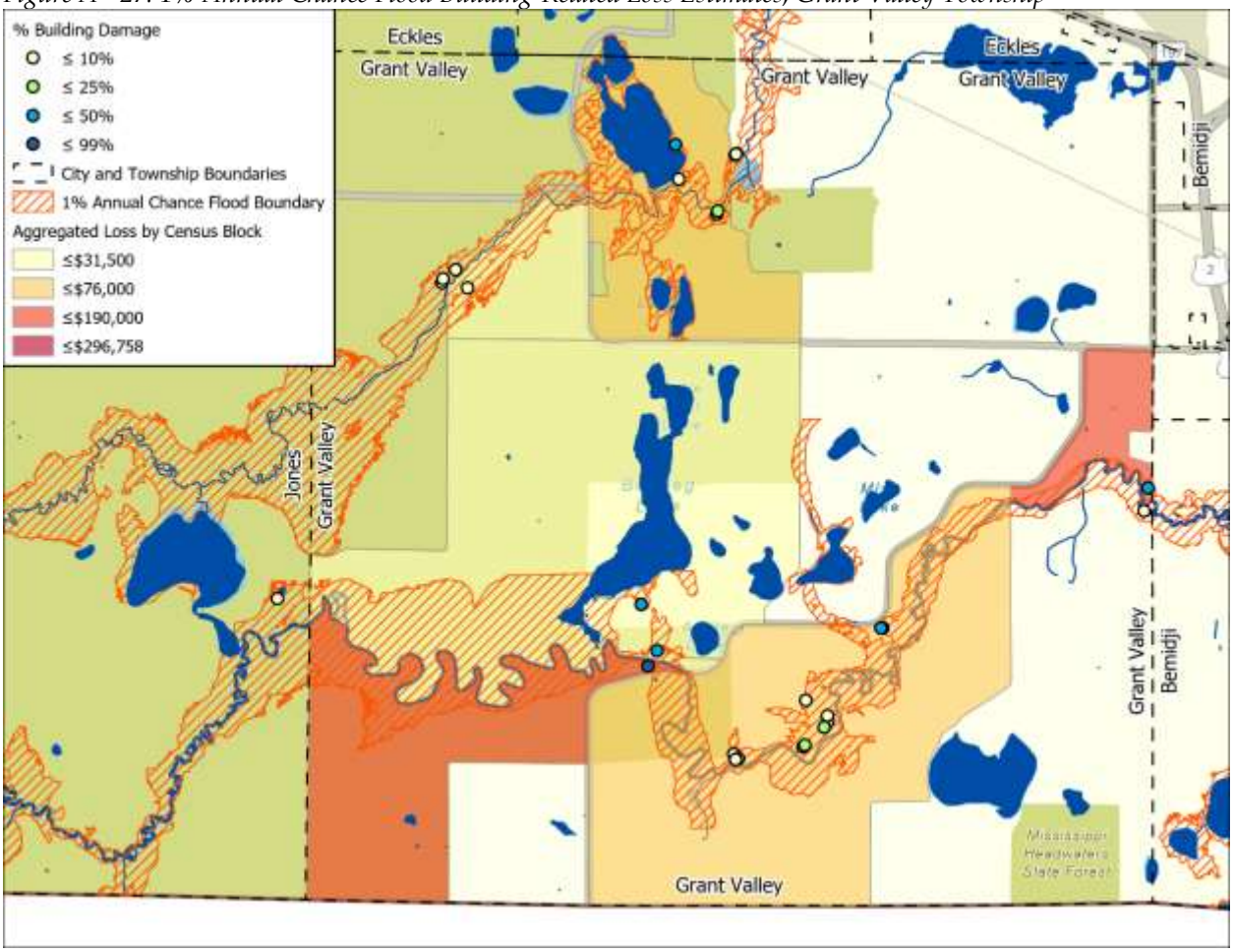
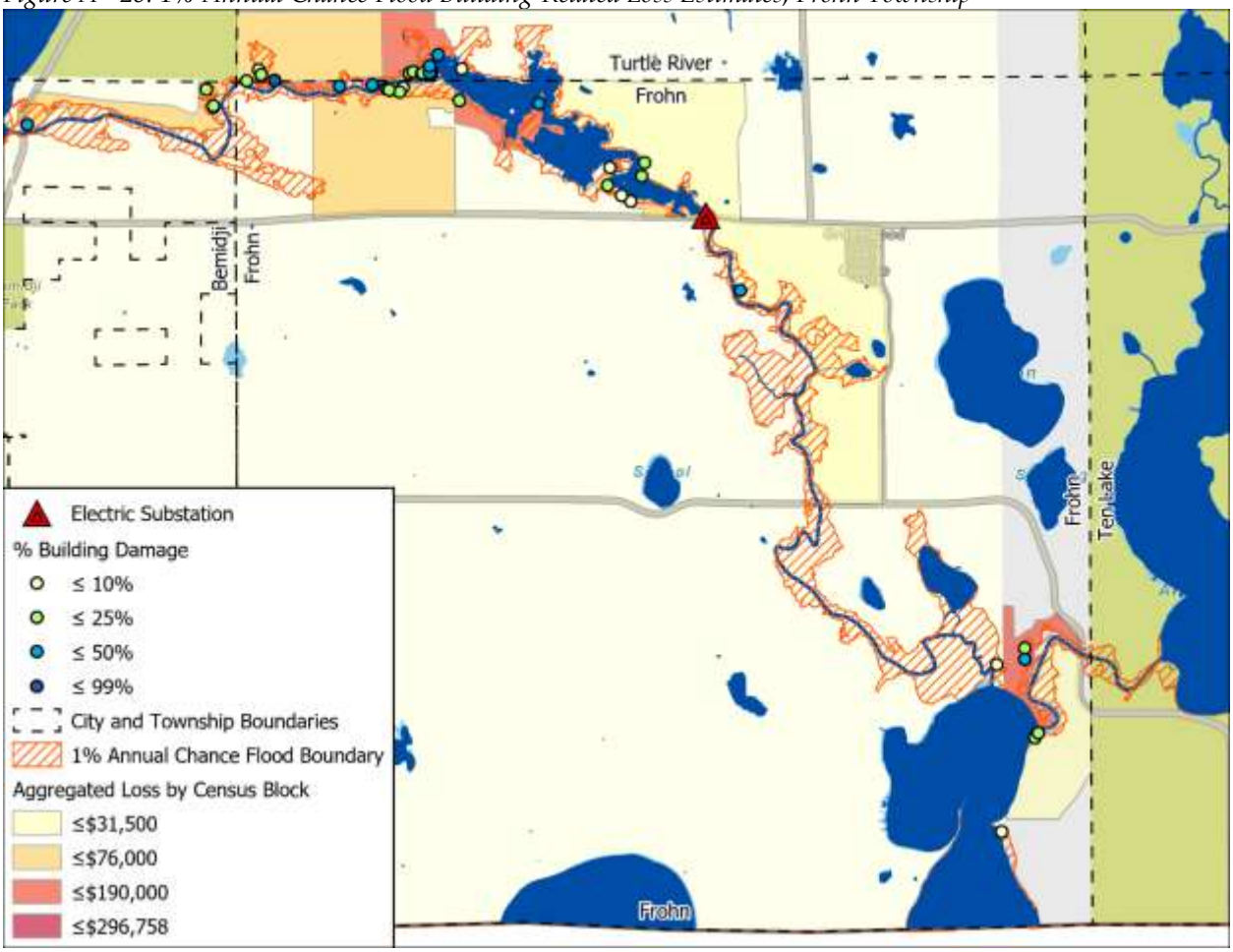


Figure A - 28. 1% Annual Chance Flood Building-Related Loss Estimates, Frohn Township



Appendix B
Beltrami County Critical Infrastructure

Healthcare Facilities				
Name	**Address**	**City**	**Zip**	**Type**
Birchhaven Village	1700 Norton Ave NW	Bemidji	56601	Nursing Home
Cedar Cottage	1711 Delton Ave NW	Bemidji	56601	Assisted Living Facility
Community Behavioral Health Hospital Bemidji	800 Bemidji Avenue North	Bemidji	56601	Hospital
Good Samaritan Society Blackduck	172 Summit Avenue West	Blackduck	56630	Nursing Home
Havenwood Care Center	1633 Delton Avenue	Bemidji	56601	Nursing Home
Neilson Place	1000 Anne Street NW	Bemidji	56601	Nursing Home
Sanford Bemidji 1611 Anne St Clinic	1611 Anne St NW	Bemidji	56601	Hospital
Sanford Bemidji Behavioral Health	722 15th St NW	Bemidji	56601	Hospital
Sanford Bemidji Hospice	3201 Pine Ridge Avenue NW #A	Bemidji	56601	Hospice
Sanford Bemidji Medical Center	1300 Anne Street NW	Bemidji	56601	Hospital
Sanford Blackduck Clinic	81 1st St NW	Blackduck	56630	Hospital
Sanford Dialysis Bemidji	1300 Anne Street NW	Bemidji	56601	Dialysis Center
Sanford Kelliher Clinic	243 Clark Ave N	Kelliher	56650	Hospital
Tamarack Court	1511 Delton Ave NW	Bemidji	56601	Assisted Living Facility
Trillium	930 Anne Street NW	Bemidji	56601	Assisted Living Facility
Windsong	1010 Anne Street NW	Bemidji	56601	Assisted Living Facility

Emergency Services			
Name	**Address**	**City**	**Zip**
Alaska Fire Department	28987 Alaska Lane Northwest	Alaska Township	56667
Beltrami County Emergency Operations Center	613 Minnesota Avenue Northwest	Beltrami	56601
Beltrami County Jail	626 Minnesota Avenue Northwest	Bemidji	56601
Beltrami County Law Enforcement Center – Police Department	613 Minnesota Avenue Northwest	Bemidji	56601
Beltrami County Law Enforcement Center – Sheriff's Office	613 Minnesota Avenue Northwest	Bemidji	56601
Bemidji Fire Department - Crash Fire Response	4015 Moberg Drive Northwest	Bemidji	56601

Emergency Services			
Name	**Address**	**City**	**Zip**
Bemidji Fire Department – North Station		Bemidji	
Bemidji Fire Department Nymore Station	312 Lake Avenue Southeast	Bemidji	56601
Bemidji Fire Department Station 1	318 5th Street Northwest	Bemidji	56601
Blackduck Fire Department	33 Margaret Avenue Northeast	Blackduck	56630
Blackduck Police Department	88 1st Street Southeast	Blackduck	56630
Kelliher Volunteer Fire Department	217 East Main Street	Kelliher	56650
Solway Rural Volunteer Fire Department	137 2nd Street Northwest	Solway	56678

Schools & Shelters				
Name	**Address**	**City**	**Zip**	**Type**
Archdeacon Gilfillan Center	1741 15th St NW	Bemidji	56601	School
Bemidji ALC	802 Paul Bunyan Dr NW	Bemidji	56601	School
Bemidji Bylaw	502 Minnesota Ave	Bemidji	56601	School
Bemidji ESY	502 Minnesota Ave NW	Bemidji	56601	School
Bemidji High	2900 Division St W	Bemidji	56601	School & Shelter
Bemidji High ALP	1910 Middle School Ave NW	Bemidji	56601	School
Bemidji Lumberjack ALC	2900 Division St W	Bemidji	56601	School
Bemidji Middle	1910 Middle School Ave NW	Bemidji	56601	School
Bemidji Middle School	201 15th Street NW	Bemidji	56601	Shelter
Bemidji Middle TS	502 Minnesota Ave NW	Bemidji	56601	School
Bemidji Regional Interdist. Council	1615 NW 5th St	Bemidji	56601	School
Bemidji Seventh-Day Adventist Church	4400 Eckles Rd NW	Bemidji	56601	Shelter
Bemidji State University	1500 Birchmont Drive NE	Bemidji	56601	School
Blackduck Elementary	156 1st St NE	Blackduck	56630	School
Blackduck ESY	156 1st Street NE	Blackduck	56630	School
Blackduck High	156 1st St NE	Blackduck	56630	School
Central Elementary	815 Beltrami Ave	Bemidji	56601	School
Crossroads Victory Assembly of God	3354 Laurel Dr NW	Bemidji	56601	Shelter
First City School	1230 5th St NW	Bemidji	56601	School
First Lutheran Church	900 Bemidji Ave N	Bemidji	56601	Shelter
First Presbyterian Church	23285 Gate Ln NE	Blackduck	56630	Shelter
Gene Dillon Elementary	3795 Division St W	Bemidji	56601	School

Schools & Shelters				
Name	**Address**	**City**	**Zip**	**Type**
Heartland Christian Academy	9914 Heartland Circle NW	Bemidji	56601	School & Shelter
Holy Spirit Newman Center	1701 Birch Lane NE	Bemidji	56601	Shelter
Horace May Elementary	4415 Washington Ave SW	Bemidji	56601	School & Shelter
J.W. Smith Elementary	1712 America Ave	Bemidji	56601	School & Shelter
Kelliher Elementary	345 4th St NW	Kelliher	56650	School
Kelliher High	345 4th St NW	Kelliher	56650	School & Shelter
Lincoln Elementary	1617 5th St nE	Bemidji	56601	School & Shelter
North Country Voc. Coop Center	905 Grant Ave SE	Bemidji	56601	School
Northern Elementary	8711 Irvine Ave NW	Bemidji	56601	School & Shelter
Northwest Regional Juvenile Ctr	1230 5th St NW	Bemidji	56601	School
Northwest Tech College	905 Grant Avenue SE	Bemidji	56601	School
Oak Hills Christian Institute	1600 Oak Hills Road SW	Bemidji	56601	School & Shelter
Oshki Manidoo Center	802 Paul Bunyan Dr NW	Bemidji	56601	School
Paul Bunyan Center	3300 Gillett Dr NW	Bemidji	56601	School
Professional Salon Academy	519 Anne Street NW	Bemidji	56601	School
Sacred Heart Church	135 3rd Street NW	Wilton	56601	Shelter
Schoolcraft Learning Community	8955 Deer School Rd NW	Bemidji	56601	School
Seven-Day Adventist School	801 15th Street NW	Bemidji	56601	Shelter
Solway Bible Chapel	222 Solway Ave NW	Solway	56678	Shelter
Solway Elementary	159 Lomen Ave NE	Solway	56678	School
Solway Lutheran Church	277 Second St NW	Solway	56678	Shelter
St Patrick's Catholic Church	165 5th St NE	Kelliher	56650	Shelter
St. Marks	2220 Anne St NW	Bemidji	53301	School & Shelter
St. Philips	620 Beltrami Ave NW	Bemidji	56601	School
TrekNorth High	2400 Pine Ridge Avenue NW	Bemidji	56601	School
TrekNorth Middle	2400 Pine Ridge Ave NW	Bemidji	56601	School
Trinity Lutheran Church	26685 Dibs Rd NW	Pinewood	56676	Shelter
Voyageurs Expeditionary	3724 Bemidji Ave N	Bemidji	56601	School
Voyageurs Expeditionary Charter	102 1st Street W	Bemidji	56601	School

Schools & Shelters				
Name	**Address**	**City**	**Zip**	**Type**
Voyageurs Expeditionary Charter EY	102 1st St W	Bemidji	56601	School
Voyageurs Expeditionary ESY	3724 Bemidji Avenue North	Bemidji	56601	School
Voyageurs Expeditionary High	3724 Bemidji Ave N	Bemidji	56601	School
Voyageurs Expeditionary MS	3724 Bemidji Ave N	Bemidji	56601	School
Zion Lutheran Church	414 Lincoln Ave SE	Bemidji	56601	Shelter
Zion Lutheran Church	217 Main Street NW	Blackduck	56630	Shelter

Transportation			
Name	**Address**	**City**	**Zip**
Beltrami County Highway Department	2491 Adams Ave NW	Bemidji	56601
Bemidji Regional Airport	3824 Moberg Dr NW	Bemidji	56601
Moberg Air Base	Aero Dr NW	Bemidji	56601
Twin Cities BNSF –Grand Forks Subdivision	1796 Demers Ave	Grand Forks, ND	58201
Waskish Municipal Airport	53939 Sandy Ridge Rd NE	Waskish	56685

Utilities			
Name	**Address**	**City**	**Zip**
Anderson Contracting Inc	4781 Jones Townhall Rd NW	Solway	56678
Beltrami County Highway Dept	2491 Adams Ave NW	Bemidji	56601
Bemidji Public Works Dept	1351 5th St NW	Bemidji	56601
Bemidji WWTP	412 Irving Access Loop SW	Bemidji	56601
Blackduck Public Works Dept	8 Summit Ave	Blackduck	56630
Blackduck WWTP	County Road 30 & Tepee Hill Ln	Blackduck	56630
Enbridge Pipeline	1129 Industrial Park Dr SE	Bemidji	56601
Gas Lake Trans Co	677 Anne St NW #H	Bemidji	56601
Kelliher WWTP	12731 Derwal Rd	Kelliher	56650
Minnkota Power Cooperative	5301 32nd Ave S	Grand Forks, ND	58201
Norbord Minnesota	4409 Northwood Rd NW	Solway	56678
Northstar Materials Inc dba Knife River Materials	4101 Bemidji Ave N	Bemidji	56601
Northwoods Ice of Bemidji Inc	811 Industrial Park Dr SE	Bemidji	56601
Otter Tail Power Co	320 4th St NW	Bemidji	56601

Utilities			
Name	**Address**	**City**	**Zip**
Stoney Creek Sand & Gravel	36974 Corral Rd NE	Kelliher	56650
Xcel Energy	404 Nicollet Mall	Minneapolis, MN	55401

Dams & Levees				
Name	**Owner**	**Location**	**City/Twp.**	**Type**
Blackduck Lake	Township of Hines	Blackduck River	Hines Twp	Dam
Buena Vista State Forest 1	MNDNR-Wildlife	Turtle River-TR	Turtle Lake Twp	Dam
Erickson Lake	MNDNR	Gull River	Tenstrike	Dam
Forster Rice Paddies	Beltrami County Natural Resource Department	Rustad Creek	Langor Twp	Dam
Fox Lake	MNDNR	Turtle River-TR	Turtle Lake Twp	Dam
Knutson	USDA FS	Mississippi River	Brook Lake Unorg. Territory	Dam
Lake Bemidji	Ottertail Power Co	Mississippi River	Frohn Twp	Dam
Little Turtle Lake	MNDNR		Turtle Lake Twp	Dam
Moose River Project	WD of Red Lake	Moose River	North Beltrami Unorg. Territory	Dam
Movil Lake	MNDNR	Turtle River	Turtle Lake Twp	Dam
Mud River	Red Lake Fisheries Assoc	Mud River	Lower Red Lake Unorg. Territory	Dam
Plantagenette Lake	MNDNR		Bemidji Twp	Dam
Rabideau Lake	MNDNR	North Turtle River	Birch Twp	Dam
Teske Pond	Teske, Grant	Clearwater River	Buzzle Twp	Dam
Three Island Lake	MNDNR-Trails	Turtle River	Port Hope Twp	Dam

Hazardous Materials Facilities			
Name	**Address**	**City**	**Zip**
Agriliance LLC – Blackduck	23325 Nebish Rd	Blackduck	56630

Major Employers			
Name	**Address**	**City**	**Zip**
Anderson Fabrics	348 Summit Ave W	Blackduck	56630
Beltrami County			

Major Employers			
Name	**Address**	**City**	**Zip**
Beltrami Electric	4111 Technology Dr NW	Bemidji	56601
Bemidji State University	1500 Birchmont Dr NE	Bemidji	56601
City of Bemidji		Bemidji	56601
Concordia Language Village	8659 Thorsonveien Rd NE	Bemidji	56601
Delta Dental	2017 Net Way NW	Bemidji	56601
Enbridge	1129 Industrial Park Dr SE	Bemidji	56601
Knife River Materials	4101 Bemidji Ave N	Bemidji	56601
Minnesota Limited	1300 30th St SE	Bemidji	56601
Norbord	4409 Northwood Rd NW	Solway	56678
North Central Door	900 Carr Lake Rd SE	Bemidji	56601
North Central Service	5487 Hart Ln NW	Bemidji	56601
Northwest Technical College	905 Grant Ave SE	Bemidji	56601
Oak Hills Christian College	1600 Oak Hills Rd SW	Bemidji	56601
Paul Bunyan Communications	1831 Anne St NW	Bemidji	56601
Sanford Health	1233 34th St NW	Bemidji	56601
Sanford Regional Event Center	1111 Event Center Dr NE	Bemidji	56601
State of Minnesota			
Team Industries	102 2nd St NW	Bemidji	56601

Government Buildings			
Name	**Address**	**City**	**Zip**
Beltrami County Judicial Center	600 Minnesota Avenue NW	Bemidji	56601
Bemidji City Hall	317 4th St NW	Bemidji	56601
Blackduck City Hall	8 Summit Ave	Blackduck	56630
Hines Town Hall	22009 Wood Ln NE	Hines	56647
Kelliher City Hall	217 E Main St	Kelliher	56650
Waskish Town Hall	56090 Waskish Rd NE	Waskish	56685

Cultural Resources	
Name	**Location**
Beltrami County Courthouse	600 Minnesota Ave NW # 108, Bemidji, MN 56601
Bemidji Carnegie Library	317 4th St NW, Bemidji, MN 56601

Cultural Resources	
Name	**Location**
David Park House	1501 Birchmont Dr NE, Bemidji, MN 56601
District No. 132 School	Debs, MN 56676
Great Northern Depot	130 Minnesota Ave SW, Bemidji, MN 56601
Lake Bemidji State Park	3401 State Park Rd NE, Bemidji, MN 56601
Nymore Bridge	MN 197 (First Street) over the Mississippi River, Bemidji, MN 56601
Paul Bunyan and Babe the Blue Ox	300 Bemidji Ave N, Bemidji, MN 56601
Rabideau Civilian Conservation Corps (CCC) Camp	Scenic Hwy NE, Blackduck, MN 56630
Saum Schools	Kelliher, MN 56650

Appendix C
Beltrami County Hazard Events

The National Centers for Environmental Information (NCEI) 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 2019.

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

Location or County	Date	Magnitude	Deaths	Injuries	Property Damage
Malcolm	7/17/2019	EF0	0	0	*Unknown*
Waskish Muni Arpt	8/26/2018	EF1	0	0	*Unknown*
Saum	7/11/2018	EF1	0	0	$100,000
Ponemah	7/11/2018	EF1	0	0	$20,000
Ponemah	7/11/2018	EF0	0	0	$20,000
Bemidji	7/4/2018	EF1	0	0	$250,000
Saum	7/21/2017	EF1	0	0	$100,000
Redby	9/9/2016	EF0	0	0	*Unknown*
Puposky	7/19/2016	EF1	0	0	*Unknown*
Bemidji	7/22/2010	EF0	0	0	*Unknown*
Redlake	6/21/2010	EF0	0	0	*Unknown*
Funkley	7/14/2008	EF0	0	0	*Unknown*
Redlake	6/14/2007	EF0	0	0	*Unknown*
Blackduck	6/23/2005	F1	0	0	*Unknown*
Puposky	6/23/2005	F1	0	0	*Unknown*
Turtle River	8/8/2004	F0	0	0	*Unknown*
Debs	8/8/2004	F0	0	0	*Unknown*
Redby	7/6/2003	F0	0	0	*Unknown*
Redby	7/2/2003	F0	0	0	*Unknown*
Ponemah	7/31/2001	F0	0	0	*Unknown*
Funkley	7/17/2001	F0	0	0	*Unknown*
Funkley	7/17/2001	F0	0	0	*Unknown*
Funkley	7/17/2001	F0	0	0	*Unknown*
Redby	7/17/2001	F0	0	0	*Unknown*
Saum	7/17/2001	F0	0	0	*Unknown*
Redlake	5/15/2001	F0	0	0	*Unknown*
Redlake	5/15/2001	F0	0	0	*Unknown*
Pinewood	5/15/2001	F0	0	0	*Unknown*
Clearbrook	6/27/1997	F1	0	0	*Unknown*
Fourtown	6/27/1997	F1	0	0	*Unknown*
Beltrami County	7/7/1991	F0	0	0	*Unknown*
Beltrami County	8/2/1981	F1	0	0	$250
Beltrami County	8/17/1978	F1	0	0	$25,000
Beltrami County	4/27/1974	F1	0	0	$250,000
Beltrami County	8/6/1969	F0	0	0	*Unknown*

Location or County	Date	Magnitude	Deaths	Injuries	Property Damage
Beltrami County	9/26/1964	F1	0	0	$2,500
Highest Value Property Damage					**$250,000**

Table C - 2. All severe hail storm events recorded by NCEI, 1955-2019

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Bemidji	7/3/2019	1	0	0	*Unknown*
Bemidji	7/3/2019	1	0	0	*Unknown*
Lavinia	6/30/2019	0.75	0	0	*Unknown*
Bemidji	6/30/2019	1.25	0	0	*Unknown*
Saum	6/29/2019	1	0	0	*Unknown*
Lavinia	6/4/2019	2	0	0	*Unknown*
Pennington	6/4/2019	1	0	0	*Unknown*
Puposky	6/4/2019	0.88	0	0	*Unknown*
Waskish Muni Arpt	6/4/2019	1	0	0	*Unknown*
Island Lake	9/12/2018	1	0	0	*Unknown*
(Bji)Bemidji Arpt	8/27/2018	1	0	0	*Unknown*
Debs	7/31/2018	1	0	0	*Unknown*
Saum	7/11/2018	0.88	0	0	*Unknown*
Fourtown	7/4/2018	1.5	0	0	*Unknown*
Birchmont	6/28/2018	0.75	0	0	*Unknown*
Turtle River	6/28/2018	1	0	0	*Unknown*
Lavinia	6/28/2018	1.5	0	0	*Unknown*
Farley	6/28/2018	0.75	0	0	*Unknown*
Redlake	5/29/2018	1.25	0	0	*Unknown*
Debs	5/29/2018	1.25	0	0	*Unknown*
Carmel	9/22/2017	1	0	0	*Unknown*
Puposky	9/4/2017	1	0	0	*Unknown*
Saum	7/21/2017	1	0	0	*Unknown*
North Pole	7/18/2017	0.88	0	0	*Unknown*
Wilton	7/18/2017	1	0	0	*Unknown*
Bemidji	6/21/2017	0.75	0	0	*Unknown*
Puposky	6/13/2017	1	0	0	*Unknown*
Puposky	7/19/2016	1	0	0	*Unknown*
Nebish	7/19/2016	1.75	0	0	*Unknown*
Debs	7/19/2016	1.25	0	0	*Unknown*

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Waskish Muni Arpt	6/25/2016	1.25	0	0	*Unknown*
Waskish	6/25/2016	1.25	0	0	*Unknown*
Ponemah	6/25/2016	1.5	0	0	*Unknown*
Waskish	6/17/2016	0.75	0	0	*Unknown*
Waskish	6/17/2016	1	0	0	*Unknown*
Pinewood	6/17/2016	0.88	0	0	*Unknown*
Tenstrike	6/12/2016	1	0	0	*Unknown*
Tenstrike	6/12/2016	1.75	0	0	*Unknown*
Wilton	5/26/2016	1	0	0	*Unknown*
Tenstrike	7/5/2015	1.5	0	0	*Unknown*
Farley	7/5/2015	1	0	0	*Unknown*
Blackduck	7/5/2014	1	0	0	*Unknown*
Blackduck	7/5/2014	1	0	0	*Unknown*
Saum	7/5/2014	1	0	0	*Unknown*
Carmel	7/5/2014	1.75	0	0	*Unknown*
Saum	9/19/2013	1	0	0	*Unknown*
Malcolm	8/31/2013	0.75	0	0	*Unknown*
Lavinia	8/25/2013	1.75	0	0	*Unknown*
Bemidji	8/25/2013	1	0	0	*Unknown*
Bemidji	8/25/2013	1	0	0	*Unknown*
Lavinia	8/21/2013	0.75	0	0	*Unknown*
Hines	8/15/2012	1.75	0	0	*Unknown*
Hines	8/15/2012	0.75	0	0	*Unknown*
Bemidji	7/2/2012	0.88	0	0	*Unknown*
Debs	7/2/2012	0.75	0	0	*Unknown*
Bemidji	8/19/2011	1.5	0	0	*Unknown*
Scribner	8/19/2011	1	0	0	*Unknown*
Pinewood	8/19/2011	0.88	0	0	*Unknown*
Pennington	8/5/2011	0.88	0	0	*Unknown*
Bemidji	8/5/2011	1	0	0	*Unknown*
Pinewood	8/5/2011	1	0	0	*Unknown*
Blackduck	7/17/2011	1	0	0	*Unknown*
Blackduck	7/17/2011	1	0	0	*Unknown*
Thorhult	7/17/2011	1	0	0	*Unknown*
Solway	5/10/2011	1.25	0	0	*Unknown*
Scribner	7/15/2010	1	0	0	*Unknown*
Shooks	6/21/2010	1	0	0	*Unknown*
Lavinia	6/17/2010	1	0	0	*Unknown*
Bemidji	6/17/2010	0.75	0	0	*Unknown*

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Pinewood	6/17/2010	0.75	0	0	*Unknown*
Lavinia	6/17/2010	0.75	0	0	*Unknown*
Bemidji	6/17/2010	0.75	0	0	*Unknown*
(Bji)Bemidji Arpt	6/17/2010	0.88	0	0	*Unknown*
Thorhult	5/24/2010	1	0	0	*Unknown*
Malcolm	5/24/2010	1	0	0	*Unknown*
Bemidji	5/24/2010	0.88	0	0	*Unknown*
Bemidji	5/24/2010	0.88	0	0	*Unknown*
Bemidji	5/24/2010	1.25	0	0	*Unknown*
Bemidji	5/24/2010	0.75	0	0	*Unknown*
Bemidji	5/24/2010	1.25	0	0	*Unknown*
Carmel	4/2/2010	0.75	0	0	*Unknown*
Malcolm	7/23/2009	0.88	0	0	*Unknown*
Carmel	7/23/2009	1	0	0	*Unknown*
Blackduck	5/6/2009	0.75	0	0	*Unknown*
Shotley	7/20/2008	0.88	0	0	*Unknown*
Redlake	7/14/2008	1	0	0	*Unknown*
Kelliher	7/14/2008	1	0	0	*Unknown*
Shooks	7/14/2008	1	0	0	*Unknown*
Carmel	7/11/2008	0.75	0	0	*Unknown*
Puposky	7/9/2008	1	0	0	$5,000
Ponemah	7/1/2008	0.88	0	0	*Unknown*
Thorhult	7/1/2008	1	0	0	*Unknown*
Malcolm	7/1/2008	0.88	0	0	*Unknown*
Shooks	6/12/2008	1	0	0	*Unknown*
Bemidji	6/12/2008	1.75	0	0	$400,000
Waskish Muni Arpt	5/25/2008	1	0	0	*Unknown*
Shotley	5/25/2008	0.88	0	0	*Unknown*
Pennington	5/25/2008	0.75	0	0	*Unknown*
Farley	5/25/2008	0.75	0	0	*Unknown*
Bemidji	5/25/2008	1	0	0	*Unknown*
Waskish	10/7/2007	0.88	0	0	*Unknown*
Ponemah	10/7/2007	1.75	0	0	*Unknown*
Puposky	9/28/2007	1.75	0	0	*Unknown*
Waskish	9/21/2007	1.5	0	0	*Unknown*
Tenstrike	8/13/2007	1.25	0	0	*Unknown*
Birchmont	8/13/2007	0.75	0	0	*Unknown*
Debs	8/13/2007	1.75	0	0	*Unknown*
Puposky	8/13/2007	0.88	0	0	*Unknown*

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Waskish	8/10/2007	0.75	0	0	*Unknown*
Malcolm	7/22/2007	1	0	0	*Unknown*
Blackduck	6/7/2007	0.88	0	0	*Unknown*
Turtle River	6/7/2007	0.88	0	0	*Unknown*
Debs	6/7/2007	0.88	0	0	*Unknown*
Thorhult	9/7/2006	1	0	0	*Unknown*
Carmel	9/7/2006	0.75	0	0	*Unknown*
Fourtown	8/5/2006	2.75	0	0	*Unknown*
Ponemah	7/27/2006	1.75	0	0	*Unknown*
Fourtown	6/26/2006	1	0	0	*Unknown*
Waskish	6/26/2006	0.75	0	0	*Unknown*
Thorhult	6/5/2006	0.75	0	0	*Unknown*
Puposky	6/5/2006	0.75	0	0	*Unknown*
Waskish	5/29/2006	0.75	0	0	*Unknown*
Wilton	5/9/2006	0.75	0	0	*Unknown*
Fourtown	8/17/2005	0.88	0	0	*Unknown*
Thorhult	7/20/2005	0.88	0	0	*Unknown*
Fourtown	7/3/2005	0.88	0	0	*Unknown*
Waskish	6/26/2005	1	0	0	*Unknown*
Fourtown	6/23/2005	1	0	0	*Unknown*
Waskish	6/19/2005	0.88	0	0	*Unknown*
Blackduck	8/8/2004	0.88	0	0	*Unknown*
Nebish	8/8/2004	0.88	0	0	*Unknown*
Nebish	8/8/2004	0.88	0	0	*Unknown*
Debs	8/8/2004	0.88	0	0	*Unknown*
Bemidji	11/17/2003	0.75	0	0	*Unknown*
Waskish	11/17/2003	0.75	0	0	*Unknown*
Fourtown	8/25/2003	1.75	0	0	*Unknown*
Solway	7/30/2003	0.75	0	0	*Unknown*
Nebish	7/29/2003	0.75	0	0	*Unknown*
Bemidji	7/29/2003	0.75	0	0	*Unknown*
Bemidji	7/29/2003	0.75	0	0	*Unknown*
Pennington	7/6/2003	1.75	0	0	*Unknown*
Saum	7/6/2003	1	0	0	*Unknown*
Redby	7/6/2003	1	0	0	*Unknown*
Bemidji	7/2/2003	0.88	0	0	*Unknown*
Kelliher	6/28/2003	0.75	0	0	*Unknown*
Bemidji	5/29/2003	0.88	0	0	*Unknown*
Bemidji	8/31/2002	0.75	0	0	*Unknown*
Waskish	8/26/2002	0.75	0	0	*Unknown*

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Nebish	7/31/2002	0.88	0	0	*Unknown*
Waskish	7/30/2002	1.75	0	0	*Unknown*
Waskish	7/1/2002	0.88	0	0	*Unknown*
Kelliher	6/25/2002	1.5	0	0	*Unknown*
Bemidji	6/22/2002	1.75	0	0	*Unknown*
Bemidji	6/22/2002	1.25	0	0	*Unknown*
Fourtown	5/29/2002	0.75	0	0	*Unknown*
Bemidji	8/17/2001	1	0	0	*Unknown*
Fourtown	8/17/2001	0.75	0	0	*Unknown*
Ponemah	7/31/2001	0.88	0	0	*Unknown*
Tenstrike	7/17/2001	1	0	0	*Unknown*
Ponemah	7/17/2001	1.75	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Tenstrike	7/17/2001	0.75	0	0	*Unknown*
Hines	7/17/2001	0.75	0	0	*Unknown*
Hines	7/17/2001	1.75	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	0.88	0	0	*Unknown*
Turtle River	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	1.5	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	0.75	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	1.75	0	0	*Unknown*
Ponemah	7/17/2001	0.75	0	0	*Unknown*
Bemidji	7/17/2001	1.75	0	0	*Unknown*
Bemidji	7/17/2001	2.75	0	0	*Unknown*
Kelliher	7/17/2001	0.75	0	0	*Unknown*
Bemidji	7/17/2001	1.5	0	0	*Unknown*
Fourtown	7/17/2001	1.75	0	0	*Unknown*
Bemidji	7/17/2001	1.5	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	1	0	0	*Unknown*
Bemidji	7/17/2001	0.75	0	0	*Unknown*
Blackduck	5/15/2001	0.75	0	0	*Unknown*
Blackduck	5/14/2001	0.75	0	0	*Unknown*
Blackduck	5/14/2001	1	0	0	*Unknown*
Pennington	8/8/2000	0.88	0	0	*Unknown*

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Turtle River	8/8/2000	0.75	0	0	*Unknown*
Kelliher	8/8/2000	0.88	0	0	*Unknown*
Bemidji	7/25/2000	1	0	0	*Unknown*
Debs	7/25/2000	0.75	0	0	*Unknown*
Blackduck	7/7/2000	0.75	0	0	*Unknown*
Island Lake	6/9/2000	0.75	0	0	*Unknown*
Bemidji	6/8/2000	1.75	0	0	*Unknown*
Bemidji	6/8/2000	1.75	0	0	*Unknown*
Waskish	8/15/1999	1.75	0	0	*Unknown*
Bemidji	7/28/1999	1.75	0	0	*Unknown*
Saum	7/27/1999	0.75	0	0	*Unknown*
Bemidji	7/27/1999	1.75	0	0	*Unknown*
Bemidji	7/27/1999	2	0	0	$50,000
Blackduck	7/4/1999	1	0	0	*Unknown*
Blackduck	7/4/1999	0.88	0	0	*Unknown*
Tenstrike	6/9/1999	0.75	0	0	*Unknown*
Tenstrike	6/9/1999	0.75	0	0	*Unknown*
Bemidji	6/9/1999	0.75	0	0	*Unknown*
Tenstrike	6/9/1999	0.75	0	0	*Unknown*
Fourtown	6/6/1999	1.75	0	0	*Unknown*
Blackduck	6/6/1999	1	0	0	*Unknown*
Fourtown	6/6/1999	0.75	0	0	*Unknown*
Tenstrike	6/4/1999	0.75	0	0	*Unknown*
Bemidji	6/4/1999	0.75	0	0	*Unknown*
Bemidji	6/4/1999	0.88	0	0	*Unknown*
Blackduck	6/4/1999	0.88	0	0	*Unknown*
Tenstrike	6/4/1999	0.75	0	0	*Unknown*
Tenstrike	7/18/1998	0.75	0	0	*Unknown*
Bemidji	7/14/1998	0.75	0	0	*Unknown*
Bemidji	6/27/1998	0.75	0	0	*Unknown*
Pinewood	5/15/1998	1	0	0	*Unknown*
Bemidji	7/16/1997	0.75	0	0	*Unknown*
Blackduck	6/27/1997	3	0	0	*Unknown*
Fourtown	8/21/1996	0.75	0	0	*Unknown*
Bemidji	7/21/1996	0.75	0	0	*Unknown*
Bemidji	7/21/1996	1.75	0	0	$100,000
Bemidji	7/21/1996	0.75	0	0	*Unknown*
Bemidji	7/21/1996	1.75	0	0	$100,000
Bemidji	7/21/1996	1.75	0	0	*Unknown*
Bemidji	7/21/1996	1	0	0	*Unknown*

Location or County	Date	Size in Inches	Deaths	Injuries	Property Damage
Turtle River	6/25/1996	0.75	0	0	*Unknown*
Thorhult	6/25/1996	0.75	0	0	*Unknown*
Bemidji	6/25/1996	0.75	0	0	*Unknown*
Bemidji	6/25/1996	0.75	0	0	*Unknown*
Bemidji	9/15/1995	0.75	0	0	*Unknown*
Beltrami County	9/16/1992	1.75	0	0	*Unknown*
Beltrami County	8/9/1992	0.75	0	0	*Unknown*
Beltrami County	6/28/1991	1	0	0	*Unknown*
Beltrami County	6/28/1991	0.75	0	0	*Unknown*
Beltrami County	9/11/1990	1	0	0	*Unknown*
Beltrami County	8/3/1989	0.75	0	0	*Unknown*
Beltrami County	6/29/1989	1	0	0	*Unknown*
Beltrami County	6/29/1989	1	0	0	*Unknown*
Beltrami County	5/10/1985	0.75	0	0	*Unknown*
Beltrami County	4/21/1985	1.75	0	0	*Unknown*
Beltrami County	7/16/1984	1	0	0	*Unknown*
Beltrami County	7/9/1984	1.75	0	0	*Unknown*
Beltrami County	7/8/1984	1.75	0	0	*Unknown*
Beltrami County	7/2/1984	1	0	0	*Unknown*
Beltrami County	8/7/1983	1.75	0	0	*Unknown*
Beltrami County	8/7/1983	1.75	0	0	*Unknown*
Beltrami County	8/7/1983	1.75	0	0	*Unknown*
Beltrami County	8/7/1983	1.75	0	0	*Unknown*
Beltrami County	8/18/1982	1	0	0	*Unknown*
Beltrami County	8/18/1982	1.75	0	0	*Unknown*
Beltrami County	8/2/1981	1.75	0	0	*Unknown*
Beltrami County	6/25/1979	1.5	0	0	*Unknown*
Beltrami County	6/25/1979	1.5	0	0	*Unknown*
Beltrami County	7/12/1978	1.75	0	0	*Unknown*
Beltrami County	6/27/1977	1.25	0	0	*Unknown*
Beltrami County	6/15/1977	1	0	0	*Unknown*
Beltrami County	6/26/1976	1.75	0	0	*Unknown*
Beltrami County	6/8/1964	2	0	0	*Unknown*
Beltrami County	7/21/1962	0.75	0	0	*Unknown*
Beltrami County	8/30/1958	1	0	0	*Unknown*
Beltrami County	8/17/1956	1.75	0	0	*Unknown*
Highest Value Property Damage					**$400,000**

Table C - 3. All severe thunderstorm wind events recorded by NCEI, 1955-2019

Location or County	Date	Type	Magnitude (Knots)	Deaths	Injuries	Property Damage
Malcolm	7/17/2019	Thunderstorm Wind	52	0	0	*Unknown*
Carmel	7/15/2019	Thunderstorm Wind	65	0	0	*Unknown*
Ponemah	7/15/2019	Thunderstorm Wind	60	0	0	*Unknown*
Waskish Municipal Airport	7/15/2019	Thunderstorm Wind	70	0	0	*Unknown*
Solway	7/8/2019	Thunderstorm Wind	60	0	0	*Unknown*
Birchmont	7/8/2019	Thunderstorm Wind	65	0	0	*Unknown*
Birchmont	7/8/2019	Thunderstorm Wind	70	0	0	*Unknown*
Lavinia	7/8/2019	Thunderstorm Wind	60	0	0	*Unknown*
Wilton	7/3/2019	Thunderstorm Wind	55	0	0	*Unknown*
Farley	6/30/2019	Thunderstorm Wind	65	0	0	*Unknown*
Lavinia	6/4/2019	Thunderstorm Wind	70	0	0	*Unknown*
Pennington	8/27/2018	Thunderstorm Wind	70	0	0	*Unknown*
Malcolm	8/26/2018	Thunderstorm Wind	60	0	0	*Unknown*
Saum	8/26/2018	Thunderstorm Wind	65	0	0	*Unknown*
Waskish	7/11/2018	Thunderstorm Wind	65	0	0	*Unknown*
Waskish	7/11/2018	Thunderstorm Wind	61	0	0	*Unknown*
Saum	7/11/2018	Thunderstorm Wind	70	0	0	*Unknown*
Waskish	7/8/2018	Thunderstorm Wind	65	0	0	*Unknown*
Island Lake	7/8/2018	Thunderstorm Wind	55	0	0	*Unknown*
Ponemah	7/8/2018	Thunderstorm Wind	55	0	0	*Unknown*
Saum	7/8/2018	Thunderstorm Wind	61	0	0	*Unknown*
Birchmont	7/4/2018	Thunderstorm Wind	60	0	0	*Unknown*
Scribner	6/29/2018	Thunderstorm Wind	70	0	0	*Unknown*
Birchmont	6/29/2018	Thunderstorm Wind	65	0	0	*Unknown*
Redlake	6/29/2018	Thunderstorm Wind	57	0	0	*Unknown*
North Pole	6/29/2018	Thunderstorm Wind	65	0	0	*Unknown*
Shooks	6/29/2018	Thunderstorm Wind	75	0	0	*Unknown*
Kelliher	6/29/2018	Thunderstorm Wind	80	0	0	*Unknown*
Kelliher	6/29/2018	Thunderstorm Wind	80	0	0	*Unknown*
Blackduck	6/29/2018	Thunderstorm Wind	75	0	0	*Unknown*
Pennington	5/29/2018	Thunderstorm Wind	50	0	0	*Unknown*
Shooks	7/21/2017	Thunderstorm Wind	52	0	0	*Unknown*
Solway	7/21/2017	Thunderstorm Wind	61	0	0	*Unknown*
Wilton	7/21/2017	Thunderstorm Wind	65	0	0	*Unknown*
(BJI)Bemidji Airport	7/21/2017	Thunderstorm Wind	54	0	0	*Unknown*
Birchmont	7/21/2017	Thunderstorm Wind	50	0	0	*Unknown*
Farley	7/21/2017	Thunderstorm Wind	56	0	0	*Unknown*
Birchmont	7/21/2017	Thunderstorm Wind	56	0	0	*Unknown*

Location or County	Date	Type	Magnitude (Knots)	Deaths	Injuries	Property Damage
Turtle river	7/21/2017	Thunderstorm Wind	56	0	0	*Unknown*
Lavinia	7/21/2017	Thunderstorm Wind	61	0	0	*Unknown*
(BJI)Bemidji Airport	7/21/2016	Thunderstorm Wind	52	0	0	*Unknown*
Bemidji	7/21/2016	Thunderstorm Wind	56	0	0	*Unknown*
Waskish	7/20/2016	Thunderstorm Wind	56	0	0	*Unknown*
Wilton	7/20/2016	Thunderstorm Wind	56	0	0	*Unknown*
Puposky	7/19/2016	Thunderstorm Wind	56	0	0	*Unknown*
North Pole	7/19/2016	Thunderstorm Wind	56	0	0	*Unknown*
Bemidji	7/19/2016	Thunderstorm Wind	52	0	0	*Unknown*
Pennington	7/19/2016	Thunderstorm Wind	56	0	0	*Unknown*
Pennington	7/11/2016	Thunderstorm Wind	61	0	0	*Unknown*
Bemidji	7/5/2016	Thunderstorm Wind	52	0	0	*Unknown*
Tenstrike	7/24/2015	Thunderstorm Wind	60	0	0	*Unknown*
Pennington	7/24/2015	Thunderstorm Wind	60	0	0	*Unknown*
Pennington	7/24/2015	Thunderstorm Wind	55	0	0	*Unknown*
Farley	7/22/2015	Thunderstorm Wind	50	0	0	*Unknown*
Funkley	7/5/2015	Thunderstorm Wind	52	0	0	*Unknown*
Farley	7/5/2015	Thunderstorm Wind	65	0	0	*Unknown*
Fourtown	7/21/2014	Thunderstorm Wind	65	0	0	*Unknown*
Blackduck	8/31/2013	Thunderstorm Wind	52	0	0	*Unknown*
Blackduck	8/31/2013	Thunderstorm Wind	65	0	0	*Unknown*
Funkley	8/31/2013	Thunderstorm Wind	55	0	0	*Unknown*
Malcolm	8/31/2013	Thunderstorm Wind	50	0	0	*Unknown*
Tenstrike	8/25/2013	Thunderstorm Wind	55	0	0	*Unknown*
Debs	7/25/2013	Thunderstorm Wind	60	0	0	*Unknown*
Ponemah	7/12/2013	Thunderstorm Wind	55	0	0	*Unknown*
Waskish	7/12/2013	Thunderstorm Wind	60	0	0	*Unknown*
Waskish	7/4/2012	Thunderstorm Wind	60	0	0	*Unknown*
Lavinia	7/4/2012	Thunderstorm Wind	52	0	0	*Unknown*
Birchmont	7/4/2012	Thunderstorm Wind	65	0	0	*Unknown*
Solway	7/2/2012	Thunderstorm Wind	65	0	0	*Unknown*
Bemidji	7/2/2012	Thunderstorm Wind	65	0	0	*Unknown*
Bemidji	7/2/2012	Thunderstorm Wind	65	0	0	*Unknown*
Lavinia	5/18/2012	Thunderstorm Wind	70	0	0	$10,000
Bemidji	8/19/2011	Thunderstorm Wind	61	0	0	*Unknown*
Bemidji	8/19/2011	Thunderstorm Wind	55	0	0	*Unknown*
Bemidji	8/19/2011	Thunderstorm Wind	55	0	0	*Unknown*
Pennington	8/19/2011	Thunderstorm Wind	55	0	0	*Unknown*
Bemidji	8/19/2011	Thunderstorm Wind	55	0	0	*Unknown*

Location or County	Date	Type	Magnitude (Knots)	Deaths	Injuries	Property Damage
(BJI)Bemidji Airport	8/5/2011	Thunderstorm Wind	50	0	0	*Unknown*
Bemidji	8/5/2011	Thunderstorm Wind	55	0	0	*Unknown*
Bemidji	8/5/2011	Thunderstorm Wind	55	0	0	*Unknown*
Blackduck	7/17/2011	Thunderstorm Wind	61	0	0	*Unknown*
Bemidji	7/17/2011	Thunderstorm Wind	55	0	0	*Unknown*
Redlake	7/4/2011	Thunderstorm Wind	55	0	0	*Unknown*
Birchmont	5/30/2011	Thunderstorm Wind	52	0	0	*Unknown*
Shooks	8/30/2010	Thunderstorm Wind	52	0	0	*Unknown*
Scribner	7/15/2010	Thunderstorm Wind	52	0	0	*Unknown*
Lavinia	7/15/2010	Thunderstorm Wind	56	0	0	*Unknown*
Lavinia	7/15/2010	Thunderstorm Wind	56	0	0	*Unknown*
Bemidji	5/28/2010	Thunderstorm Wind	50	0	0	*Unknown*
Kelliher	8/15/2009	Thunderstorm Wind	56	0	0	*Unknown*
Waskish	8/14/2009	Thunderstorm Wind	61	0	0	*Unknown*
Waskish	8/14/2009	Thunderstorm Wind	61	0	0	*Unknown*
Waskish	8/14/2009	Thunderstorm Wind	61	0	0	$2,000
Malcolm	7/23/2009	Thunderstorm Wind	60	0	0	*Unknown*
Blackduck	7/14/2009	Thunderstorm Wind	43	0	0	$5,000
South Beltrami (Zone)	6/28/2009	High Wind	50	0	0	*Unknown*
Blackduck	5/6/2009	Thunderstorm Wind	52	0	0	$8,000
Waskish	7/29/2008	Thunderstorm Wind	55	0	0	$5,000
Shooks	7/14/2008	Thunderstorm Wind	52	0	0	$20,000
Lavinia	7/11/2008	Thunderstorm Wind	60	0	0	$40,000
Redlake	8/26/2007	Thunderstorm Wind	60	0	0	*Unknown*
Redlake	8/26/2007	Thunderstorm Wind	60	0	0	*Unknown*
Saum	8/26/2007	Thunderstorm Wind	60	0	0	*Unknown*
Waskish	8/10/2007	Thunderstorm Wind	55	0	0	*Unknown*
Waskish	8/10/2007	Thunderstorm Wind	55	0	0	*Unknown*
Bemidji	6/18/2007	Thunderstorm Wind	50	0	0	*Unknown*
Blackduck	6/18/2007	Thunderstorm Wind	55	0	0	*Unknown*
Waskish	6/18/2007	Thunderstorm Wind	55	0	0	*Unknown*
Waskish	7/31/2006	Thunderstorm Wind	52	0	0	*Unknown*
Wilton	7/28/2006	Thunderstorm Wind	50	0	0	*Unknown*
Bemidji	7/28/2006	Thunderstorm Wind	50	0	0	*Unknown*
Blackduck	7/13/2006	Thunderstorm Wind	52	0	0	*Unknown*
Pennington	6/26/2006	Thunderstorm Wind	61	0	0	*Unknown*
South Beltrami (Zone)	11/8/2005	High Wind	40	0	0	*Unknown*

Location or County	Date	Type	Magnitude (Knots)	Deaths	Injuries	Property Damage
South Beltrami (Zone)	11/8/2005	High Wind	40	0	0	*Unknown*
Bemidji	9/9/2005	Thunderstorm Wind	52	0	0	*Unknown*
Thorhult	7/20/2005	Thunderstorm Wind	55	0	0	*Unknown*
Fourtown	7/19/2005	Thunderstorm Wind	55	0	0	*Unknown*
Bemidji	6/29/2005	Thunderstorm Wind	52	0	0	*Unknown*
Ponemah	6/23/2005	Thunderstorm Wind	52	0	0	*Unknown*
Blackduck	6/19/2005	Thunderstorm Wind	52	0	0	*Unknown*
Bemidji	5/8/2005	Thunderstorm Wind	52	0	0	*Unknown*
Blackduck	7/29/2003	Thunderstorm Wind	61	0	0	*Unknown*
(BJI)Bemidji Airport	7/2/2003	Thunderstorm Wind	50	0	0	*Unknown*
Kelliher	7/2/2003	Thunderstorm Wind	65	0	0	$5,000
Fourtown	9/1/2002	Thunderstorm Wind	Unknown	0	0	$5,000
Waskish	7/7/2002	Thunderstorm Wind	Unknown	0	0	$100
Jelle	6/9/2002	Thunderstorm Wind	Unknown	0	0	$100
South Beltrami (Zone)	2/11/2002	High Wind	56	0	0	*Unknown*
South Beltrami (Zone)	2/11/2002	High Wind	56	0	0	*Unknown*
Fourtown	8/14/2001	Thunderstorm Wind	Unknown	0	0	$5,000
Waskish	8/14/2001	Thunderstorm Wind	Unknown	0	0	$1,000
(BJI)Bemidji Airport	8/8/2001	Thunderstorm Wind	Unknown	0	0	$3,000
Solway	8/8/2001	Thunderstorm Wind	Unknown	0	0	$500
Wilton	8/8/2001	Thunderstorm Wind	Unknown	0	0	$500
Bemidji	8/8/2001	Thunderstorm Wind	Unknown	0	0	$25,000
(BJI)Bemidji Airport	8/8/2001	Thunderstorm Wind	57	0	0	*Unknown*
Bemidji	8/8/2001	Thunderstorm Wind	Unknown	0	0	$15,000
Tenstrike	8/8/2001	Thunderstorm Wind	Unknown	0	0	$1,000
Waskish	7/31/2001	Thunderstorm Wind	Unknown	0	0	$500
Thorhult	7/31/2001	Thunderstorm Wind	Unknown	0	0	$500
Fourtown	7/31/2001	Thunderstorm Wind	Unknown	0	0	$1,000
Redby	7/31/2001	Thunderstorm Wind	Unknown	0	0	$2,000
Jelle	7/18/2001	Thunderstorm Wind	Unknown	0	0	$500
Waskish	7/18/2001	Thunderstorm Wind	Unknown	0	0	$2,000
Tenstrike	7/18/2001	Thunderstorm Wind	Unknown	0	0	$25,000
Thorhult	7/17/2001	Thunderstorm Wind	Unknown	0	0	*Unknown*
South Beltrami (Zone)	12/25/1999	High Wind	75	0	0	*Unknown*
South Beltrami (Zone)	12/25/1999	High Wind	75	0	0	*Unknown*

Location or County	Date	Type	Magnitude (Knots)	Deaths	Injuries	Property Damage
South Beltrami (Zone)	11/1/1999	High Wind	60	0	0	*Unknown*
South Beltrami (Zone)	11/1/1999	High Wind	60	0	0	*Unknown*
Kelliher	7/25/1999	Thunderstorm Wind	61	0	0	*Unknown*
Blackduck	7/4/1999	Thunderstorm Wind	Unknown	0	0	$2,000
Bemidji	7/4/1999	Thunderstorm Wind	Unknown	0	0	$10,000
Blackduck	7/4/1999	Thunderstorm Wind	Unknown	0	0	$1,000
Bemidji	6/26/1999	Thunderstorm Wind	Unknown	0	0	$20,000
Hines	7/18/1998	Thunderstorm Wind	Unknown	0	0	$5,000
Bemidji	6/27/1998	Thunderstorm Wind	Unknown	0	0	$200
Bemidji	6/27/1998	Thunderstorm Wind	Unknown	0	0	$400
South Beltrami (Zone)	9/1/1997	High Wind	Unknown	0	0	$3,000
South Beltrami (Zone)	8/31/1997	High Wind	Unknown	0	0	$2,000
Grygla	6/27/1997	Thunderstorm Wind	Unknown	0	0	$5,000
Waskish	6/27/1997	Thunderstorm Wind	Unknown	0	0	$10,000
(BJI)Bemidji Airport	6/27/1997	Thunderstorm Wind	50	0	0	*Unknown*
Bemidji	6/27/1997	Thunderstorm Wind	Unknown	0	0	$5,000
Turtle River	8/21/1996	Thunderstorm Wind	Unknown	0	0	$5,000
Solway	5/17/1996	Thunderstorm Wind	Unknown	0	0	$10,000
Bemidji	5/17/1996	Thunderstorm Wind	Unknown	0	0	$10,000
Bemidji	5/17/1996	Thunderstorm Wind	Unknown	0	0	$5,000
Bemidji	5/17/1996	Thunderstorm Wind	Unknown	0	0	$5,000
Big Turtle Lake	6/22/1995	Thunderstorm Wind	55	0	0	*Unknown*
Blackduck	6/19/1994	Thunderstorm Wind	Unknown	0	0	*Unknown*
Bemidji	5/23/1994	Thunderstorm Wind	Unknown	0	0	*Unknown*
Bemidji	8/9/1993	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	9/16/1992	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/5/1989	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	6/18/1988	Thunderstorm Wind	61	0	0	*Unknown*
Beltrami County	7/23/1987	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/23/1987	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/23/1987	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/18/1987	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/20/1985	Thunderstorm Wind	50	0	0	*Unknown*
Beltrami County	4/21/1985	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	6/25/1984	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	6/12/1984	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	6/12/1984	Thunderstorm Wind	Unknown	0	0	*Unknown*

Location or County	Date	Type	Magnitude (Knots)	Deaths	Injuries	Property Damage
Beltrami County	9/5/1983	Thunderstorm Wind	55	0	0	*Unknown*
Beltrami County	8/26/1983	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	8/26/1983	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/3/1983	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	8/18/1982	Thunderstorm Wind	70	0	0	*Unknown*
Beltrami County	6/17/1981	Thunderstorm Wind	52	0	0	*Unknown*
Beltrami County	9/9/1979	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/12/1978	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	6/27/1977	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/1/1975	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	7/22/1972	Thunderstorm Wind	Unknown	0	0	*Unknown*
Beltrami County	8/9/1971	Thunderstorm Wind	50	0	0	*Unknown*
Beltrami County	9/1/1960	Thunderstorm Wind	Unknown	0	0	*Unknown*
Highest Value Property Damage						**$40,000**

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

Location or County	Date	Type	Deaths	Injuries	Property Damage
Waskish	6/19/2014	Flood	0	0	$20,000
Debs	5/1/2013	Flood	0	0	$5,000
Debs	4/28/2013	Flood	0	0	$5,000
Bemidji	8/19/2011	Flash Flood	0	0	$5,000
Bemidji	8/19/2011	Flash Flood	0	0	$5,000
Malcolm	3/25/2009	Flood	0	0	$5,000
Kelliher	6/19/2005	Flash Flood	0	0	*Unknown*
Kelliher	6/19/2005	Flash Flood	0	0	*Unknown*
Bemidji	6/23/2002	Flash Flood	0	0	*Unknown*
Bemidji	6/23/2002	Flash Flood	0	0	*Unknown*
North Beltrami (Zone)	6/11/2002	Flood	0	0	*Unknown*
South Beltrami (Zone)	6/11/2002	Flood	0	0	*Unknown*
Thorhult	7/31/2001	Flash Flood	0	0	$2,000
Fourtown	7/31/2001	Flash Flood	0	0	*Unknown*
Fourtown	7/31/2001	Flash Flood	0	0	$10,000
Fourtown	7/31/2001	Flash Flood	0	0	*Unknown*
Thorhult	7/17/2001	Flash Flood	0	0	*Unknown*

Location or County	Date	Type	Deaths	Injuries	Property Damage
South Beltrami (Zone)	9/1/1999	Flood	0	0	*Unknown*
Bemidji	6/4/1999	Flash Flood	0	0	$50,000
Highest Value Property Damage					**$50,000**

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

Location or County	Date	Type	Deaths	Injuries	Property Damage
North Beltrami (Zone)	12/28/2019	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/28/2019	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/8/2019	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/1/2019	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/30/2019	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	4/11/2019	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	4/11/2019	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	3/9/2019	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	3/9/2019	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	2/24/2019	Blizzard	0	0	*Unknown*
South Beltrami (Zone)	2/24/2019	Blizzard	0	0	*Unknown*
South Beltrami (Zone)	2/6/2019	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	2/6/2019	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	2/3/2019	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	2/3/2019	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	12/26/2018	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	12/26/2018	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	2/18/2018	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	2/18/2018	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	12/4/2017	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/4/2017	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	10/26/2017	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	1/2/2017	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	1/2/2017	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/25/2016	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/25/2016	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/5/2016	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/18/2016	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/16/2016	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	12/16/2015	Winter Storm	0	0	*Unknown*

Location or County	Date	Type	Deaths	Injuries	Property Damage
North Beltrami (Zone)	1/2/2015	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	1/2/2015	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	4/1/2014	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/1/2014	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/31/2014	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/31/2014	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/21/2014	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/21/2014	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	2/26/2014	Blizzard	0	0	*Unknown*
North Beltrami (Zone)	12/3/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/3/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/2/2013	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	4/14/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/14/2013	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/17/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/17/2013	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/4/2013	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	3/4/2013	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	2/17/2013	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	2/10/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	2/10/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	1/28/2013	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	1/11/2013	Ice Storm	0	0	*Unknown*
North Beltrami (Zone)	1/11/2013	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	2/26/2012	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/15/2011	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	3/22/2011	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	1/1/2011	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	1/1/2011	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/31/2010	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	12/31/2010	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/31/2010	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/30/2010	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	11/29/2010	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/29/2010	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/22/2010	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	11/22/2010	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	1/22/2010	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	1/22/2010	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/23/2009	Heavy Snow	0	0	*Unknown*

Location or County	Date	Type	Deaths	Injuries	Property Damage
North Beltrami (Zone)	12/23/2009	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	10/12/2009	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	4/1/2009	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/1/2009	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/30/2009	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/30/2009	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/24/2009	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/24/2009	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/9/2009	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/9/2009	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	2/9/2009	Ice Storm	0	0	*Unknown*
South Beltrami (Zone)	2/9/2009	Ice Storm	0	0	*Unknown*
South Beltrami (Zone)	1/2/2009	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	1/2/2009	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	12/13/2008	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/13/2008	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/25/2008	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	4/25/2008	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/10/2008	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	4/6/2008	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	4/5/2008	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/1/2007	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/1/2007	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	2/28/2007	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	2/24/2007	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	2/24/2007	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/30/2006	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/28/2006	Ice Storm	0	0	*Unknown*
North Beltrami (Zone)	3/1/2006	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	2/24/2006	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/27/2005	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/27/2005	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	1/1/2005	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	1/1/2005	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/31/2004	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/31/2004	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/29/2004	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/29/2004	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/11/2004	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/11/2004	Winter Storm	0	0	*Unknown*

Location or County	Date	Type	Deaths	Injuries	Property Damage
South Beltrami (Zone)	1/24/2004	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	1/24/2004	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	1/2/2004	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/15/2003	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/15/2003	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/12/2003	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/12/2003	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	4/4/2003	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	3/27/2003	Heavy Snow	0	0	*Unknown*
North Beltrami (Zone)	3/8/2002	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	3/8/2002	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/24/2001	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/24/2001	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	10/24/2001	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	10/24/2001	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	4/23/2001	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	4/23/2001	Heavy Snow	0	0	*Unknown*
South Beltrami (Zone)	2/23/2001	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	2/23/2001	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/20/2000	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/20/2000	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	12/16/2000	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	12/16/2000	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	4/3/1999	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	3/17/1999	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	1/13/1999	Winter Storm	0	0	*Unknown*
South Beltrami (Zone)	11/18/1998	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/18/1998	Winter Storm	0	0	*Unknown*
North Beltrami (Zone)	11/10/1998	Blizzard	0	0	*Unknown*
South Beltrami (Zone)	11/10/1998	Blizzard	0	0	*Unknown*
North Beltrami (Zone)	1/9/1997	Blizzard	0	0	*Unknown*
South Beltrami (Zone)	1/9/1997	Blizzard	0	0	*Unknown*
North Beltrami (Zone)	11/16/1996	Blizzard	0	0	*Unknown*
South Beltrami (Zone)	11/16/1996	Blizzard	0	0	*Unknown*
North Beltrami (Zone)	10/17/1996	Heavy Snow	0	0	*Unknown*
Highest Value Property Damage					***unknown***

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

Location or County	Date	Type	Deaths	Injuries	Property Damage
North Beltrami (Zone)	3/2/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	3/2/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/24/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/7/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/7/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/28/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/28/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/26/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/26/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/1/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/1/2019	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	12/31/2018	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	12/31/2018	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/12/2018	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/12/2018	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/1/2018	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/1/2018	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	12/29/2017	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	12/29/2017	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	12/24/2017	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	12/24/2017	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	12/17/2016	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	12/17/2016	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/16/2016	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/16/2016	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/21/2015	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/21/2015	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/6/2015	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/6/2015	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/3/2015	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/3/2015	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	3/1/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	3/1/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/28/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/28/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/26/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/26/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/26/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/26/2014	Extreme Cold/Wind Chill	0	0	*Unknown*

Location or County	Date	Type	Deaths	Injuries	Property Damage
South Beltrami (Zone)	1/22/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/22/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/4/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/4/2014	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	12/28/2013	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	12/28/2013	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/20/2013	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/20/2013	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/10/2012	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/10/2012	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/18/2012	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/18/2012	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/21/2011	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/21/2011	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/15/2009	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/14/2009	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/14/2009	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/14/2009	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/14/2009	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/4/2009	Extreme Cold/Wind Chill	0	0	$21,000
North Beltrami (Zone)	12/15/2008	Extreme Cold/Wind Chill	0	0	$21,000
South Beltrami (Zone)	12/15/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/19/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/19/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/9/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/9/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/29/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/29/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/17/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/17/2008	Extreme Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/16/2006	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/16/2006	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/13/2005	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/13/2005	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	8/19/2004	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	8/19/2004	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	6/23/2004	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	6/23/2004	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/26/2004	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/26/2004	Cold/Wind Chill	0	0	*Unknown*

Location or County	Date	Type	Deaths	Injuries	Property Damage
North Beltrami (Zone)	1/21/2004	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/21/2004	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	1/4/2004	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	1/4/2004	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	3/8/2003	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	3/8/2003	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	12/21/1996	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	12/21/1996	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	11/25/1996	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	11/25/1996	Cold/Wind Chill	0	0	*Unknown*
North Beltrami (Zone)	2/1/1996	Cold/Wind Chill	0	0	*Unknown*
South Beltrami (Zone)	2/1/1996	Cold/Wind Chill	0	0	*Unknown*
Highest Value Property Damage					**$21,000**

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

Location or County	Date	Type	Deaths	Injuries	Property Damage
North Beltrami (Zone)	8/4/2001	Heat	0	0	*Unknown*
South Beltrami (Zone)	8/4/2001	Heat	0	0	*Unknown*
Highest Value Property Damage					***Unknown***

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

Location or County	Date	Deaths	Injuries	Property Damage
Scribner	6/17/2016	0	0	$20,000
Bemidji	9/9/2005	0	0	*Unknown*
Bemidji	9/4/2004	0	0	$10,000
Highest Value Property Damage				**$20,000**

Appendix D
Adopting Resolutions

Resolutions to be added to Appendix D by Beltrami 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

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)





Who You Are (County Emergency Managers):

- Name, Title, and County
- Past Experience with MHMPT

Minnesota HSEM:

Jennifer Nelson, MN HSEM
State Hazard Mitigation Officer

Project Overview

- 10 Counties

County	HMMP Expiration Date
St. Louis	8/14/2018
Itasca	8/14/2018
Marion	8/14/2018
Beltrami	9/1/2018
Lake of the Woods	9/1/2018
Koochiching	9/1/2018
Aitkin	9/25/2018
Cass	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.

2

7/3/2019

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

Estimated Time-line (scenario)

Our Recent Experience

These things help speed up the update process.

The UMD Team provides you with prepared communications & formats.

- [illegible]

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

- [illegible]

EM's help coordinate getting information that we need.

- [illegible]
- [illegible]

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

- [illegible]

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

7/3/2019

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
sstark@d.umn.edu
218-726-7438

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

4

Beltrami County
Multi-Hazard Mitigation Plan Update
Wednesday, June 5, 2019 MHMP Planning Team Meeting #1
Beltrami County Law Enforcement Center – Bemidji, MN
2:00 p.m. – 4:00 p.m.

Meeting Summary:
On Wednesday, June 5, 2019, key county and city representatives, as well as other stakeholders were convened to participate in a Planning Team Meeting for the update of Beltrami 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 Beltrami County MHMP. A total of **15** people attended the meeting.

The opening presentation covered 6 key areas:

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.***
    - ***Severe Summer Storms - No noted changes in the last 5 years.***
    - ***Flooding – Beltrami County is large and flooding is not an issue county-wide. Overland flooding is the most volatile flooding with culverts being washed out. A lot of ditching has occurred in the northern part of the county to help avoid road flooding. There is not much river flooding but there is some shoreland flooding along lakes (from wave action). The City of Bemidji continues to grow and build – a large rain has not happened recently to test how additional impervious surfaces will impact a large rain event. Within the last 5 years the City of Bemidji has implemented regulations to mitigate stormwater runoff. There is a stormwater runoff fee which is a point of contention with much of the community.***

- ***Extreme Temperatures - No noted changes in the last 5 years.***
- ***Erosion, Landslides & Land Subsidence – Beltrami County updated it's shoreline ordinance in 2018. There is also a new Minnesota statewide Buffer Law (Mn State Statute 103F.48)***
- ***Wildfire – Annual occurrence of wildfire are up county-wide. There is growing development and more individuals in the county are suspected to be part of the cause (9 out of 10 wildfires in MN are caused by humans).***
- ***Drought – No noted change in the last 5 years.***
- ***Dam Failure – Otter Tail Power owns the Bemidji Hydroelectric Plan.***

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:

- 6-5-19 Planning Team Meeting Stakeholder Invite List
- 6-5-19 Beltrami County Meeting Email Invite
- 6-5-19 Meeting Agenda
- 6-5-19 Meeting Sign-in Sheets (Scan of hardcopy & Excel copy)
- 6-5-19 Power Point Presentation Slides
- 6-5-19 Meeting Handouts (Mitigation Strategies, HMA Grants, Mitigation Ideas Worksheet)
- 6-5-19 Mitigation Ideas Working Session Notes

Meeting Summary Prepared By: Bonnie Hundrieser, UMD Project Team

Beltrami County 2019 MHMP Update
6-5-19 Planning Team Meeting Stakeholder Invite List

Following is the list of stakeholders that were invited via email to attend the Beltrami County MHMP Update Planning Team Meeting #1 held on June 5, 2019.

BELTRAMI COUNTY

- Christopher Muller, Beltrami County Emergency Management Director
- Kay Mack - Beltrami County Administrator
- Brent Rud - Beltrami County Environmental Services
- Bruce Hasbargan - Beltrami County Engineer
- Ernie Beitel - Beltrami County Sheriff
- Jarrett Walton - Beltrami County Sheriff Chief Deputy
- Jodee Treat - Beltrami County Auditor
- Kevin Trappe - Beltrami County GIS Director
- Lauren Williams - Beltrami County Highway Department
- Cynthia Brogren - Beltrami County Public Health Director
- Megan Heuer-Korhonen - Beltrami County Public Health Preparedness Coordinator
- Beltrami County Board of Commissioners
  - Craig Gaasvig, District 1
  - Reed Olson, District 2
  - Richard Anderson, District 3
  - Tim Sumner, District 4
  - Jim Lucachick, District 5

CITY / TOWNSHIP JURISDICTIONS

City of Bemidji

- Craig Gray - Bemidji Public Works Director
- Nate Matthews - Bemidji City Manager
- Rita Albrecht - Bemidji Mayor
- Mike Mastin - Bemidji Police Chief
- Dave Lazella - Bemidji Police Captain
- David Hoefer - Bemidji Fire Chief

City of Blackduck

- Christina Regas - Blackduck City Clerk
- Jace Grangruth - Blackduck Police Chief

City of Funkley

- City of Funkley (Mayor/Clerk)

City of Kelliher

- Shelli Krueth - City of Kelliher

City of Solway
- City of Solway (Mayor/Clerk)

City of Tenstrike
- City of Tenstrike (Mayor/Clerk)

City of Turtle River
- City of Turtle River (Mayor/Clerk)

City of Wilton
- Jeff Snyder - City of Wilton Mayor

Ray Berger - Waskish Township

OTHER STAKEHOLDERS
- Erin Morrill - Bemidji State University
- Arlen Hogquist - Beltrami Electric Cooperative
- Duane Oothoudt - Leech Lake Emergency Management
- Kathleen Luepke - USDA
- Dan Carroll – MN DNR Firewise Coordinator
- Heather Winkleblack – HSEM Region 3 Regional Program Coordinator

Office of **SHERIFF OF BELTRAMI COUNTY**
613 Minnesota Avenue NW
Bemidji, Minnesota 56601

Ernie Beltel, Sheriff
Phone (218) 333-8111
Fax (218) 333-8325

April 19th, 2019

2019 Multi-Hazard Mitigation Plan Update – Meeting Invitation

Your presence is requested at a Planning Team Meeting for the update of the 2019 Beltrami 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, June 5th, 2019
Time: 1400 – 1600hrs (2:00PM – 4:00PM)
Location: Beltrami County EOC (located in the Law Enforcement Center, 613 Minnesota Ave NW, Bemidji)

About the Plan
The update of the Beltrami County Multi-Hazard Mitigation Plan (MHMP) is a requirement by the State of Minnesota Department of Homeland Security and Emergency Management as well as the Federal Emergency Management Agency (FEMA) every 5 years. Our 2013 plan is due for an update and our planning is currently underway. The plan addresses the natural hazards that Beltrami County faces and will result in the identification of mitigation actions that will help to reduce or eliminate the impact of future hazard events, such as flooding and severe winter/summer storms.

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

- You will help identify critical mitigation projects to implement at the county/local level and how they can be integrated with existing plans, policies and project efforts.
- Participating jurisdictions will be eligible to apply for FEMA hazard mitigation grant funding.
- Mitigation planning is necessary to keep our communities resilient against future disasters and reduce the costs of recovery.
- FEMA required 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 in Beltrami 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 let me know so I can plan for attendance. If you cannot attend, please plan to send someone in your stead to ensure representation. You are encouraged to bring a team of additional staff from your county department, municipality or associated stakeholder organization.

-Christopher Muller – Beltrami County Emergency Management Director
Email: chris.muller@co.beltrami.mn.us ph.218-333-8386

Beltrami County

2019 Multi-Hazard Mitigation Plan Update

Planning Team Meeting

Wednesday, June 5, 2019, 2:00 p.m. – 4:00 p.m.
Beltrami County Law Enforcement Center (EOC)– Bemidji, 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:
Chris Muller
Beltrami County Emergency Management Director
Phone: 218-333-8386
Email: Chris.muller@co.beltrami.mn.us

Beltrami County
6/5/19 MHMP Planning Team Meeting #1
List of Participants *(15)*

Beltrami County MHMP Update - Planning Team Meeting #1 Wednesday, June 5, 2019, 2:00 p.m. - 4:00 p.m. Participant Sign-in List			
Name	**Agency/Organization**	**Title**	**Email**
Cindy Borgen	Beltrami County Public Health	Director	cynthia.borgen@co.beltrami.mn.us
Megan Heuer Korhonen	Beltrami County Public Health	Manager	megan.heuer@co.beltrami.mn.us
Carrie Yavara	Beltrami County Public Health	Intern	carrie.yavara@co.beltrami.mn.us
Erin Morrill	Bemidji State University/NTC	Security Coordinator	erin.morrill@bemidjistate.edu
Joseph Corser	Bemidji Ambulance	Quality Director	jcorser@bemidjiambulance.com
Jake Howard	Bemidji Ambulance	Personnel Director	jhoward@bemidjiambulance.com
David Hoefer	Bemidji Fire	Fire Chief	david.hoefer@ci.bemidji.mn.us
David Hansen	Bemidji Public Works	Street Superintendent	david.hansen@ci.bemidji.mn.us
Jace Grangruth	Blackduck Police Dept.	Chief of Police	jace.grangruth@blackduckmn.com
Shelli Krueth	City of Kelliher	City Clerk	citykelr@pau.boreas.net
Kevin Trappe	Beltrami County GIS	Director	kevin.trappe@co.beltrami.mn.us
Christopher Muller	Beltrami County Sheriff's Office	Emergency Management Director	chris.muller@co.beltrami.mn.us
Rich Riewer	Beltrami Electric	Manager of Engineering	rriewer@beltramielectric.com
Bruce Hasbargen	Beltrami County Highway Dept.	County Engineer	bruce.hasbargen@co.beltrami.mn.us
Mike Mastin	Bemidji Police Dept.	Chief of Police	mmastin@ci.bemidji.mn.us

Beltrami County – Multi Hazard Mitigation Plan Update
Planning Team Meeting #1 – Wednesday, June 5, 2019 – 2:00 p.m. – 4:00 p.m.

PARTICIPANT SIGN IN SHEET

Name	Agency/Organization	Title	Email
1. Cindy Borgen	Beltrami Co Public Health	Director	cynthia.borgen@co.beltrami.mn.us
2. Megan Heuer Korhonen	BC Public Health	Manager	megan.heuer@co.beltrami.mn.us
3. Carrie Yaverbaum	BC PH	Intern	carrie.yaverbaum@co.beltrami.mn.us
4. Erin Merrill	BSU/NTC	Security Coordinator	erinmerrill@bemidjistate.edu
5. Joseph Corser	Bemidji Ambulance	Quality Director	jcorser@bemidjiambulance.com
6. Jake Howard	Bemidji Ambulance	Personnel Director	jhoward@bemidjiambulance.com
7. David Hoefer	Bemidji Fire	Fire Chief	david.hoefer@ci.bemidji.mn.us
8. David Hanson	Bemidji Public Works	Street Supt	david.hanson@ci.bemidji.mn.us
9. Jace Gregerud	Blackduck Police Dept	Chief of Police	jace.gregerud@blackduckmn.com
10. Shelli Kruseth	City of Kelliher	City Clerk	cityhelr@paulbunyan.net
11. Kevin Trapp	BC GIS	Director	kevin.trapp@co.beltrami.mn.us
12. CHRISTOPHER MUELLER	BELTRAMI CO	E.M. DIRECTOR	chris.mueller@co.beltrami.mn.us
13. Rich Riewer	Beltrami Electric	Mgr of Eng.	rr.riewer@beltramielectric.com
14. Bruce Hasbargen	Beltrami Co. Hwy	Engineer	bruce.hasbargen@co.beltrami.mn.us
15. Mike Mastin	Bemidji Police Dept	Police Chief	mmastin@ci.bemidji.mn.us
16.			
17.			
18.			
19.			
20.			
21.			
22.			

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Beltrami County

2019 MULTI-HAZARD MITIGATION PLAN UPDATE
PLANNING TEAM MEETING #1
JUNE 5, 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

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 Beltrami County, including the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton.

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

Led by HC
Led by HMD

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

HAZUS

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Critical Infrastructure (CI)

Essential Services	Examples
Healthcare Facilities	Hospitals; nursing homes; blood banks; other housing for occupants who may not be sufficiently mobile to avoid the loss of life or injury during natural disasters
Emergency Services	Law enforcement; fire & rescue services; EMS; Emergency Operations Centers (EOC)
Schools & Evacuation Centers/Shelters	Schools; churches; community centers; other designated emergency shelters
Infrastructure Systems	**Examples**
Transportation Systems	airports; roadways; railways; commercial shipping ports
Utility Systems	Energy utilities (electricity); pipeline systems (oil & natural gas); water & sewer utilities; water treatment plants; Communications: radio towers used for emergency communication; (ARMER) sites

Critical Infrastructure (CI)

High Potential Loss	Examples
Dams & Levees	Hydroelectric power generation; water supplies; agricultural irrigation; sediment and flood control; river navigation; waste management; mine tailings and recreation
Hazardous Materials Facilities	EPA Tier II facilities; storage of highly volatile, flammable, explosive, toxic or water-reactive materials
Significant County Assets	**Examples**
Employers	Large employers (e.g. hospitals, universities); or who represent the primary economic sector of a community
Government Buildings (Federal, State, Local, Tribal)	Government service centers; court houses; jails & prisons
Cultural Resources	Cultural and historic assets that are unique or irreplaceable

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 Beltrami County

Beltrami County has been part of **18** FEMA-declared disasters & emergencies.

Most Recent:

2018: DR-4380 *(Due to severe storms, tornadoes, straight-line winds, and flooding)*

2014: DR-4182 *(Due to severe storms, straight-line winds, flooding, landslides, and mudslides)*

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 Beltrami 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, roof collapse)
  - Interruption to Transportation and Emergency 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 Roads & 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 (heat) / High (cold)**
- *Possible Impacts:*
  - Danger to Life Safety (prolonged exposure)
  - 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:* **High**
- *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 Beltrami County resulting from Hazard Mitigation funding

DR Year	Project Description	Funding Type	Sub-Grantee	Federal Share
2013	Beltrami County	PDM		$45,000
2008	City Of Preston Buyout	HMGP	Preston	$41,925
2007	Headwaters Risk Mitigation Plan	HMGP	Headwaters Regional Development Comm	$30,000
2008	Beltrami Electric Cooperative, Inc	HMGP	Beltrami Electric Co-Op	$150,000
1997	Overhead To Underground Power Line Conversion	HMGP	Beltrami Electric Cooperative, Inc.	$207,500

Mitigation Action Working Session

- Review feedback from Beltrami County 2019 LMS Report.
- 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.

8

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 • 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
Structure and Infrastructure Projects	These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.	• 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 *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 • 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 *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 • 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 • Presentations to school groups or neighborhood organizations • Mailings to residents in hazard-prone areas. • NWS StormReady Program • Firewise Communities *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 • Flood fight plans and preparedness measures • Dam emergency action plans • Emergency Warning Systems (i.e., CodeRed, warning sirens) • Generator backup power • NWS Storm Spotter Training • 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.

DPS-HSEM December 2018

- **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

DPS-HSEM December 2018

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

BELTRAMI COUNTY

June 5, 2019 MHMP Planning Meeting #1

Mitigation Ideas Worksheet Notes

Following are notes from the **Beltrami County 6-5-19 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 Beltrami County MHMP 2019 Update.

Beltrami County

Submitted by: Kevin Trappe, GIS Director

Hazard: Severe Storms
Action: (Infrastructure damage from storms, i.e. debris on roads, road flooding, washouts) Use of GIS applications to collect information on the locations of damage and actions needed after an event. (Strategy: Mitigation Preparedness & Response Support)

City of Kelliher

Submitted by: Shelli Krueth, City Clerk

Hazard: Severe Storms (downed power lines)
Action: Utility undergrounding. From Kelliher to Waskish power failure happens often (winter & summer).

Hazard: Straight line winds/Tornado
Action: Safe room with Generator Power. The City would like a safe room or retrofit of old school building to be the safe room.

City of Bemidji

Submitted by: Mike Mastin, Chief of Police

Hazard: Railroad crossing over Mississippi River (spill/leak/derail)
Action: With the increase of oil transport via rail there is an increased risk of disaster involving a small/leak/derailment that may impact the Mississippi River and 2 lakes (Irving & Bemidji).

Beltrami County / City of Bemidji

Submitted by: Erin Morrill, Bemidji State University/Northwest Technical College, Security Coordinator

Hazard: Severe Storm/Tornado
Action: There is a lack of a safe rooms / storm shelters for the Bemidji community. The city of Bemidji / Beltrami County have a number of mobile home parks and we lack safe places for them to go. It would be nice to have some safe rooms in various places throughout the county/cities.

Beltrami County Multi-Hazard Mitigation Plan Update
Planning Team Meeting #2
May 22, 2020, 10:00 a.m. – 12:00 p.m.
Remote Meeting via Zoom Video/Phone Conference

Meeting Summary:

On Friday, May 22, 2020 Beltrami County Emergency Management convened representatives from Beltrami County, cities, townships and other key stakeholders to participate in the 2nd Planning Team Meeting for the Beltrami County Multi-Hazard Mitigation Plan (MHMP) Update for 2020-2025. The meeting was held remotely via Zoom video/phone conferencing from 10:00 a.m. – 12:00 p.m. and a total of **19** 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 Beltrami 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:

- *During the hazard profile map presentation for Tornadoes, Chris Muller, Beltrami County Emergency Manager noted that the National Weather Service reports 50 tornados in the time period shown and the City of Bemidji had one in 2018 that is not on the map. To follow up on this, Stacey Stark with U-Spatial@UMD confirmed the tornado source data. In doing so, an error was found in the map displayed in the county presentation and the map was corrected for the Beltrami County MHMP final draft. An email was sent to Chris to follow-up with this correction.*
- *There were no other comments or questions during the presentation or during the discussion of the mitigation action charts.*

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:
- 5-22-20 Planning Team Meeting Stakeholder Invite List
- 5-22-20 Email Invites to Planning Team & Neighboring Jurisdictions
- 5-22-20 Meeting Agenda
- 5-22-20 List of Meeting Participants
- 5-22-20 Power Point Presentation Slides

Meeting Summary Prepared By: Bonnie Hundrieser, U-Spatial@UMD Project Team

Beltrami County 2020 MHMP Update

5-22-20 MHMP Planning Team Mtg. #2 (Virtual)

Stakeholder Invite List

Following is the list of stakeholders that were invited via email to attend the Beltrami County MHMP Update Planning Team Meeting #2 held via Zoom Video/Phone Conferencing on Friday, May 22, 2020.

BELTRAMI COUNTY

- Christopher Muller, Beltrami County Emergency Management Director
- Kay Mack - Beltrami County Administrator
- Brent Rud - Beltrami County Environmental Services
- Bruce Hasbargan - Beltrami County Engineer
- Ernie Beitel - Beltrami County Sheriff
- Jarrett Walton - Beltrami County Sheriff Chief Deputy
- Jodee Treat - Beltrami County Auditor
- Kevin Trappe - Beltrami County GIS Director
- Lauren Williams - Beltrami County Highway Department
- Cynthia Brogren - Beltrami County Public Health Director
- Megan Heuer-Korhonen - Beltrami County Public Health Preparedness Coordinator
- Beltrami County Board of Commissioners
    - Craig Gaasvig, District 1
    - Reed Olson, District 2
    - Richard Anderson, District 3
    - Tim Sumner, District 4
    - Jim Lucachick, District 5

CITY / TOWNSHIP JURISDICTIONS

City of Bemidji

- Craig Gray - Bemidji Public Works Director
- Nate Matthews - Bemidji City Manager
- Rita Albrecht - Bemidji Mayor
- Mike Mastin - Bemidji Police Chief
- Dave Lazella - Bemidji Police Captain
- David Hoefer - Bemidji Fire Chief

City of Blackduck

- Christina Regas - Blackduck City Clerk
- Jace Grangruth - Blackduck Police Chief

City of Funkley

- City of Funkley (Mayor/Clerk)

City of Kelliher

- Shelli Krueth - City of Kelliher

City of Solway
- City of Solway (Mayor/Clerk)

City of Tenstrike
- City of Tenstrike (Mayor/Clerk)

City of Turtle River
- City of Turtle River (Mayor/Clerk)

City of Wilton
- Jeff Snyder - City of Wilton Mayor

Ray Berger - Waskish Township

OTHER STAKEHOLDERS
- Erin Morrill - Bemidji State University/Northwest Technical College
- Arlen Hogquist - Beltrami Electric Cooperative
- Duane Oothoudt - Leech Lake Emergency Management
- Kathleen Luepke - USDA
- Dan Carroll – MN DNR Firewise Coordinator
- Heather Winkleblack – HSEM Region 3 Regional Program Coordinator
- Amy Card – Northwest Health Services Coalition

NEIGHBORING JURISDICTIONS
- Josh Johnston, Marshall County EM Director, josh.johnston@co.marshall.mn.us
- Erik Beitel, Pennington County EM Director, elbeitel@co.pennington.mn.us
- **Willi Kostiuk, Koochiching County EM Coordinator,** willi.kostiuk@co.koochiching.mn.us
- Marlyn Halvorson, Itasca County EM Coordinator, marlyn.halvorson@co.itasca.mn.us
- Jill **Hasbargen** Olson, Lake of the Woods County EM Coordinator, jill_o@co.lake-of-the-woods.mn.us
- **Chad Emery, Cass County EM Director,** chad.emery@co.cass.mn.us
- **Brian Halbasch, Hubbard County EM Director,** bhalbasch@co.hubbard.mn.us

Beltrami County

2020 Multi-Hazard Mitigation Plan Update

Planning Team Meeting #2

Friday, May 22, 2020, 1:00 p.m. – 3:00 p.m.
Remote Meeting via Zoom Video/Phone Conference

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:
Chris Muller
Beltrami County Emergency Management Director
Phone: 218-333-8386
Email: Chris.muller@co.beltrami.mn.us

From: Chris Muller
To: Kay Mack; Brent Rud; Bruce Hasbargen; Ernie Beitel; Jarrett Walton; Jodee Treat; Kevin Trappe; Lauren Williams; Cynthia Borgen; Megan Heuer; Craig Gray; Nate Mathews; Rita Albrecht; Mike Mastin; David Lazella; David Hoefer; Christina Regas; Rudy Patch; Erin.Morrill@bemidjistate.edu; Duane.Oothoudt@lpolice.org; Heather.Winkelblack@state.mn.us; citykeln@paulbunyan.net; Dan.Carroll@state.mn.us; RRiewer@beltramielectric.com; kathleen.luepke@mn.usda.gov
Cc: hundrieserconsulting@outlook.com
Subject: RE: POSTPONED: Multi-Hazard Mitigation Plan update meeting
Date: Friday, May 15, 2020 10:10:53 AM

BELTRAMI COUNTY

2020 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

Greetings,

We have rescheduled the 2nd Planning Team meeting for the update of the Beltrami County Multi-Hazard Mitigation Plan (MHMP). We will be holding the meeting virtually using Zoom video/phone conferencing. Note the time is two hours, but will likely not take the entire time depending on questions and input.

MEETING DETAIL
Date: Friday, May 22, 2020
Time: 10:00 a.m. – 12:00 p.m.
Join Zoom Meeting: https://umn-private.zoom.us/j/2501571657
Call in for audio if necessary: 651 372 8299
Meeting ID: 250 157 1657

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.

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 Beltrami 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.

Attached are the draft 5-year jurisdictional mitigation action charts for Beltrami County and the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River, and Wilton. We will be referencing these during the meeting. The draft Beltrami County MHMP will be ready for public review soon after this meeting.

Please email me to RSVP your plans to attend. If you cannot attend, please seek to have someone else participate on your behalf and feel free to invite anyone else who could have positive impacts to the meeting.

If you have any questions, please do not hesitate to contact me.

Christopher Muller
Emergency Management Director
Beltrami County Law Enforcement Ctr
613 Minnesota Ave NW
Bemidji, MN 56601
218-333-8386

From: Chris Muller
To: Kay Mack; Brent Rud; Bruce Hasbargen; Ernie Reitel; Jarrett Walton; Jodee Treat; Kevin Trapp; Lauren Williams; Cynthia Borgen; Craig Gray; Nate Mathews; Rita Albrecht; Mike Mastin; David Lazella; David Hoefer; Christina Regas; Rudy Patch; Erin.Morrill@bemidjistate.edu; Duane.Oothoudt@lioolice.org; Heather.Winkjeblack@state.mn.us; citykeln@paulbunyan.net; Dan.Carroll@state.mn.us; RRiewer@beltramielectric.com; kathleen.luepke@mn.usda.gov; Megan Heuer
Cc: Bonnie K Hundrieser
Subject: Attachments
Date: Friday, May 15, 2020 2:13:24 PM
Attachments: Beltrami County_MAC.pdf
City of Bemidji_MAC.pdf
City of Blackduck_MAC.pdf
City of Funkley_MAC.pdf
City of Kelliher_MAC.pdf
City of Solway_MAC.pdf
City of Tenstrike_MAC.pdf
City of Turtle River_MAC.pdf
City of Wilton_MAC.pdf

Apologies - here is another email from Chris. I forgot to include the mitigation action chart attachments.

TGIF and enjoy the weekend!

-Chris

~Christopher S. Muller

Beltrami County Sheriff's Office

Emergency Services Director

Emergency Management | 911 | Communications

613 Minnesota Ave NW

Bemidji, MN 56601

ph.218.333.8386

From: Chris Muller
To: Bonnie K Hundrieser
Subject: FW: Hazard Mitigation Plan Invite
Date: Friday, May 15, 2020 2:13:47 PM

From: Chris Muller
Sent: Friday, May 15, 2020 10:21 AM
To: bhalbasch@co.hubbard.mn.us; Jennifer Olson; Jill Olson; Josh Johnston; Chad Emery; Marlyn Halvorson; Candace Coulter; Willi Kostiuk; Erik Beitel; Susan L. Grafstrom
Subject: Hazard Mitigation Plan Invite

Greetings Erik, Josh, Jill, Willi, Sue, Brian, Marlyn, Candace and Chad,

We have rescheduled the 2nd Planning Team meeting for the update of the Beltrami County Multi-Hazard Mitigation Plan. We will be holding the meeting virtually using Zoom video/phone conferencing.

As part of the stakeholder engagement process, FEMA requires that neighboring communities be provided with an opportunity to be involved in the planning process. As jurisdictional neighbors to Beltrami County you are invited to our next Multi-Hazard Mitigation Planning Team Meeting:

MEETING DETAIL

Date: Friday, May 22, 2020

Time: 10:00 a.m. – 12:00 p.m.

Join Zoom Meeting: https://umn-private.zoom.us/j/2501571657

Call in for audio if necessary: 651 372 8299

Meeting ID: 250 157 1657

The draft Beltrami County MHMP will be ready for public review soon after this meeting.

This the 2nd and last group planning meeting prior to the plan being submitted to HSEM and FEMA for approval. If you would like to attend, please RSVP to me via email.

Thank you,

Christopher Muller
Emergency Management Director
Beltrami County Law Enforcement Ctr
613 Minnesota Ave NW
Bemidji, MN 56601
218-333-8386

Beltrami County

5/22/20 MHMP Planning Team Meeting #2

List of Participants *(19)*

Beltrami County MHMP Update - Planning Team Meeting #2 Friday, May 22, 2020, 10:00 a.m. - 12:00 p.m. Participant Sign-In List			
Name	**Agency/Organization**	**Title**	**Email**
Chris Muller	Beltrami County Sheriff's Office	Emergency Management Director	chris.muller@co.beltrami.mn.us
Lauren Williams	Beltrami County Hwy. Dept.	Administrative Support	Lauren.Williams@co.beltrami.mn.us
Brent Rud	Beltrami County Environmental Services Department	Director	brent.rud@co.beltrami.mn.us
Mike Mastin	Bemidji Police Department	Police Chief	mmastin@ci.bemidji.mn.us
Jarrett Walton	Beltrami County Sheriff's Office	Chief Deputy	jarrett.walton@co.beltrami.mn.us
JoDee Treat	Beltrami County Auditors Office	Auditor	jodee.treat@co.beltrami.mn.us
David Hoefer	Bemidji Fire Department	Fire Chief	david.hoefer@ci.bemidji.mn.us
Brent Kinn	Beltrami County Hwy. Dept.	Highway Maintenance Foreman	
Kevin Trappe	Beltrami County GIS Dept.	GIS Director	Kevin.Trappe@co.beltrami.mn.us
Megan Heuer	Beltrami County Public Health	Public Health Manager	
Erik Beitel	Pennington County Emergency Management	Emergency Management Director	eibeitel@co.pennington.mn.us
Ernie Beitel	Beltrami County Sheriff's Office	Sheriff	ernie.beitel@co.beltrami.mn.us
Holy Solo	Beltrami Electric Cooperative	Engineering/Operations	hsolo@beltramielectric.com
Erin Morril	Bemidji State University / Northwest Technical College	Public Safety	Erin.Morril@bemidjistate.edu
Joseph Corser	Bemidji Ambulance	Quality Director/Paramedic	
Chad Emery	Cass County Sheriff's Office	Emergency Management Director	chad.emery@co.cass.mn.us
Cammie Vogel	Beltrami Electric Cooperative	Plant Accountant	cvogel@beltramielectric.com
Amy Card	Northwest Health Services Coalition	Regional Healthcare Preparedness Coordinator	amy.card@sanfordhealth.org
Brian Halbasch	Hubbard County Sheriff's Office	Emergency Management Director	bhalbasch@co.hubbard.mn.us

5/22/2020

Beltrami County

2020 MULTI-HAZARD MITIGATION PLAN UPDATE
PLANNING TEAM MEETING #2
May 22, 2020

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

Hazard Mitigation Planning Meeting #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.

Overview of Plan Update & Purpose

- Beltrami 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.

Who the Plan Covers

This is a multi-jurisdictional plan that covers Beltrami County, including the cities of Bemidji, Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River and Wilton.

The County and Cities are required to adopt the final plan. Townships are covered under the umbrella of the County.

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 website, social media and local media
- Online public review & comment period for draft plan

1

5/22/2020

Prioritization of Hazards for Beltrami County

Prioritization of hazards by the Beltrami 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
Wildfire	High
Erosion/Landslides	Moderate
Flash Flooding & Riverine Flood	Moderate
Extreme Heat/Extreme Cold	Moderate
Drought	Low
Dam Failure	Low

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

U-Spatial@UMD – County Coordination

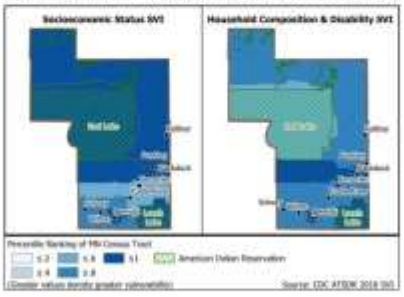
U-Spatial@UMD Team has worked closely with personnel from the County to collect key information for the plan update.

- County Emergency Management Director
- County GIS Specialist
- County Assessor

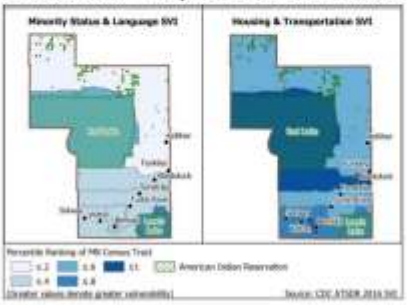
All Hazards – Critical Infrastructure

- Healthcare Facilities
- Emergency Services
- Schools and Shelters
- Transportation
- Utilities
- Dams and Levees
- Hazardous Materials Facilities
- Major Employers
- Government Buildings
- Cultural Resources

All Hazards – Population Vulnerability



All Hazards – Population Vulnerability

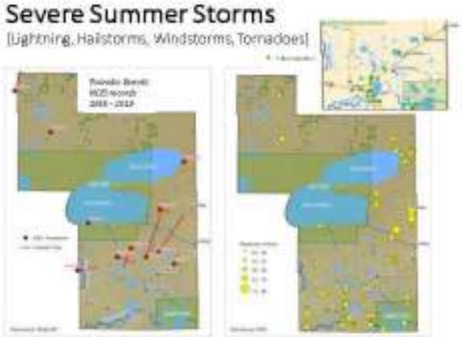


2

5/22/2020

Severe Summer Storms

[Lightning, Hailstorms, Windstorms, Tornadoes]

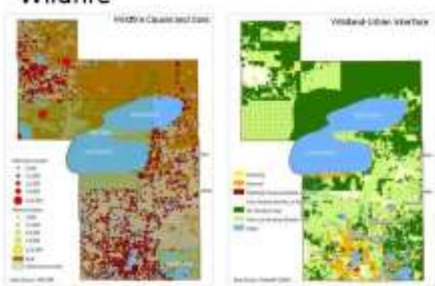


Winter Storms

Blizzards
Heavy Snow
Ice Storms
Winter Storms

Program Gaps and Deficiencies:
Equipment
Gaps in Radar Coverage
Aboveground Power Lines
Backup Power
Communications

Wildfire



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

Flash Flooding & Riverine Flood

Jurisdiction	Count of Buildings in Flood	Est. Building+Contents loss
Alaska township	1	$36,624
Battle township	1	$10,142
Bemidji	8	$109,768
Bemidji township	9	[illegible]
Beltrami township	1	$12,001
Birch township	1	$49,148
Brook Lake UT	11	$166,944
Durand township	3	$48,538
Eckles township	4	$118,321
Frohn township	13	[illegible]
Grant Valley township	12	$409,354
Hines township	3	$41,411
Hornet township	1	$62,563
Nebish township	1	$108,782
Northern township	1	$47,528
Port Hope township	1	$18,228
Shotley Brook UT	1	$5,336
Stevenson township	2	$3,944
Sugar Bush township	1	$4,302
Tenstrike	1	$21,295
Turtle Lake township	7	$341,017
Turtle River	1	$141,788
Totals	1737 (170 with damage)	[illegible]

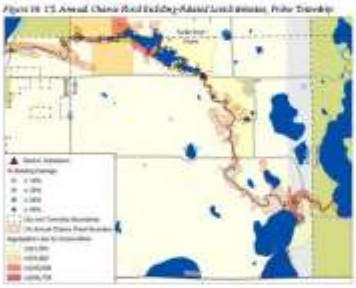
Flash Flooding & Riverine Flood

3

5/22/2020

Flash Flooding & Riverine Flood

Flash Flooding & Riverine Flood



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.

MAC Overview

Mitigation Strategy #1
Local Planning & Regulations

Beltrami County Examples

- *Wildfire (County)* – Work with the MN DNR to develop a Community Wildfire Protection Plan for Beltrami County. *(Bemidji)* – Adopt a Wildland-Urban Interface Code.
- *Tornado (Bemidji)* – Work with MHP's within the city to approve construction of storm shelters/apply for FEMA HMA grant funding.
- *Severe Storms (Kelliher)* – Ensure the city has an emergency shelter designated and ready to care for residents displaced from severe storms or extreme temperatures.

Mitigation Strategy #2
Structure and Infrastructure Projects

Beltrami County Examples

- *Severe Storms (County)* – Work with Beltrami Electric Coop to bury/strengthen powerlines to reduce vulnerability to outages.
- *Severe Summer Storms/Tornado (Kelliher)* – Construct a storm shelter/tornado safe room at the city park & campground. *(Blackduck)* Work with mobile home park to construct a safe room.
- *Flooding (Wilton)* – Improve the culvert system at the Melby Lane & Grant Creek Crossing to reduce the chance of a washout during high rain events.

5/22/2020

Mitigation Strategy #3
Natural Systems Protection

Beltrami County Examples

- *Flood/Erosion (SWCD)* – Work with the Clearwater Lake Area Association and the Red Lake Watershed District to prevent and restore identified high-bank failure.
- *Severe Winter/Summer Storms (County)* – Conduct tree trimming or removal of trees in the ROW of county roads to reduce the risk of road blockages/downed power lines due to falling tree limbs.

Mitigation Strategy #4
Education and Awareness Programs

Beltrami County Examples

- *All-Hazards (All)* – Encourage residents to sign up for Beltrami County's CodeRED emergency notification system.
- *Severe Winter/Summer Storms (All)* – Provide education & outreach to residents on personal preparedness for severe weather events.
- *Flooding (Blackduck)* – Increase public awareness of sump pump maintenance & discharge to better support stormwater management.

Mitigation Strategy #5
Mitigation Preparedness and Response Support

Beltrami County Examples

- *All-Hazards (County)* – Work with the American Red Cross to increase the amount of shelter facilities to care for people temporarily displaced by severe storms or other hazard events.
- *Severe Winter/Summer Storms (Blackduck/Kelliher)* – Obtain generators to provide emergency backup power (i.e., Fire Hall, municipal well, sewer lift stations).

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

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.

Next Steps (May – June, 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.

5

Appendix F
Public Outreach & Engagement Documentation

Record of Public Input & Incorporation

News Release #1 – January 18, 2019, "-Hazard Mitigation Plan Update - Public Feedback and Participation Invited"

On January 18, 2019, Beltrami 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 Beltrami County Emergency Management Facebook and the Bemidji Pioneer (online & printed news). 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.

Beltrami 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 Beltrami 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:

Beltrami County Emergency Management received **7 comments** providing feedback to the news release that was posted on the Beltrami County Emergency Management Facebook page. Following are the responses and information on how the feedback was incorporated into the plan.

1) **Comment: "It's important to have tornado shelters in mobile home parks, a siren we could hear out near Buena Vista or County 22 East, and a big beautiful doppler radar unit somewhere in the area."**

How public feedback was incorporated:

- Mitigation Action #5 in the Beltrami County Mitigation Action Chart (MAC) addresses the issue of poor radar coverage for the County and how the County will seek to work with the National Weather Service to improve radar coverage.
- Mitigation Action #10 in the Beltrami County MAC addresses working with communities on the upgrade or installation of new outdoor warning sirens where they are needed.
- Mitigation Action #12 Beltrami County MAC addresses the construction of storm shelters or tornado safe rooms where they are needed in the county, and how Beltrami County Emergency Management will seek to provide assistance in this effort.

2) **Comment: "Curious about why sirens didn't sound with tornado in town last summer. From my home, I could clearly see the cloud rotation prior to the funnel actually forming. (I believe it was rain-wrapped by the time it formed and touched down)."**

How public feedback was incorporated:

- Mitigation Action #5 in the Beltrami County MAC addresses the issue of poor radar coverage for the County and how the County will seek to work with the National Weather Service to improve radar coverage.
- Mitigation Action #10 in the Beltrami County MAC addresses working with communities on the upgrade or installation of new outdoor warning sirens where they are needed.

3) **Comment: "Forest fires are my biggest concern for a natural disaster."**

How public feedback was incorporated:

- Mitigation Action #16 in the Beltrami County MAC addresses public outreach & education to raise public awareness about wildfire and safety measures that should be taken.
- Mitigation Action #17 in the Beltrami County MAC addresses developing a Community Wildfire Protection Plan (CWPP) for Beltrami County and working with the MN DNR Firewise Coordinator to do this.

4) **Comment: "I thought BSU (Bemidji State University) was listed as a fall-out shelter."**

How public feedback was incorporated:

- Mitigation Action #2 in the Beltrami County MAC addresses working to increase the amount of shelter facilities in the county to care for people displaced from severe storms, power outages or other hazard events.

5) **Comment: "Here in Bemidji I'd like to do a project to create a fire-break around the animal shelter. It is surrounded by brush and dry grass on all sides and dead trees and forest in the back, with the RR to one side. During drought, which we've had over the last few summers, all it takes is one spark from a train, one thrown lit cigarette from a passing car, or one strike of lighting and the animal shelter is very much at risk and would be gone in a flash."**

How public feedback was incorporated:

- Mitigation Action #4 in the City of Bemidji MAC addresses promoting wildfire prevention to the public through outreach & education and providing guidance or assistance in mitigation measures where appropriate.
- Mitigation Action #5 in the City of Bemidji MAC addresses enforcing the city Fire Code that mitigates against wildfire risk to the community.

6) **Comment: "Thank you for taking public input on the Hazard Mitigation Plan. 1) It's become clear that mid-summer wind events are now a regular, damaging occurrence. 2) Yes. 3) I think there is more we can do to mitigate storm damage, including the city taking a more active role in managing the health of our trees, power companies burying more lines and extending the siren system out into the surrounding townships. Given that there always seem to be large festivals going on about the time the storms come through, improving the storm shelter infrastructure near major public gathering places can be critical. Been caught exposed down at the waterfront too many times now!"**

How public feedback was incorporated:

- Mitigation Action #6 in the Beltrami County MAC addresses tree management to minimize damages during severe storm events.
- Mitigation Action #7 in the Beltrami County MAC addresses working with Beltrami Electric Co-op to bury or strengthen powerlines that are vulnerable to failure from severe storm events.
- Mitigation Action #10 in the Beltrami County MAC addresses working with communities on the upgrade or installation of new outdoor warning sirens where they are needed.
- Mitigation Action #12 Beltrami County MAC addresses the construction of storm shelters or tornado safe rooms where they are needed in the county, and how Beltrami County Emergency Management will seek to provide assistance in this effort.

7) **Comment: "Tree damage can be reduced with proper forest management. We are in a terrible position for radar warnings, so there is little that can be done about this issue as far as mitigation goes. Only emergency response."**

How public feedback was incorporated:

- Mitigation Action #6 in the Beltrami County MAC addresses tree management to minimize damages during severe storm events.
- Mitigation Action #5 in the Beltrami County Mitigation Action Chart (MAC) addresses the issue of poor radar coverage for the County and how the County will seek to work with the National Weather Service to improve radar coverage.

News Release #2 – (Month), (day), 2020, "Public Feedback Sought for Draft Beltrami County Multi-Hazard Mitigation Plan"

On (Month), (day), 2020 Beltrami County Emergency Management put out a news release announcing the completion of the draft Beltrami 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 including the Beltrami County website, Beltrami County Emergency Management website, local newspapers and city websites. In addition, the Beltrami County Emergency Management Director also sent an email directly to county staff, city representatives and other stakeholders encouraging them to review the plan and provide feedback. The news release informed the public that a copy of the draft MHMP and a survey for public feedback was available online at https://scse.d.umn.edu/Beltrami-mhmp. The public feedback period for the draft plan was open from (Date), 2020 to (Date), 2020, for a total of (##) 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 Beltrami 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.

(insert summary of any feedback received and how incorporated into the plan)

Office of **SHERIFF OF BELTRAMI COUNTY**
613 Minnesota Avenue NW
Bemidji, Minnesota 56601

Ernie Beltrel, Sheriff
Phone (218) 333-8111
Fax (218) 333-8325

PRESS RELEASE – JANUARY 18th, 2019

MULTI-HAZARD MITIGATION PLAN UPDATE, PUBLIC FEEDBACK AND PARTICIPATION INVITED

The Beltrami 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 Beltrami County MHMP is a multi-jurisdictional plan that covers Beltrami County, including the cities of Blackduck, Funkley, Kelliher, Solway, Tenstrike, Turtle River, and Wilton. The Beltrami County MHMP also incorporates the concerns and needs of townships, school districts, and other stakeholders participating in the plan.

Beltrami 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.

According to Beltrami County Emergency Management Director, Chris Muller, "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, 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, 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 to be prepared to take safe action before, during, or following a hazard event.

Public Feedback and Participation is Encouraged
As part of the planning process, gathering input from the public is an important and required step. Beltrami 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?

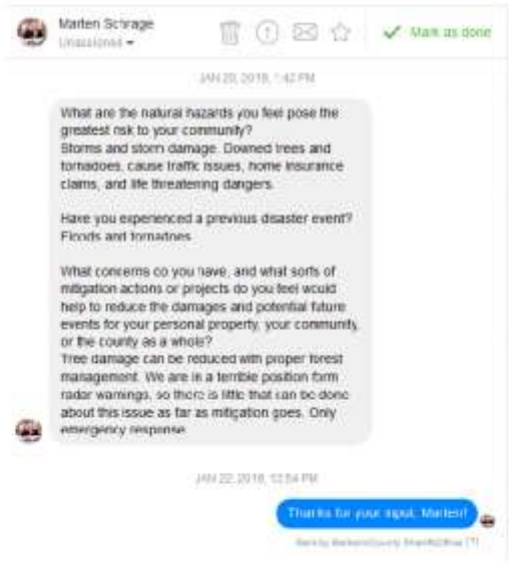
The public is strongly encouraged to submit your comments, concerns, or questions regarding natural disasters and potential mitigation actions to be included into the plan update process. Please submit your feedback to Beltrami County Emergency Management Director, Chris Muller at 218-333-8386 or Chris.muller@co.beltrami.mn.us

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
Chris Muller
Beltrami County Emergency Management Director
Phone: 218-333-8386
Email: Chris.muller@co.beltrami.mn.us

Beltrami County MHMP News Release #1 - Public Outreach
Beltrami County Emergency Management Facebook Posting
January 18, 2019


Joe Czaplewski
Unassigned
Mark as done
Thank you for taking public input on the Hazard Mitigation Plan. 1)It's become clear that mid-summer wind events are now a regular, damaging occurrence. 2)Yes 3)I think there is more we can do to mitigate wind storm damage, including the city taking a more active role in managing the health of our trees, power companies burying more power lines, and extending the siren system out into the surrounding townships (with the county or townships, of course). Given that there always seem to be large festivals going on about the time the storms come through, improving the storm shelter infrastructure near major public gathering places can be critical. Been caught exposed down at the waterfront too many times now!!!
Thanks for your input Joe, we appreciate it!


Marlen Schrage
Unassigned
Mark as done
JAN 20, 2019, 1:42 PM
What are the natural hazards you feel pose the greatest risk to your community?
Storms and storm damage. Downed trees and tornadoes, cause traffic issues, home insurance claims, and life threatening dangers.
Have you experienced a previous disaster event?
Floods and tornadoes
What concerns do you have, and what sorts of mitigation actions or projects do you feel would help to reduce the damages and potential future events for your personal property, your community, or the county as a whole?
Tree damage can be reduced with proper forest management. We are in a terrible position form radar warnings, so there is little that can be done about this issue as far as mitigation goes. Only emergency response
JAN 22, 2019, 12:54 PM
Thanks for your input, Marlen!

Beltrami County MHMP News Release #1 - Public Outreach
Bemidji Pioneer Online News
January 31, 2019

https://www.bemidjipioneer.com/news/4564861-beltrami-county-updating-severe-weather-natural-disaster-mitigation-strategies

Beltrami County updating severe weather, natural disaster mitigation strategies

By Matthew Liedke on Jan 31, 2019 at 5:24 p.m.

Residents and officials clean up storm damage along Irvine Avenue Northwest and 18th Street Northwest on July 4 in Bemidji. (Pioneer file photo)

BEMIDJI—Beltrami County is no stranger to severe weather.

Just last year, a tornado ripped through the county seat in Bemidji on the Fourth of July. That came on the heels of several storms moving through the region.

So, to better prepare for these types of events, and mitigate potential hazards in the future, Beltrami County drafts a multi-hazard mitigation plan with an outlook of five years.

And now, with assistance from the University of Minnesota Duluth Geospatial Analysis Center, the Beltrami County Emergency Management Department is working on a full update of its multi-hazard mitigation plan.

The plan is a requirement of the Federal Disaster Mitigation Act of 2000 and must be updated every five years.

"The plan is to identify projects or initiatives across the county that could enhance resilience to natural disasters as well as other known issues," said Chris Muller, Beltrami County Emergency Management director. "This is going to be an entire revamp of the plan. It's an opportunity to review some of the changes in our community. Where we tend to build is a big factor, for example. We have more people living in places they didn't before. It gives us a measurement of what's changed."

While the plan's writing is under direction of Muller's office, the process involves representatives from other county departments, local municipalities, school districts and other stakeholders. Muller said the team will help review and rank the hazards while also identifying strategic, cost-effective mitigation activities.

These projects, Muller said, can range from flood reduction measures to infrastructure retrofits and the construction of safe rooms to protect citizens from severe wind events.

While the plan is for the whole county, Muller said the Red Lake Nation won't be included, as their department communicates directly with federal agencies.

"With Red Lake, they have their own plan," Muller said. "As a sovereign nation, emergency management can become really complicated. They would qualify, though, to do their own plan and can work directly with FEMA."

In the months ahead, Muller said his office is accepting public comments to reference as the plan is formed. Muller said he invites residents to call his office at (218) 333-8386 or email chris.muller@co.beltrami.mn.us.

"We have several sources for data," Muller said. "We can look at the number of tornadoes, we can speak with the National Weather Service and find out about storm damage. We can check with climatology experts to find out the scientific information.

"What we're really looking for from the public are stories. Natural disasters they've been affected by and how they've seen the community change."

Once a draft of the plan is finished, Muller said it will be available on the county's website before its submitted to state agencies for review.

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nesh-Podein, DFL-New
at Tuesday's hearing,
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s a national endemic,"
Podein, the bill's chief
the House, said. "This
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historic times, and it
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er all of these times."

ge 10

thresholds due to the cold

By Josh Verges
St. Paul Pioneer Press

ST. PAUL — Minnesota schools will not be punished if they fall short of the state's instruction time laws because of this week's dangerous weather, Gov. Tim Walz's office said Wednesday.

"The Governor has assured local school districts that they will not be penalized for keeping their students safe," a spokesman for the governor said.

Classes are canceled across the metro Thursday, Jan. 31, for a fourth consecutive day due to snow and cold.

By statute, Minnesota schools must meet minimum thresholds for instruction time each school year.

Minneapolis Superintendent Ed Graff on Monday wrote a letter asking Walz if he can waive those statutes.


Walz

"In line with your vision for local decisions and control, it would be helpful in this instance if there was some sort of waiver from the Department of Education for schools who choose to close the next few days due to the extreme, potentially dangerous temperatures, especially since it is a statewide issue," Graff wrote.

"This would allow Superintendents flexibility in making the decision this week, particularly since we haven't hit the heaviest snowfall months of March and April."

SCHOOLS: Page 10

Preparing for the worst

Beltrami County updating severe weather, natural disaster mitigation strategies

By Matthew Liedke
mliedke@bemidjipioneer.com

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WEATHER: Page 10

www.bemidjipioneer.com
218-333-9200
news@bemidjipioneer.com
Informing the Bemidji area and North Central Minnesota since 1896

BEMIDJI PIONEER 2019 FEB 01

must adopt the child, a process that can take a year.

It took 11 months for Nikki Graf when Logan's dairy allergy first revealed itself. Nikki was home alone with her and rushed her to Dibble. "But that's not happening."

lengthy battle with cancer.

Benson, 73, of Lanesboro subsidized health plan for the working poor, in 1992.

WEATHER

From Page 1

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SCHOOLS

From Page 1

A handful of Minneapolis schools have more built-in half-days and are close to going under the statutory minimums, spokesman Dirk Tedmon said.

This week's lost days have Stillwater Area high and middle schools on pace to fall below the required instruction hours for the year.

"Unfortunately, we'll need to look at either increasing the length of our school days or adding days to the school calendar on future non-school days or at the end of the year," spokeswoman Carissa Keister said early Wednesday.

St. Paul Public Schools can miss one more day this year without falling below the state's class time minimum for its secondary schools. They aren't scheduling make-up days at this point.

"We will discuss this when/if it becomes (an) actual issue," Superintendent Joe Gothard said via Twitter.

A Pioneer Press analysis of Minnesota Department of Education data found 28 percent of the state's secondary schools would have gone under the state's instruction time minimum in 2017-18 had they missed four additional school days.

Just three Minnesota elementary schools, which have a lower class time requirement, would have missed the minimum.

Anoka-Hennepin spokesman Jim Skelly said that it's too early to comment on schedule changes but that district leaders will discuss it next week.

The South Washington County and Rosemount-Apple Valley-Eagan districts have no plans to change their schedules.

Spokesman Tony Taschner said RAVE is looking into online-learning options for future weather cancellations.

Minnesota allows schools to deliver instruction online for up to five days a school year and apply that time toward their class time minimum.

BILL

From Page 1

Greywind

Minnesota isn't the only state with this kind of legislation in the works. A pair of Nebraska state senators are pushing a bill to invest-

na's Act," a measure that aims for better coordination between different law enforcement agencies and requires

Mountain Indian Reservation who was murdered in Fargo in August 2017, her unborn child pulled from her womb via crude cesarean section.

The task force outlined in Kunesh-Podein's bill in Minnesota would be

Appendix G
Mitigation Actions by Jurisdiction

Table G - 1. City of Bemidji 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 Beltrami County's CodeRED emergency notification system.	n/a	Ongoing	High	2020-2025	City Admin / Emergency Mgmt. in cord with Beltrami County Emergency Mgmt.	The city of Bemidji participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. The city's Police Department webpage includes a link for residents to register for the CodeRED system.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	Ongoing	High	2020-2025	City Admin / Emergency Mgmt.	The city of Bemidji encourages our residents to be prepared for severe weather events, power outages and other hazard events. The Bemidji Police Department utilizes its PD Facebook page to communicate all types of weather-related information. This includes severe storm watches and warnings.	City funding
3	Severe Summer Storms / Tornado	Local Planning & Regulations	Work with mobile home parks within the city to approve construction for storm shelters or identify alternate facilities in close proximity.	n/a	In Progress	High	2020-2025	City Admin / Emergency Mgmt.	The city of Bemidji is working with mobile home park (MHP) owners within the city to either approve of the construction of new shelters on-site or establish emergency shelters with existing structures that are in close proximity for MHP residents. If a MHP wishes to pursue construction of a tornado safe room, the city may seek to apply for a FEMA hazard mitigation grant to make that project possible.	City funding, MHP funding, FEMA HMA grant funding

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	Wildfire	Education & Awareness Programs	Promote wildfire prevention to the public and local businesses through outreach & education, and provide guidance or assistance in mitigation measures where appropriate.	n/a	Ongoing	High	2020-2025	City Fire Dept.	The Fire Department conducts outreach & education for wildfire prevention through the use of social media and radio PSAs. The Fire Dept. also conducts enforcement of our fire code. The City's Fire Department is a resource for homeowners or businesses that may have questions on how to decrease fire risk around their properties.	City funding
5	Wildfire	Local Planning & Regulations	Enforce city codes that mitigate against wildfire risk to the community.	Yes *(Existing Buildings & New Development)*	Ongoing	High	2020-2025	City Admin / City Fire Dept.	City Code Chapter 16 (Fire Prevention and Protection) includes regulations for Open Burning and also the city's Fire Code, which is regularly enforced by the city's Fire Chief.	City funding
6	Wildfire	Local Planning & Regulations	Adopt a Wildland-Urban Interface Code.	Yes *(New Development)*	**New**	High	2020-2025	City Admin / City Fire Dept. in cord. with MN DNR and U.S.F.S. & Beltrami County Envr. Services Dept.	This is one of the recommendations for implementation in the *"Community Planning Assistance for Wildfire – Recommendations for Greater Bemidji Area, MN"* (2017). **A summary of the action is to:** *Adopt the International Code Council International Wildland-Urban Interface Code (IWUIC) to establish minimum wildfire safety standards for future development in designated wildland-urban interface areas of the Greater Bemidji Planning Area.*	City funding

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
7	Wildfire	Education & Awareness Programs	Expand Capacity to Educate, Prevent, and Implement Wildfire Mitigation Activities.	n/a	**New**	High	2020-2025	City Admin / City Fire Dept. in cord. with MN DNR and U.S.F.S. & Beltrami County Emergency Mgmt.	This is one of the recommendations for implementation in the *"Community Planning Assistance for Wildfire – Recommendations for Greater Bemidji Area, MN"* (2017). **A summary of the action is to:** *The Bemidji Fire Department, in collaboration with other partners, should expand its capacity to educate, prevent, and implement local wildfire mitigation activities through increased staffing, trainings, and development of programmatic resources and outreach materials.*	City funding

The mitigation activities listed in the **City of Bemidji Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Blackduck 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Blackduck participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. The city has a website and city Facebook page where information on the CodeRED system with a link could be posted. We will work with Beltrami County Emergency Mgmt. to provide us with this link.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Blackduck will work to pass along information that we receive from Beltrami County Emergency Management to our residents. Our city Facebook page is our main outreach method to our residents.	City funding
3	Severe Winter / Summer Storms	Mitigation Preparedness & Response Support	Obtain generators to provide emergency backup power for the city's Fire Hall, municipal well pump and the main sanitary sewer lift station.	Yes *(Critical Facilities & Infrastructure)*	**New**	High	2020-2025	City Admin / City Public Works	The city of Blackduck will seek to budget for purchase and installation of portable or permanent generators as needed for the Firehall, well pump and lift station.	City funding

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	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	Work with the mobile home park in Blackduck to construct a storm shelter / tornado safe rooms for sheltering residents during severe storm events with high winds or tornadoes.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt. in cord with Beltrami County EM	The city of Blackduck has worked with the MHP on evacuation plans, but it does not have a storm shelter or tornado safe room. The city will work with the MHP operator and Beltrami County EM to consider options. If a construction project is pursued outside grant funding will be needed, such as FEMA HMA funding for a tornado safe room.	City funding, FEMA HMA grant funding
5	Flood	Structure & Infrastructure Projects	Implement improvements to roads and culverts to manage high rain events, sump pump overflow and spring melt.	Yes (Transportation Infrastructure)	In Progress	High	2020-2025	City Public Works	The City adopted a CIP in 2018 for water/sewer and street improvements. The City has projects slated to begin in 2020 for improvement projects to Croswell Ave. and Liberty Drive. Northern Ave. will need to be completely reconstructed.	City funding
6	Flood	Education & Awareness Programs	Increase public awareness of sump pump maintenance & discharge and not putting certain items in the sewer system that will decrease lift station functions. These efforts will support better stormwater management when high rain events occur.	Yes (Stormwater / Sewer System Infrastructure)	Ongoing	High	2020-2025	City Public Works Dept.	This is an ongoing education and outreach effort of the Public Works Dept.	City funding

The mitigation activities listed in the **City of Blackduck Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Funkley 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Funkley participates in the County's CodeRED emergency notification system and we encourage our residents to sign up for it. Our population consists of only 5 people, so our outreach on this is solely through in-person communication.	City funding

The mitigation activities listed in the **City of Funkley Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Kelliher 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Kelliher participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. The city has a website where information on the CodeRED system with a link could be posted.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Kelliher will work to pass along information that we receive from Beltrami County Emergency Management to our residents via flyers or announcements at City Council meetings.	City funding
3	Severe Winter / Summer Storms	Local Planning & Regulations	Ensure the City has an emergency shelter designated and capable of serving residents who have been displaced from severe weather or extreme temperatures, particularly the elderly.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The City will seek to work to assess appropriate facilities within our community that can serve as a temporary shelter, especially for the elderly. We will work with the Beltrami County Emergency Management Director for guidance.	City funding
4	Severe Winter / Summer Storms	Mitigation Preparedness & Response Support	Purchase and install a generator to provide emergency backup power for the city's sewer lift stations.	Yes *(Sewer Lift Stations)*	**New**	High	2020-2025	City Public Works Dept.	To date this has been a cost prohibitive purchase for the city. Outside grant funding may be needed to assist to purchase a generator. We will work with the Beltrami County Emergency Management Director for guidance.	City funding, Other funding TBD

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 Summer Storms / Tornado	Structure & Infrastructure Projects	Construct a storm shelter / tornado safe room at the city park/ campground to provide protection during severe storm events with high winds or tornadoes.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	Our local campground was severely impacted with over 60 falling trees during a storm in June, 2018. The campground does not have a storm shelter and needs one to protect campers during future severe storm events. We will work with the Beltrami County Emergency Management Director for guidance and potential assistance in writing a grant for supportive funding.	City funding, FEMA HMA grant funding, Other funding TBD
6	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	Work with Beltrami County Emergency Management to upgrade the City's outdoor warning siren.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	We will work with the Beltrami County Emergency Management Director for guidance and potential assistance in writing a grant for supportive funding from the USDA Rural Development grant program, which funds outdoor warning sirens.	City funding, USDA Rural Dev. grant funding

The mitigation activities listed in the **City of Kelliher Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Solway 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Solway participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. We are a small city with a population of 96 and do not have a website or social media. We can provide reminders at City Council meetings or on community flyers to remind residents to sign-up.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Solway will work to pass along information that we receive from Beltrami County Emergency Management to our residents via flyers or announcements at City Council meetings.	City funding
3	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	Work with Beltrami County Emergency Management to obtain funding for purchase & installation of a new outdoor warning siren for the city.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The City will work with the Beltrami County Emergency Management Director for guidance and potential assistance in writing a grant for supportive funding from the USDA Rural Development grant program, which funds outdoor warning sirens.	City funding, USDA Rural Dev grant funding

The mitigation activities listed in the **City of Solway Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Tenstrike 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Tenstrike participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. We are a small city with a population of 201 and do not have a website or social media. We can provide reminders at City Council meetings or on community flyers to remind residents to sign-up.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Tenstrike will work to pass along information that we receive from Beltrami County Emergency Management to our residents via flyers or announcements at City Council meetings.	City funding

The mitigation activities listed in the **City of Tenstrike Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Turtle River 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Turtle River participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. We are a small city with a population of 77 and do not have a website or social media. We can provide reminders at City Council meetings or on community flyers to remind residents to sign-up.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Turtle River will work to pass along information that we receive from Beltrami County Emergency Management to our residents via flyers or announcements at City Council meetings.	City funding

The mitigation activities listed in the **City of Turtle River Mitigation Action Chart** were identified for inclusion in the Beltrami 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 Wilton 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 Beltrami County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Wilton participates in the County's CodeRED emergency notification system and encourages residents to sign up for it. We are a small city with a population of 204 and do not have a website or social media. We can provide reminders at City Council meetings or on community flyers to remind residents to sign-up.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Wilton will work to pass along information that we receive from Beltrami County Emergency Management to our residents via flyers or announcements at City Council meetings.	City funding
3	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	Work with Beltrami County Emergency Management to obtain funding for purchase & installation of a new outdoor warning siren for the city.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The City will work with the Beltrami County Emergency Management Director for guidance and potential assistance in writing a grant for supportive funding from the USDA Rural Development grant program, which funds outdoor warning sirens.	City funding, USDA Rural Dev. grant funding

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	Improve the culvert system at the Melby Lane and Grant Creek crossing to reduce the chance of a washout during a high rain event.	Yes *(Transportation Infrastructure & Existing Homes)*	**New**	High	2020-2025	City Admin, City Public Works Dept.	The city of Wilton will work to address planning and implementation to improve the culvert system at this crossing. If it washes out, which it has done before, there would be 5 or 6 residences in Wilton, Grant Valley, and Eckles that would be land locked. Taking action on this project has been delayed due to costs. We are a small city with a limited budget and transportation projects are a challenge.	City funding, Other funding TBD

The mitigation activities listed in the **City of Wilton Mitigation Action Chart** were identified for inclusion in the Beltrami 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)

Following is a report on the status of mitigation actions listed in **Section IV: "The Plan for Action" from the Beltrami County 2013 Hazard Mitigation Plan Update**. This report describes those actions that have been completed, are being deleted, or are being carried over into the 2020 plan update.

Hazard	Mitigation Action	Status	Comments
Flooding	**Objective 1, Strategy A – Flood Damage Reduction:** Perform capital improvement planning around road related flooding issues by: 1) providing an annual opportunity for townships to identify flood related road issues throughout the County; 2) continue to maintain a database of all flood related road costs and improvements made over the years; and 3) prioritize the flood related road issues and incorporate implementation strategies in capital improvement planning.	Carried over.	No detectable patterns of flooding have been identified. Beltrami County experiences overland flooding in varying areas of the county following high precipitation events or rapid spring runoff. No database has been established due to a lack of tangible information.
Flooding	**Objective 1, Strategy B – Flood Education:** Host informational flood meetings each spring after high precipitation falls and winters to: 1) provide an opportunity for property owners to report flooding issues; 2) promote the use of backflow prevention valves in areas prone to groundwater flooding; and 3)promote home flood insurance. This strategy may supplant the opportunity for townships to identify flood related road issues identified in strategy 1.	Delete.	This has not been implemented.
Flooding	**Objective 1, Strategy C – City of Bemidji Flooding:** Manage the flow of spring snow melts prior to them reaching the private development bounded by Tyler and the Power Dam Rd. The area to the east drains into this development. Flooding has overtopped Tyler Ave Ne and can present a risk to the homes in this development. The County has identified these parcels to be at risk for flooding.	Completed.	Mitigation efforts (not under this plan) were completed by the developed to have retaining ponds and collection areas to the north of the development. There has not been any flooding issues since this was completed.
Wildfire	**Objective 2, Strategy D - Develop a Community Wildfire Protection Plan:** Identify wildfire mitigation strategies related to managing fuel loads, educating the public, and improving the fire resistance of properties. This is a continuation of a previous mitigation strategy to continue implementing	Completed	While not as part of the hazard mitigation plan, Bemidji Fire Department developed a urban-rural interface plan.

Hazard	Mitigation Action	Status	Comments
	Firewise site assessment in high risk area of the County.		
Wildfire	**Objective 2, Strategy E – Install Dry Hydrants:** Install new dry-hydrants identified in this planning process to improve access to water outside of areas with city water. This is a continuation of efforts to increase access to water. As a result of the previous mitigation plan four new dry hydrants were installed.	Carried over.	The fire departments have installed limited dry-hydrants, but there is a desire for more if funding were available.
Severe Summer and Winter Weather	**Objective 3, Strategy F – Safe Room Construction:** Promote safe room construction in public spaces, high density residential development, and manufactured home parks to provide protection from severe summer storms.	Carried over.	We would like to explore safe room construction.
All-Hazards, Particularly severe weather	**Objective 3, Strategy G – Increase Sheltering Facilities:** Increase the sheltering capacity of communities within the County. Beltrami County Emergency Management works closely with communities to identify sheltering locations.	Carried over.	This has not been completed.
Severe Weather	**Objective 3, Strategy H - Severe Weather Education and Awareness:** Improve public education surrounding severe storm awareness and preparedness. This includes educating the public about what public warning options are available, including but not limited to sirens and Code Red reverse 911, what they should do to prepare for severe events, what to do when they get a severe weather warning, and offering weather spotter training classes.	Completed.	Public access to Skywarn and weather preparedness training is provided annually. Beltrami County participates in Severe Weather Awareness Week as well as two tornado drills in April. Beltrami County utilizes CodeRED Community Notifications for high-impact weather events including tornadoes and extreme wind events. Beltrami County has established a well followed Facebook page to continue to educate the public.
Severe Winter Weather	**Objective 3, Strategy I - Reduce Severe Winter Weather Driving Risks:** Reduce the hazards of winter driving by: 1) reducing the number of driving motorists by offering "rest stop" locations for them to get off the road during a winter storm; 2) promote living snow fences to reduce snow drifts on roads; and 3) offer winter	Delete.	Some snow fencing has been installed in drift-prone areas by MNDOT. The other aspects are part of living in Minnesota and people should have enough initiative to take these into consideration before driving.

Hazard	Mitigation Action	Status	Comments
	driver safety courses. This is intended to be a comprehensive strategy to improve road conditions, reduce motorists, and improve driving habits.		
Severe Weather	**Objective 4, Strategy J - Severe Weather Warning:** Improve the County's ability to warn the public about impending severe weather. Several existing warning sirens are aging and are due for replacement. Additionally, new warning sirens are needed in areas of the County more recently developed. Of note is the relatively high densely developed area in Bemidji along 30th street.	Carried over.	The City of Bemidji installed new outdoor warning sirens to provide warning to most areas of the city. The City increased in size as a result of annexation. The number of sirens were increased from six to ten. There are densely populated areas of the county as well as several county parks that should have outdoor warning sirens and possible shelters installed. Several of our smaller cities want sirens but can't afford them on their own.
Severe Weather	**Objective 4, Strategy K – Checking on Vulnerable Residents:** Work with power companies, particularly Beltrami Electric, to identify and document vulnerable rural residents with dependencies on power. The County dispatch already maintains a list of vulnerable residents and uses volunteers to check in on them during power outages and severe weather. This would be an expansion of this existing list to identify those who need power restored priority.	Carried over.	This has not been implemented.
Severe Weather	**Objective 4, Strategy L - Backup Power for Continuity of Government:** Assess the need for backup power generators at previously mentioned locations, safe rooms and sheltering facilities, but also fire halls, city halls, law enforcement offices, medical facilities, municipal drinking well pumps, municipal lift station pumps, and other locations needed for continuity of government.	Carried over.	This project is still desired, but previously have been told these projects are "too small".
Hazardous Materials	**Objective 5, Strategy M - Improve Availability of Regional Resources:** Continue discussing the need for and opportunities to provide increased local capacity to respond to hazardous materials incidents. Leading this discussion is the responsibility of County	Delete.	This can be accomplished through the Emergency Operations Plan as well as other available resources.

Hazard	Mitigation Action	Status	Comments
	Emergency Management; however, they will need to rely heavily on the local expertise of fire departments and others who currently respond to hazardous materials incidents.		
Flooding	**(City of Blackduck)** **Flood Damage Reduction -** Mill Street, Liberty Street, and Oscar Avenue have regularly experienced flood related erosion damage. Previous FEMA public assistance dollars have been spent rebuilding these gravel roads. To reduce long-term maintenance costs they should be redesigned to resist flood damage.	Carried over.	This has not been implemented.
Severe Weather	**(City of Blackduck)** **Safe Room Construction -** Both the school and manufactured home park in Blackduck need safe rooms for sheltering.	Carried over.	This has not been implemented.
All-Hazards	**(City of Blackduck)** **Increase Sheltering Facilities** The school currently serves as an emergency sheltering facility. In the short-term this is acceptable; however, it would be preferred if another location in the community was identified as the emergency sheltering facility to prevent the disruption of school.	Delete.	This can be accomplished in other planning.
Severe Weather	**(City of Blackduck)** **Backup Power for Continuity of Government** The City of Blackduck fire hall needs a backup generator. Additional generators or one larger generator is needed for the municipal well pump (the water tower has less than two days of water) and the main sanitary sewer lift station.	Carried over.	This project is still desired, but previously have been told these projects are "too small".
Wildfire	**(City of Kelliher)** **Community Wildfire Protection Plan** (no notes included)	Carried over.	This has not been implemented.
All-Hazards	**(City of Kelliher)** **Increase Sheltering Facilities** A sheltering plan needs to be created for events held at the City Park. The Old School, which would serve as a local sheltering facility if needed should be outfitted with a backup generator and enough electrical receptacles to support	Delete.	This can be accomplished in other planning.

Hazard	Mitigation Action	Status	Comments
	community members whom rely electricity to charge at-home healthcare equipment.		
Severe Weather	**(City of Kelliher)** **Backup Power for Continuity of Government** The City needs a backup generator to serve the sanitary sewer lift station, and to serve the emergency warning siren.	Carried over.	This project is still desired, but previously have been told these projects are "too small".

Appendix I
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.

ASU Center for Emergency Management and Homeland Security. (2018, November 8). Spatial Hazard Events and Losses Database for the United States (SHELDUS) Version 17.0. *Spatial Hazard Events and Losses Database for the United States (SHELDUS) Version 17.0*. Tempe, Arizona, USA: ASU Center for Emergency Management and Homeland Security. Retrieved from https://cemhs.asu.edu/SHELDUS/

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)*.

Beltrami County. (2014). *About Beltrami County.* Retrieved April 29, 2019, from Beltrami County Minnesota: http://www.co.beltrami.mn.us/aboutus.html

Beltrami County. (2014). *Beltrami County*. Retrieved from Beltrami County.

Beltrami County. (2017, February 23). *Beltrami County Priority Concerns Scoping Document.* Retrieved April 29, 2019, from Beltrami County Minnesota: http://www.co.beltrami.mn.us/Departments/SWCD/Resources/Local%20Water%20Plan%20Priority%20Concerns.pdf

Beltrami County. (2017, September 27). *Comprehensive Local Water Management Plan.* Retrieved April 25, 2019, from Beltrami County Minnesota: http://www.co.beltrami.mn.us/Departments/SWCD/Resources/Local%20Water%20Plan.pdf

Beltrami County. (n.d.). *Local Government.* Retrieved April 25, 2019, from Beltrami County Minnesota: http://www.co.beltrami.mn.us/Government/Local%20Government.html

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.

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

EPA. (n.d.). *Why are Wetlands Important?* Retrieved from United States Environmental Protection Agency: https://www.epa.gov/wetlands/why-are-wetlands-important

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

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.

MDH, M. D. (2018). *Planning for Climate & Health Impacts in Metro Minnesota.* MDH Minnesota Climate & Health Program.

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

Midwestern Regional Climate Center. (n.d.). Daily Minimum Low Temperature.

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). *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

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. (2013). *Lakes, rivers, and wetlands facts.* Retrieved April 30, 2019, from MN Department of Natural Resources: https://www.dnr.state.mn.us/faq/mnfacts/water.html

MN DNR. (2013, October 30). *Stream Routes - Major River Centerlines.* Retrieved from Minnesota Geospatial Commons: https://gisdata.mn.gov/dataset/water-major-river-centerlines

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. (2014, August 19). *DNR Hydrography Dataset.* Retrieved from Minnesota Geospatial Commons: https://gisdata.mn.gov/dataset/water-dnr-hydrography

MN DNR. (2015). *Drought Monitor Overview*. Retrieved from http://www.dnr.state.mn.us/climate/journal/140814_drought.html

MN DNR. (2018, December 7). *Minnesota Department of Natural Resources Infested Waters List*. Retrieved from http://www.eddmaps.org/midwest/tools/infestedwaters/

MN DNR. (2019, January 17). *National Wetland Inventory Update for Minnesota.* Retrieved from Minnesota Geospatial Commons: https://gisdata.mn.gov/dataset/water-nat-wetlands-inv-2009-2014

MN Environmental Quality Board. (2014). Minnesota and Climate Change: Our Tomorrow Starts Today.

MN PCA. (2018). *Surface Water Data Access*. Retrieved from Minnesota Pollution Control Agency: http://pca-gis02.pca.state.mn.us/eda_surfacewater/

MN PCA. (n.d.). *Basins in Minnesota.* Retrieved April 29, 2019, from Minnesota Pollution Control Agency: https://www.pca.state.mn.us/water/basins-minnesota

MN PCA. (n.d.). *Minnesota's Ground Water.* Retrieved April 29, 2019, from MN Pollution Control Agency: https://www.pca.state.mn.us/sites/default/files/pp-mngroundwater.pdf

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). *Background*. Retrieved from United States Drought Monitor: https://droughtmonitor.unl.edu/AboutUSDM/Background.aspx

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. (2018). *National Weather Service Storm Data Preparation.* National Weather Service. Retrieved from https://www.nws.noaa.gov/directives/sym/pd01016005curr.pdf

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

NOAA NCEI. (2019, October 31). Retrieved from NCEI Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

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.

Radbruch-Hall, D. H., Colton, R. B., Davies, W. E., Lucchitta, I., Skipp, B. A., & Varnes, D. J. (1982). *Landslide Overview Map of the Conterminous United States.* Retrieved November 15, 2019, from https://pubs.usgs.gov/pp/p1183/pp1183.html

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 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. Census Bureau. (2010, April 1). *Beltrami County QuickFacts (Population, Census).* Retrieved April 25, 2019, from United States Census Bureau: https://www.census.gov/quickfacts/fact/table/beltramicountyminnesota/POP010210

U.S. Census Bureau. (2010, April 1). *Bemidji City QuickFacts (Population, Census).* Retrieved April 26, 2019, from United States Census Bureau: https://www.census.gov/quickfacts/fact/table/bemidjicityminnesota/POP010210

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. (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

USDA ERS. (2019, August 20). *USDA Economic Research Service (ERS) Major Land Uses Glossary.* Retrieved December 10, 2019, from USDA Economic Research Service (ERS): https://www.ers.usda.gov/data-products/major-land-uses/glossary/

USDM. (n.d.). *Drought Classification*. Retrieved from United States Drought Monitor: https://droughtmonitor.unl.edu/AboutUSDM/AbouttheData/DroughtClassification.aspx

USGS. (2020). *Peak Streamflow for Minnesota.* Retrieved January 1, 2019, from National Water Information System: https://nwis.waterdata.usgs.gov/mn/nwis/peak

Appendix J
Beltrami County Plans & Programs in Place

Planning & Regulatory

Plans/Programs	*Yes/No*
Comprehensive/Master Plan	No
Capital Improvements Plan	No
Economic Development Plan	No/Unknown
Emergency Operations Plan	Yes (Needs update)
Climate Adaptation Plan	No
Continuity of Operations Plan	Yes (Needs update)
Transportation Plan	Yes (2017-2022 TIP)
Stormwater Management Plan	No
Community Wildfire Protection Plan	Yes
FireWise Program	Expired
Water Conservation/Emergency Preparedness Plan	No
Wellhead Protection Plan	Unknown
Database of dry hydrants/well access	Yes (needs update)
Burning permits/restrictions	No
Water Management Plan	Yes
Zoning ordinance	No
Subdivision ordinance	Unknown
Floodplain ordinance	No
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No
Flood insurance rate maps	No
Acquisition of land for open space and public recreation uses	No
School closing policy/communications plan in event of inclement weather/temperatures	No
Storm shelters (list all locations)	Yes– Bemidji (volunteer church – need more)
Warning sirens (list all locations)	Yes – Bemidji (10 sirens), Blackduck (one siren – needs replacement), Kelliher (one siren – needs replacement), Waskish (one siren). City of Solway and Wilton would like sirens bust cost prohibitive.
SKYWARN Program	Yes
CodeRED Mass Notification System	Yes
Severe Weather Awareness Week	Yes
Winter Weather Awareness Week	Yes
NOAA Weather Radios	No

Administrative & Technical

Administration	*Yes/No*
Planning Commission	Yes – City of Bemidji and Northern Township
Mitigation Planning Committee	None
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Yes (basic Hwy. system maintenance)
Mutual aid agreements	Some
Staff	*Yes/No*
Chief Building Official	None
Floodplain Administrator	None
Emergency Manager	Christopher Muller
Community Planner	None
Civil Engineer	Beltrami County Engineer Bruce Hasbargan
GIS Coordinator	Kevin Trappe, Beltrami County
Technical	*Yes/No*
Warning systems/services (Reverse 911, outdoor warning signals)	Yes
Hazard data and information	None
Hazus analysis	None

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.	None
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Facebook – BCEM
Natural disaster or safety related school programs	None
StormReady certification	Yes
Firewise Communities certification	Expired
Public-private partnership initiatives addressing disaster-related issues	None
*Other *please describe*	Weather Ready Nation Ambassador (NWS Program)

Appendix K
Local Mitigation Survey Report

As part of Beltrami County's 2020 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.

BELTRAMI COUNTY EMERGENCY SERVICES COMMITTEE

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?** Wildfires: property loss, no life lost. Houses lost due to wildfire. Fire near Gene Dillon School, evacuation required. Wildfire: Highway 1 near reservation – no evacuations required. North Minnie Fire near Fourtown, required evacuation of residents. Brush pile spread to a residential fire near Saum. No known fatalities or injuries to public from fire 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?** Community Planning Assistance for Wildfires (CPAW) (2015-2016 – implemented in 2017). Resiliency in development, egress for new construction. Education outreach from fire departments, participate in fire prevention week in October. Alternative water sources are desired, previously but not in the last period dry hydrant construction took place. 99% of fires are started by people.

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?** Construction in fire prone areas – rapid development in the southern part of the county, especially for residential areas. Additional people moving into forested areas.

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?** Communications is a concern for responders in the north part of the county – for both cell phone and radios. Cell phones, even with boosters, are under reliable.

   Public Education – Firewise could benefit the community.

   Public notification for severe weather events… rural areas that don't have any outdoor warning sirens.

   Lack of adequate radar coverage for weather information.

   Alternative water sources are desired for fighting wildfire.

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?** Blandin Foundation. Neilson Foundation.

   PILT/CON-CON funds for areas north of Highway 1.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Not qualifying for MHMP grants.

   Being an impoverished community.

   Lack of planning and zoning in the county.

   Specific enough hazards (river flooding versus spontaneous overland flooding).

   Lack of staff.

Part C: Contributors & Time

Bob Cribb, Kelliher Fire Department, 1 hour

Molly Vollbrecht, Blackduck Ambulance, 1 hour

Rachel Myers, Blackduck Ambulance, 1 hour

Erin Morrill, BSU

Michael Schultz, Sanford AirMed, 1 hour

Jason Riggs, Beltrami County Sheriff's Office, 1 hour

Morris Frenzel, Kelliher Fire Department, 1 hour

Megan Heur-Korhonen, Beltrami County Public Health, 1 hour

David Hoefer, Bemidji Fire Department, 1 hour

Mike Mastin, Bemidji Police Department, 1 hour

BELTRAMI COUNTY HIGHWAY DEPARTMENT

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 major flooding in 2014 that caused damage to county roads; eroding out sections of roads and culverts. We have experienced major wind storms in 2016 and 2018 that caused damages to trees that blocked 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. The County has made improvements to roads which includes acquiring and clearing additional right of way which will help prevent trees from falling and blocking the road. It also included improvements to stormwater structures/culverts which will help prevent road washouts.

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 would pertain to roads.

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?** Continue to upgrade stormwater facilities, continue to clear trees from right of way, and address river and lake erosion that is threatening roads and bridges.

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 annual transportation plan that identifies and schedules road improvement projects that include culvert and drainage improvements to reduce over-the-road repetitive flooding.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** We have a County Public Works Director that addresses road maintenance issues and road improvement projects.

3. **What programs are in place to help accomplish mitigation in your community?** For the County Highway Dept it would be our annual transportation plan.

4. **What funding or other resources are available to help accomplish mitigation in your community?** We have utilized state and federal partners to address mitigation efforts following past disaster events.

   We utilize existing funds for road improvements and maintenance projects.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** The County needs funding assistance to improve roads and culverts that experience repetitive flooding.

Part C: Contributors & Time

Bruce Hasbargen, Public Works Director, 1 hour

BELTRAMI ELECTRIC COOPERATIVE

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. In March of 2014 we had heavy wet snow and wind that caused numerous outages on our overhead lines. We experienced high winds in July 2016 and 2017 that knocked over trees and took out our overhead power lines causing outages for some of our members that lasted 3-4 days in each of those years. In June of 2018 high winds and storm damage caused outages that lasted 3-4 days again for quite a few of our members.

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?** Beltrami Electric has taken measures to replace overhead line with underground line to reduce outages in certain areas. We have also installed additional protective equipment to isolate outages areas as much as possible.

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?** Nothing has increased our vulnerability, physical or otherwise to severe weather other than our members are resistant to tree trimming/removal and our member expectations are higher. They don't tolerate blinks in service and outages that last longer than a day usually are not tolerable.

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 conversion of more overhead lines to underground would definitely reduce our exposure to severe weather events.

   Educating our members and community on measures they can take to reduce the adverse effects of loss of power would help. Beltrami Electric does offer a new program on the installation and maintenance of a generator system for homeowners.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Beltrami Electric continues to convert overhead lines to underground as our budget allows. All of our new infrastructure is installed underground.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Beltrami Electric has staff that attend community meetings regarding mitigation efforts. Employees from our Accounting, Engineering, and Operations departments keep current on submitting estimates and reporting damages, reimbursement measures, and applying for FEMA Mitigation Grants when available.

3. **What programs are in place to help accomplish mitigation in your community?** Beltrami Electric has a Vulnerability Risk Assessment (VRA) and an Emergency Response Plan (ERP) in place to guide us through emergency situations as they arise. We have participated with Beltrami County staff and other county and emergency response personnel in annual tabletop emergency simulation exercises.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Beltrami Electric has applied for FEMA Mitigation grants in the past. We were awarded FEMA Mitigation grants in 2003 and 2006 in Beltrami County to bury overhead lines that served critical facilities in Beltrami County.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** The funding availability in the FEMA Mitigation grant program hasn't been available for overhead to underground line conversions for a few years now. The cost benefit analysis formula seems too restrictive to submit some projects we deem worthy for consideration.

Part C: Contributors & Time

Rich Riewer, Manager of Engineering, 2 hours

Rebecca Zaiser, Operations Coordinator, 30 minutes

CITY OF BEMIDJI

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?** The City of Bemidji has experienced several high wind events that have caused significant property to both public and private properties. There has been a confirmed tornado touchdown which

caused moderate damage in public and private property in the center of the city. In addition, there have been instances of flooding in residential neighborhood on the east side of the city.

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 Police Department has established a social media presence which has been utilized to communicate all types of weather-related information. This includes serve storm watches and warning as well as winter weather emergencies.

   The Fire Department has implemented numerous wildfire prevention, mitigation and response improvements. This includes the use of social media and radio PSAs, fuel reduction programs and fire code/land use enforcement.

   The outdoor emergency warning public notification systems (warning sirens) have all been replaced and the system coverage area is expanded.

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?** Residential construction has significantly increased the number and location of new housing. This has increased the need for emergency shelters and notices.

   Over the past five years, a total of 166 new homes were constructed within the Greater Bemidji Area. A majority of these new homes are built on the outskirts of the City within the Northwoods, which could be potentially prone to wildfires.

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?** Installation of a Doppler weather system that could accurately capture the weather that is impacting our area. The current system creates a cone directly above the Bemidji Area that is not covered by radar and therefore severe storms are not detected. The tornado that hit the City of Bemidji is a perfect example of this phenomena.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** 2040 Comprehensive Plan – This plan is a guide for the Greater Bemidji Area to plan for the future and the expected growth that is anticipated. It was adopted in March of 2019.

   Transportation Plan – This plan is a guide to road related investments in the Greater Bemidji growth areas through 2025. It was established in February of 2007 and revised in March of 2011.

   Bemidji Wildfire Modeling Tool – This plan is for community planning assistance for wildfires. It was established in 2018-2019.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** The Bemidji Fire Chief is the Emergency Service's Coordinator and lead fire code official for the Bemidji area. The Fire Chief actively participates in local, county and regional hazard planning.

   The Bemidji Police Chief participates in monthly Emergency Management meetings with other local stakeholders.

3. **What programs are in place to help accomplish mitigation in your community?** The Fire Department and Planning Department routinely consider wildfire threats when assessing future projects. The fire department maintains a robust fire prevention program, which includes education and code enforcement.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Unknown.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Mobile home parks need to identify or establish storm shelters on site or with the area. The City is currently in the process of working with the mobile home parks to either approve new shelters on site or establish shelters with existing structures in close proximity.

Part C: Contributors & Time

Mike Mastin, Chief of Police, 30 minutes

Michelle Miller, City Clerk, 30 minutes

Steve Jones, Community Development Director, 30 minutes

Casey Mai, Greater Bemidji Area Planning & Zoning Director, 30 minutes

David Hoefer, Bemidji Fire Chief, 30 minutes

CITY OF BLACKDUCK

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, wind and hail damage to various city owned buildings; wind damage to trees; and power outages. 2014 – re-shingle of city owned buildings; 2018 trees on golf course; 2019 winter was

hard on all city owned rural gravel roads – one suffered damage that will have improvements in 2020 because.

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?** 2020 Croswell Ave will have improvements to it due to winter frost & additional traffic and sump pump water; Liberty Drive will have curb and gutter improved in 2020 because of excess sump pump water from residents; 2019 improvements to Union Ave. culverts due to increased commercial and residential construction for snow removal.

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?** Yes, new Dollar General and additional single-family housing created more snow removal and storage on Brandl and Union Ave. filling and blocking culverts. Two new apartment buildings increased impermeable surface on Oscar Ave and additional vehicle traffic will force the City to widen and improve the road which is currently a rural section.

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 works is working to increase public involvement with sump pump discharge; not putting certain items in the sewer to decrease lift station malfunctions; and what can and cannot be done on some older City roads that have suffered major damage due to poor grading and bad water run-off. Northern Ave. will need to be completed reconstructed, since the addition of the walking trail on the MnDot ROW the water run-off and spring melt keep water from draining correctly and stand on this road.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** The City adopted a CIP in 2018 for water/sewer and street improvements. In 2018 the City attempted to adopt a .5% sales tax to receive revenue for these improvements but it was not approved in the general election. The City plans to submit for approval the sales tax proposal in 2020. City Planning and Zoning does have a flood plain ordinance adopted; City participates in sewer back up liability insurance; City has an evacuation plan for the trailer park; the school and churches participate; the emergency siren in the City alerts for bad weather; and emergency response; the emergency agencies in the City of Blackduck are established and prepared for incidents.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Blackduck Police Department: Police Chief Jace Grangruth; Officer Andrew Jespersen; PT Officer Lee Andersen

Blackduck Fire Department: Fire Chief Brian Larson; Assistant Chief Terry Frenzel + 20 volunteer firefighters

Blackduck Ambulance: (run by the manager and governed by the taxing district) Manager Molly Vollbrecht + staff

Sanford Clinic

Good Samaritan Society

City Engineer Curt Meyer from WSN

Public Works Supervisor Mike Schwanke

3. **What programs are in place to help accomplish mitigation in your community?**

CodeRed system with Beltrami County + alert system is tested daily @ noon

Fire Department offers fire safety and presents at school in October each year

Blackduck School participates in school drills annually

Blackduck Police Chief offers informative classes for ALICE preparedness for businesses and the school

Crisis Go Application for Blackduck School District Staff

4. **What funding or other resources are available to help accomplish mitigation in your community?** Blackduck has worked with the county for county-wide mitigation funding.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Comprehensive Plan needs updating to address changing in management; and responses efforts.

Public should be allowed to be sign up for county emergency alert system but administration for city is not aware of how to offer this.

Part C: Contributors & Time

Christina Regas, City Administrator, 30 minutes

Mark Lundin, Blackduck School District #32 Superintendent 30 minutes

Molly Vollbrecht, Blackduck Ambulance Manager, 30 minutes

Jace Grangruth, Blackduck Police Chief, 30 minutes

Brian Larson, Blackduck Fire Chief, 30 minutes

Mike Schwanke, Blackduck Public Works Supervisor, 30 minutes

CITY OF FUNKLEY

No LMS form submitted. (Note: The city has a population of 5.)

CITY OF KELLIHER

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 many severe storms with rain, hail and wind damage. On June 29, 2018, a severe storm came through with heavy rain/hail and winds that caused extensive damage throughout town. Trees were down throughout, blocking streets, damaging houses and vehicles. The Park was particularly damaged with 61 trees either blown over or severely damaged and needing to be removed. The Park had campers at the time of the storm and we do NOT have any storm shelter, fortunately no one was hurt. The Cemetery also had 8 trees go down. Many houses were damaged also.

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 did a street reconstruct, on Hwy 72 through the center of town which also included updating & rerouting the storm sewer. Side street storm sewers were also redone, and numerous culverts were replaced and enlarged. All new sewer lines to stop the infiltration of storm water into the sewer system. We repaired and re-installed our severe weather siren on a higher tower, however it is still very old and cannot be heard everywhere. Code Red was implemented a few years ago, but not everyone has signed up.

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?** I'd like to upgrade our weather siren and/or add another one to what we have. I also think we need to build a central storm shelter that has the capabilities to run the elderly residents medical equipment (from assisted living) and just our aging population. We also need a generator to run out lift stations so the sewer keeps pumping. The one we have doesn't work, old army surplus and electricians can't get it working!

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; however it is very old.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** None. We only have 1 city clerk and 1 maintenance person full-time.

3. **What programs are in place to help accomplish mitigation in your community?** We participate with the County emergency alert program. We have summer Severe Weather drills/siren. Fire Department gives presentations to the school annually. Schools practice tornado drills, etc.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Unknown.

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, and zoning map/ordinances.

   Not all residents are signed up for Code Red, but a lot of them do not have the ability to do so.

Part C: Contributors & Time

Shelli Krueth-City Clerk/Treasurer 1.5 hours

CITY OF SOLWAY

No LMS form submitted.

CITY OF TENSTRIKE

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?** 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 follow Beltrami County.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Beltrami County

3. **What programs are in place to help accomplish mitigation in your community?** Beltrami County

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.

Part C: Contributors & Time

Cathy Nash, City Clerk, 30 minutes

Mike Fellows, Mayor, 30 minutes

CITY OF TURTLE RIVER

No LMS form submitted.

CITY OF WILTON

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,

two summers ago heavy winds blew down trees across power lines and caused power outages at elderly residences that require power to operate medical equipment.

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. Ottertail Power is in charge of power in the city of Wilton.

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?** There's nothing that could be done here 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?** We have a Planning and Zoning Commission that evaluates circumstances on a monthly basis.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** City Council.

3. **What programs are in place to help accomplish mitigation in your community?** CodeRed System - for public emergency notification by phone.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The city uses existing funds to fix problems.

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 CODE RED system.

Part C: Contributors & Time

Jeff Snyder, Mayor, 30 minutes

Appendix L
Minnesota Department of Health Climate & Health Report

Planning for Climate & Health Impacts in Northwest Minnesota

Emergency Management Considerations for HSEM Region 3

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.

Drainage Ditch (Jackson Forderer, 2012)

REGION 3 /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 3 OVERVIEW

REGION 3: Northwest Minnesota

COUNTIES

- Becker
- Beltrami
- Clay
- Clearwater
- Hubbard
- Kittson
- Lake of the Woods
- Mahnomen
- Marshall
- Norman
- Pennington
- Polk
- Red Lake
- Roseau

HSEM REGIONAL PROGRAM COORDINATOR:
Heather Winkleblack
218-766-2301
heather.winkleblack@state.mn.us

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 3 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 3:

Average Summer Maximum Temperature for HSEM Region 3		
1981-2010	2050-2075	Change
78.6 °F	86.0 °F	+7.4 °F

Average Winter Minimum Temperature for HSEM Region 3		
1981-2010	2050-2075	Change
-0.8 °F	9.4 °F	+10.2 °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 3 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 3		
1981-2010	2050-2075	Change
3.8"	4.3"	+0.5"

Average Early Fall Precipitation for HSEM Region 3		
1981-2010	2050-2075	Change
2.4"	2.1"	-0.3"

REGION 3 /4

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 3 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 3		
2015	2050	Change
52,279	48,610	-7%

Elder Population (65+) Projection Estimates for HSEM Region 3		
2015	2050	Change
46,182	64,968	41%

REGION 3 CASE STUDY

The following case study is intended to illustrate the links between climate and weather and natural disasters. The case study demonstrates how a previous weather-related event (i.e., severe drought) 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: DROUGHT

DATE: 2012

Fall 2011 precipitation totals ranked among the driest fall seasons on record. As a result, Minnesota was on the northern edge of a devastating drought that impacted much of the Midwest during the 2012 growing season. To enable disaster relief support, the federal government through the U.S. Department of Agriculture (USDA), declared 75 MN counties disaster areas, mainly in northwest and far southeast Minnesota. Conditions for the drought evolved over many months.

- **OCTOBER 2011** — Nearly every Minnesota county was undergoing some level of drought.
- **MARCH 2012** — Signs of spring appeared 3-4 weeks earlier than average.
- **JULY 2012** — Precipitation totals were the lowest on record, a "flash drought" was declared.
- **NOVEMBER 2012** — 83% of Minnesota's landscape was undergoing extreme drought.

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REGION 3 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 experienced by Minnesota from the 2012 drought is difficult to capture in a single cost estimate. Considered the most extensive drought to impact the U.S. since the 1930s, the 2012 drought was estimated to have cost affected states together approximately 33 billion dollars, including revenue loss from crop failure.

The following are just a few examples of the adverse impacts on HSEM Region 3 communities from the 2012 drought:

AGRICULTURE LOSSES: Crop yields in Northwest and Southwest Minnesota were 10-20 percent below expected yields.

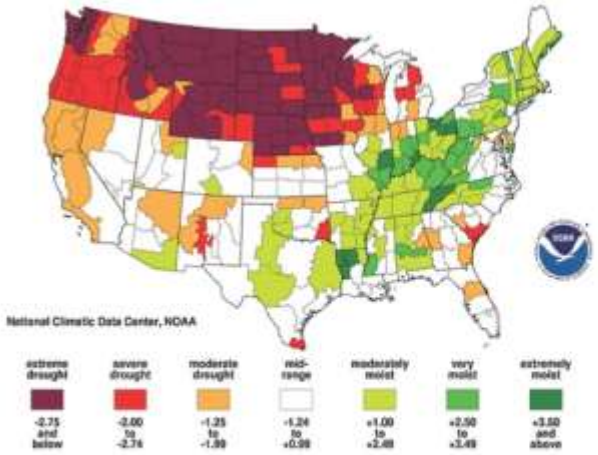
WATER LEVELS: Water levels fell in response to dry, hot weather. Unusually warm lake water temperatures were also deemed responsible for some fish kills. The U.S. Geological Survey (USGS) and Minnesota Department of Natural Resources (MNDNR) reported extremely low stream discharge values in late September, in some cases approaching the lowest on record.

WILDFIRE: Numerous wildfires emerged in part from widespread drought conditions, including eight fires in Roseau County and an especially large fire near Red Lake. At least 16 local fire departments and state and federal fire crews were mobilized to fight the fires, yet at least 55,000 acres were burned and a number of homes and outbuildings were lost.

PERMIT SUSPENSION: To safeguard water availability, the MNDNR suspended 16 surface water appropriation permits across the state, including a mining operation, golf courses, a sugar processing plant, and other public and private sector entities. By the end of October, roughly 50 surface water appropriation permits had been suspended by the MNDNR.

DEPLETED WELL WATER: A number of complaints were filed with the state when private wells went dry. Neighboring production wells were suspected of amplifying the problems related to the drought.

STRICTER REGULATIONS: For the first time, Minnesota state regulators plan to experiment with stricter rules that will require some local communities to allocate water.



U.S. Drought Conditions for September 2012 based on Palmer Z Index (NOAA, 2012)

REGION 3 /6

"The 2012 drought was estimated to have cost affected states together approximately 33 billion dollars, including revenue loss from crop failure."

Top. Farm fields (Mark Steil, 2012)
Bottom left. Dry cattle pasture (Seth Perlman, AP, 2012)
Bottom right. Dry well (Mark Steil, 2012)

CLIMATE PROJECTION DATA

Following are visual representations of climate projection data for Region 3. Data for all counties included in Region 3 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 from January through September are provided to underscore the cumulative growth of peak drought.

LEGEND

- **Historical:** 1981- 2010
- **Case Study:** 2012 drought
- **Projected:** 2050- 2074

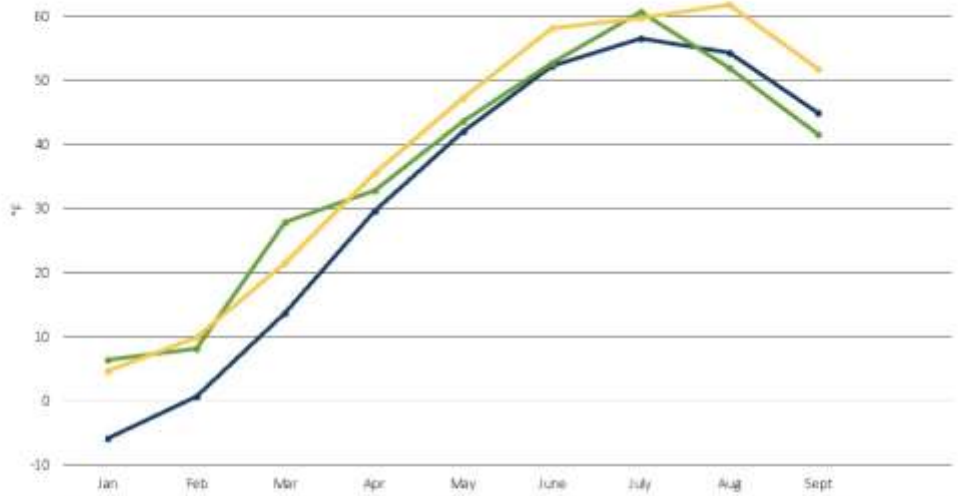
Maximum Temperature

Trend comparison to 2012 drought data

	January	February	March	April	May	June	July	August	September
Historical	14.9	22.6	34.4	52.3	67.3	75.9	80.6	79.4	68.6
Case Study	24.4	28.2	49.3	56.9	69.4	78.2	85.6	79.7	70.8
Projected	22.3	29.8	41.7	58.2	72.6	82.1	88.5	87.4	76.0

Minimum Temperature

Trend comparison to 2012 drought data



	January	February	March	April	May	June	July	August	September
Historical	-5.9	0.7	13.7	29.7	42.0	52.3	56.6	54.4	44.9
Case Study	6.4	8.2	27.9	32.8	43.6	52.7	60.7	52.0	41.6
Projected	4.6	9.9	21.6	35.5	47.3	58.1	59.7	61.8	51.8

Total Precipitation

Trend comparison to 2012 drought data

	January	February	March	April	May	June	July	August	September
Historical	0.7	0.5	0.9	1.6	2.7	4.1	3.4	3.1	2.8
Case Study	0.5	0.6	1.7	1.7	2.5	3.2	2.8	2.0	0.3
Projected	0.9	0.7	1.0	1.6	2.7	4.9	3.6	3.4	2.5

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SUMMARY

CLIMATE DATA EXPERTS expect that future climate conditions across the Midwest will continue to change and affect our environment, economy, and public health. Such conditions are projected to lead to a higher frequency of late growing season drought conditions, elevated winter temperatures with reduced snowpack, prolonged high heat days, and extended periods of low rainfall. Similar conditions in the past likely contributed to the 2012 drought disaster. While climate experts expect hotter, longer dry spells in the future, they also anticipate that these conditions will be punctuated with more frequent episodes of heavy rainfall. These combined too-wet and too-dry conditions were observed during the summer of 2012, when flood and drought disasters co-existed in Minnesota with diverse and dire consequences for impacted communities. Current climate projection data are available as monthly averages, which obscure potential extremes. Thus, it is important to track climate research and expert consensus on future climate trends in order to critically assess and apply projection data.

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 is 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.

For example, in HSEM Region 3, population projections show a slight decrease in children but a substantial increase in seniors. Older people may be more at-risk for respiratory complications during dry, dusty periods, or have limited access to transportation if evacuation is necessary. Considering the impacts of climate change to vulnerable populations is just one example of how to prioritize mitigation and response planning.

> *"Climate data is a critical tool in planning for resilient communities into the future."*

CLIMATE PROJECTION DATA continues to improve and should be considered as a priority to advance for Minnesota. Currently, global climate models that produce climate projection data for the Midwest are more accurate at simulating future temperature changes than they are for precipitation. However, the accuracy and resolution of these models are advancing rapidly as are their ability to model the future prevalence in short-duration, high-intensity localized heavy rainfall events.

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

- 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/
- Midwest Drought Monitor, United States Drought Monitor
  Source for historical and current drought conditions for the Midwest and other regions.
  http://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?Midwest
- 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
- Drought in Minnesota, Minnesota Department of Natural Resources
  Comprehensive catalog of drought information.
  https://www.dnr.state.mn.us/climate/drought/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/
- Preparing for the Health Effects of Drought (PDF), Centers for Disease Control and Prevention
  A resource guide for including public health in drought preparedness and response.
  https://www.cdc.gov/nceh/hsb/cwh/docs/CDC_Drought_Resource_Guide-508.pdf
- 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/
- U.S. Drought Portal, National Integrated Drought Information System
  Source of data, research, and guidance related to understanding, preparing for, and responding to drought.
  https://www.drought.gov/drought/

REFERENCES

- Fuchs, B., Wood, D., & Ebbeka, D, 2015. From Too Much to Too Little: How the central U.S. drought of 2012 evolved out of one of the most devastating floods on record in 2011. Drought Mitigation Center Faculty Publications.
  http://digitalcommons.unl.edu/droughtfacpub/118/
- Steil, M., 2012. SW Minn. residential wells run dry as drought drags on. MPR News.
  https://www.mprnews.org/story/2012/12/19/environment/residential-wells-run-dry

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Front cover photo: Hardened Soil (Jackson Forderer for MPR, 2012)

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