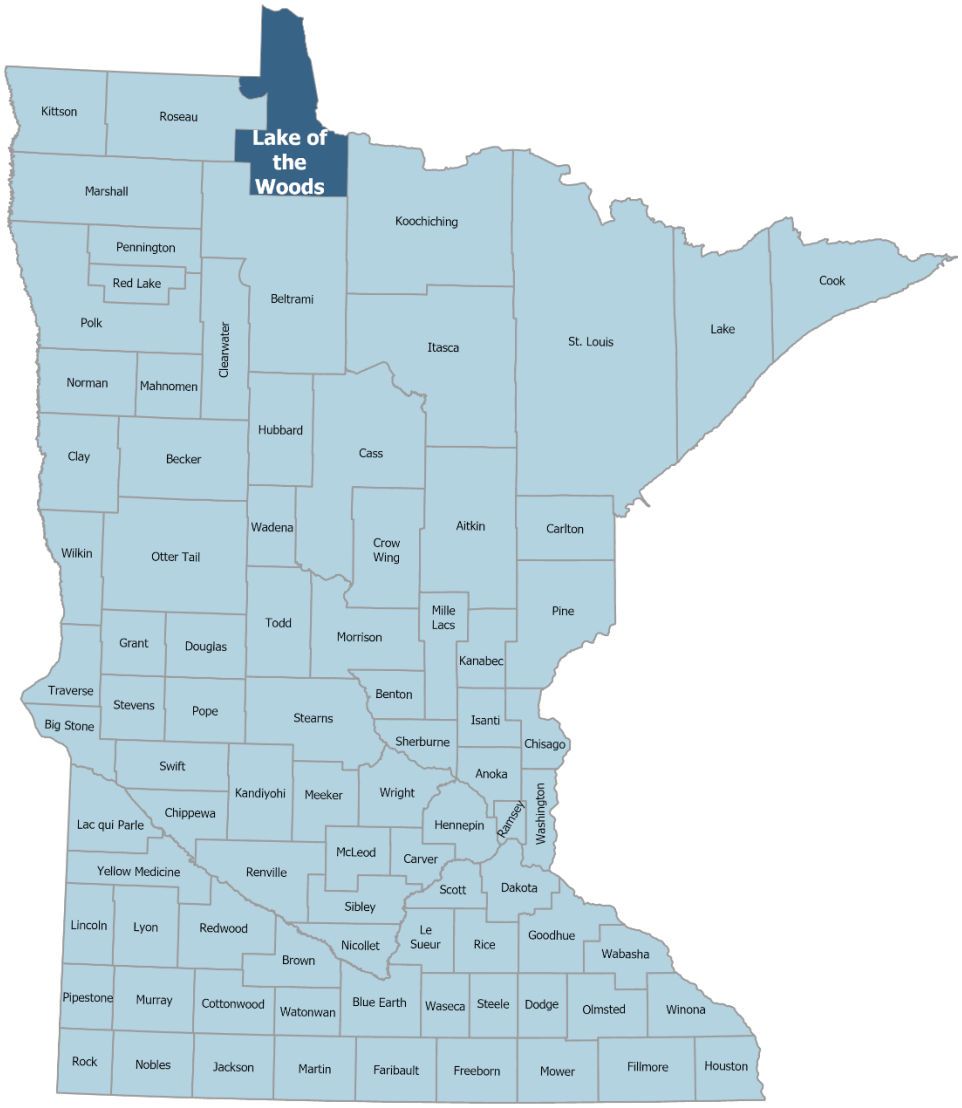
Multi-Hazard Mitigation Plan

Lake of the Woods County, Minnesota, 2020



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Multi-Hazard Mitigation Plan
Lake of the Woods 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; the hazard mitigation planning process and subsequent implementation of resulting projects, measures, and policies is a primary mechanism in achieving FEMA's goal (FEMA, 2015).

From 1980-2018, the 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, 2019). 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 is an effective process to prepare communities and lessen the impact of loss of life and property from future disasters. Although mitigation efforts will not eliminate all disasters, governments should endeavor to be as prepared as possible for a disaster for the wellbeing of its citizens.

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).

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

This Multi-Hazard Mitigation Plan represents the efforts of Lake of the Woods 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 Lake of the Woods County Emergency Manager and U-Spatial@UMD have combined efforts to update the 2013 Lake of the Woods 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 Lake of the Woods County as determined by frequency of event, economic impact, deaths, and injuries. Mitigation recommendations are based on input from state and local agencies, the public, and national best practices.

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 Lake of the Woods County, including the City of Williams, and the county seat, Baudette. The City of Roosevelt is not covered in this plan, as it is located primarily in the neighboring county of Roseau. The Lake of the Woods 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 jurisdiction-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 the plan is approved by FEMA. County and local city resolutions will be added by the county after final approval by FEMA, in *Appendix D* in the back of the plan.

Lake of the Woods County has specified the following goals for this MHMP update:

- Include more recent data documenting the critical infrastructure and hazards faced by Lake of the Woods 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 Lake of the Woods County.

1.1.2 Hazard Mitigation Definition

Hazard mitigation may be defined as any action taken to eliminate or reduce the long-term risk to human life and property from natural hazards. Following are examples of hazard mitigation measures that fall within one of five types of mitigation strategies:

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

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

1.1.3 Benefits of Mitigation Planning

The benefits of hazard mitigation planning include the following:

- Saving lives, protecting the health of the public, and reducing injuries
- Preventing or reducing property damage
- Reducing economic losses
- Minimizing social dislocation and stress
- Reducing agricultural losses
- Maintaining critical facilities in functioning order
- Protecting infrastructure from damage
- Protecting mental health
- Reducing legal liability of government and public officials

1.2 State Administration of Mitigation Grants

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

Section 2 – Public Planning Process

2.1 Steering Committee Information

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

Table 1. Multi-Hazard Mitigation Steering Committee

Name	Agency/Organization	Participant Title
Jill Hasbargen Olson	Lake of the Woods County	Emergency Management Director
Heather Winkleblack	HSEM	RPC
Julie Berggren	Lake of the Woods County	Administrative Assistant
Mary Jo Otten	Lake of the Woods County	County Assessor
Verra McVay	City of Williams	Mayor
Jenny Loughrey	CHI Lakewood Health	RN
Chris Plourde	Baudette Fire Department	Training Officer
Marla Carlson	City of Baudette	City Council Member
Brian Novak	Lake of the Woods School	High School Principal
Jeff Nelson	Lake of the Woods School	Superintendent
Marty Mollberg	Northstar Electric	Operations Manager
Amy Ballard	Lake of the Woods County	Social Service Director
Kay Schell	CHI Lakewood Health	Public Health

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. The list of final mitigation actions was divided into jurisdiction-specific mitigation action charts so that each jurisdiction could see and address those actions that applied specifically to their cities (see *Appendix G: Mitigation Actions by Jurisdiction*).

2.2 Review of Existing Plans, Capabilities & Vulnerabilities

Lake of the Woods County and its local communities utilized a variety of planning documents to direct community development. These documents included a Comprehensive/Master Plan, Emergency Operations Plan, Continuity of Operations Plan, Comprehensive Local Water Management Plan, Wellhead Protection Plan, Bridge Replacement Plan, etc. (see *Appendix J* for a full listing of plans and programs in place in Lake of the Woods 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 Lake of the Woods County Multi-Hazard Mitigation Plan, UMD consultants reviewed and incorporated a variety of planning documents that direct community development and influence land use decisions for the county and its jurisdictions. In addition, UMD consultants worked closely with the Lake of the Woods 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 Lake of the Woods 2020 Multi-Hazard Mitigation Plan update, participating jurisdictions and key county personnel were asked to fill out a two-part Local Mitigation Survey (LMS) form. *Part A: Past Events & Vulnerability Assessment* included questions about hazard events in each jurisdiction. The assessment questions addressed 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) changes within the last five years that have increased local vulnerabilities to future disaster events, and 4) concerns or specific ideas for mitigation projects to help reduce or eliminate risk resulting from future severe weather or disaster events. The *Part B: Local Mitigation Capabilities Assessment* was used to collect detailed information on each jurisdiction's capabilities to support mitigation such as 1) plans, authorities, or policies, 2) staff (organizational capacity), 3) programs, and 4) funding or other resources. Information was also collected about 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 Lake of the Woods County Multi-Hazard Mitigation Plan, UMD consultants worked in coordination with the Lake of the Woods 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 Lake of the Woods County residents and emergency planning officials, but also new thinking about how to best address these hazards.

On January 7, 2019, Lake of the Woods County issued a news release inviting public feedback and participation for the Lake of the Woods County MHMP update (for complete documentation, see *Appendix F: Public Outreach & Engagement Documentation*).

On January 16, 2019, U-Spatial@UMD hosted a kickoff meeting online that was attended by the Lake of the Woods County Emergency Management Director. The webinar included a project overview, the roles and responsibilities of the Emergency Management Director, contents of the Multi-Hazard Mitigation Plan, planning process and projected timeline (see *Appendix E* for webinar slides).

A steering committee meeting took place on June 4, 2019 at the Lake of the Woods Ambulance Building in Baudette. The steering committee was provided with an overview of the purpose, process and timeline for the Lake of the Woods County Multi-Hazard Mitigation Plan update, as well as the role and responsibilities of steering committee members. *Appendix E* provides documentation of steering committee meeting summaries, including participant sign-in sheets and presentation slides.

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

On May 13, 2020, members of the steering committee convened again with the UMD planning team to conduct a review and discussion of the draft mitigation action charts developed for Lake of the Woods County and the city jurisdictions participating in the plan. See *Appendix E* for a full meeting summary.

In order to provide opportunity for public input, Lake of the Woods County issued a second new release on June 2, 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 Lake of the Woods County MHMP, including excerpts of the Lake of the Woods 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 Lake of the Woods County and jurisdictions. The public feedback period for the draft plan was open from June 2, 2020 to June 17, 2020, for a total of 15 days.

Table 2. Lake of the Woods County Hazard Mitigation Update Meetings and Public Outreach

Meeting Type	Date	Location
Public Outreach	1/7/2019	News release inviting public feedback and participation.
Kickoff Webinar	1/16/19	Webinar hosted by U-Spatial@UMD
Steering Committee #1	6/4/19	Lake of the Woods Ambulance Garage – Baudette, MN
Steering Committee #2	5/13/20	Remote meeting, via UMN Zoom

Meeting Type	Date	Location
Public Outreach	6/2/20 – 6/17/20	Website and feedback form

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

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

2.3.1 Overview of Jurisdictional Participation

Throughout the planning process, Lake of the Woods 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 Lake of the Woods 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)	Planning Team Mtg. #1 (Appendix E)	Local Mitigation Action Chart Review (Appendix E)	Planning Team Mtg. #2 (Appendix E)	Draft MHMP Review (Appendix F)
Lake of the Woods County	X	X	X	X	X
City of Baudette	X	X	X	X	X
City of Williams	X	X	X	X	X

Section 3 – Lake of the Woods County Profile

3.1 General County Description

Lake of the Woods County, named after Lake of the Woods which covers 25% of the county, saw its first European explorer, Jacques de Noyon, in 1688. Nearly 200 years later the first permanent European settler, Wilhelm Zippel, a German immigrant and fisherman, settled on the south shore of the Lake of the Woods at Zippel Bay (Lake of the Woods County, 2019).

Lake of the Woods County is located approximately 275 miles northwest of the Twin Cities. Nearly half of the county's borders are shared with Ontario, Canada to the north, while the remaining border lines are adjacent to Roseau County to the west, Beltrami County to the south, and Koochiching County to the east. As the 11th largest county in Minnesota and "Walleye Capital of the World", Lake of the Woods County has abundant fishing and outdoor adventure opportunities, encompassing nearly 1,780 square miles, 27% of which is covered by water.

Lake of the Woods County contains 12 unorganized territories and three cities: Roosevelt (which is partially located in Roseau County), Williams, and the county seat, Baudette. The county is also home to the Northwest Angle - the northernmost point of the Lower 48 States. The 2010 Census lists the county with a total population of 4,045 (US Census Bureau, 2019).

3.2 Environmental Characteristics

Lake of the Woods County is a series of steps formed by glacial Lake Agassiz beaches sloping gradually toward the northeast. The highest elevation in the county is 1,312 feet at Norris Camp. The lowest point is Lake of the Woods at 1,060 feet. Baudette has an elevation of 1,090 feet. The sandy soils and peatlands in the upland area act as groundwater recharge areas for the underground aquifers.

Elevations in the southwestern part of the county are approximately 200 feet higher than areas near Lake of the Woods. Because of its elevation, Beltrami Island State Forest is a groundwater recharge area of regional significance to Lake of the Woods and Roseau Counties. Peat bogs overlying deposits of sand collect water and recharge the confined and unconfined aquifers. Water in the aquifers on the north side of Beltrami Island moves in a northeasterly direction to Lake of the Woods and discharges into streams, springs and the lake. Groundwater on the south side of Beltrami Island moves southeasterly toward the Rapid River. Underground bedrock contours range between 1,050 and 1,110 feet in the southwestern part of the county to 950 to 1,100 feet in the northerly areas. Glacial drift is thickest in the southwestern part of the county, and thins to a few feet in the northern areas. Springs are a frequent occurrence in some parts of the county where high underground bedrock contours cause increased pressure on the movement of water in the aquifer layers. The approximate location of the transition from the area of net groundwater recharge to the area of net groundwater discharge lies along an irregular line extending from Baudette to Roosevelt.

3.3 Geology

The land area the county occupies was created largely by several periods of glaciation, particularly glacial Lake Agassiz. The county is on the southern edge of the Canadian Shield, is generally flat, sloping very gradually toward the Rainy River and Lake of the Woods, with scattered bedrock outcrops and glacial lake beach deposits. Lake of the Woods is the dominant water-related feature, covering 950,400 acres in Minnesota and Canada, itself containing 14,000 islands.

The bedrock in the county consists of a complex of Precambrian igneous and metamorphic rocks. Bedrock distribution is mainly inferred from gravity and aeromagnetic data. Glacial drift thickness ranges from zero to greater than 200 feet in the county. The thinnest drift is near Rainy River and Lake of the Woods. In the eastern part of the county, where subsurface control permits relatively close definition, extreme variability in the drift thickness is evident. Within a mile of a bedrock outcrop, drift thickness may exceed 100 feet.

3.4 Hydrography

Lake of the Woods County lies within two hydrologic basins, with the majority of the county being in the Rainy Basin and a small portion intersecting the Lower Red Basin. Water that falls in the county is carried out from one of the following major watersheds: Roseau River, Rainy River – Black River, Rapid River, Rainy River – Baudette, and Lake of the Woods (MN DNR, 2019); the Lake of the Woods watershed is the largest, covering 1,151 square miles.

Lake of the Woods County includes a number of protected (i.e. public) waters, which are lakes, wetlands, and watercourses regulated by the Minnesota DNR. The inventory of protected waters in the county includes: 31 lakes, 50 watercourses (rivers and streams), and three wetlands (MN DNR, 1985).

The Minnesota Pollution Control Agency (MPCA) designates beneficial uses for all waters in Minnesota, develops water quality standards to protect each use, and monitors the bodies of water to ensure water quality standards are being met. Bodies of water which fail to meet one or more water quality standards are considered "impaired"; about 40% of Minnesota's lakes and streams are impaired. 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. Some of the waters in Lake of the Woods County have been identified as "impaired" due to pollutants or stressors found in these waters - examples include mercury in fish tissue and unhealthy dissolved oxygen levels (MPCA, 2019).

While not as extensive as impaired waters, about 7% of lakes throughout Minnesota are infested with an aquatic invasive species which could spread to other waters (MN DNR, 2018). The MN DNR has identified 10 water bodies in Lake of the Woods County infested with the spiny waterflea (MN DNR, 2019).

A map of the basic hydrography of Lake of the Woods County is found in

3.4.1 Groundwater

With such an abundance of groundwater available, it is important to examine how sensitive this natural resource is to pollution. Groundwater sensitivity to pollution is measured by flow rate and soil permeability. Figure A - 12 maps pollution sensitivity of near-surface materials based on the time it takes water to travel through three feet of soil and seven feet of surficial geology, to a depth of 10 feet from the land surface. The total travel time is then categorized into five sensitivity classes, ranging from high (<=170 hours) to ultra-low (>8,000 hours). Areas with special geologic conditions, such as: karsts, peatlands, bedrock at or near the surface, and disturbed lands (e.g. open pit mines) require individual consideration. Of these special condition areas, only karst areas have been assigned a sensitivity ranking ("very high") due to karst areas consistently showing very fast water infiltration rates. The remaining special condition areas are classified together as they cannot be assigned a sensitivity ranking using the same methodology (MN DNR, 2019).

3.4.2 Lakes

Lake of the Woods County is dominated by a single lake, Lake of the Woods, which straddles the US-Canadian border with its massive 1,679 mi² surface area; 25% of the county is covered by this lake. The remaining 835 lakes and ponds scattered throughout the county are significantly smaller in size, with a combined area of 2.9 mi².

Of the lakes within the county, only the Lake of the Woods is classified as being "impaired" (MPCA, 2019).

3.4.3 Rivers

Three major rivers flow through Lake of the Woods County: the Roseau River, the Rapid River, and the Rainy River. Beginning in Lake of the Woods County, the Roseau River, a tributary of the Red River, flows northwest for 214 miles until entering the Red River. The Rapid River is a tributary of the Rainy River, flowing 71 miles east-northeast until flowing into the Rainy River. The 85-mile-long Rainy River is part of the US-Canadian border, flowing west-northwest from International Falls, MN until emptying into the southern end of Lake of the Woods.

The MPCA classifies a number of rivers and streams in the county as "impaired", including: Williams Creek, Zippel Creek, Baudette River, and Rainy River (MPCA, 2019).

3.4.4 Wetlands

The term "wetland", as defined by the Minnesota Legislature, are "…areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (2016). For the purposes of this definition, wetlands must have the following three attributes: "a predominance of hydric soils; inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted

for life in saturated soil conditions; and under normal circumstances, able to support a prevalence of such vegetation" (Minnesota Legislature, 2016).

All eight types of wetlands which are present in Minnesota are also in Lake of the Woods County. These wetlands total 707,674 acres and cover 62% of the county (MN DNR, St. Mary's University of Minnesota, 2019). The total acreage of wetlands by type is presented in Table 4 and displayed in the hydrography map (Figure A - 1).

Table 4. Lake of the Woods County Wetland Acreage, by Type

Wetland Type	Acres
Bog	272,829
Shrub Swamp	197,287
Wooded Swamp	154,289
Wet Meadow	51,705
Open Water Wetland	19,550
Shallow Marsh	7,980
Deep Marsh	2,153
Seasonally Flooded Basin	1,881
Total	**707,674**

Source: (MN DNR, St. Mary's University of Minnesota, 2019)

Although not as prevalent as in lakes and rivers, the MPCA has identified a number of impaired wetlands throughout Minnesota, fortunately, none of these wetlands are located in Lake of the Woods County (MPCA, 2019).

3.5 Climate

According to the Köppen climate classification system, Lake of the Woods County's climate is classified as "Dfb" – a humid continental climate region with large seasonal temperature contrasts; with precipitation distributed throughout the year (no dry season); and at least four months of the year averaging above 50° F, but the warmest month averaging below 71.6 F° (Encyclopedia Britannica, 2019).

Since 1895, climate in the United States has been analyzed using the Climate Divisional Dataset. The boundaries of climate divisions have evolved significantly over the years; beginning in 1909 with 12 climatological districts which followed the principal drainage basins, to the current 344 climate divisions based largely on the USDA Bureau of Agricultural Economics Crop Reporting Districts (Guttman & Quayle, 1996). Climate division temperature, precipitation, and drought values are derived from the values reported by the weather stations in each climate division. In 2014 new methodologies to compute the climate division data were implemented, improving the data coverage and quality of the dataset (NOAA, 2019).

Table 5 displays monthly average temperatures as reported by the weather stations located within Lake of the Woods County, as well as the climate division in which Lake of the Woods County is located.

Table 5. Lake of the Woods County's Average Monthly Temperature, 1981-2010

Month	Weather Stations within the County	MN Climate Division 2
January	6.0°F	6.5°F
February	11.6°F	12.4°F
March	24.8°F	25.4°F
April	40.9°F	40.6°F
May	53.5°F	53°F
June	62.7°F	62.2°F
July	67.3°F	66.9°F
August	65.5°F	64.9°F
September	55.9°F	55.4°F
October	42.9°F	42.7°F
November	26.7°F	26.8°F
December	11.1°F	11.7°F

Source: (Midwestern Regional Climate Center, 2019)

Note: The methodology used to determine monthly temperatures differ between the county-level and climate division-level. At the county-level, daily mean temperature values reported from the weather station within the county are averaged together, daily averages are then averaged by month over the period of record. The climate division data is based off the nClimDiv dataset which uses a 5km grid-based calculation.

3.5.1 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. , Minnesota Weather Almanac, 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 Lake of the Woods 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).

3.6 Demographics

Lake of the Woods County contains three cities (including the small section of Roosevelt City located within the county) and 12 unorganized territories. In 2010, Lake of the Woods County had a population of 4,045, averaging three people per square mile of land area (US Census Bureau, 2019). The county seat, Baudette, is the largest city in the county with a 2010 population of 1,106. Table 6 lists the communities in Lake of the Woods County along with their respective population numbers.

Table 6. Lake of the Woods County Population by Community, 2010

Community	Total	% Population
Angle township	119	2.94%
Baudette city	1106	27.34%
Baudette township	345	8.53%
Boone township	36	0.89%
Chilgren township	182	4.50%
Forest Area township	5	0.12%
Gudrid township	219	5.41%
Kiel township	1	0.02%
Lakewood township	85	2.10%
McDougald township	225	5.56%
Myhre township	180	4.45%
Potamo township	107	2.65%
Prosper township	164	4.05%
Rapid River township	12	0.30%
Roosevelt city	7	0.17%
Rulien township	0	0.00%
Spooner township	190	4.70%
Swiftwater township	60	1.48%
Township 157-30	1	0.02%
Township 158-30	36	0.89%
Victory township	7	0.17%
Wabanica township	237	5.86%
Walhalla township	131	3.24%
Wheeler township	281	6.95%
Williams city	191	4.72%
Zippel township	118	2.92%
Total	**4,045**	

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.

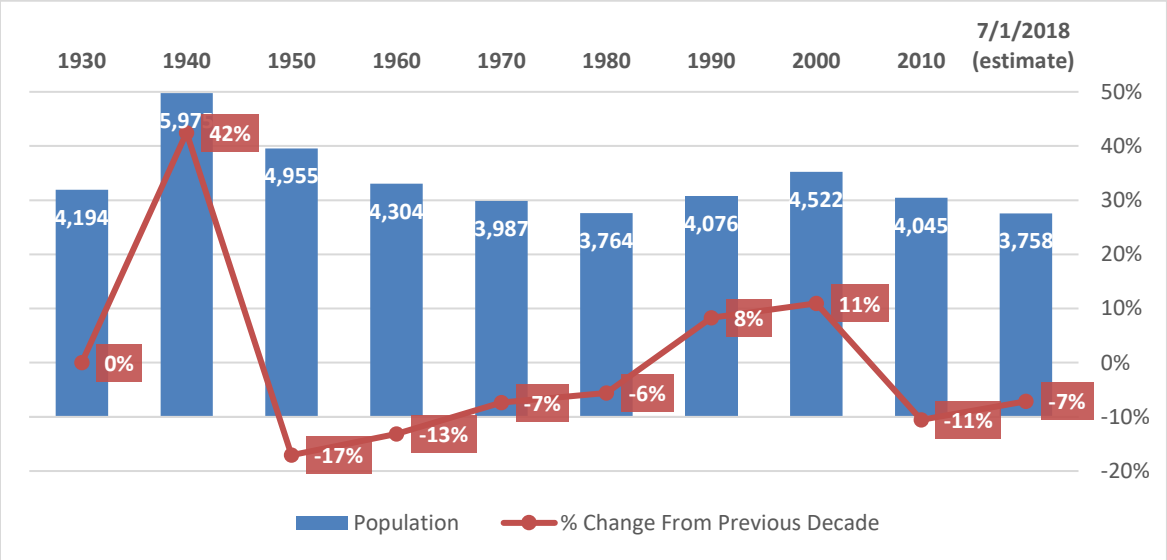
The county's population saw a surge in growth during the 1930's and reached its record high population of 5,975 in 1940. Between 1940 and 1980 the county's population shrank by 37% before steadily growing again by 19% during the 1980's and 1990's. Since 2000 the county's population has been trending downward, falling 11% from 2000-2010, and an estimated -7% from 2010-July 2018 (US

Census Bureau, 2019). The Minnesota State Demographic Center projects a decline in Lake of the Woods County's population through 2050 (2017).

Figure 1 provides an overview of the county's historic population change and

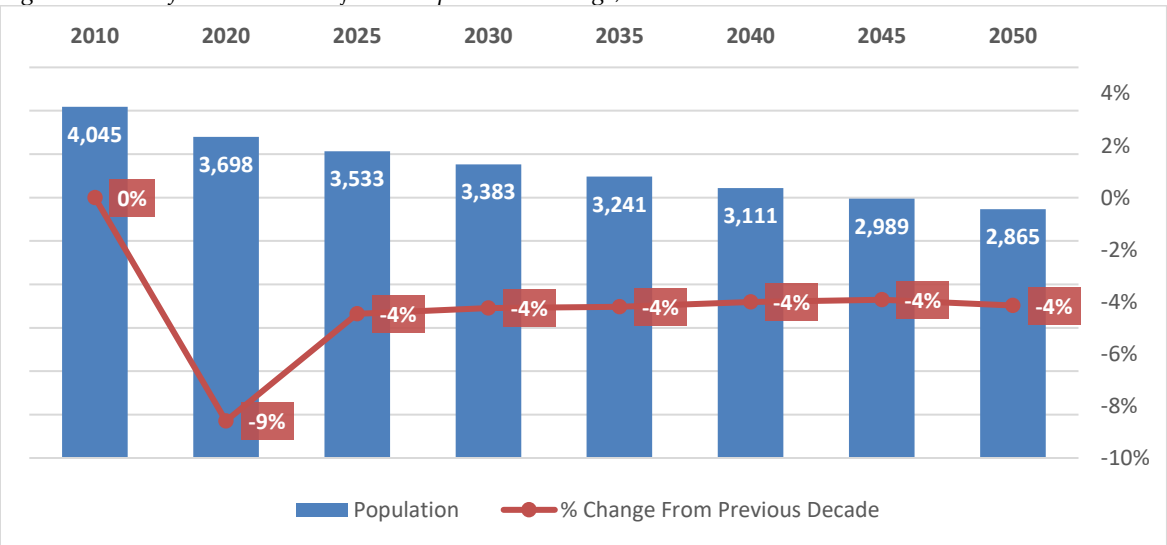
Figure 2 shows the projected population change.

Figure 1. Lake of the Woods Population Change, 1930-1918



SOURCE: US CENSUS

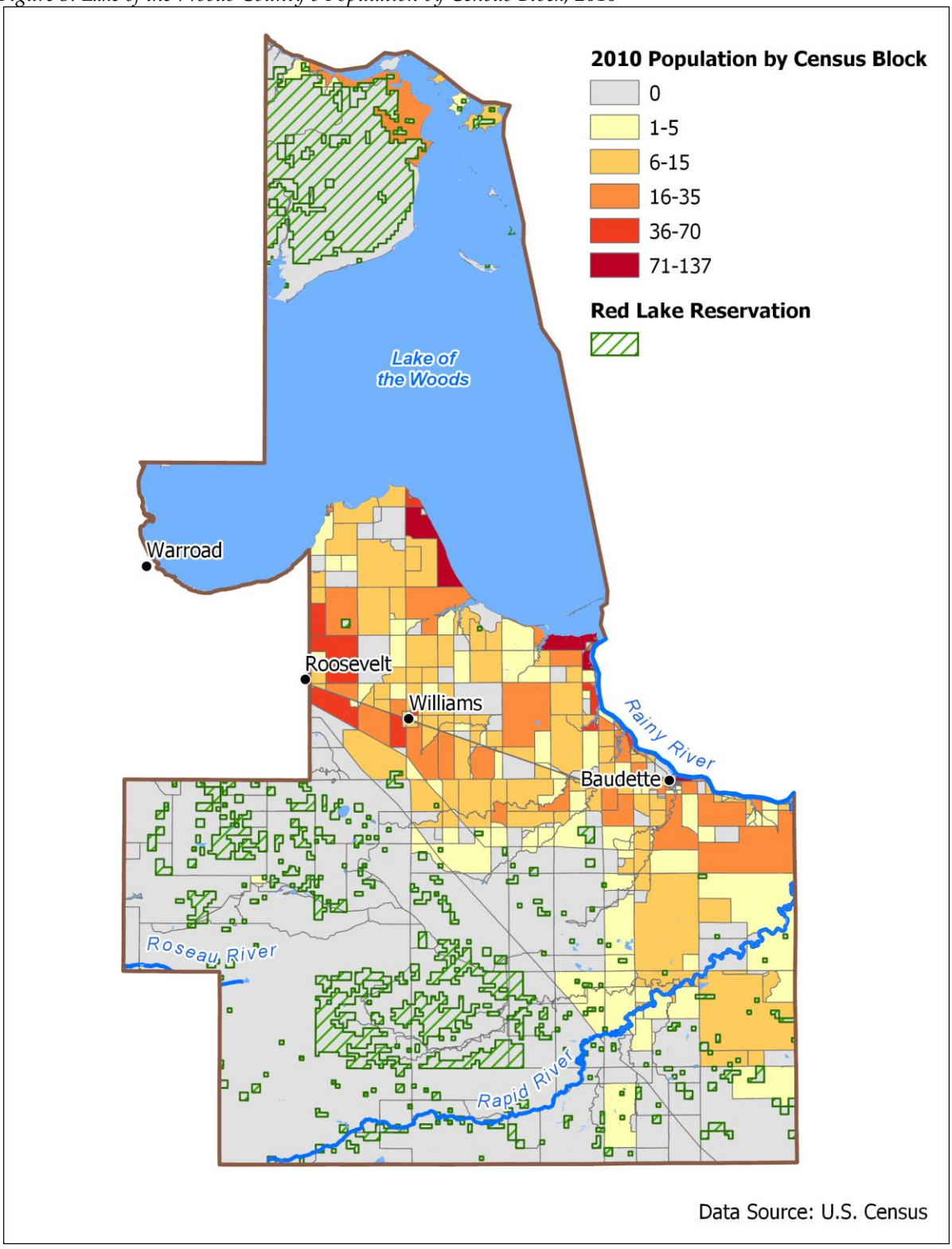
Figure 2. Lake of the Woods Projected Population Change, 2010 - 2050



SOURCE: MINNESOTA STATE DEMOGRAPHIC CENTER

Figure 3 shows the Lake of the Woods County population density by census block. The population change by minor civil division, from 2000 to 2010, is mapped in Figure A-2.

Figure 3. Lake of the Woods County's Population by Census Block, 2010



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 7).

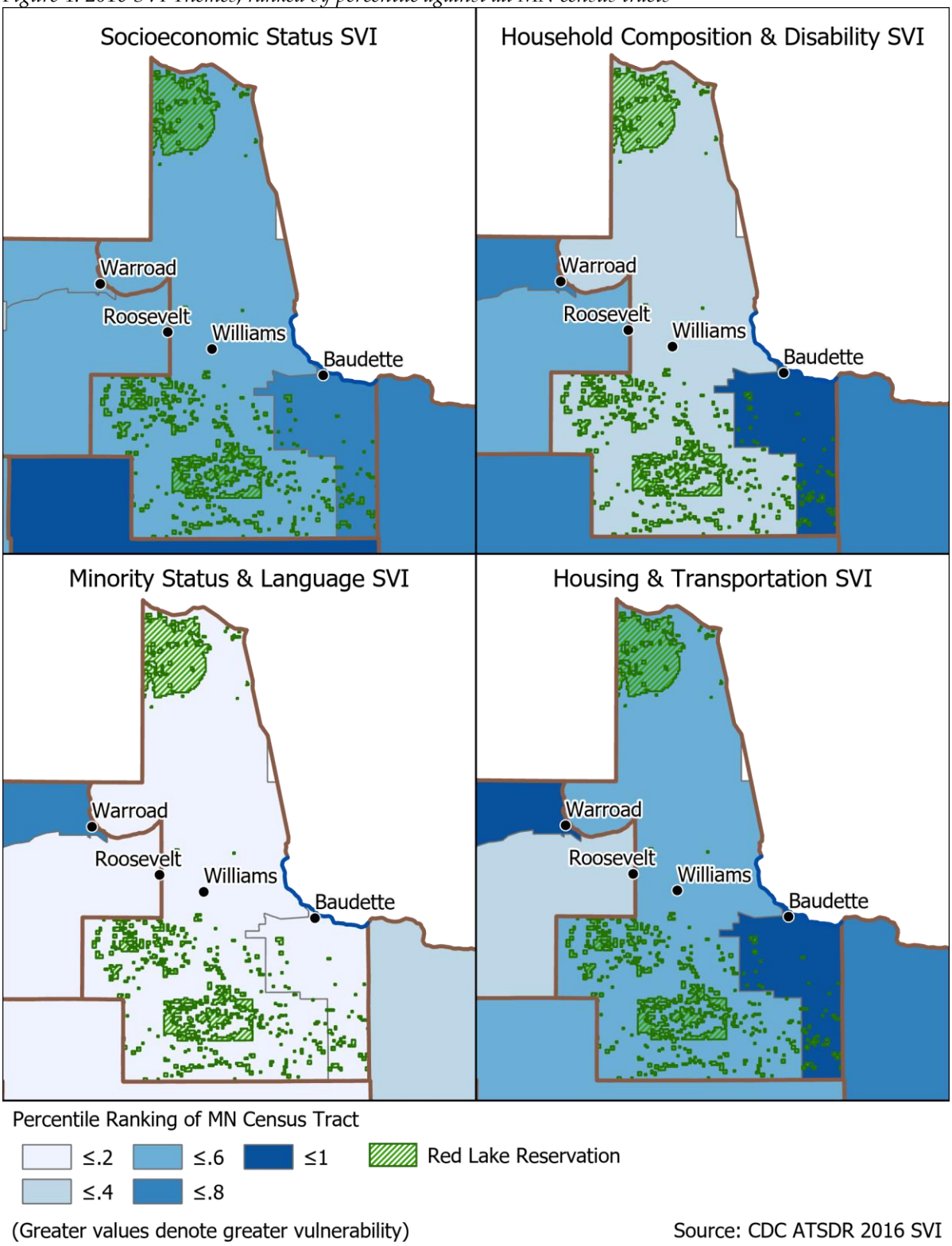
Table 7. Social Vulnerability Index (SVI) Variables

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 Lake of the Woods is displayed in Figure 4.

Figure 4. 2016 SVI Themes, ranked by percentile against all MN census tracts



3.7 Economy

Lake of the Woods County is dominated by the leisure/hospitality industry, followed by education and health services, and trade, transportation and utilities. The total number of jobs in the county increased by over 6.5% between 2007 and 2017. The 10-year change in the average annual employment of each industry supersector in Lake of the Woods County is in Table 8.

Table 8. Average Annual Employment by Industry Supersector, Lake of the Woods County

Industry Supersector	Average # of Employees (2007)	Average # of Employees (2017)	% Change
Construction	No Data	43	N/A
Education and Health Services	294	288	-2.04%
Financial Activities	35	29	-17.14%
Information	23	15	-34.78%
Leisure and Hospitality	451	480	6.43%
Natural Resources and Mining	No Data	57	N/A
Other Services	61	63	3.28%
Professional and Business Services	11	37	236.36%
Public Administration	158	151	-4.43%
Trade, Transportation and Utilities	283	277	-2.12%
Total, All Industries	**1,518**	**1,619**	**6.65%**

Source: Minnesota Department of Employment and Economic Development

In 2017, the median household income in Lake of the Woods County was $46,943, 28% less than the Minnesota average household income of $65,699. The percent of the county's population living below the poverty level in 2017 was 9.7%, compared to a 9.5% average for the state of Minnesota (US Census Bureau, 2019).

3.8 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 Lake of the Woods County.

Critical infrastructure have been identified based on FEMA's guidelines (FEMA, 2013) as well as input from Lake of the Woods 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, see *Appendix B*.

3.8.1 Emergency & Shelter Facilities

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

Figure A - 3; facilities in the Angle Inlet and Williams are in Figure A - 4.

3.8.1.1 Healthcare Facilities

Lake of the Woods County is served by one healthcare facility, CHI LakeWood Health. The facility includes a clinic, hospital, public health department, assisted living care, and three ambulances which provide emergency medical transportation for more than 1,000 patients each year (LakeWood Health Center, 2019).

3.8.1.2 Emergency Services

Law Enforcement

A full time police department is in place for the city of Baudette. The county has a full service Sheriff's Department, headquartered in the Lake of the Woods Law Enforcement Center. US Customs and Border Protection patrol the Baudette Port of Entry.

The State Patrol has offices located in Bemidji and Thief River Falls. State Patrol officers provide law enforcement throughout the region, including patrols of the state Trunk Highway system. Bureau of Criminal Apprehension officers serve northern Minnesota out of offices and a lab located in Bemidji. These officers investigate major crimes in support of local law enforcement.

The one Emergency Operation Center in Lake of the Woods County is located in the county Administrative Complex in Baudette.

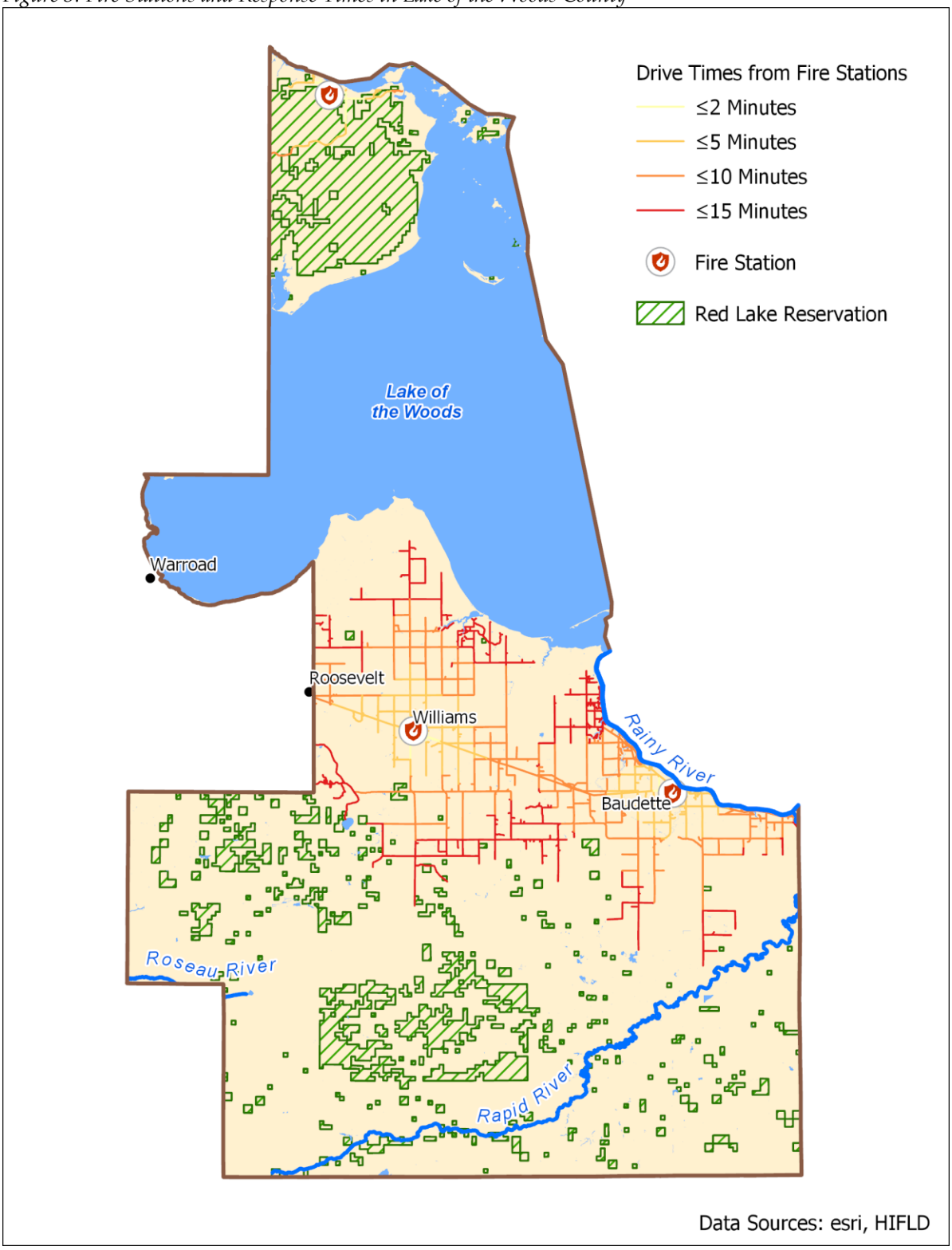
Fire & Rescue Services

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 Baudette, Williams, and the Northwest Angle. All firefighters in the county are volunteer.

The Department of Natural Resources operates with the National Interagency Fire Center to coordinate DNR, BIA, National Forest Service, and other local and regional fire assets in the event of rural wildfires. These resources include airplane and helicopter assets, located at the Bemidji/Beltrami County Airport during the spring fire season.

Figure 5 shows fire departments and fire response times in Lake of the Woods 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 communities in the county are within 15 minutes of a fire department.

Figure 5. Fire Stations and Response Times in Lake of the Woods County



3.8.1.3 Schools & Evacuation Centers/Shelters

The three schools located in Lake of the Woods County include a high school and elementary school in Baudette and an elementary school in the Angle Inlet.

FEMA and the American Red Cross have designated nine facilities within Lake of the Woods County as shelters to be used in the event of an issued evacuation. Four of the shelters are located in Williams and the other five shelters are in Baudette.

3.8.2 Infrastructure Systems

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

3.8.2.1 Transportation Systems

The infrastructure of transportation systems facilitates the movement of individuals, goods, and services. Figure A - 6 displays Lake of the Woods County's transportation systems.

Roadways

As of 2012, there were approximately 893 miles of roads within Lake of the Woods County. The county's road network connects to 49 bridges and passes over 97 culverts. Uses of the road network include timber and agricultural commodity harvesting and shipping, commuting, long-haul shipping, and tourism. 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 9 lists the total miles of road for each route system within Lake of the Woods County.

Table 9. Road Miles by Route System

Route System Defined	Miles
County Road	46
County State Aid Highway (CSAH)	195
MN Highway	68
Municipal	15
Private Road-Public Access	8
Ramp or Connector	0
State Forest Road	168
State Park Road	6
Township Road	0
Tribal Road	30
Unorganized Territory Road	356
Total	**893**

Source: (MnDOT, 2012)

Railways

One main railway, operated by Canadian National (CN), runs northwest through the central portion of the county, connecting the cities of Baudette, Williams, and Roosevelt.

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, 2019).

There is one main waterway which enters Lake of the Woods from the Rainy River and branches off to cities and ports along the lake. Vessels use this waterway to transport a variety of commodities, including: fuel, metals, and various earthen and construction materials.

Airports

There are two airports in Lake of the Woods County: a small grass runway in Roosevelt and the Baudette International Airport. The Lakewood Health Center in Baudette also has a helipad.

3.8.2.2 Utility Systems

The infrastructure of utility system networks facilitates the process of providing essential utilities to consumers. A map of major utilities systems in Lake of the Woods County is displayed in Figure A - 6.

Water & Sewer

Lake of the Woods is home to two wastewater treatment plants, one located in Baudette and the other in the city of Williams. An additional six facilities in the county are classified as wastewater treatment plants and regulated by the Minnesota Pollution Control Agency. Residents of Baudette receive their water from Baudette Municipal Light & Water.

Energy

Six electrical substations are located within Lake of the Woods County along with three major electric transmission lines. Residents of Baudette receive their electricity from Baudette Municipal Light & Water. The rest of the county's residents are served by two electric coops – Roseau Electric Coop servicing the Angle Inlet, and the North Star Electric Cooperative the remaining rural communities.

A natural gas pipeline runs between Roosevelt and Baudette. Minnesota Energy Resources delivers natural gas to the residents of Baudette.

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, 2019). There are five ARMER towers in Lake of the Woods County.

3.8.3 High Potential Loss Structures

High potential loss structures are structures which would have a high loss or negative impact on the community if they were damaged or destroyed (FEMA). These structures include dams, levees, and facilities storing hazardous materials. The locations of these structures are mapped in Figure A - 7.

3.8.3.1 Dams & Levees

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 Lake of the Wood County's infrastructure. The three dams in Lake of the Woods County serve to maintain lake levels, impound water for flood control, and are used for recreation activities; there are no levees in the county. Table 10 provides the properties of each dam and the locations of the dams are displayed in Figure 17below Figure 18 in section

Table 10. Dams in Lake of the Woods County

Dam Name	Owner	River	Primary Type	NID Height (ft)	Primary Purpose
Brown's Lake	MN DNR-Wildlife	Judicial Ditch 62	Gravity	10'	Flood Control
Keller	MN DNR-Fisheries	Winter Road River	Earth	12'	Fish and Wildlife
Roseau River	MN DNR-Wildlife	Roseau River	Earth	10'	Recreation

3.8.3.2 Hazardous Materials Facilities

Hazardous materials facilities contain extremely hazardous materials that would threaten the public if released. The inventory of these facilities in Lake of the Woods County includes those required to submit a Tier II report to the EPA (due to the quantity of hazardous chemicals being stored), as well as facilities which are not required to submit a Tier II report but still produce or store materials which are highly volatile, corrosive, explosives, flammable, toxic, radioactive, or water-reactive. Lake of the Woods County has identified 14 such facilities.

3.8.4 Significant County Assets

Significant county assets include larger employers which represent a primary economic sector of a community; buildings of government services deemed to be significant (e.g. government service center, court house, jails & prisons); and cultural or historic assets that are deemed important to a community. An inventory of Lake of the Woods County's significant assets are listed in *Appendix B*.

3.8.4.1 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. Ten of these employers were identified in Lake of the Woods County.

3.8.4.2 Government Buildings

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

3.8.4.3 Cultural Resources

Cultural resources are cultural or historic assets that are unique or irreplaceable, or any asset that is important to a community. Ten structures of this nature have been identified in the county.

3.9 Land Use and Ownership

Lake of the Woods County is a large, wet county. The county is 1,780 square miles, 42% of which is covered by woody wetlands, followed by open water (27%), and emergent herbaceous wetlands (20%). These three land classifications alone, all characterized by high amounts of water, make up nearly 90% of the county's total land cover (U.S. Geological Survey, 2014).

Cultivated crops (3%) and hay/pasture fields (2%) are the fourth and fifth most extensive types of land cover in the county respectively (U.S. Geological Survey, 2014). The small area of land use devoted to agriculture and livestock has been shrinking for more than 20 years. Between 1997 and 2017 the number of farms operating in the county decreased by 43%, from 237 farms to 134; the total acreage farmed also fell by 43%, from 158,907 acres to 91,288 (Census of Agriculture, 2012). A map of Lake of the Woods County's land cover is displayed in Figure A - 8.

In 2016 there were 32 active feedlots in Lake of the Woods County; the majority are raising cattle as the primary stock. An average of 97 animals are on each of these feedlots (Minnesota Pollution Control Agency, 2016). A map of these feedlots are displayed in Figure A - 10.

Ownership of the land and water within the county is divided between 14 different agencies, the majority being privately owned (46%). Land ownership by agency is displayed in Figure A - 9 .

3.9.1 Structure Replacement Costs

Lake of the Woods-specific building data was sourced from the county parcel tax databases. Records were aggregated to the relevant census administrative boundaries. The FEMA Hazus model produced total structure replacement costs (building plus contents values) by general occupancy class. The total estimated building exposure for Lake of the Woods County is shown in Table 11.

Table 11. Lake of the Woods County's Total Building Exposure

General Occupancy	County Total Buildings	County Building & Contents Value
Residential	3,580	$198,649,478
Commercial	366	$46,919,321
Other	1,344	$114,528,943
Total:	**5,290**	**$360,097,742**

Section 4 – Risk Assessment

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

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

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

4.1 Hazard Identification/Profile

4.1.1 Hazard Identification

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

Natural hazards are identified in the FEMA publication "Multi-Hazard Identification and Risk Assessment – A Cornerstone of the National Mitigation Strategy," also known as MHIRA. FEMA Region V developed a list based on state mitigation plans in the region. Table 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 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 Lake of the Woods County, updated the existing mitigation actions published in the 2013 Multi-Hazard Mitigation Plan, and proposed new mitigation actions.

To engage in this process, the committee drew on a number of data sources. First, the committee examined the hazards identified in the 2013 Multi Hazard Mitigation Plan (Table 13). The natural hazards that pose risk to Lake of the Woods 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 Lake of the Woods County were categorized the same way as the priority hazards established by the State of Minnesota.

Table 13. Natural hazards identified in the 2013 Lake of the Woods County Hazard Mitigation Plan

Natural Hazards	
Flooding	Severe Summer Weather
Wildfires	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 Lake of the Woods 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 4, 2019. In the review of each hazard, the group was asked to consider if the risk to severe natural hazard events 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, flooding, and wildfire continued to be high priority hazards to address as previously in 2013. 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 4, 2019 meeting.

Table 14. Prioritization of Hazards for Lake of the Woods 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	High
Erosion/Landslides	Moderate
Extreme Heat/Extreme Cold	Moderate
Drought	Low
Dam Failure	Low

Vulnerability Assessment by Jurisdiction

Jurisdictions in Lake of the Woods 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.

Lake of the Woods County

- In 2018 there was a new development project adding a 24-unit apartment building and Hockey Arena in the city of Baudette, which would increase the cost of damage due to a tornado, wind or hail. Businesses are expanding and growing.
- In general, we have noticed an increase in more frequent high-rain events in the last five years.

City of Williams

- The increased number of empty/abandoned homes has created hazardous conditions; empty lots that have been abandoned have dead and dying trees that pose hazards as winter blizzards and summer storms could easily knock them into neighboring lots and roadways. Lightning strikes could easily set the trees and empty structures on fire, which would be hard on our community as we do not have enough water storage units for our fire department to handle a larger fire.

4.1.3 Hazard Profiling Concept of Planning

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

4.1.4 GIS and Risk Assessment

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

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

4.1.5 National Centers for Environmental Information (NCEI) Records

Much of the storm data used in this plan is from the National Centers for Environmental Information's (NCEI) Storm Events Database. The NCEI receives storm data from the National Weather Service (NWS), which receives the information from various local, state, and federal sources. The Storm Events Database contains records documenting:

- The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
- Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
- Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event. (NOAA NCEI, 2019)

Records in the Storm Events Database go back as far as January 1950; however, only tornado events were being reported from the beginning. In 1955, thunderstorm wind and hail events began being reported, and in 1996, 48 additional types of storm events were introduced to the database (NCEI, 2019). Revisions to the types of storm events being reported to the database are ongoing. As of the July 16, 2018, 55 different storm events types were being reported to the Storm Events Database (NWS, 2018).

The economic and property loss estimates in the database are often preliminary in nature and may not match the final assessment of losses related to given weather events.

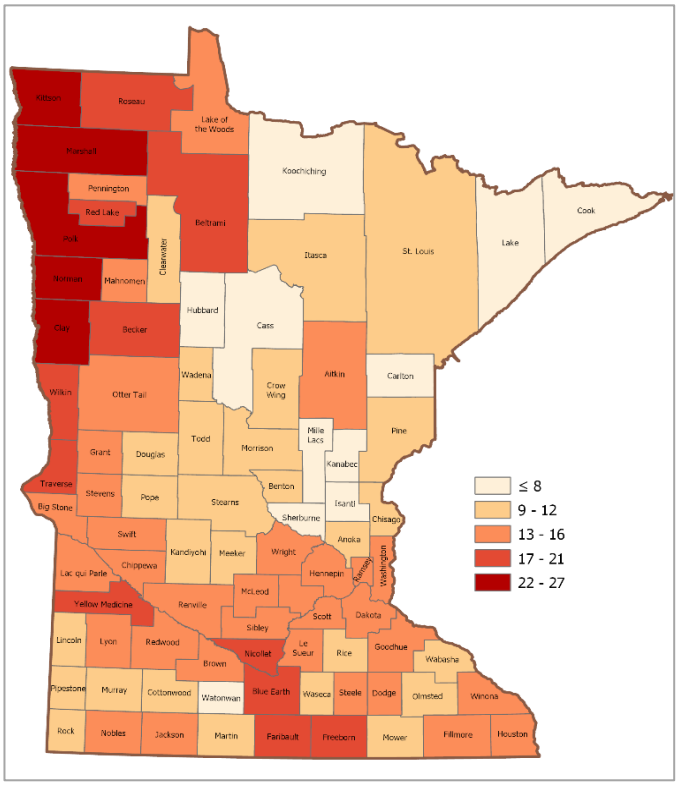
The NCEI data included reported events in Lake of the Woods County between 1950 and March 2019 however, some weather event categories only had available data going back as recent as 1996. No records before 1950 were available. A summary table of events related to each hazard type is included in the hazard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

Figure 6. FEMA-Declared Disasters and Emergencies in Minnesota, 1957-2019



Another historical perspective is derived from FEMA-declared disasters. Thirteen Major Disaster Declarations and one Emergency Declaration have been made in Lake of the Woods County since 1957 (Figure 6).

Table 16 and Table 17 show the details of the disasters, including payments for Public Assistance (PA) and Individual Assistance (IA). 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 Lake of the Woods County (1957 – 2019)

Incident	Incident Period	Declaration Date and Disaster Number	Total PA Obligated by FEMA for Disaster in Minnesota	Total PA Obligated by FEMA for Disaster in Lake of the Woods County	Individual Assistance in Minnesota	Individual Assistance in Lake of the Woods County
Severe Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides	06/11/2014 - 07/11/2014	07/21/2014 DR-4182	$40,844,210.87	Yes, Amount Unknown	None	None
Severe Storms And Flooding	03/16/2009 - 05/22/2009	04/09/2009 DR-1830	$29,675,993.97	Yes, Amount Unknown	None	None
Severe Storms, Flooding And Tornadoes	06/09/2002 - 06/28/2002	06/14/2002 DR-1419	$26,435,703.20	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Severe Winter Storms, Flooding, and Tornadoes	03/23/2001 - 07/03/2001	05/16/2001 DR-1370	$36,227,572.27	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Severe Flooding, High Winds, Severe Storms	03/21/1997 - 05/24/1997	04/08/1997 DR-1175	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Severe Winter Storms	1/3/1997 – 2/3/1997	1/16/1997 DR-1158	Yes, Amount Unknown	Yes, Amount Unknown	None	None
Flooding & Severe Storms	3/14/1996 – 6/17/1996	6/1/1996 DR-1116	Yes, Amount Unknown	Yes, Amount Unknown	None	None
Severe Storms & Flooding	4/30/1979	4/30/1979 DR-582	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Heavy Rains & Flooding	6/10/1974	6/10/1974 DR-440	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Heavy Rains & Flooding	7/22/1970	7/22/1970 DR-291	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Flooding	4/18/1969	4/18/1969 DR-255	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Flooding	3/22/1966	3/22/1966 DR-215	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown
Flooding	4/11/1965	4/11/1965 DR-188	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown	Yes, Amount Unknown

Source: Data downloaded from https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1 on 4/3/2019. Monetary values are estimates collected at the time of the disaster and were taken from https://www.fema.gov/disasters/state-tribal-government/0/MN on 7/17/2019.

Table 17. FEMA-Declared Emergencies in Lake of the Woods County (1957 – 2019)

Incident	Incident Period	Declaration Date and Disaster Number	Public Assistance (all affected areas)	Individual Assistance in Minnesota

Hurricane Katrina Evacuation	9/29/2005 – 10/1/2005	9/13/2005 EM-3242	None	None

Source: Data downloaded from https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1 on 4/3/2019. Monetary values are estimates collected at the time of the disaster and were taken from https://www.fema.gov/disasters/state-tribal-government/o/MN on 7/17/2019.

Lake of the Woods County has not been part of any State Disaster Declarations. 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.

The Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) Program, and Flood Mitigation Assistance (FMA) Program are FEMA-administered hazard mitigation assistance programs which provide funding for eligible mitigation planning, and projects which reduce disaster losses and protect life and property from future disaster damages (FEMA, 2018). Table 18 lists the projects in Lake of the Woods County funded by a hazard mitigation assistance program.

Table 18. Historical Hazard Mitigation Funding in Lake of the Woods County

Year	Project Description	Sub-Grantee	Funding Type	Federal Share
2010	Local Multi-hazard Mitigation Plan	Lake of the Woods County	PDM	$25,000
Total Funding – Lake of the Woods County				**$25,000**

Source: Data provided by MN HSEM in March 2019

4.2 Future Development

Because Lake of the Woods 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. Lake of the Woods 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.

Lake of the Woods County did note a slight increase in local development in the city of Baudette over the last five years that may increase vulnerability to severe weather or disaster events (see Section 4.1.2, Vulnerability Assessment by Jurisdiction).

The Lake of the Woods County Emergency Management Director will work to keep the jurisdictions covered by the Multi-Hazard Mitigation Plan engaged and informed during the plan's cycle. By keeping jurisdictional leaders involved in the monitoring, evaluation and update of the MHMP, they will keep their local governments aware of the hazards that face their communities and how to mitigate those hazards through planning and project implementation. Each jurisdiction has identified mitigation strategies they will seek to implement in their communities (see *Appendix G: Mitigation Actions by Jurisdiction*). Jurisdictions will include considerations for hazard mitigation in relation to future

development when updating local comprehensive plans or other plans that may influence development.

Section 6 of this plan further outlines the process by which Lake of the Woods 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 steering committee, are profiled separately as tornadoes, windstorms, lighting and hail.

4.3.1 Flooding

Flooding is the most significant and costly natural hazard in Minnesota. 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.

Flash floods generally occur in the upper parts of drainage basins and are typically 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, flash floods cause damage over relatively localized areas, but they can be quite severe. Flash floods in urban areas involve the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. 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 flash floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage.

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

Flood History in Lake of the Woods County

The NWS has documented five flooding and seven flash flooding episodes in Lake of the Woods County since 1996, when it began recording these types of events. The cumulative property damage estimate from these floods is $952,000. Below are brief descriptions of some of the notable floods. The complete list of these floods are in Table 19.

March 2009: The most recent flooding event to impact the county was due to two stretches of warmer than normal weather during the month of March, resulting in a fast snowmelt which flooded the Red River Valley and west central Minnesota. This was followed by two wet winter storms which added to the flooding of the rivers. Water covered many roads and resulted in numerous road closures. $5,000 of property damage was reported from this event.

June 9-10, 2002: Over eight inches of rain fell across the entire county, with some areas receiving 12-14 inches, causing flash flooding and washouts of County Roads 3, 65, and 66, and necessitating the closing of Highway 11 due to high water. The widespread damage resulted in a Presidential Disaster Declaration. Low lake levels allowed absorption of most of the runoff with minimal property damage. Even so, over 200 homes sustained flood damage, with an estimated total of $500,000 in property damage.

July 31, 2001: A storm hit Baudette and the southern sector dropped over five inches of rain, and three inches of that fell within a two-hour period. This storm caused flooding of streets, roads, and basements. Property damage in Baudette, Williams, and Graceton totaled $172,000.

Table 19. Lake of the Woods County Floods, 1996-March 2018

Type	Date	Location	Deaths	Injuries	Property Damage
Flood	3/25/2009	Williams	0	0	$5,000
Flood	4/1/2004	*no data*	0	0	*no data*
Flood	3/28/2004	*no data*	0	0	*no data*
Flash Flood	6/22/2002	Arnesen	0	0	*no data*
Flood	6/10/2002	*no data*	0	2	$500,000
Flash Flood	6/10/2002	Baudette	0	0	*no data*
Flash Flood	6/9/2002	Baudette	0	0	*no data*
Flash Flood	7/31/2001	Baudette	0	0	$10,000
"	"	Graceton	0	0	$150,000

Type	Date	Location	Deaths	Injuries	Property Damage
"	"	Williams	0	0	$10,000
"	"	Baudette	0	0	$2,000
Flash Flood	7/18/2001	Baudette	0	0	$10,000
"	"	Lude	0	0	$5,000
Flash Flood	7/17/2001	Carp	0	0	*no data*
Flood	7/1/2001	*no data*	0	0	$250,000
Flash Flood	5/17/1996	Baudette	0	0	$10,000

Source: (NOAA NCEI)

The USGS provides information from gauge locations at points along various rivers across the United States. There are four gauging stations located in Lake of the Woods County, however the Rainy River gauge near Wheeler's Point has been discontinued. Table 20 below shows data on the highest-recorded annual peaks. The two highest peaks for the last five years are included.

Table 20. Historical Peak Streamflow data (in feet) for USGS gauging stations.

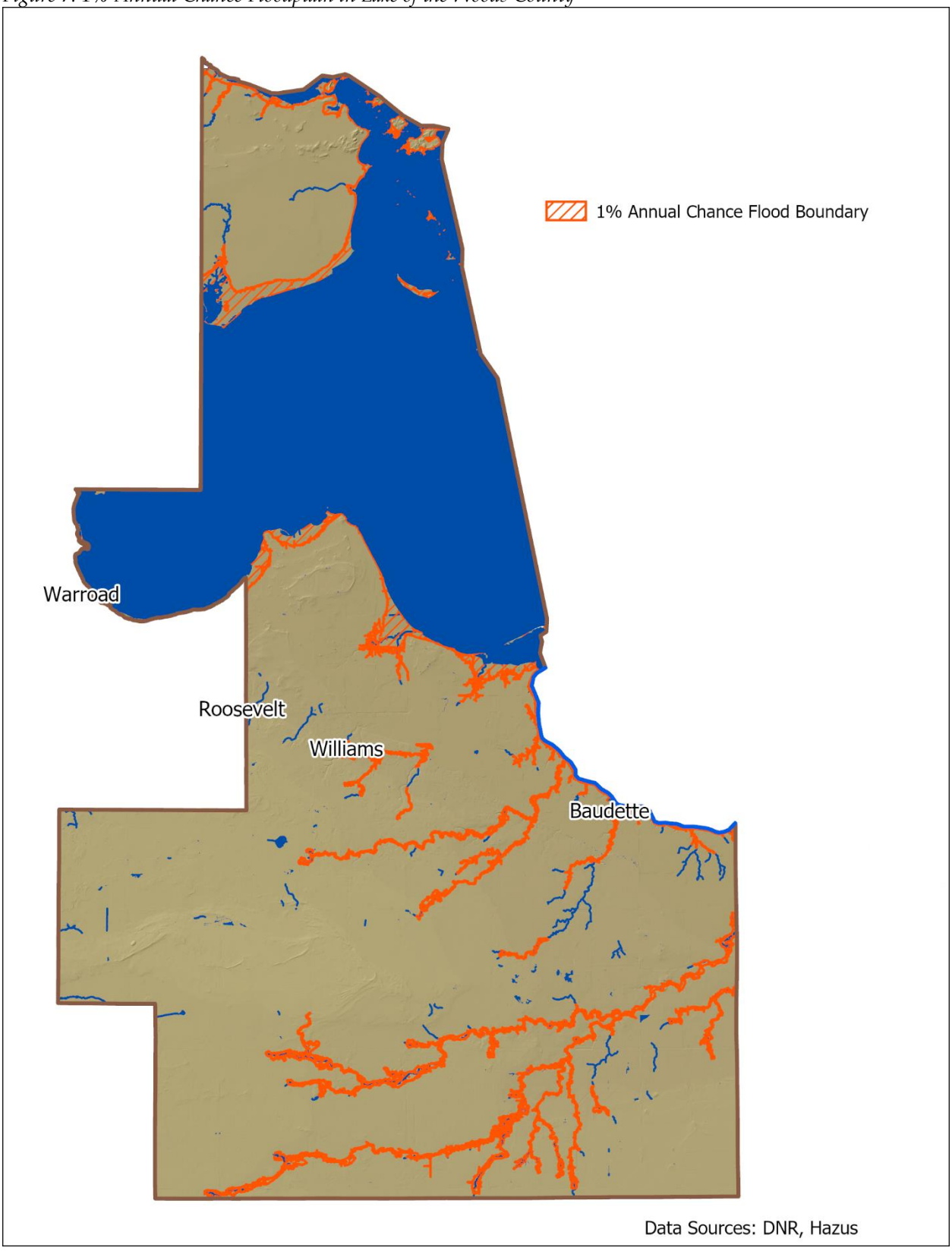
USGS 05134100 NORTH BRANCH RAPID RIVER NEAR BAUDETTE, Lake of the Woods County, MN 1996-2019		USGS 05134200 RAPID RIVER NEAR BAUDETTE, Lake of the Woods County MN 1950-2019		USGS 05137000 WINTER ROAD RIVER NEAR BAUDETTE, Lake of the Woods County, MN 1986-2019		USGS 05137500 RAINY RIVER NEAR BOAT LANDING AT WHEELERS POINT, Lake of the Woods County, MN 2014-2017	
Jun. 11, 2002	18.34	Jun. 26, 1985	22.78	Jun. 11, 2002	19.35	Jun. 18, 2014	8.09
Aug. 02, 2001	13.93	Apr. 26, 1979	21.13	Aug. 01, 2001	16.25	Jul. 11, 2016	5.76
May. 18, 1996	13.27	May. 11, 1950	21.10	May. 18, 1996	15.35	Jun. 24, 2015	5.72
Apr. 18, 2009	12.84	Apr. 14, 1969	21.50	Mar. 24, 2009	15.08	Apr. 05, 2017	4.50
Apr. 12, 2011	12.71	June 19, 1993	18.90	Mar. 31, 1986	14.30	(N/A)	
(8) Jul. 16, 2014	11.94	(22) Jul. 20, 2016	9.20	(7) Mar. 31, 2017	14.25	(N/A)	
(18) Jun. 14, 2017	9.76	(23) Jun. 8, 2015	8.90	(12) Jun. 19, 2016	12.21	(N/A)	

Source: United States Geological Survey

Vulnerability and Hazus Flood Risk Analysis

A potential risk and economic loss analysis for a 1% annual chance flood was performed using a FEMA tool, Hazus for ArcGIS. A Digital Flood Insurance Rate Map (DFIRM) defined the 1% annual chance flood boundary and a 10-meter Digital Elevation Model (DEM) was used to create a flood depth grid. The resulting Hazus 1% annual chance floodplain output is shown in Figure 7.

Figure 7. 1% Annual Chance Floodplain in Lake of the Woods County



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

Hazus reports the percent damage of each building in the floodplain, defined by the centroid of each building footprint. After formatting the tax and spatial data, 5,290 points were input to Hazus to represent buildings with a total estimated building plus contents value of $360,097,742. Approximately 68% of the buildings (and 55% of the building value) are associated with residential housing.

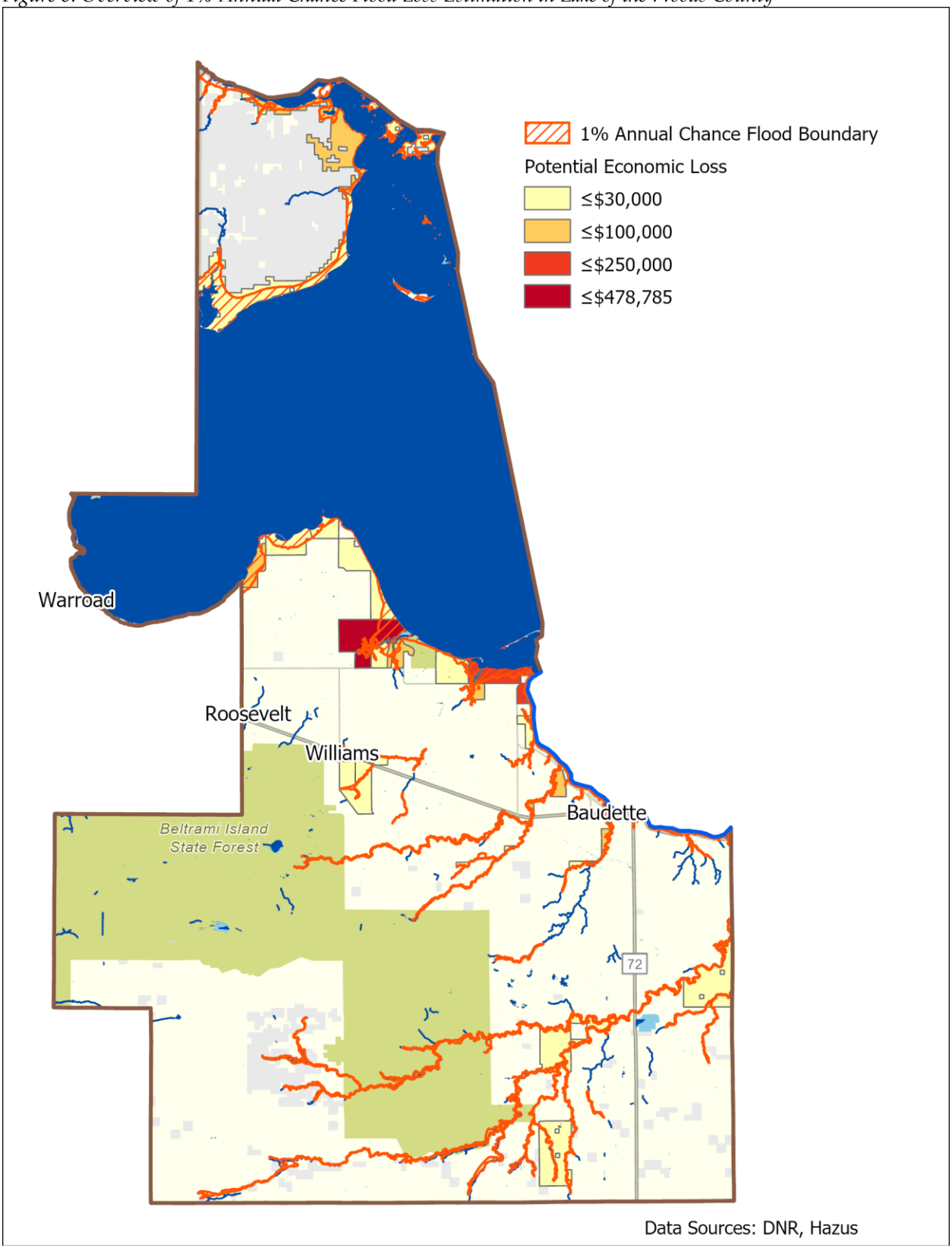
The estimated loss by occupancy class for the entire county is shown in Table 21.

Table 21. 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	3,580	$198,649,478	226	$16,541,212	207	$2,594,539
Commercial	366	$46,919,321	58	$10,761,922	51	$1,674,272
Other	1,344	$114,528,943	70	$13,249,650	41	$1,115,127
Totals	**5,290**	**$360,097,742**	**354**	**$40,552,784**	**299**	**$5,383,938**

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 8. Please note: It is possible for a building location to report no loss even if it is in the flood boundary. For example, if the water depth is minimal relative to 1st-floor height, there may be 0% damage.

Figure 8. Overview of 1% Annual Chance Flood Loss Estimation in Lake of the Woods County



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 3.8 and verified by Lake of the Woods 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, thereby negatively impacting the communities relying on these facilities' services. Fortunately, none of Lake of the Woods County's essential facilities included in the Hazus flood analysis are located within the 1% annual chance 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. None of Lake of the Woods County's critical infrastructure was determined to be in the 1% annual chance flood boundary using the available facility data.

Potential economic losses were estimated by Census County Subdivision. The city of Baudette was the only city with a significant estimated loss. All jurisdictions with buildings identified in the 1% annual chance flood zone are listed in Table 22.

Table 22. 1% Annual Chance Flood Building-Related Loss Estimates by Jurisdiction in Lake of the Woods County

Jurisdiction (county subdivision)	Count of Buildings in Floodplain	Estimated Building and Contents Loss*
Angle township	40	$1,116,364
Baudette city	1	$79,048
Baudette township	1	$86,733
Gudrid township	5	$155,673
Kiel township	1	$2,544
Lakewood township	14	$136,646
McDougald township	3	$14,758
Prosper township	1	$919
Rapid River township	2	$4,340
Spooner township	3	$137,239
Swiftwater township	4	$46,205
Victory township	2	$140,772
Wabanica township	6	$161,763
Walhalla township	3	$27,076
Wheeler township	96	$1,977,323
Zippel township	117	$1,296,528
Totals	**299**	**$5,383,938**

**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 community of Wheeler Township is mapped in Figure 9. The communities of Zippel Township and Angle Township are shown in Figure 10 and Figure 11**Error! Reference source not found.**. 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 9. 1% Annual Chance Flood Building-Related Loss Estimates, Wheeler Township

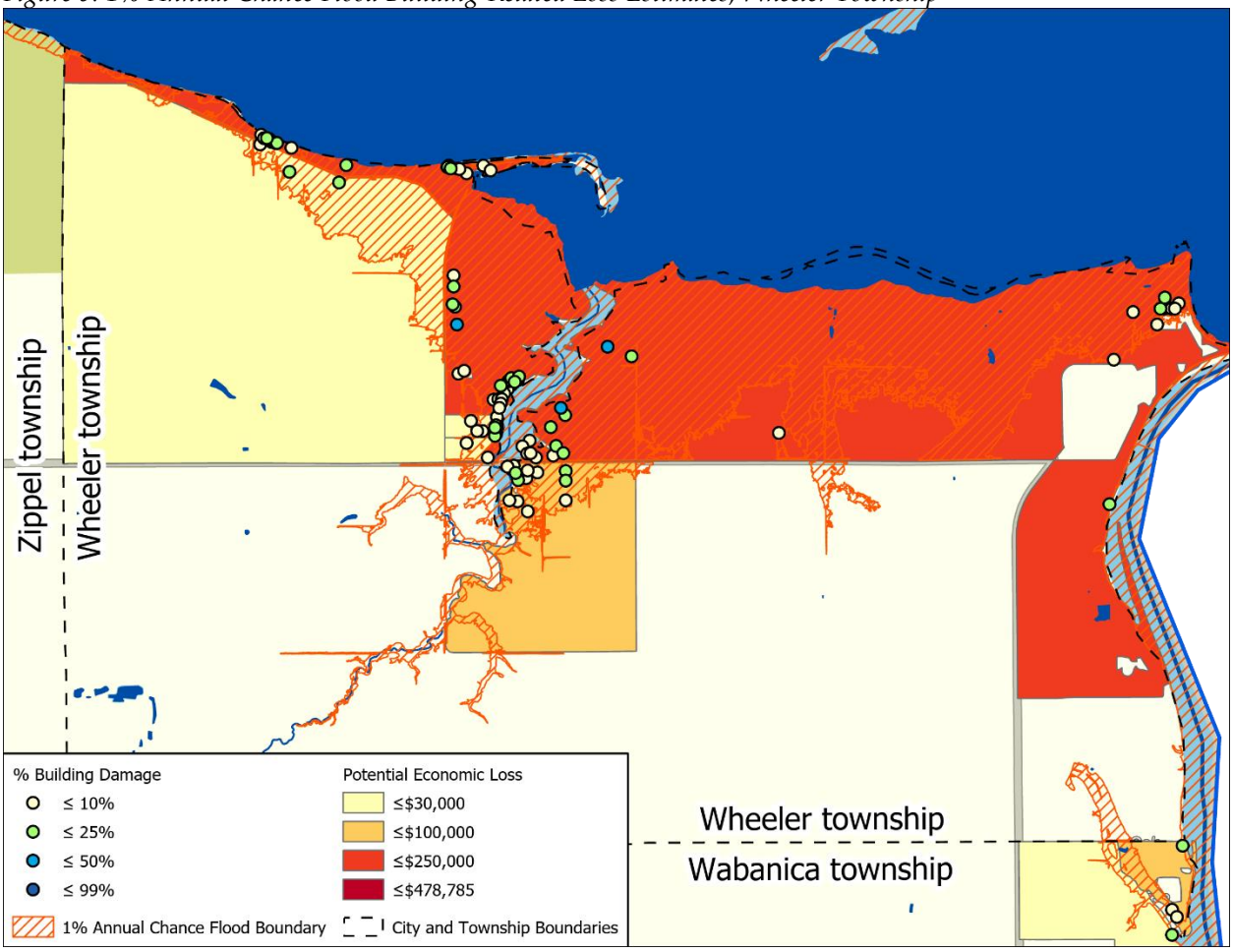


Figure 10. 1% Annual Chance Flood Building-Related Loss Estimates, Zippel Township

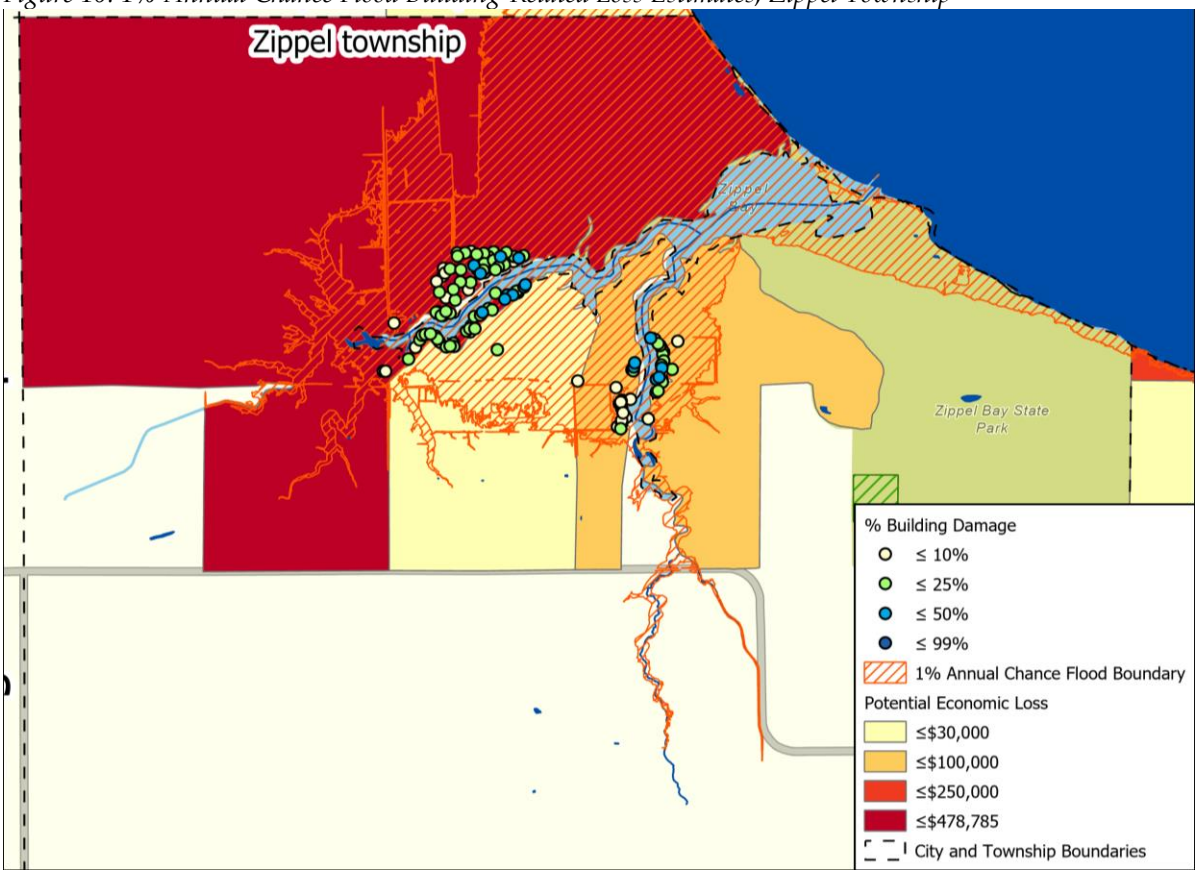
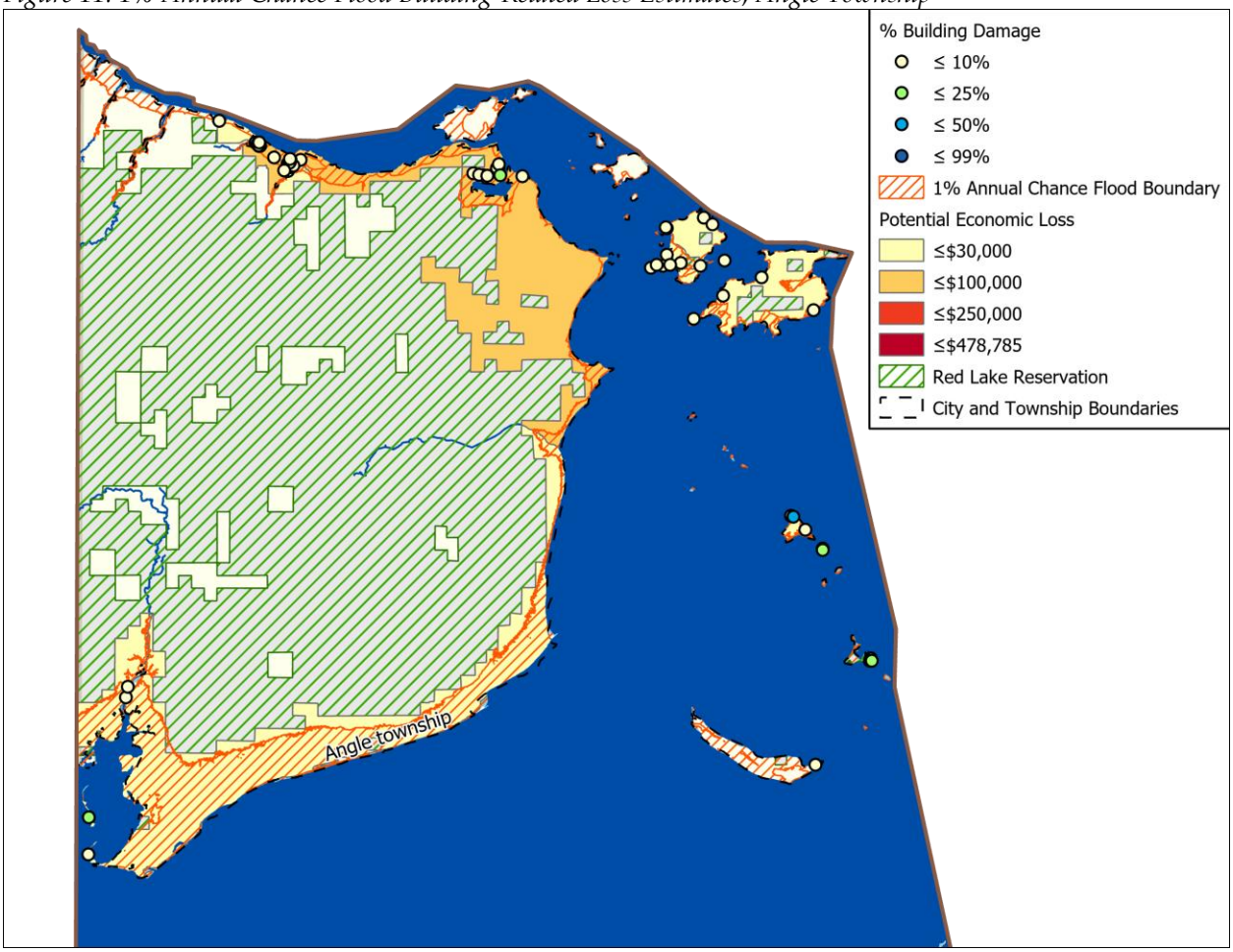


Figure 11. 1% Annual Chance Flood Building-Related Loss Estimates, Angle Township



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).*

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

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

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 M. , 2013). In 2007, 24 Minnesota counties received drought designation, while seven counties were declared flood disasters. In 2012, 55 Minnesota counties received federal drought designation at the same time 11 counties declared flood emergencies. In addition, the yearly frequency of the largest storms – those with three inches or more of rainfall in a single day – has more than doubled in just over 50 years. In the past decade, such dramatic rains have increased by more than 7% (MN Environmental Quality Board, 2014).

Southeastern Minnesota has experienced three 1000-year floods in the past decade: in September 2004, August 2007, and September 2010 (Meador, 2013). The 2004 flood occurred when parts of south-central Minnesota received over eight inches of precipitation. Faribault and Freeborn counties received over 10 inches in 36 hours. The deluge led to numerous reports of stream flooding, urban flooding, mudslides, and road closures (MN DNR, 2004). During the 2007 event, 15.10 inches fell in 24 hours in Houston County, the largest 24-hour rainfall total ever recorded by an official NWS 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).

4.3.2 Wildfires

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 ERS, 2019).

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 Lake of the Woods County

The Minnesota DNR responded to 753 wildfires in Lake of the Woods County from January of 1985 through June of 2019. 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 vast majority of these fires were caused by humans, with 39% caused by acts of arson. In total, the wildfires in Lake of the Woods County have burned over 20,000 acres of land (Minnesota DNR, 2019).

Some of the more devastating wildfire years in Lake of the Woods County have been thought to be due to warmer winters and springs with normal or slightly below normal precipitation (Lake of the Woods County, Baudette City, Williams City, 2007).

1987 holds the record for the most land burned by wildfires in a year (9,153 acres). April of that year was particularly destructive with 23 documented wildfires, including the largest single wildfire on record which burned over 3,400 acres (Minnesota DNR, 2019).

In 1990, Lake of the Woods County suffered from 50 wildfires, more wildfires than any other year-to-date. These wildfires burned nearly 1,000 acres of land (Minnesota DNR, 2019).

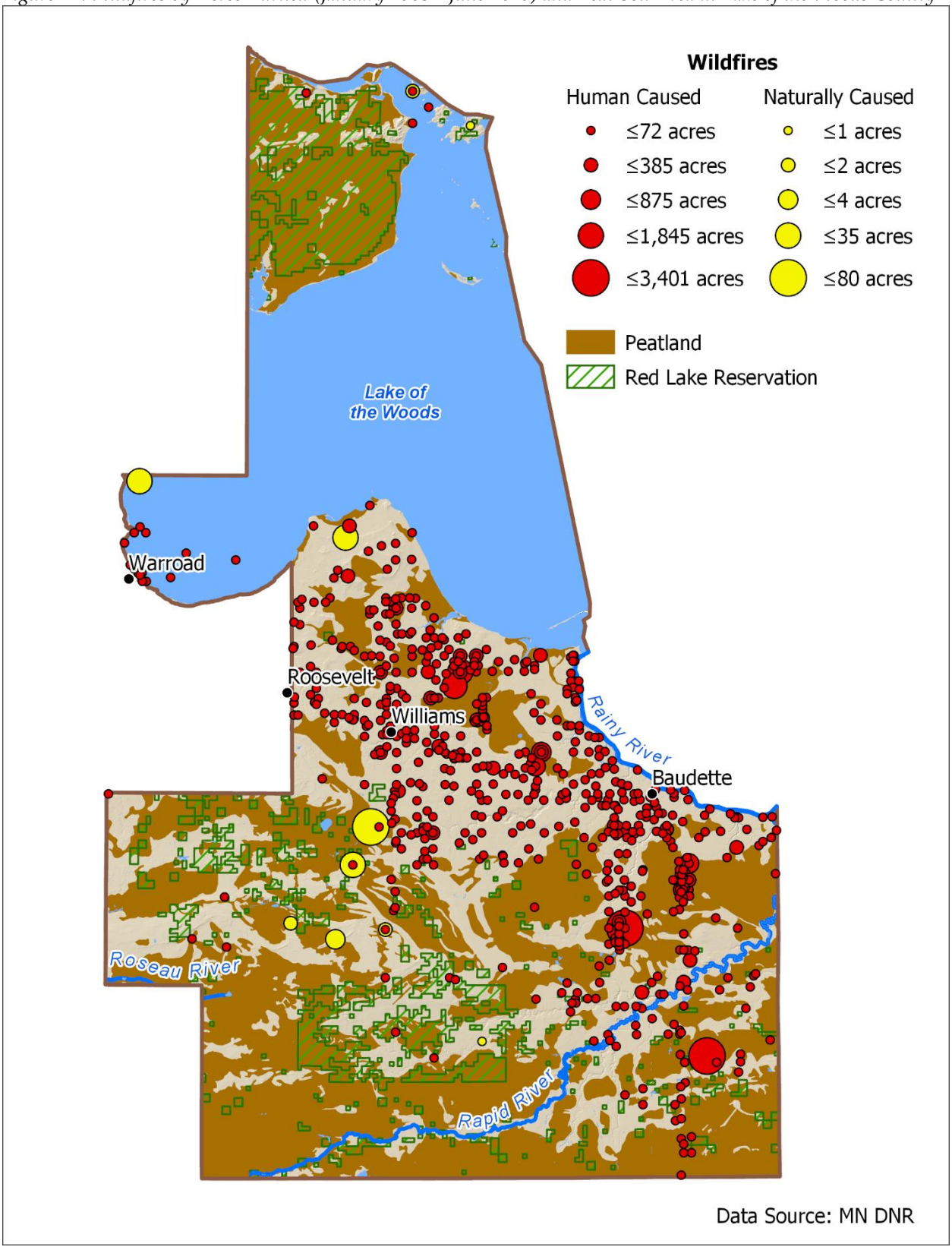
When examining wildfires it is important to consider the locations of peatlands as peat fires can burn for days, weeks, months, or even years - smoldering underground and re-immerging in another location, making them very difficult to extinguish (University of Leicester, 2019). Peat is partially decayed 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 (MN DNR, 2019). Peat fires can smolder during winter months beneath the snow, surfacing again in the spring to burn aboveground. 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.

According to MN DNR data, there are 454,229 acres of peat in Lake of the Woods County; fortunately, peat fires have not been an issue in the county.

The history of wildfires and locations of peatlands in Lake of the Woods County is mapped in Figure 12.

To determine the probability of future wildfires in Lake of the Woods County, records of previous wildfires in the county were summed and divided by the dataset's period of record, resulting in the annual relative frequency of wildfires in Lake of the Woods County. Based on Minnesota DNR records, the relative frequency of wildfire events in the county is 21.8 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Figure 12. Wildfires by Acres Burned (January 1985 - June 2019) and Peat Soil Area in Lake of the Woods 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

Wildfires jeopardize the built environment and health and wellbeing of individuals living near its fuel source. Some residents are more vulnerable to air quality conditions of wildfire, including children, older adults, and those with respiratory issues. The Household Composition & Disability SVI map (section 3.6.1) is made up of these population groups and should be reviewed to better understand the vulnerability of each jurisdiction.

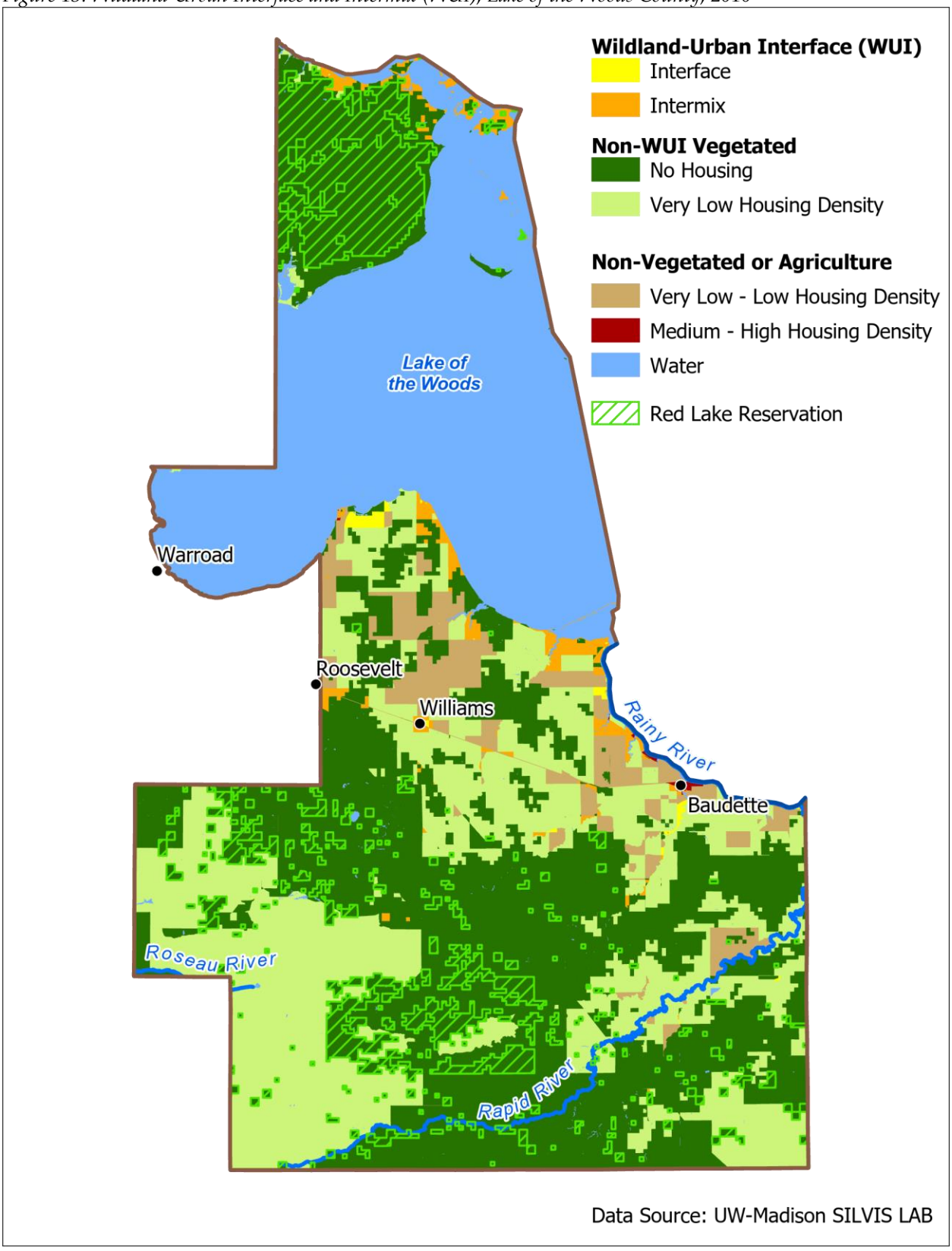
Structures located in areas near undeveloped wildland are also vulnerable to wildfires. The SILVIS Lab at University of Wisconsin – Madison created a dataset documenting the changes of the Wildland Urban Interface (WUI) in the Unites States from 1990 to 2010. Radeloff et al. (2018) define WUI as the area where structures and other human development meet or intermingle with wildland vegetation. With the increase of development in metropolitan fringes and rural areas, the WUI is growing. The expansion of the WUI in recent decades has significant implications for wildfire management and impact as it creates an environment in which fire can readily move between structural and vegetation fuels. Its expansion has increased the likelihood that wildfires will threaten structures and people (Radeloff, et al., 2018).

There are two main types of WUI: intermix and interface. Intermix WUI are areas where housing and wildland vegetation intermingle; interface WUI are areas where housing are adjacent to wildland vegetation (Radeloff, et al., 2018). Table 23 shows the change of total WUI (intermix and interface) in the county from 1990 to 2010, and the percent of the county's land, housing, and population located in the WUI area. Figure 13 displays a map of the WUI in Lake of the Woods County.

Table 23. Wildland-Urban Interface (WUI), Lake of the Woods County, 1990-2010

Units	Total WUI 1990	Total WUI 2000	Total WUI 2010	% Change (1990 - 2010)
Land Area	1.4%	1.5%	1.7%	21.4%
Housing	45.6%	46.4%	48.1%	5.5%
Population	26.5%	32.2%	31.6%	19.3%

Figure 13. Wildland-Urban Interface and Intermix (WUI), Lake of the Woods County, 2010



Lake of the Woods 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:

Dry Hydrants and Water Access – The NWACWPP identifies where improved water access (such as underground tanks and dry hydrants) is needed for fighting wildfire. These areas are rural and not supported by a municipal water source.

Public Awareness – Raising public awareness of wildfire safety and dangerous conditions is an ongoing effort of Lake of the Woods County Emergency Management, local fire departments, as well as MN DNR Forestry and the U.S. Forest Service.

Emergency Operations Center (EOC) – Lake of the Woods County Emergency Management needs a permanent established EOC location that is set up, furnished, ready to go and large enough for use.

4.3.3 Windstorms

A windstorm hazard is a wind strong enough to cause light damage to trees and buildings. Wind speeds during a windstorm typically exceed 34 miles per hour (29.5 knots). Wind damage can be caused by gusts or sustained winds (Pielke, 2012). Windstorms encompass a large variety of damaging wind types, including straight-line wind (thunderstorm wind not associated with rotation), downdraft (a small-scale column of air that rapidly sinks toward the ground), downburst (a strong downdraft with an outrush of damaging winds on or near the earth's surface), gustnado (small whirlwind originating from the ground and not connected to any cloud-based rotation), and a derecho (widespread, long-lived wind storm associated with a band of rapidly moving showers or thunderstorms) (NOAA National Severe Storms Laboratory, 2019). Tornadoes and hurricanes are categorized as separate hazards from windstorms.

The NWS (2016) classifies windstorm events using the following criteria:

- **Strong wind events** are "non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage" (p. 63).
- **High wind events** are "sustained non-convective winds of 35 knots (40 mph) or greater lasting for one hour or longer or gusts of 50 knots (58 mph) or greater for any duration" (p. 32).
- **Thunderstorm wind events** are "winds arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph) or winds of any speed … producing a fatality, injury, or damage" (p. 65). Downbursts and gustnadoes are classified as thunderstorm windstorm events.

When wind speeds are not able to be measured, they are estimated. Part of the process to determine wind speed is observing the damage. Table 24 lists the expected effects of increasing wind speeds.

Table 24. 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: (NWS, 2018)

Windstorm History in Lake of the Woods County

Lake of the Woods County experienced seven high wind and 60 thunderstorm wind events between 1955 and April of 2019, with wind speeds up to 91 knots (105 mph) (NOAA NCEI). Historically, the month of July has experienced the most frequent (and costly) windstorms. Notable windstorms include:

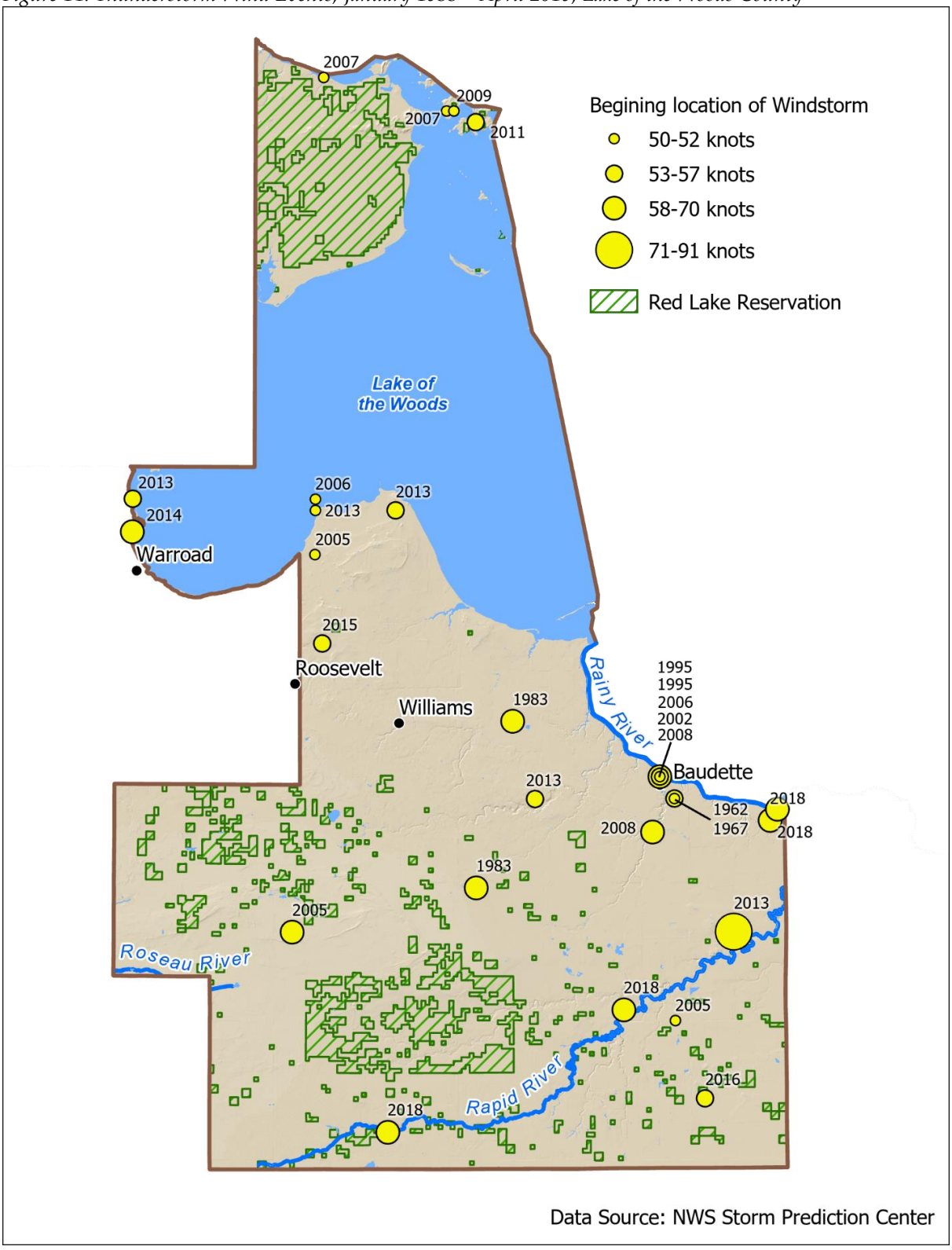
August 26, 2018: Thunderstorms moved across the central and northern portion of the Red River Valley and into northwest Minnesota. The thunderstorms produced damaging winds, reaching 70 knots in towns across Lake of the Woods County. Minnesota DNR aerial photos showed large areas of blowdown timber, stretching along a southwest to northeast diagonal from about 26 miles south of Williams, near the Beltrami County line, to this location southwest of Clementson. Hundreds of pine trees blew down in successive microbursts along the overall downburst path. Numerous trees were twisted and snapped at the Clementson resort (NOAA NCEI).

July 22, 2013: In Clementson, a microburst damage area was produced across the northeast quarter of section 30 in Rapid River Township. A 95-105 mph downburst hit the southwest corner of a farmstead and projected to the east and northeast across the farmyard. A steel pole shed was torn open and demolished with debris impacting and denting several steel grain bins along the east end of the yard. Several pine trees and two power poles in the yard were also snapped by the wind. The resulting damage was estimated at $500,000 – the highest recorded property damage from a windstorm event in Lake of the Woods County (NOAA NCEI).

July 18-31 2001: Four separate thunderstorm windstorms hit the towns of Carp, Lude, Baudette, and Pitt, causing $312,500 in property damage. The storms blew down trees, branches, and power lines. Several roofs were also heavily damaged (NOAA NCEI).

Thunderstorm Wind events, from 1955 – April 2019, in Lake of the Woods County, are shown in Figure 14.

Figure 14. Thunderstorm Wind Events, January 1955 – April 2019, Lake of the Woods County



To determine the probability of future windstorms in Lake of the Woods County, records of previous windstorm events (Strong Wind, High Wind, and Thunderstorm Wind) in the county were examined through April of 2019. Because the datasets have two different periods of record, separate relative frequencies were calculated. Thunderstorm wind events, which date back to January of 1955, have a relative frequency of .9 per year. The relative frequency of all windstorm events (strong wind and high wind, and thunderstorm wind) since January of 1996 is 2.2 per year. These relative frequencies can be used to infer 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).

Vulnerability

Vulnerability to injury from all kinds of windstorms decreases with adequate warnings, warning time, and sheltering in a reinforced structure. Vulnerability to structures depends upon construction of the building and infrastructure. Residents of mobile homes are more vulnerable to fatality or injury from windstorms because mobile homes are not able to withstand high winds as well as other structural dwellings. Wind in excess of 50 mph (43.4 knots) is the lower limit of wind speeds capable of damaging mobile homes (American Meteorological Society, 2004). Steps to mitigate these vulnerabilities have been taken but have not proven sufficient. For example, mobile home parks with 10 or more homes that received their primary license after March 1, 1998, are required to provide storm shelters that meet standards specified by the commissioner of administration (Minnesota Department of Health, 2018). However, mobile home parks often do not provide the required storm shelters. Building codes have also changed to improve the strength of new mobile home construction, but there are still many older mobile homes in use that do not meet these new standards.

According to NOAA's Storm Prediction Center, from 1985-2002, 49% of tornado fatalities in the United States were people who remained within or attempted to flee from mobile homes (American Meteorological Society, 2004). Given the vulnerability of mobile home residents to windstorm events, it is important to have a general understanding of where mobile homes are located. Figure A - 11 displays the locations and sizes of mobile home parks in Lake of the Woods County.

The likelihood of a windstorm event does not vary geographically in Lake of the Woods 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 4, citizens with social factors that make up the household composition and disability theme may be greatest around Baudette. As with all summer storms, those who work outdoors or do not have permanent housing are also at greater risk.

Lake of the Woods 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:

Warning Sirens – There are no outdoor warning sirens at the school, Northwest Angle (NWA) or local resort areas in Lake of the Woods County. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

Aboveground Power Lines – A majority of the power lines in the county are aboveground and subject to damage from severe 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 storm that takes out power.

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

Campground Shelters – Campgrounds have RV's and campers that are vulnerable to severe weather such as high winds and damaging hail and thunderstorms. Many campgrounds in Lake of the Woods County do not have any official storm shelters or safe rooms.

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

Radar – Weather radar by both the Grand Forks and Duluth Weather Service areas are not able to properly read weather conditions in Lake of the Woods County due to radar gaps and high levels of off the ground reading.

Emergency Operations Center (EOC) – Lake of the Woods County Emergency Management needs a permanent established EOC location that is set up, furnished, ready to go and large enough for use.

4.3.4 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 Lake of the Woods County

According to the NCEI Storm Events Database, 15 tornadoes have been reported in Lake of the Woods County since January 1950, three of which occurred since the county's last hazard mitigation plan (July of 2013).

The most recent tornado in the county occurred on July 17, 2019 when thunderstorms in the region produced several tornadoes, including an EF1 which began near Faunce and traveled east-northeast through the Beltrami Island State Forest for about 15 miles before ending south of Baudette. The tornado damage was limited to snapping trees. Peak winds were estimated at 105 mph (NOAA NCEI).

An EF1 tornado was spotted on June 19, 2016 near Faunce and blew down a swath of trees. Peak winds were estimated at 105 mph (NOAA NCEI).

On September 11, 2013, strong thunderstorms moved across the Lake of the Woods region producing an EF0 tornado near Williams. The tornado traveled a short distance before ending near Graceton. Peak winds from the tornado were estimated at 70 mph with damages limited to broken tree branches (NOAA NCEI).

Table 25 lists all the tornadoes which have occurred in the county and Figure 15 maps these tornados' touchdown points and paths.

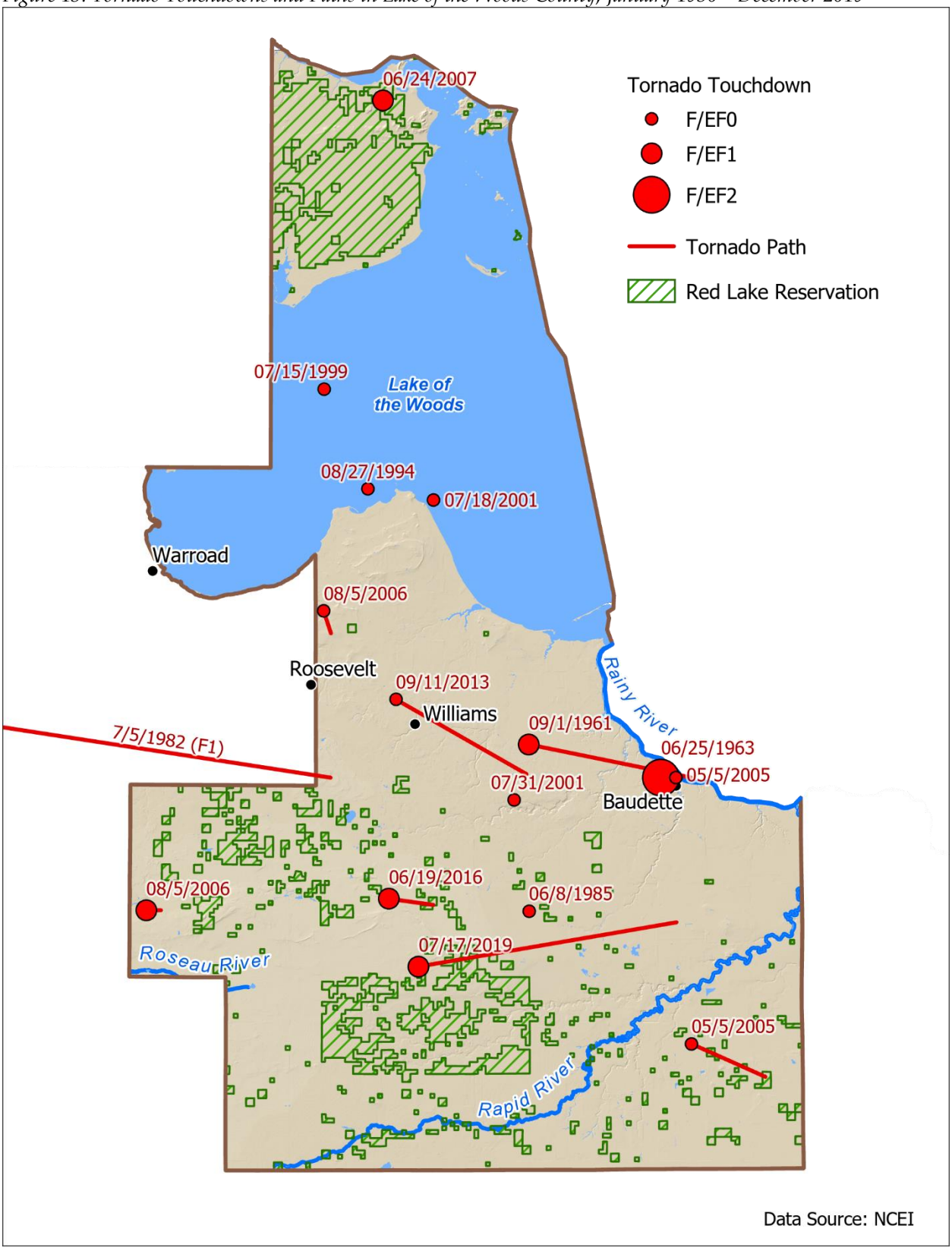
Table 25. Tornado Events in Lake of the Woods County, January 1950 – December 2019

Date	Begin/End Location	Magnitude	Deaths	Injuries
7/17/2019	Faunce/Baudette	EF1	0	1
6/19/2016	Faunce	EF1	0	0
9/11/2013	Williams/Graceton	EF0	0	0
6/24/2007	Arnesen	EF1	0	0
8/5/2006	Williams	F0	0	0
8/5/2006	Faunce	F1	0	0
6/23/2005	Angle Inlet/Oak Island	F1	0	0
5/5/2005	Baudette	F0	0	0
5/5/2005	Carp	F0	0	0
7/31/2001	Graceton	F0	0	0
7/18/2001	Lude	F0	0	0
7/15/1999	Lude	F0	0	0
6/8/1985	Lake of the Woods County	F0	0	0
6/25/1963	Lake of the Woods County	F2	0	0
9/1/1961	Lake of the Woods County	F1	0	1

Source: (NOAA NCEI)

To determine the probability of future tornadoes in Lake of the Woods County, records of previous tornado events in the county were summed and divided by the dataset's period of record, resulting in the annual relative frequency of tornadoes in Lake of the Woods County. Based on records in the NCEI Storm Events Database through December of 2019, the relative frequency of tornados in the county is .2 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Figure 15. Tornado Touchdowns and Paths in Lake of the Woods County, January 1950 – December 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 1 EF1 or greater tornadoes is decreasing. Thus, tornadoes are occurring on fewer days, but *more* are occurring on outbreak days.

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

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

Vulnerability

The likelihood of a tornado does not vary geographically within Lake of the Woods County; however, certain populations may be more vulnerable and less resilient to the impacts of a tornado. In general, tornado casualties decrease when people receive adequate warnings with sufficient time to seek shelter in a reinforced structure. Because communication is critical before a tornadic event, certain citizens may be more negatively impacted by a tornado, including those living in rural areas, individuals with limited mobility, people who do not live near an outdoor warning siren, or those who do not use social media.

People living in mobile home parks are also particularly vulnerable to tornadoes. While Minnesota law requires most mobile home parks to have storm shelters, many do not (Sepic, 2017). There are 14 mobile home parks in Lake of the Woods County (Figure A - 11). The majority of the parks are clustered northwest of Baudette City and a few are located along the shores of Lake of the Woods.

Some of the vulnerability factors mentioned above are included as social factors in the Housing and Transportation SVI map (Figure 4) and may provide general insight on where in the county the more vulnerable communities are located.

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

Warning Sirens – There are no outdoor warning sirens at the school, Northwest Angle (NWA) or local resort areas in Lake of the Woods County. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

Aboveground Power Lines – A majority of the power lines in the county are aboveground and subject to damage from severe 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 storm that takes out power.

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

Campground Shelters – Campgrounds have RV's and campers that are vulnerable to severe weather such as high winds and damaging hail and thunderstorms. Many campgrounds in Lake of the Woods County do not have any official storm shelters or safe rooms.

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

Radar – Weather radar by both the Grand Forks and Duluth Weather Service areas are not able to properly read weather conditions in Lake of the Woods County due to radar gaps and high levels of off the ground reading.

Emergency Operations Center (EOC) – Lake of the Woods County Emergency Management needs a permanent established EOC location that is set up, furnished, ready to go and large enough for use.

4.3.5 Hail

A hailstorm forms in severe thunderstorms and develops within an unstable air mass. Warm moist air rises rapidly into the upper atmosphere and subsequently cools, leading to the formation of ice crystals. These are bounced about by high velocity updraft (or strong) winds and accumulate into frozen droplets, falling as precipitation after developing enough weight (FEMA, 1997).

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, penny size is ¾-inch, quarter size is 1-inch, golf ball size is 1 ¾-inches, and baseball size is 2 ¾-inches (2015). 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.

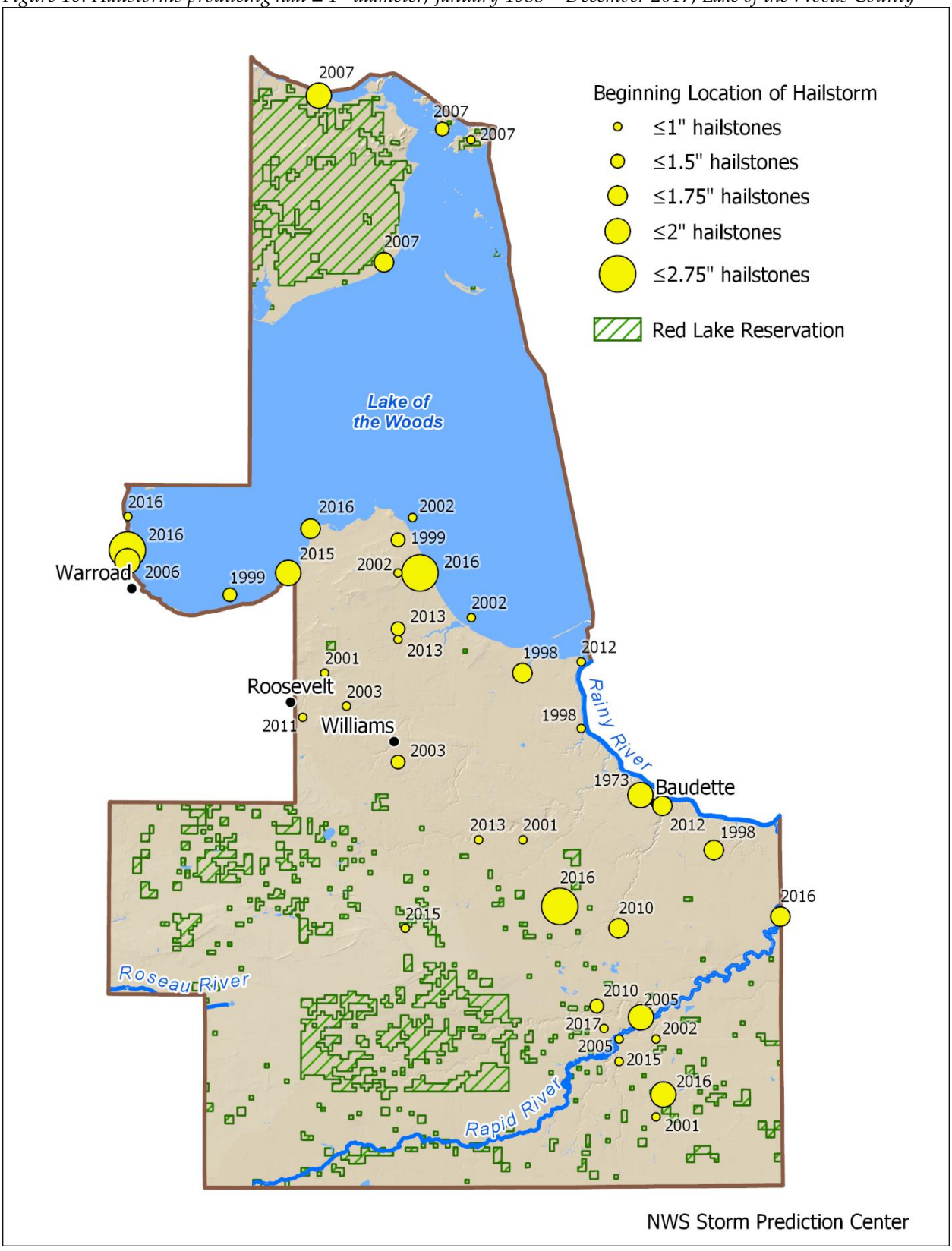
Although hailstorms rarely cause injury or loss of life, they do cause millions in property, livestock, and crop damage each year. Severe hailstorms cause considerable damage to buildings, automobiles, and airplanes. Significant property damage does not occur until hailstone size reaches about 1.5 inches in diameter. This size will cause damage to cars, windows, and siding. When hailstones get larger and approach three inches in diameter, roofs start to experience major damage.

Hail History in Lake of the Woods County

From January of 1955 through December of 2017, Lake of the Woods County experienced 98 hailstorms; 52 of these storms produced hailstones at least 1 inch in diameter. Although hailstorms can be costly, only one of the hailstorms resulted in property damage. This storm, which occurred in August of 1998, produced 1.75 inch diameter hailstones and caused $20,000 in damage to vehicles and awnings at the Sportsman Lodge in Baudette (NOAA NCEI).

Figure 16 shows the hailstorms in Lake of the Woods County which produced hailstones at least 1 inch in diameter.

Figure 16. Hailstorms producing hail ≥ 1" diameter, January 1955 – December 2017, Lake of the Woods County



To determine the probability of future hailstorms in Lake of the Woods County, records of previous hail events in the county were summed and divided by the dataset's period of record, resulting in the annual relative frequency of hailstorms. Based on records in the NCEI Storm Events Database through December of 2017, the relative frequency of hail events in the county is 1.6 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Vulnerability

The magnitude of hail-producing storms each year is unpredictable, and within Lake of the Woods County, the vulnerability of jurisdictions to summer storms does not vary geographically. The vulnerability of each jurisdiction to hail-producing storms has not changed due to any development in the last 5 years.

Hail and Climate Change

According to the U.S. Global Change Research Program 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 (USGCRP, 2014).

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

Program Gaps and Deficiencies

Warning Sirens – There are no outdoor warning sirens at the school, Northwest Angle (NWA) or local resort areas in Lake of the Woods County. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

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

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

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

Campground Shelters – Campgrounds have RV's and campers that are vulnerable to severe weather such as high winds and damaging hail and thunderstorms. Many campgrounds in Lake of the Woods County do not have any official storm shelters or safe rooms.

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

Radar – Weather radar by both the Grand Forks and Duluth Weather Service areas are not able to properly read weather conditions in Lake of the Woods County due to radar gaps and high levels of off the ground reading.

Emergency Operations Center (EOC) – Lake of the Woods County Emergency Management needs a permanent established EOC location that is set up, furnished, ready to go and large enough for use.

4.3.6 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, 2019).

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 Lake of the Woods County

A 27-year dataset revealed cloud-to-ground lightning strikes occur on average 3,160 times per year in Lake of the Woods County, or 1.8 strikes per square mile (NOAA NCEI).

Since 1996, the National Centers for Environmental Information's (NCEI) Storm Events Database has been keeping records of lightning events resulting in a fatality, injury, and/or damage (NWS, 2016). There are no records of such lightning strikes occurring in Lake of the Woods County.

The probability of future lightning events in the county was determined by examining the NCEI Storm Events Database for previously reported events. Because no lightning events have been reported, the relative frequency of these events is 0 per year. This relative frequency can be used to infer the probability of lightning events occurring in the county that result in a fatality, injury, and/or damage in the future is very low.

Vulnerability

The magnitude of summer storms with lightning each year is unpredictable and within Lake of the Woods 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.

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.

Program Gaps and Deficiencies

Warning Sirens – There are no outdoor warning sirens at the school, Northwest Angle (NWA) or local resort areas in Lake of the Woods County. Local radio and television stations do provide warnings but are only effective if tuned to one of the local stations. Warning sirens are an important communication tool in the event of dangerous high wind events.

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

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

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

Campground Shelters – Campgrounds have RV's and campers that are vulnerable to severe weather such as high winds and damaging hail and thunderstorms. Many campgrounds in Lake of the Woods County do not have any official storm shelters or safe rooms.

Storm Shelters / Community Safe Rooms – Additional storm shelter areas would enhance public safety. Construction or retrofit of facilities to serve as community safe rooms for severe wind events

should also be evaluated for areas where there are vulnerable populations, such as public campgrounds and resorts.

Radar – Weather radar by both the Grand Forks and Duluth Weather Service areas are not able to properly read weather conditions in Lake of the Woods County due to radar gaps and high levels of off the ground reading.

Emergency Operations Center (EOC) – Lake of the Woods County Emergency Management needs a permanent established EOC location that is set up, furnished, ready to go and large enough for use.

4.3.7 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 over dams and levees 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 Lake of the Woods County

None of the dams in Lake of the Woods County have ever failed. To determine the probability of future dam failures in Lake of the Woods County, records of previous dam failures and the period in which they occurred are examined, and the relative frequency of these events is calculated; however, because

there are no records of dam failures in the county, the relative frequency is 0 per year. This relative frequency can be used to infer that the probability of future dam failures in the county is very low.

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 26 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 26. 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)

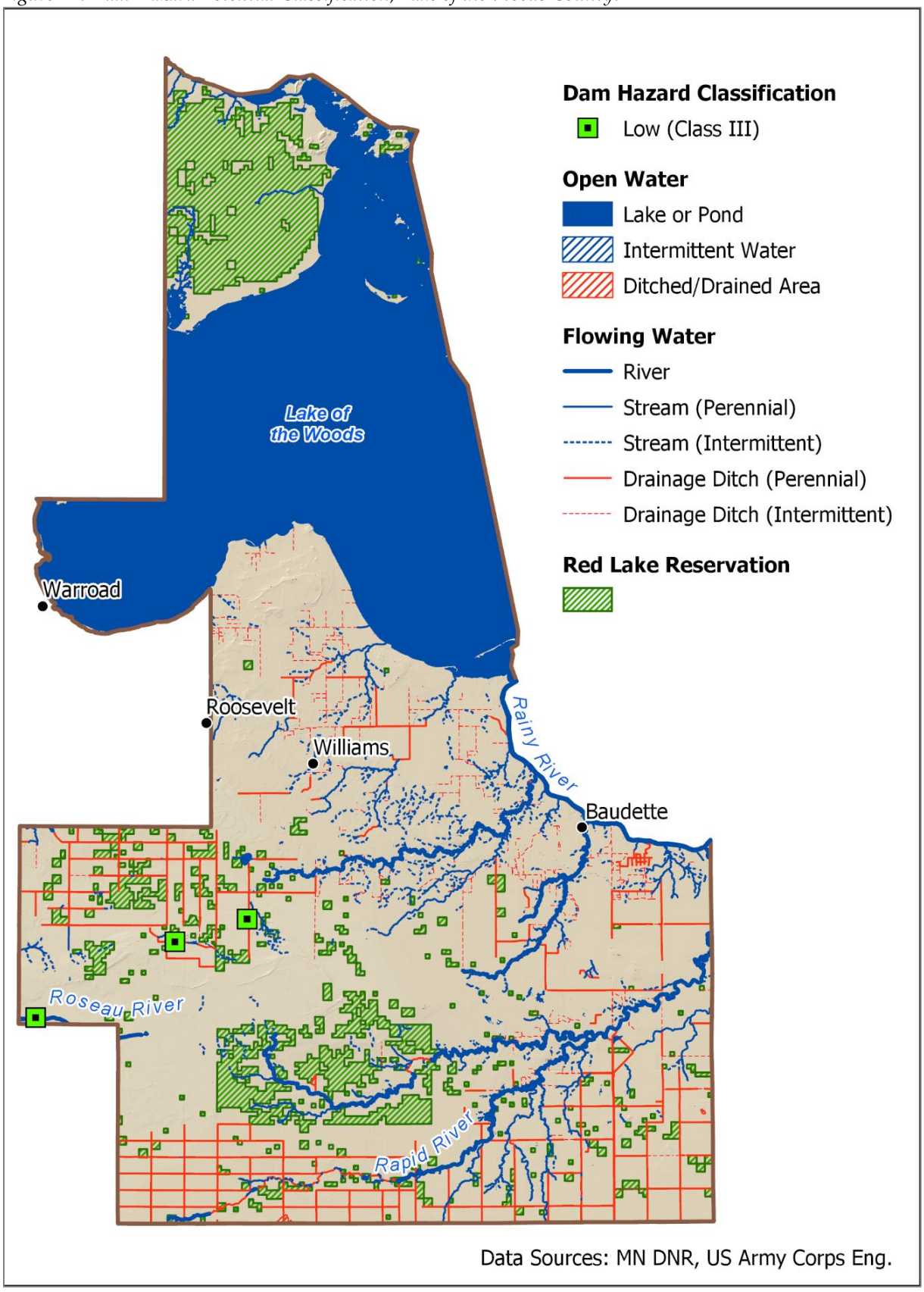
Minnesota's hazard classifications for dams are as follows:

- **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. (Minnesota Legislature, 2008)

Class I dam owners are required to have an Emergency Action Plans (EAP) on file, notifying individuals whose lives, property, or health may be endangered by failure, misoperation, 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".

All three dams in Lake of the Woods County have a hazard classification ranking of "Low" (Figure 17); none of the dams have an Emergency Action Plan (EAP).

Figure 17. Dam Hazard Potential Classification, Lake of the Woods County.

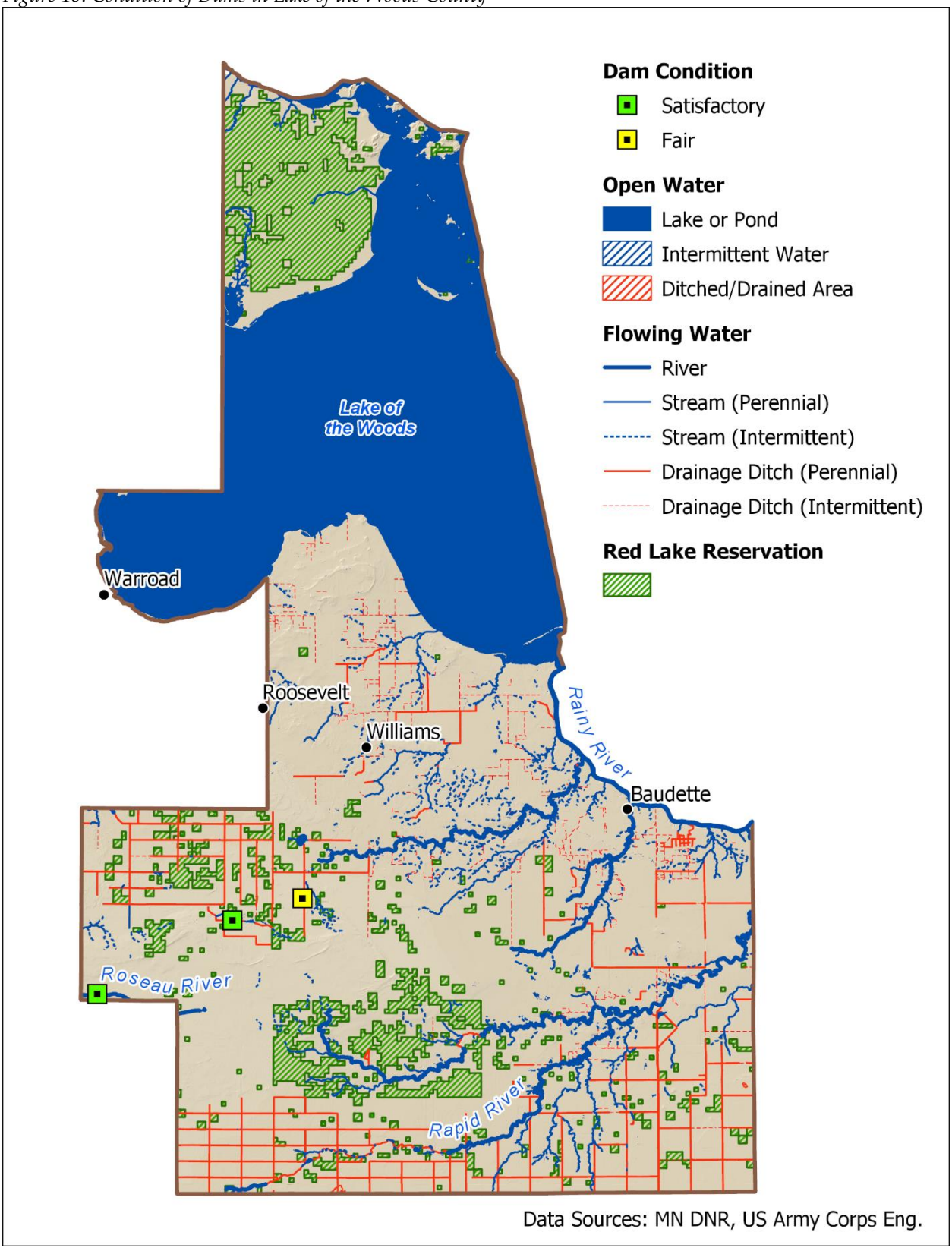


In addition to dams being classified by their hazard potential, the physical condition of dams are inspected and given a condition ranking. The condition of a dam is categorized into one of the following classifications:

- **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" conditions are more vulnerable to failure and pose a greater threat to the surrounding community and infrastructure. Fortunately, none of the dams in Lake of the Woods County have a condition ranking below "Fair".

Figure 18. Condition of Dams in Lake of the Woods County



Dam/Levee 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.

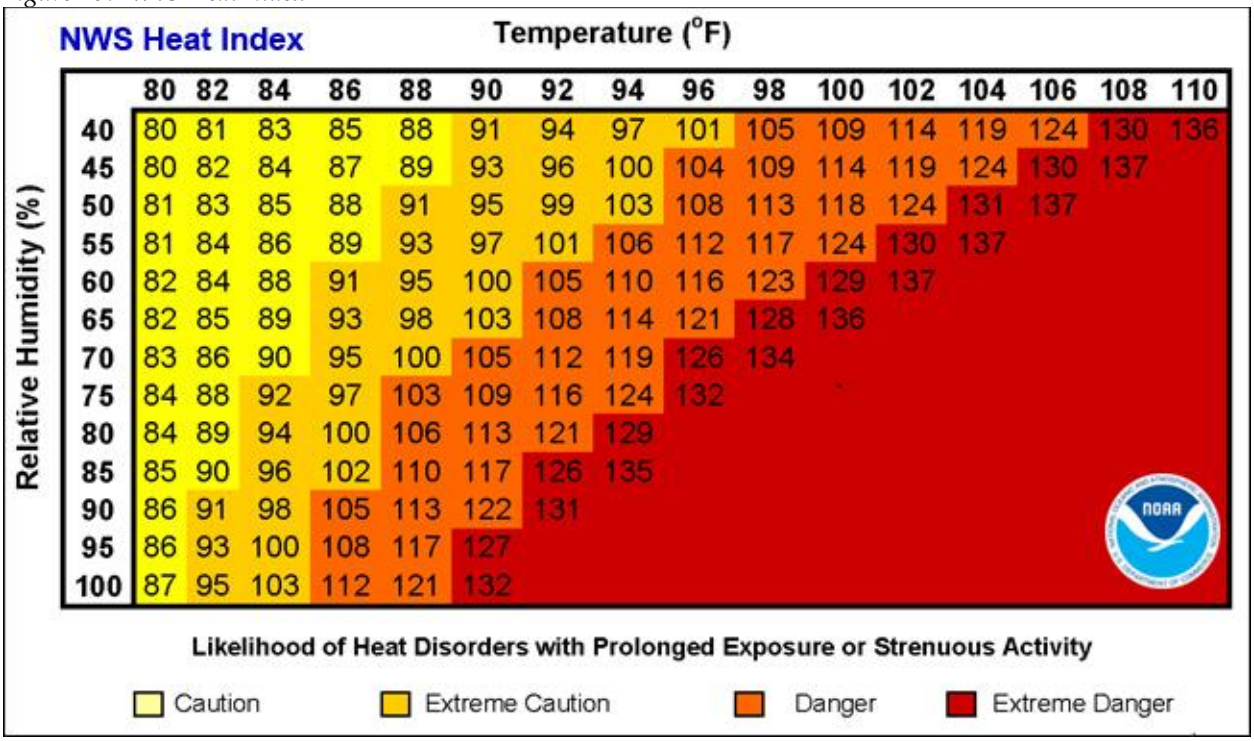
Program Gaps and Deficiencies

No program gaps or deficiencies have been identified.

4.3.8 Extreme Heat

Extreme summer 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 NWS Heat Index (Figure 19) is a measure of how hot the body feels when relative humidity is factored in with actual air temperature. The heat index values are for shady locations - exposure to direct sunlight may increase these values by up to 15°F. The NWS will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F for at least 2 consecutive days (2019).

Figure 19. NWS Heat Index



Source: (NWS, 2019)

Extreme heat events are linked to a range of illnesses, even death, and can exacerbate pre-existing chronic conditions (2013). Medical costs related to extreme heat can be enormous: in 2005 the total was $1.5 billion nationwide, or more than $16,000 per patient (Union of Concerned Scientists, 2009). Figure 20 describes the effects increasing levels of heat has on the body during prolonged exposure and/or physical activity.

Figure 20. 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: (NWS, 2019)

Extreme Heat History in Lake of the Woods County

Historically, extreme heat has not been an issue in Lake of the Woods County. July is the hottest month with a mean temperature of 67.3°F. Although extremely rare, triple-digit daily maximum temperatures have been reported from the Baudette weather station - eight times since December 1, 1908; with the record temperature reaching 103°F on July 13, 1936. The last time a weather station in the county recorded temperatures in the triple-digits was on August 7, 1983, when the Baudette weather station reported a high of 101°F (Midwestern Regional Climate Center, 2019).

The NWS reports on 'heat' and 'excessive heat' events. A 'heat' event results from a combination of above normal high temperatures and relative humidity, while an 'excessive heat' event is characterized by well above normal high temperatures and high humidity. These heat-related events are reported whenever heat index values meet or exceed locally/regionally established heat thresholds (2018). The National Centers for Environmental Information has only one record of a heat-related event impacting Lake of the Woods County. This event occurred on August 4, 2001, when heat indices rose to around 115°, with temperatures in the 90s and dew points in the 70s. No injuries or fatalities resulted from this event.

To determine the probability of future heat-related events in Lake of the Woods County, records of previous events were summed and divided by the dataset's period of record, resulting in the annual relative frequency of heat-related events in the county. Based on records in the NCEI Storm Events Database through April of 2019, the relative frequency of heat-related events in the county is .04 per year. This relative frequency can be used to infer the probability of these events occurring in the future is very low.

Vulnerability

Within Lake of the Woods County, the risk of extreme heat does not vary geographically other than possible minor urban heat island effects in built-up areas; however, the impact extreme heat has on individuals is not equal. According to the Center for Disease Control and Prevention (CDC), population groups more vulnerable to extreme heat include:

- Older adults (≥65 years old). The elderly are not able to easily adjust to sudden changes in temperature and more likely to have a chronic medical condition, or take medication affecting their body's ability to control its temperature.
- Infants and children. Young children and infants have limited control with their surroundings and rely on others to keep them cool and hydrated.
- Individuals with chronic health conditions. These individuals are less likely to respond to changes in temperature, may be taking a medication which exacerbates the effects of extreme heat, or have a condition which is a risk-factor for heat-related illness (e.g. heart disease, mental illness, poor blood circulation, and obesity).
- People with low income. These individuals may not be able to afford to properly cool their home and may face transportation challenges when trying to access cooling shelters.
- Athletes and people working outdoors. Both groups are likely to exert energy while being exposed to the heat (2019).

Many of the population groups vulnerable to extreme heat are included as social variables in the CDC's SVI data, specifically in the Socioeconomic Status, and Household Composition & Disability themes. These SVI maps, displayed in section 3.6.1, can be a reference to identify the census tracts within the county with residents who may be more susceptible to the risk of extreme heat.

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 ten warmest years occurred in the last 15 years. Projected increases are 2° F to 6° F more by 2050 and 5° F to 10° F by 2100 (MN Environmental Quality Board, 2014). The Midwest has experienced major heat waves and their frequency has increased over the last six decades (Perera, et al., 2012). For the U.S., mortality increases 4% during heat waves compared with non-heat wave days (Anderson & Bell, 2011). During July 2011, 132 million people across the U.S. were under a heat alert – and on July 20 the majority of the Midwest experienced temperatures in excess of 100° F. Heat stress is projected to increase as a result of climbing summer temperatures and humidity (Schoof, 2012). On July 19, 2011, Moorhead Minnesota set a new state record for the hottest heat index ever, at 134° F. That same day, Moorhead also recorded a new state record for the highest dew point at 88. It was the hottest, most humid spot on the planet that day (Douglas, 2011).

Recent statistics from NOAA show that there are more human fatalities each year due to heat waves than from floods, lightning, tornadoes and winter storms. Many cities have responded by creating Heat

Wave Response Plans to ensure that those in marginal health without air conditioning can obtain the relief and care they need, and the Minnesota Department of Health developed the Extreme Heat Toolkit to help educate at-risk populations on how to reduce risks associated with heat waves (Seeley M. , Minnesota Weather Almanac, 2015).

Program Gaps and Deficiencies

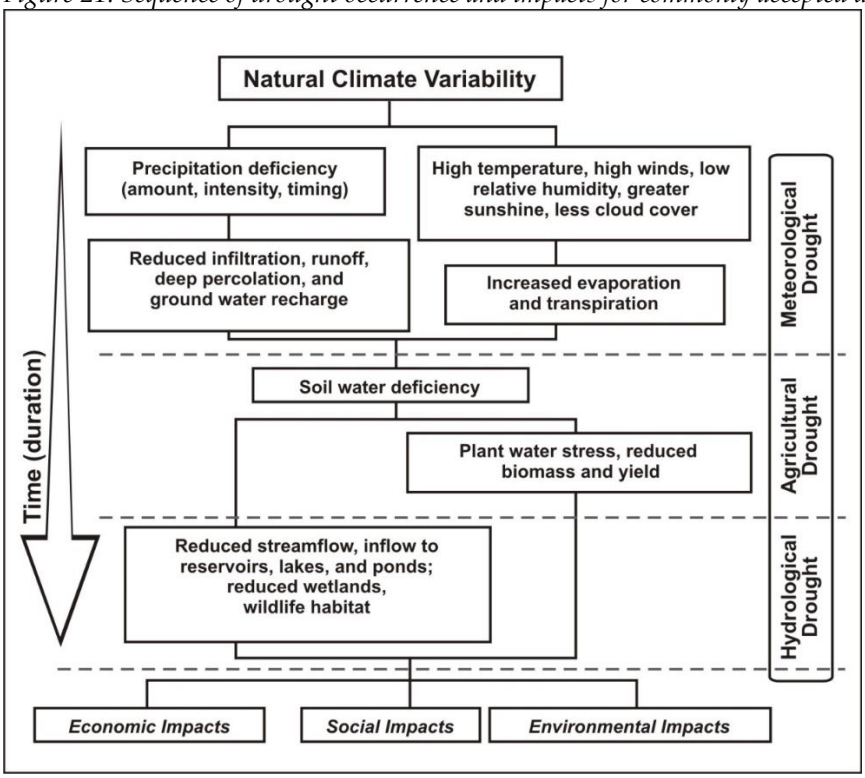
Mass Care Shelter Facilities – Lake of the Woods County Emergency Management is working with the Red Cross to get additional local shelters certified, and identify hotels that are willing to honor emergency shelter rates as an option for impacted residents.

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

4.3.9 Drought

Within the broad domain of natural hazards that comprise disaster science, drought is unequivocally the most difficult to define. This is primarily due to its insidious nature, and because the parameters that typically control it vary both spatially and temporally. For instance, the hydro-meteorological conditions that constitute drought in one location, may not necessarily qualify as drought in a contrasting climate. Even in regions that share a statistically similar climate, other factors such as soil type, antecedent moisture conditions, ground cover and topography all play a vital role in dictating drought emergence. To further complicate matters, drought is associated with a diverse number of climatic and hydrological stressors, which come with a unique set of collective impacts that affect nearly every corner of our economy and environment. Subsequently, there are over a hundred and fifty different definitions of drought, not just because it is difficult to define, but precisely on the grounds that drought affects different regions in different ways (Fu, Svoboda, & Tang, 2013). When one attempts to merge and understand these various definitions and impacts, it is evident that drought can be integrated into five principal categories. These include: meteorological, agricultural, hydrological, ecological and socio-economic drought (Figure 21).

Figure 21. 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 (The National Drought Mitigation Center, 2018). Figure 22 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 27 displays these drought categories along with the potential impacts at each level.

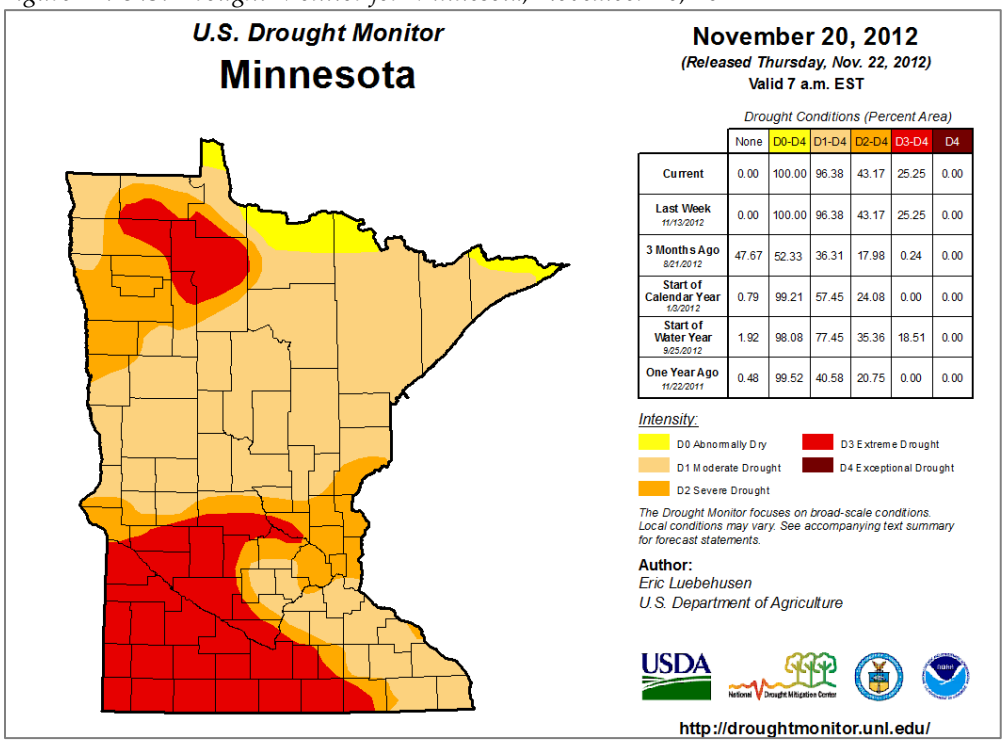
Table 27. USDM Drought Classification

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, 2019)

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 22. U.S. Drought Monitor for Minnesota, November 20, 2012



Source: (National Drought Mitigation Center, 2018)

Drought History in Lake of the Woods County

The NCEI Storm Events Database uses the US Drought Monitor's drought classification system as a guide to determine which droughts to include in the database; for locations east of the Rocky Mountains only drought events categorized as severe (D2) or higher are included (NWS, 2018). The Storm Events Database have recorded a total of 18 drought events in Lake of the Woods County. These drought events represent three main droughts which lasted multiple months; the longest lasting for 12 months, from July 2006-June 2007.

Beginning in May 2006, warmer than normal temperatures and lack of rain across northwest and west central Minnesota contributed to a D2 (severe drought) designation being issued for the region in July of that year. As drought conditions worsened through the month many of the counties' (including Lake of the Woods') classification changed to D3 (extreme drought) in late July. Lack of precipitation through the fall and winter season kept Lake of the Woods County in the extreme drought status for over eight months. Heavy snow in March 2007 provided enough precipitation for the county to downgrade the drought designation the following month to a D2 where it remained in severe drought status through June of that year.

The most recent drought stint in Lake of the Woods County lasted for four months. Beginning in July 2012, the lack of precipitation led to the county being in a severe drought (D2) status, and by September the drought in portions of the county were upgraded to extreme (D3). October rains brought much needed precipitation allowing portions of the county to downgrade the drought classification to severe (D2).

To determine the probability of future droughts in Lake of the Woods County, records of previous droughts in the county were summed and divided by the dataset's period of record, resulting in the annual relative frequency of droughts in the county. The USDM database was examined from January 2000 – July 2019 (1,021 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 relative frequency of the county experiencing drought conditions ≥ D1 is 15 weeks per year, and the relative frequency of drought conditions ≥ D2 is 5.3 weeks per year.

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

Table 28. Average Percent of Lake of the Woods County's Land Area by Drought Category

Timeframe	No Drought	DO	D1	D2	D3	D4
2009-2013	51.27%	25.56%	18.58%	2.87%	1.72%	0%
2014-2018	68.2%	20.09%	11.63%	.08%	0%	0%
% Change	+33.02%	-21.4%	-37.41%	-97.21%	-100%	0%

Vulnerability

Drought has impacted Lake of the Woods 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 examines the reports for drought-related impacts. The NDMC (2019) defines a drought impact as "An observable loss or change that occurred at a specific place and time because of drought." Drought impacts are categorized based on the sector(s) the drought impacts. A single drought impacting multiple sectors will be categorized into the respective sectors.

DIR records show 14 incidents of drought impacting at least one sector in Lake of the Woods County from 2005-2018. Table 29 lists the number of times a drought incident was reported for each sector.

Table 29. Reported Drought Impacts for Lake of the Woods County, 2005-2018

Sector	# of drought incidents reported
Agriculture	5
Business & Industry	0
Energy	0
Fire	5
Plants & Wildlife	2
Relief, Response & Restrictions	7
Society & Public Health	0
Tourism & Recreation	0
Water Supply & Quality	1

Source: (National Drought Mitigation Center)

Since droughts are regional in nature jurisdictions within Lake of the Woods County do not vary in their vulnerability to drought; however, certain jurisdictions may be more negatively impacted than others.

For example, droughts can contribute to poor air quality by increasing the risk of wildfires and creating a dustier than normal environment. Populations vulnerable to these conditions include children, older adults, and those with respiratory issues. The Household Composition & Disability SVI theme map (section 3.6.1) is made up of these population groups and should be reviewed to better understand the vulnerability of each jurisdiction.

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, Lake of the Woods County received $970,641 (2017 ADJ) in crop indemnity payments due to drought, which ranks in the 5th percentile of drought-related crop indemnity payments received by other counties in Minnesota (ASU Center for Emergency Management and Homeland Security, 2018).

Drought and Climate Change

Droughts have been happening throughout Minnesota's history and it is not yet clear how climate change may impact this (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).

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).

Across the nation, drought is affecting water supplies, as ground and surface water levels are increasingly reduced due to growing consumption and withdrawal. These trends are expected to continue, with a higher likelihood of water shortages (Georgakakos, et al., 2014).

In 2007, 24 Minnesota counties received drought designation, while 7 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).

In May of 2015, over 90% of Minnesota was undergoing severe or moderate drought, due to low snow levels during the 2014-2015 winter and dry spring weather, with precipitation deficits totaling 3-6 inches below average across much of the state since October 2014. Water levels on streams, lakes, and wetlands were below average, and wildfires were common during April of 2015. Blowing soil was also reported due to high winds and the dried-out landscape (MN DNR, 2015)

Program Gaps and Deficiencies

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

4.3.10 Winter Storms

Winter storms encompass a number of winter weather events which the NWS organizes into the following categories: blizzard, heavy snow, ice storm, lake-effect snow, sleet, winter storm, and winter weather. Lake-effect snow, sleet, and winter weather categories were not reported for Lake of the Woods County.

Blizzard

A blizzard is a winter storm which has the following conditions for at least three consecutive hours: (1) sustained winds or frequent gusts of 35 mph or greater and (2) falling and/or blowing snow which reduces visibility to less than ¼ mile (NWS, 2018). Blizzards are the most dramatic and destructive of all winter storms generally characterized as 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 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. In Minnesota, blizzards typically occur between October and April, with the majority occurring the months of January March, and November, respectively. Lake of the Woods County, along with all areas of Minnesota, is susceptible to blizzards.

Figure 23. Thanksgiving Weekend Blizzard, 2019

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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.

Heavy Snow

A heavy snow event is characterized as snow accumulation meeting or exceeding the local/regional defined 12 and/or 24-hour warning criteria. Depending on the area, this could mean 4-8 inches or more of snow in 12 hours or less, or 6-10 inches or more of snow in 24 hours or less. Heavy snow events may cause structural damage due to the weight of snow accumulation (NWS, 2018).

Ice Storm

An ice storm is characterized by a buildup of ice (typically ¼ - ½ inch or more) due to freezing rain or other type of precipitation; however, even small accumulations of ice on sidewalks, streets, and highways may create extremely hazards conditions to motorists and pedestrians (NWS, 2018). 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 electrical wires, telephone lines, and even trees, telephone poles, and communication towers. The NWS notes that over 85% of ice storm-related deaths are the result of traffic accidents.

Winter Storm & Winter Weather

A winter storm is an event that has more than one winter hazard (i.e. heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements (NWS, 2018).

Winter weather is a winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria. The winter weather classification is also used to document out-of-season occurrences of winter precipitation (NWS, 2018).

Winter Storms History in Lake of the Woods County

From January 1996 through September 2019, Lake of the Woods County reported 69 winter-related weather events, including 4 blizzards, 17 heavy snows, two ice storms, and 46 winter storm events. Nearly one third of these events occurred since the county's last hazard mitigation plan (July 2013). The following are narratives of the events which occurred since the county's last hazard mitigation plan. No deaths or injuries were reported from these events.

2019

- March 9 – 10 (Heavy Snow)

6 to 16 inches of heavy wet snow fell throughout northcentral Minnesota. Snowfall reports in Lake of the Woods County ranged from 6 to 8 inches (NCEI, 2019).

- February 24 (Blizzard)

Not much snow fell over eastern North Dakota or the northwest quarter of Minnesota, but strong northwest winds lasted for much of the day, which produced ground blizzard conditions in open country. Winds gusted up to 50 mph for many locations. The highest wind in the local area was at Baudette, Minnesota, with a 55 mph wind gust. The blizzard left dozens of anglers stranded on Lake of the Woods when winds quickly covered the lake's plowed access road (NCEI, 2019). These people were stranded on the lake until rescuers could reach them on Monday the 25th.

- February 23 (Heavy Snow)

Most of eastern North Dakota and the northwest quarter of Minnesota saw 2 to 6 inches of snow from this event. However, there was a stationary surface boundary that set up from near Aberdeen, South Dakota, northeast to just south of the Fargo-Moorhead area. Bands of steady snow kept rotating along this line, resulting in a fairly narrow band of 6 to 8 inches of snow from Oakes to Lisbon, North Dakota, to Sabin, Minnesota. Similar amounts were also reported in the Williams and Roosevelt areas near Lake of the Woods (NCEI, 2019).

- February 6 – 7 (Winter Storm)

From Wednesday, February 6th to Thursday, February 7th, the main surface low passed from the Southern Plains up to the Great Lakes. However, there was plenty of forcing to create areas of heavy snow over the Northern Plains as well. The snow fell in three distinct periods, but the heaviest snow fell on Wednesday in a narrow band. This band may only have been 10 miles wide, but within this band, from 6 to 10 inches of snow occurred. This narrow band fell from Litchville to just north of West Fargo in North Dakota, then from Georgetown to Ada to Fosston to the Lower Red Lake in Minnesota. Snowfall totals in Lake of the Woods County ranged from 4 to 6 inches (NCEI, 2019).

- February 3 – 4 (Heavy Snow)

Heavy snow fell across portions of eastern North Dakota and northwest Minnesota from Sunday, February 3rd, to Monday, February 4th. At the surface, an inverted trough extended back into northwest Minnesota, helping to enhance the snowfall in that area (NCEI, 2019). The Baudette and Camp Norris DNR weather stations reported 8 and 4.5 inches of snowfall respectively (MRCC, 2019).

2018

- December 26 – 27 (Heavy Snow)

Over a two day period a strong winter storm moved through the Northern Plains and brought heavy snow, strong winds, and blizzard conditions to much of the Red River Valley (Grand Forks NWS, 2018). Central Minnesota saw the highest amounts of snowfall, with 13 inches reported in Battle Lake and Sebeka. Lake of the Woods County did not have reports of snowfall until the 27th when 4 inches fell at the Camp Norris DNR weather station (MRCC, 2019).

2017

- December 4 (Winter Storm)

Surface low pressure began to organize over the Colorado/Wyoming area on the evening of December 3rd. Surface winds over eastern North Dakota and the northwest quarter of Minnesota were from the east, and temperatures and dew points remained fairly mild. At midnight, temperatures for most of the area held in the 30s with dew points in the mid to upper 20s. This moist and mild air led to some of the precipitation starting out as rain and/or freezing rain on Monday morning the 4th. The precipitation would eventually change over to snow, with the most falling from Mayville, ND, up towards the Lake of the Woods region of Minnesota. In this area, roughly 6 to 11 inches of snow fell. Roosevelt, Minnesota, reported the 11 inches of snow (NCEI, 2019).

- October 26 – 27 (Winter Storm)

As an area of surface low pressure tracked into the Grand Forks, North Dakota, area just after midnight on Thursday, October 26th, temperatures in the Lake of the Woods region were still in the low 40s. Therefore, the light precipitation that fell there still fell as rain. By sunrise, the low had only moved to near Crookston, Minnesota, and temperatures in the Lake of the Woods region were still in the low 40s. As the low tracked to near Bemidji by mid morning, temperatures in the Lake of the Woods region quickly dropped around or below freezing, switching the precipitation over to snow. Persistent snow lingered in the Lake of the Woods region through much of the day. 6 to 8 inches of snow fell in the Lake of the Woods region along with gusty north winds (NCEI, 2019).

- January 2 – 3 (Winter Storm)

Surface low pressure moved from southwest Minnesota on the evening of Monday January 2nd to near Bemidji by the early morning hours of Tuesday January 3rd. This brought a period of steady snowfall to most of eastern North Dakota and portions of the northwest quarter of Minnesota. Many locations in this area saw 8 to 12 inches of snow, however, some spots around the Lake of the Woods region did pick up around 18 inches of snow. As the low pushed off to the east, northwest winds were rather gusty into the day on January 3rd. This resulted in periods of reduced visibility due to blowing and drifting snow. Many schools were closed for both days (NCEI, 2019).

2016

- December 25 – 26 (Winter Storm)

Very light freezing drizzle fell across southeast North Dakota and west central Minnesota during the early morning hours of the 25th, producing slick roads in spots. As a strong low pressure system moved out of Colorado and tracked to the north-northeast, temperatures rose from just below freezing to just above freezing across southeast North Dakota and west central and northwest Minnesota. This resulted in periods of rain, freezing rain, and/or sleet for these areas through the afternoon of the 25th into the early morning hours of the 26th (NCEI, 2019). Wind speeds up to 38mph were reported in Baudette. Snowfall totals in Lake of the Woods County ranged from 2 to 4.5 inches (Grand Forks NWS, 2019)

- December 5 – 6 (Winter Storm)

A hybrid-type surface low strengthened over east central South Dakota, then lifted north-northeast into the northwest corner of Minnesota by the morning of December 6th. As the low lifted north-northeast, a band of heavy snow formed over south central North Dakota and lifted northeast toward Jamestown, then Grand Forks, and on into northwest Minnesota. This band of snow produced one to two inch per hour snowfall rates. A good portion of the East Grand Forks to Roseau corridor picked up 8 to 12 inches of snow (NCEI, 2019).

- March 16 – 17 (Heavy Snow)

A snowstorm producing heavy snow fell across northwest Minnesota and moved into eastern North Dakota. 12 inches of snow was reported 5 miles southwest of Baudette, while 10 inches was reported near Williams and the Angle Inlet (Grand Forks NWS, 2019).

- February 23 (Heavy Snow)

A short-lived snowstorm dropped heavy amounts of snow in a short time. Lake of the Woods County received the highest amounts of snowfall, measuring from 3 inches in Baudette to 6.5 inches near Warroad (Grand Forks NWS, 2019).

2015

- December 16 (Winter Storm)

A Colorado Low moved into the central plains during the early evening of the 15th, then tracked northeast to near Duluth, Minnesota, by the afternoon of the 16th. Snow moved into the southern Red River Valley on the evening of the 15th, then expanded northward overnight. The most snow, around a foot, fell in a narrower band from Jamestown to Michigan to Cavalier, in North Dakota. Outside this band, a broader four to six inches of snow fell along with breezy winds and a little mixed precipitation. Snowfall reports in Lake of the Woods County ranged from 3 to 4.3 inches (Grand Forks NWS, 2019).

- January 2 – 3 (Heavy Snow)

Surface low pressure tracked from eastern Montana on the evening of January 2nd, into northeast South Dakota by the morning of January 3rd. This spread a swath of heavier snow from northeast North Dakota into northwest Minnesota, where four to ten inches of snow were reported north of the U. S. Highway 2 corridor (NCEI, 2019). The Baudette and Camp Norris DNR weather stations in Lake of the Woods County reported 10 and 7.5 inches of snowfall respectively (MRCC, 2019).

2014

- March 31 - April 1 (Winter Storm)

An area of surface low pressure intensified as it moved into southeast South Dakota on the morning of the 31st. This resulted in gusty north to northeast winds of 25 to 35 mph and heavy amounts of snow in some areas. The most snow, 12 to 20 inches, fell across Roseau, Lake of the Woods, eastern Marshall, and far northern Beltrami counties (NCEI, 2019).

- March 21 (Winter Storm)

A swath of three to eight inches of snow fell across northwest Minnesota during the morning hours. Gusty north to northeast winds at 30 to 40 mph combined with the snow to produce blowing snow and reduced visibilities (NCEI, 2019).

2013

- December 3 – 5 (Winter Storm)

1 to 9 inches of light snow fell across portions of northwest and west central Minnesota on December 2nd and 3rd, a second round of snow fell on the 3rd through the 4th, bringing about 5 to 14 inches of snow to the area (NCEI, 2019). Lake of the Woods County saw the heaviest snowfall on the 5th, where 6 inches fell in Baudette and 10 inches at the Camp Norris DNR weather station. In total, Baudette received 12 inches of snowfall from the storm (MRCC, 2019).

To determine the probability of future winter-related storm events in Lake of the Wood County, records of previous events (blizzard, heavy snow, ice storm, and winter storm) in the county 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 September of 2019, the relative frequency of winter-related storm events in the county is 2.9 per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Vulnerability

Winter storms affect Lake of the Woods County each year. While the amount of snow and ice, and type or frequency of winter weather events varies each year, it is highly likely the county and its jurisdictions will continue being impacted by winter storms on an annual basis. Vulnerability from a winter storm does not vary geographically within the county; however, certain populations are at a greater risk of their health being negatively impacted by the low temperatures, including people who work outdoors, live in older/poorly insulated homes, rely on public transportation, live alone, or are socially isolated (Jones & Mays, 2016). The SVI maps (Figure 4) can be used as a general reference to identify where some of these vulnerable population groups are concentrated within the county.

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.

Winter Storms and Climate Change

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

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).

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).

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).

Program Gaps and Deficiencies

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 Lake of the Woods County residents are signed up for our CodeRED system or have NOAA weather radios. Many people also do not use social media to follow our Facebook page to

receive important messages. Gaps in ARMER towers and cell phone coverage exist in some parts of the county.

Radar – Weather radar by both the Grand Forks and Duluth Weather Service areas are not able to properly read weather conditions in Lake of the Woods County due to radar gaps and high levels of off the ground reading.

Emergency Operations Center (EOC) – Lake of the Woods County Emergency Management needs a permanent established EOC location that is set up, furnished, ready to go and large enough for use.

4.3.11 Soil Erosion/Landslides

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 (Seeley M. , Minnesota Weather Almanac, 2015).

Soil Erosion/Landslides History in Lake of the Woods County

According to the Lake of the Woods County's Local Water Management Plan:

> *Erosion and sedimentation in ditches, watercourses, and wetlands has been a major concern for Lake of the Woods County. The county has an extremely flat landscape that was ditched extensively in the early 1900's for agricultural production. Many of the ditch systems within the county have had little or no maintenance or Best Management Practices installed. Only two ditches in the county assess benefits. In the Rapid River Watershed, historical straightening of the river and several abandoned ditches contribute to increased flashiness of the watershed resulting in increased erosion of streambanks.*
>
> *[I]n 2002 and 2014, major flood events eroded ditches, drainages, and shoreline while depositing sediment in watercourses, impeding both drainage and navigability of waterways. Many of the*

> *resorts located on tributaries to Lake of the Woods continually dredge to gain access to the channel.*
>
> *Lake of the Woods is a reservoir. Dams in International Falls and Kenora control the inflow and outflow of water. Since 1916 the lake has been controlled at approximately 3 to 2.5 feet higher than natural levels. Rainfall events, spring runoff, and controlled higher water levels may significantly impact the erosion on lakeshore. The southern shore of Lake of the Woods including Pine and Curry Islands has endured extensive erosion and loss of shoreline.* (Lake of the Woods Soil & Water Conservation District, 2015)

There is not much publicly available data on the specific locations of erosion events in the county; however, the Minnesota Board of Water and Soil Resources (BWSR) maintains a dataset of the locations of installed Best Management Practices (BMPs) in the county, which provides insight to the erosion issues at these locations. According to these data, 60 BMPs related to water erosion have been installed throughout Lake of the Woods County since 2004. 65% of these BMPs are projects to stabilize and protect stream banks and shorelines.

To determine the probability of future landslides in Lake of the Woods County, records of previous landslides in the county and the period in which they occurred are examined, and the relative frequency of these events is calculated; however, because there are no records of landslides in the county, the relative frequency is 0 per year. This relative frequency can be used to infer that the probability of future landslides in the county is very low.

Soil Erosion/Landslides Vulnerability

Human life and safety, structures, and infrastructure are all vulnerable to landslides. Slope failure and erosion along streambanks and lakeshores put structures and properties at risk. Though the BWSR is responsible for managing programs that help conserve, protect, and restore soil and surface water, protection of those resources ultimately reduces property and structures threatened by flooding and erosion. The vast majority of the BMPs implemented in the county are located on properties with residential and agricultural structures. The largest cluster of these BMPs is in the 5-A Unorganized Territory (22 BMPs), where nearly all of the BMPs are installed along the shoreline of Lake of the Woods. The Gudrid Unorganized Territory contains the second most BMPs in the county (10 BMPs) with the majority located near the Rainy River.

Soil Erosion/Landslides 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).

Program Gaps and Deficiencies

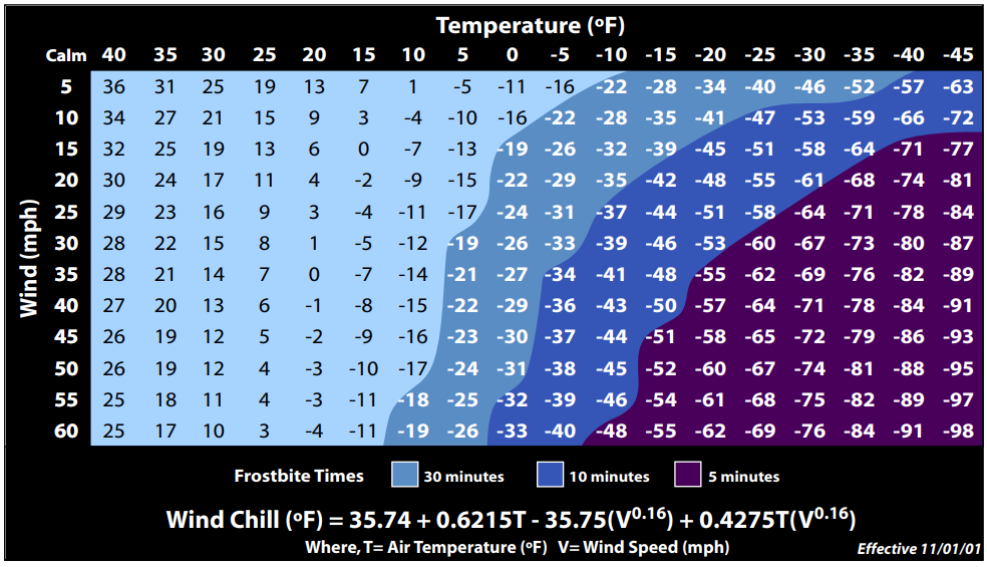
No program gaps or deficiencies were identified.

4.3.12 Extreme Cold

Record temperature lows and arctic-like wind chills can cause cold-related illnesses such as frostbite and hypothermia, the most life-threatening cold weather danger. Hypothermia occurs when the core body temperature drops below 96° F. Anyone 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 left uncovered in cold temperatures.

Wind chill, defined as how cold people and animals feel when outside, is based on the rate of heat loss from exposed skin caused by wind and cold. As wind increases it draws heat from the body, driving down skin temperature and eventually the internal body temperature. To protect the public from extreme cold, the NWS issues wind chill alerts (advisory, watch, or warning) depending on the expectation and severity of the cold weather. The NWS uses a Wind Chill Temperature Index (Figure 24) to measure wind chill.

Figure 24. NWS Wind Chill Temperature Index



SOURCE: RETRIEVED ON DECEMBER 5, 2019, FROM THE NWS (HTTPS://WWW.WEATHER.GOV/SAFETY/COLD-WIND-CHILL-CHART).

Although no specific rule exists for determining when a wind chill becomes dangerous, -20° F is used as a general threshold (NWS, 2019). The NWS issues a wind chill warning when life threatening cold wind

chill values are expected or occurring. The criteria for issuing official NWS wind chill warnings are set locally.

Because wind chill warnings are only issued if wind speeds are ≥3 mph, the NWS experimented with an "extreme cold" warning, which was not dependent on wind, to warn the public on severely cold non-windy days. Criteria for the extreme cold warning was set locally, typically defined as ambient temperature or wind chill ≤-30° F, for an extended period of time (≥3 hrs.), over a large geographical area (≥3 counties) (Chiu, Vagi, Wolkin, Martin, & Noe, 2014). This experimental warning only lasted one season.

Extreme Cold History in Lake of the Woods County

Five weather stations in Lake of the Woods County report daily temperature data. Table 30 shows the percent of days each station reported a daily minimum temperature ≤-30° F between 1981-2010.

Table 30. Extreme Cold Temperature Recording in Lake of the Woods County.

Weather Station	Weather Station ID	Station's Period of Record	# of Days in 1981-2010	# of Days in 1981-2010 Station Reported Data	# of Days Daily Min Temps ≤-30° F	% of "Extreme Cold" Days Reported
Baudette	GHCND: USC00210515	12/1/1908 – Present	10,957	9,713	111	1.14%
Baudette 21 SSE	GHCND: USC00210520	9/1/1963 – 2/28/1990	10,957	2,228	56	2.51%
Baudette Int'l AP	GHCND: USW00094961	7/1/1996 – Present	10,957	5,280	24	.45%
Baudette Minnesota	GHCND: USR0000MBAU	1/6/2003 – Present	10,957	2,773	15	.54%
Camp Norris DNR	GHCND: USC00211250	1/10/2001 – Present	10,957	3,262	24	.73%

The lowest daily minimum temperature recorded in the county is -52° F, which occurred twice, first on February 19, 1966, and again on January 6, 1968. Both occurrences were recorded at the Baudette 21 SSE station, located in the southeast corner of the county (Midwestern Regional Climate Center).

January is the coldest month in Lake of the Woods County, with an average daily minimum temperature of -3.9°F (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 (NWS, 2018). The NCEI Storm Events Database has recorded 14 cold/wind chill and 32 extreme cold/wind chill events affecting Lake of the Woods County since January 1996.

Table 31 shows cold-related events in Lake of the Woods County as reported to the NCEI Storm Events Database since the county's last Hazard Mitigation Plan (July 2013).

Table 31. Cold-Related Events in Lake of the Woods County since July 2013

Date	Event Type	Description of Event
3/2/2019 – 3/3/2019	Extreme Cold/Wind Chill	Surface high pressure built into eastern Montana and western South Dakota on the morning of Sunday, March 3rd. This kept a decent pressure gradient over eastern North Dakota and the northwest quarter of Minnesota, which led to steady west-northwest winds of 10 to 20 mph, from the 2nd into the 3rd. A frigid air mass had settled over the area as well, with morning lows on the 3rd generally from 15 below to 25 below zero. Combined with the steady winds, wind chills dipped to the 40s below zero. The coldest wind chill was Fosston and Dilworth, at 46 below zero.
2/24/2019 – 2/25/2019	Extreme Cold/Wind Chill	Northwest winds at 5 to 15 mph combined with temperatures as cold as 20 below to 30 below zero to cause wind chills of 40 below to 45 below zero.
2/7/2019 – 2/8/2019	Extreme Cold/Wind Chill	Surface high pressure built into western North Dakota during the early morning hours of February 8th. Steady northwest winds of 15 to 25 mph combined with temperatures mainly in the 20s below zero to produce wind chills of 40 below to 60 below zero.
1/28/2019 – 1/31/2019	Extreme Cold/Wind Chill	A fairly rare multi-day wind chill warning was issued for eastern North Dakota and the northwest quarter of Minnesota. Morning temperatures on the 29th ranged from 15 below to 25 below zero, while afternoon temperatures ranged in the 20s below zero. On the 30th, morning temperatures ranged in the 30s below zero, while afternoon temperatures ranged from the teens below to 20s below zero. Finally, on the morning of the 31st, temperatures ranged in the 20s below to low 40s below zero. Combined with wind speeds of 5 to 15 mph, wind chill values ranged from 40 below to 65 below zero.
1/26/2019 – 1/27/2019	Extreme Cold/Wind Chill	Frigid surface high pressure built into the area from southern Canada. Temperatures in the teens below to mid 30s below zero combined with wind speeds of 5 to 15 mph to produce wind chills of 40 below to 60 below zero.
1/1/2019	Extreme Cold/Wind Chill	Frigid surface high pressure built into the area during the early morning hours of January first. Combined with winds of 5 to 15 mph, wind chills dipped to 40 below to 50 below zero.
12/31/2018	Extreme Cold/Wind Chill	Surface high pressure built into the region the night of December 31st. Wind speeds of 5 to 15 mph, combined with temperatures of 10 below to 20 below zero, produced wind chills of 40 below to 50 below zero.
1/12/2018 – 1/13/2018	Extreme Cold/Wind Chill	Surface high pressure settled over the Northern Plains, resulting in clear skies and fairly low winds. Temperatures on the morning of the 13th dipped to 20 below to 30 below zero in most areas.
1/1/2018	Extreme Cold/Wind Chill	This event began on Friday, December 29, 2017. A frigid air mass dropped southward out of Canada, bringing some of the coldest air of the year. The morning of December 31, 2017 was the coldest, with many stations getting down to 25 below to 35 below zero. The coldest wind chill readings dipped to around 55 below zero.
12/29/2017 – 12/31/2017	Extreme Cold/Wind Chill	A frigid air mass dropped southward out of Canada, bringing some of the coldest air of the year. The morning of the 31st was the coldest, with many stations getting down to 25 below to 35 below zero. The coldest wind chill readings dipped to around 55 below zero.

Date	Event Type	Description of Event
12/24/2017 – 12/26/2017	Extreme Cold/Wind Chill	A frigid air mass settled over the Northern Plains, with morning lows on the 25th ranging from 10 below to 25 below zero. On the morning of the 26th, temperatures ranged from 15 below to 30 below zero. Winds throughout the period ranged from 5 to 15 mph, which resulted in wind chill values from 40 below to 45 below zero at times.
12/17/2016 – 12/18/2016	Extreme Cold/Wind Chill	The coldest temperatures were recorded on Sunday morning (the 18th), when most sites reported 20 below to 30 below zero minimum temperatures. When combined with steady winds of 5 to 15 mph, wind chill readings ranged from 40 below to 50 below zero.
1/16/2016 – 1/17/2016	Extreme Cold/Wind Chill	During the evening of the 16th into the morning of the 17th, temperatures dropped to the 20 below to 35 below zero range across the entire area. Combined with steady winds of 5 to 10 mph, wind chill readings dipped into the 40 below to 50 below zero range again.
2/21/2015 – 2/22/2015	Extreme Cold/Wind Chill	Temperatures fell to the twenties below zero by the morning of the 22nd along with steady northwest winds. Wind chill readings generally ranged in the 40 below to 50 below zero range.
1/6/2015 – 1/7/2015	Extreme Cold/Wind Chill	Dangerously cold wind chills settled over the area once again, ranging from 40 below to 45 below zero at times.
1/3/2015 – 1/5/2015	Extreme Cold/Wind Chill	As the blizzard event on January 3rd ended, the concern quickly shifted to dangerously cold wind chills. From the afternoon of the 3rd through the morning of the 5th, wind chill readings dipped to 40 below to 50 below zero.
3/1/2014 – 3/2/2014	Extreme Cold/Wind Chill	A very cold air mass settled over the region, with morning lows on the 1st generally in the 20s below zero. Highs on the 1st only managed to rise to around 10 below zero. New record low maximum temperatures were set at Fargo and Grand Forks for the 1st. As high pressure drifted into southern Minnesota on the morning of the 2nd, temperatures once again dropped into the teens and 20s below zero. Steady northwest winds combined with these very cold temperatures to produce wind chill readings from 40 below to 55 below zero.
2/28/2014	Extreme Cold/Wind Chill	A very cold air mass settled over the region. Steady northwest winds combined with subzero temperatures to create wind chills from 40 below to 55 below zero. The dangerously cold conditions continued through March 2.
2/26/2014 – 2/27/2014	Extreme Cold/Wind Chill	Wind chill temperatures dropped into the 40 below to 50 below zero range. Morning lows on the 27th generally ranged in the 20s below zero. A six year old girl was found dead from exposure outside an apartment complex in Bemidji early on the morning of the 27th.
1/26/2014 – 1/28/2014	Extreme Cold/Wind Chill	Arctic air pushed into the Northern Plains behind the latest blizzard. Morning lows dropped to the 20s below zero with daytime highs mainly in the single digits below zero. Wind chill values generally ranged from 40 below to 50 below zero.
1/22/2014 – 1/23/2014	Extreme Cold/Wind Chill	Wind chill readings dropped to 40 below to 50 below zero over eastern North Dakota and the northwest quarter of Minnesota.
1/4/2014 – 1/7/2014	Extreme Cold/Wind Chill	An arctic air mass settled over the Northern Plains bringing well below normal temperatures with it. Daytime highs generally ranged in the teens below zero with lows in the 20s below to 30s below zero. With steady winds, wind chill temperatures dipped into the 40s below to 60s below zero. The Minnesota Governor ordered all schools closed on Monday the 6th as a precaution.
12/28/2013 – 12/29/2013	Extreme Cold/Wind Chill	Frigid air settled over the area resulting in wind chill temperatures from 40 below to 55 below zero.

Source: (NOAA NCEI)

To determine the probability of future cold-related events in Lake of the Woods County, records of previous Cold/Wind Chill and Extreme Cold/Wind Chill events in the county were summed and divided by the dataset's period of record, resulting in the annual relative frequency of cold-related events in Lake of the Woods County. Based on records in the NCEI Storm Events Database through April of 2019, the relative frequency of cold-related storm events in the county is two per year. This relative frequency can be used to infer the probability of these events occurring in the future.

Vulnerability

Extreme cold temperatures affect the county nearly every year. The amount of snow and ice, number of blizzard conditions, and days of sub-zero temperatures each year are unpredictable.

Within Lake of the Wood 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.

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.

Program Gaps and Deficiencies

Mass Care Shelter Facilities – Lake of the Woods County Emergency Management is working with the Red Cross to get additional local shelters certified and to identify hotels that are willing to honor emergency shelter rates as an option for impacted residents.

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

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 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 Lake of the Woods County as related to hazard mitigation.
- *Appendix K:* As part of the Lake of the Woods County MHMP update, the county, its cities, and townships were asked to participate in filling out a "Local Mitigation Capabilities Assessment" (LMCA) form to report on their current mitigation capabilities and program gaps. Appendix K lists the LMCA reports gathered for Lake of the Woods County.

5.1.1 National Flood Insurance Program (NFIP)

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

Table 32 below shows which jurisdictions in Lake of the Woods County participate in the National Flood Insurance Program (NFIP). The city of Williams does not participate in the NFIP, despite it having FEMA mapped high risk areas.

Table 32. NFIP Participation in Lake of the Woods County

Community Name	Participation in the National Flood Insurance Program (NFIP)?		Initial FIRM Date
Lake of the Woods County	Participating in NFIP	FEMA Mapped High Risk Areas	9/5/1990
Baudette	Participating in NFIP	FEMA Mapped High Risk Areas	9/5/1990
Williams	Not Participating in NFIP	FEMA Mapped High Risk Areas	

Source: MN DNR, February 2019

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. Lake of the Woods 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 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 Lake of the Woods County, see Section 4.4.1 *Flooding.*

5.1.2 Plans and Ordinances

Lake of the Woods County and its incorporated communities have a number of plans and ordinances in place to ensure the safety of residents and the effective operation of communities, including a Zoning Ordinance, Floodplain Ordinance, Emergency Operations Plan, Continuity of Operations Plan, and Water Management Plan. In Section 4.4 of this plan (*Hazard Profiles)* a review of the plans and programs in place was included as related to each of the hazards addressed in the plan. See Appendix J for a list of all plans and programs in place in Lake of the Woods County, and Appendix K for the local mitigation capabilities assessment reports.

5.1.3 Plans and Programs in Place to Address Natural Hazards

Lake of the Woods 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.

Summer Storms **Winter Storms** **Floods** Erosion **Extreme Temps** Drought Dam Failure **Wildfire**
Emergency Operations Plan – Lake of the Woods 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 storm events, 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, Lake of the Woods County utilizes the CodeRED emergency notification system, Lake of the Woods County Emergency Management Facebook page, and local news media. Lake of the Woods County promotes the use of NOAA weather radios by critical facilities and the public to receive information broadcast from the NWS. Local newspaper, online news radio stations assist with sharing public information. The CodeRED database and can send messages to all landlines in the county, and many residents are subscribed to multiple means of CodeRED contact.

Summer Storms **Winter Storms** Floods Erosion Extreme Temps Drought Dam Failure Wildfire
Backup Power – Generator back-up power is in place for the Lake of the Woods County Courthouse, Jail, Sheriff's Office and Dispatch.

Summer Storms **Winter Storms** Floods Erosion **Extreme Temps** Drought Dam Failure Wildfire
Closing Policy - Lake of the Woods County has a policy in place for the emergency closing of County Government Offices in place in the event of severe winter weather. All school districts within the county have a school closing policy and communication plan in place to notify students and staff in the event of closings due to severe weather or extreme temperatures.

Summer Storms **Winter Storms** Floods Erosion Extreme Temps Drought Dam Failure Wildfire
Snow Removal – Lake of the Woods County and its cities complete the snow removal and disperse sand/salt as needed on all, county, city and township roads. MnDOT removes the snow from State Highway 11 and 72 as well as disperses salt/sand as needed.

Summer Storms **Winter Storms** Floods Erosion Extreme Temps Drought Dam Failure Wildfire
Severe Weather Awareness Weeks – Lake of the Woods County helps promote and participates in the NWS'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
Shelter Plans & Facilities- A wildfire, severe storm, period of extreme heat/cold coupled with a major power outage may require emergency sheltering for those in need. Lake of the Woods County will work with both the American Red Cross and the facilities that are identified in the event of needing to activate shelters. Lake of the Woods County has a Sheltering and Pet Sheltering Plan in place.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire
SKYWARN Program – Lake of the Woods County offers SKYWARN training on an annual basis to local fire and law enforcement and local residents that wish to be trained as volunteers. SkyWarn Spotters

help to keep their local communities safe by providing timely and accurate reports of severe weather to their local NWS office.

Summer Storms Winter Storms Floods Erosion Extreme Temps Drought Dam Failure Wildfire
MDH Requirements for Manufactured Home Parks – Lake of the Woods County Emergency Management works with the owners of manufactured home parks (MHP's) and Resorts within the county to ensure that they are meeting Minnesota Department of Health (MDH) requirements in posting storm shelters and evacuation plans.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire
Water Plan - The current Lake of the Woods County Comprehensive Local Water Plan identifies the major water resources, related programs, and infrastructure within the county. Strategies adopted as a part of the plan address issues that threaten the quality and/or quality of the county's surface and groundwater resources. The plan is developed and administered by the Lake of the Woods County Land and Water Planning Office.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire
Floodplain & Shoreland Ordinances – Lake of the Woods County Land and Water Planning Office administers land use and zoning ordinances for rural and unincorporated portions of Lake of the Woods County, including for floodplains and shoreland. The department also provides information and support for environmental health issues that may impact water quality after flooding occurs. Lake of the Woods County Zoning Ordinance Article 9 addresses Shoreland Management Regulations including building regulations to mitigate against flooding during high-water elevation (for structures along lakes, ponds, flowages, rivers, and streams).

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire
Stormwater Management Ordinance & Plans - Lake of the Woods County Zoning Ordinance Article 9 addresses Stormwater Management for the county.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire
Floodplain Mapping – Lake of the Woods County Management Information Systems Department maintains the floodplain maps for the county.

Summer Storms Winter Storms **Floods** Erosion Extreme Temps Drought Dam Failure Wildfire
Lake of the Woods County Highway Department - The Highway Department is responsible for the efficient planning, design, construction and maintenance of the Lake of the Woods County highway system, which comprises 575 miles of roadways and 120 bridges. To accomplish this, the Highway Department secures funding from Federal, State and local resources.

Summer Storms Winter Storms **Floods** **Erosion** Extreme Temps Drought Dam Failure Wildfire
Lake of the Woods County Transportation Improvement Plan – The Lake of the Woods County Public Works Department. develops and maintains a 5-year transportation improvement plan which prioritizes and details the improvement projects for implementation for roads, culverts, bridges, sidewalks, and more.

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

Local Fire Departments – There are three fire departments located in Lake of the Woods County. Each department is responsible for wildfires within their department boundaries; 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 fire departments in Lake of the Woods 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. Cross-Border wildfire agreements are in place with the Ministry of Natural Resources in Ontario Canada that share shores with Rainy River and Lake of the Woods.

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

Lake of the Woods County Community Wildfire Protection Plan (CWPP) – The Lake of the Woods County Community Wildfire Protection Plan Is in process and will have two objectives. First, it identifies and prioritizes Wildland/Urban Interface areas within Lake of the Woods County (including federal and nonfederal lands) for hazardous fuels reduction treatments and recommends methods for achieving hazardous fuels reductions. Second, the plan will outline measures for reducing fire danger to structures throughout Lake of the Woods County at-risk communities.

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

Lake of the Woods County NWA Community Wildfire Protection Plan (NWACWPP) - The Lake of the Woods County NWA Community Wildfire Protection Plan has two objectives. First, it identifies and prioritizes Wildland/Urban Interface areas within Northwest Angle (including federal and nonfederal lands) for hazardous fuels reduction treatments and recommends methods for achieving hazardous fuels reductions. Second, the plan outlines measures for reducing fire danger to structures throughout Lake of the Woods County at-risk communities This NWA plan addresses issues such as fire response, community preparedness, structure and infrastructure protection and mitigation measures for potential wildland fire fuel hazards. In development of the Lake of the Woods County NWACWPP communities discussed and refined priorities for protecting life, property, and critical infrastructure within the county. The Lake of the Woods County NWACWPP is updated on an annual basis, as well as the tracking and implementation of wildfire mitigation projects.

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

MN DNR Information and Training – The MN DNR maintains current state-wide map information on seasonal wildfire risks. Firefighters in Lake of the Woods County are encouraged to participate in annual wildfire training classes offered by the DNR Forestry Department. Lake of the Woods County has an Emergency Evacuation Plan that is used for wildfire events and other events requiring evacuation.

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

Burning Permits/Restrictions – MN DNR Forestry issues burning permits when they available and issues burning restrictions when necessary.

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

Fire Prevention Week – Fire Prevention Week is held annually each October. Most fire departments participate and provide an opportunity for local residents to learn fire safety with open houses. In

addition to fire departments going to our schools to educate our youth, our local media also assists in sharing fire safety information to the public.

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

Lake of the Woods County Water Management Plan– The Lake of the Woods County Soil and Water Conservation District (SWCD) develops and maintains a Water Management Plan. The current Lake of the Woods County Water Management plan was adopted by the county Board of Commissioners in 2010.

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

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

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

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

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

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

5.2 Mitigation Goals

In Section 4.0 of this plan, the risk assessment identified Lake of the Woods County as prone to a number of natural hazards. The steering committee members understand that although hazards cannot be eliminated altogether, Lake of the Woods County can work toward building disaster-resistant communities.

The goals and strategies being developed for the 2019 Minnesota State Hazard Mitigation Plan for natural hazards were adopted for use in the Lake of the Woods County Plan (Table 33). This framework will allow for integration of the mitigation actions that are listed by Lake of the Woods 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 that will be used in 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 flooding, dam/levee failure)
Wildfire Goal: Reduce deaths, injuries, property loss, natural resource and economic disruption due to wildfire (forest, prairie, grass, and peat bogs).
Windstorms Goal: Reduce deaths, injuries, property loss, and economic disruption due to windstorms.
Severe Winter Storms Goal: Reduce deaths, injuries, property loss, and economic disruption due to severe 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, property loss, and economic disruption due to extreme cold.
Landslide/Erosion Goal: Reduce deaths, injuries, property loss, and economic disruption due to landslides/erosion.

5.3 Mitigation Action and Project Strategies

The mitigation actions in this plan are summarized into 4 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 Plans and Regulations	These actions include government authorities, policies, or codes, that influence the way land and buildings are developed and built.	• Comprehensive plans • Land use ordinances • Planning and zoning • Building codes and enforcement • Floodplain ordinances • NFIP Community Rating System • Capital improvement programs • Open space preservation • Shoreline codes • Stormwater management regulations and master plans

Mitigation Strategy	Description	Example Mitigation Actions
Structure and Infrastructure Projects	These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. 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
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	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

Lake of the Woods County and its included municipalities share a common Multi-Hazard Mitigation Plan and worked closely to develop it. Local leaders work together with the Lake of the Woods County Emergency Management Director to assure that the hazards and mitigation actions included in this plan are accurate and addressed in their jurisdictions. The jurisdictions responsible for each action are Bertha, Browerville, Burtrum, Clarissa, Eagle Bend, Grey Eagle, Hewitt, Long Prairie, Osakis, Staples, Swanville, West Union and Lake of the Woods County.

Appendix G contains separate mitigation action tables for each jurisdiction. Each of these mitigation action charts detail the hazard, the mitigation strategy and action to address it, the priority ranking for implementation (High Priority, Moderate Priority; Low Priority; see Table 35), its current stage of implementation, the timeframe for implementation going forward, the jurisdictions who have identified they will work to implement the action, the responsible parties to carry through with implementation, and comments on how the plan will be implemented through existing planning mechanisms and potential funding to make implementation happen.

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. • The mitigation measure 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 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.

Mitigation actions that have been completed or deleted from the 2012 Lake of the Woods 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.

In addition to ranking the hazard mitigation actions, the steering committee also reports on the status of the mitigation action. Completed and deleted mitigation actions are denoted in Appendix H. Ongoing mitigation actions from the initial review were incorporated into annual reviews by the mitigation team. The status designations are:

- 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

The mitigation types are defined as follows:

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

The Lake of the Woods County Master Mitigation Action Chart is provided in Table 36.

Table 36. Lake of the Woods County Master Mitigation Action Chart (2018-2022)

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
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 the County's CodeRED Emergency Notification System.	n/a	On-going	High	2020-2025	LOTW-EM (Lake of the Woods County Emergency Mgmt.)	The LOTW Sheriff's Office Website has an LOTW Emergency Management Program page that provides information on CodeRED and a link for residents to sign up. We will continue to promote residents to sign up for the system through our county Sheriff's website as well as the county Facebook page, as well as through local media and during events or presentations.	County funding
2	All-Hazards	Mitigation Preparedness & Response Support	**EOP UPDATES** Update the Lake of the Woods County Emergency Operations Plan (EOP) to ensure it adequately details the needed steps to respond to all potential hazards.	n/a	On-going	High	2020-2025	LOTW-EM	LOTW Emergency Management 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

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
A	B	C	D	E	F	G	H	I	J	K
#	Hazard	Mitigation Strategy	Mitigation Action	Reduces Risk to New / Existing Buildings or Infrastructure	Status	Priority	Expected Time-frame	Responsible Party	Comments on Implementation, Administration & Integration into Local Planning Mechanisms	Possible Funding
3	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	On-going	High	2020-2025	LOTW-EM in cord. with Lake of the Woods-Mahnomen Public Health	LOTW 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 via our website, social media pages, classroom training and local media sources. The LOTW-EM website provides website links on personal planning, school plans and business planning for emergencies.	County funding
4	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**GENERATOR BACKUP POWER** Identify Lake of the Woods County critical buildings and facilities that do not have backup power and obtain appropriate generators to install at those locations.	n/a	On-going	High	2020-2025	LOTW-EM	Generator backup power is in place for the Courthouse, Jail, Sheriff's Office and Dispatch. The county will work to purchase and install generators for other buildings or infrastructure as funding allows. Outside grant funding may be necessary to acquire needed generators.	County funding, Other funding TBD

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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 Winter & Summer Storms	Mitigation Preparedness & Response Support	**NOAA WEATHER RADIOS** Promote the use of NOAA weather radios by County staff, community facilities (i.e., schools, nursing homes) and by local residents to receive severe weather alerts from the National Weather Service.	n/a	On-going	Mod.	2020-2025	LOTW-EM	This is an ongoing effort of the LOTW Emergency Management program. We continue to promote the use of NOAA weather radios in schools, facilities that house vulnerable populations (such as hospitals and nursing homes), county buildings and by the public. We promote use of these radios in advance of and during our severe weather months and also during the NWS severe weather awareness weeks.	County funding
6	Severe Winter & Summer Storms	Structure & Infrastructure Projects	**BURY/STRENGTHEN POWERLINES** Work with rural & municipal electrical coops to identify where it is feasible and cost effective to bury or strengthen powerlines to mitigate against power line failure and implement measures.	Yes *(Power System Infrastructure)*	On-going	High	2020-2025	LOTW-EM, LOTW Hwy. Dept in cord. with utility provides	LOTW Emergency Management and the Hwy. Dept, in conjunction with our local municipalities and electrical cooperatives will continue address upgrades as needed and as feasible. During severe weather events such as ice storms, blizzards and high wind events, many power lines and poles can be damaged or destroyed.	Rural or Municipal Coop funding, FEMA HMA Grant funding

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
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	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 powerlines due to falling limbs.	Yes *(Power System Infrastructure and Roads)*	On-going	Mod.	2020-2025	LOTW Hwy. Dept. / Utility Providers	This is an ongoing part of the of the LOTW Hwy. Dept maintenance of county roads and vegetation within the county right-of-way. Our electrical providers within the county also manage vegetation near the powerlines that they own and maintain. Trees are trimmed or removed as deemed necessary to reduce risk of falling on roads or powerlines due to high wind, ice or snow buildup.	County funding, Electrical Coop funding
8	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**RADAR TOWER COVERAGE** Work with the National Weather Service to improve radar coverage for LOTW County.	n/a	**New**	High	2020-2025	LOTW-EM	Weather radar by both the Grand Forks and Duluth NWS areas are not able to read weather conditions due to radar gaps and high level of off-the-ground reading. The LOTW-EM Director will continue to encourage the NWS to address improved radar coverage for our county.	NWS funding
9	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**CELL PHONE COVERAGE** Encourage cell phone carriers to improve coverage on the Lake of the Woods, taking advantage of already existing towers.	n/a	**New**	High	2020-2025	LOTW-EM	Gaps in cell phone coverage exist in parts of the county, which prohibits the public being able to receive CodeRED notifications. The LOTW-EM Director will continue to encourage cell phone providers to address improved tower coverage for our county.	Cell Provider funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
10	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**OUTREACH TO RESORTS** Work with Resort Owners to provide guidance on severe weather awareness and emergency preparedness for their facilities and visitor services.	n/a	On-going	High	2020-2025	LOTW-EM	The LOTW-EM Director maintains good relationships with local resort owners and works to provide critical information regarding severe weather and steps they can take for preparedness to protect their visitors and facilities.	County funding
11	Severe Summer Storms / Tornado	Mitigation Preparedness & Response Support	**SKYWARN TRAINING** Continue to offer annual SKYWARN training to local fire & law departments and the public, and utilize our Lake of the Woods County storm spotter network.	n/a	On-going	Mod.	2020-2025	LOTW-EM in cord. with NWS	LOTW-EM Director works with the National Weather Service on an annual basis to offer SKYWARN training to local fire and law enforcement as well as to community members wishing to become volunteer Storm Spotters.	County, funding, NWS funding
12	Severe Summer Storms / Tornado	Mitigation Preparedness & Response Support	**WARNING SIRENS** Install new outdoor warning sirens in key areas where sirens currently are not located (this includes Lake of the Woods School in Baudette, the Northwest Angle, and at local resort areas).	n/a	**New**	High	2020-2025	LOTW-EM	The LOTW EM Director will seek to apply for funding from outside grant sources (such as USDA Rural Development or FEMA HMA 5% Initiative funding) to purchase and install outdoor warning sirens for these critical areas where there is no current warning siren coverage. Warning sirens are an important communication tool in the event of dangerous high wind events.	County funding, USDA Rural Dev. Grant

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	**STORM SHELTERS / TORNADO SAFE ROOMS** Construct storm shelters or tornado safe rooms in the County where people are vulnerable to severe wind events. Examples include public campgrounds, mobile home parks and resorts.	n/a	**New**	High	2020-2025	LOTW-EM in cord. with City Govt's and Local Resorts	LOTW-EM Director will work to assist facilities that have identified a need for a storm shelter or tornado safe room. The LOTW EM Director will provide assistance as needed on any tornado safe room projects pursued by those entities, including possible application to FEMA for HMA grant funding to support construction.	County funding, Local funding, FEMA HMA Grant funding
14	Extreme Temps (Heat / Cold)	Mitigation Preparedness & Response Support	**EXTREME COLD AWARENESS** Expand outreach and information on the risks of extreme cold (often coupled with blizzard conditions) to county residents, especially the elderly and anglers ice fishing on Lake of the Woods.	n/a	On-going	High	2020-2025	LOTW-EM in cord. with Resort Owners	LOTW-EM Director will continue to work actively to promote awareness of dangerous extreme cold conditions for local residents as well as visitors. This is done via our website, social media and local media sources, as well as by being in contact directly with resort owners that cater to winter anglers on Lake of the Woods.	County funding
15	Flood	Education & Awareness Programs	**FLOOD SAFETY EDUCATION** Conduct public outreach in advance of and during heavy rain and flood events to educate residents on personal actions to take to reduce damages to property and protect life safety.	Yes *(Existing Buildings)*	On-going	High	2020-2025	LOTW-EM	LOTW Emergency Management regularly incorporates public outreach & education on flooding during Severe Weather Awareness Week and during actual storm events during the year. Outreach methods include the County website, social media, local media and CodeRED if needed.	County funding

LAKE OF THE WOODS COUNTY							Mitigation Action Chart		
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
16	Flood	Local Planning & Regulations	**FLOODPLAIN & SHORELAND ORDINANCES** Administer and enforce the County's Floodplain and Shoreland ordinances.	Yes *(New & Existing Buildings)*	On-going	Mod.	2020-2025	LOTW Land & Water Planning	LOTW Land and Water Planning Office administers land use and zoning ordinances for rural and unincorporated portions of the County, including for floodplains and shoreland. LOTW County Zoning Ordinance Article 9 addresses Shoreland Management Regulations including building regulations to mitigate against flooding during high-water elevation (for structures along lakes, ponds, flowages, rivers and streams).	County funding
17	Flood	Education & Awareness Programs	**HOMEOWNER FLOOD INSURANCE** Encourage homeowners to purchase private NFIP flood insurance.	n/a	**New**	Mod.	2020-2025	LOTW Land & Water Planning	LOTW Land & Water Planning will encourage the cities of Baudette & Williams to promote purchase of private NFIP flood insurance by property owners in advance of future severe flood events.	County funding
18	Flood	Local Planning & Regulations	**PROPERTY ACQUISITION (BUYOUTS)** Conduct voluntary buyouts of residential properties that repetitively flood and convert to open space for perpetuity.	Yes *(Existing Properties)*	On-going	High	2020-2025	LOTW Land & Water Planning	Lake of the Woods County has not conducted any property buyouts in the past, but may do so in the future depending on the severity of future flood events.	County funding, FEMA HMA Grant funding

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
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
19	Flood	Structure & Infrastructure Projects	**LOCALIZED FLOOD RISK REDUCTION PROJECTS** Identify and address mitigation measures for transportation and drainage system infrastructure damaged by heavy rain events (such as culverts, roads and bridges) and implement projects that reduce risk of future flood damages.	Yes *(Transportation & Drainage System Infrastructure)*	On-going	High	2020-2025	LOTW Public Works Dept.	The LOTW Highway Department maintains a 5-year transportation improvement plan which prioritizes and details the improvement projects for roads, culvers, bridges, sidewalks and more. Funding is secured for projects from County, Federal, State and local resources. Current priority projects include: - Repair Ditch along CR 80 to reduce flooding to Holte residence during high-rain events. Divert water to the north along CR 11. - Address drainage improvements along VandeHay at CR 180 and northbound ditch on CSAH 3.	County funding, other Federal and State sources, FEMA HMA grant funding
20	Flood	Structure & Infrastructure Projects	**DRAINAGE SYSTEM IMPROVEMENTS** Further explore the need for improved drainage on the east side of Williams, connecting to the County drainage system without further impacting private property owners.	Yes *(Drainage System Infrastructure)*	On-going	High	2020-2025	LOTW Public Works Dept.	The LOTW Public Works Dept is working on development of a Drainage Management Plan that will include drainage system improvement planning for the east side of Williams.	County funding

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
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
21	Flood	Local Planning & Regulations	**COMMUNITY ASSISTANCE** Work with cities and townships and private land owners within the County to identify flood & erosion mitigation solutions for damaged areas.	Yes *(New/Existing Buildings & Transportation Infrastructure)*	On-going	High	2020-2025	LOTW-EM & LOTW SWCD	The LOTW Soil & Water Conservation District has an ongoing program of technical assistance to land owners for the restoration of damaged areas and can recommend best practices to manage stormwater, erosion control and shoreland restoration. In addition, following each major flood event, the LOTW-EM Director conducts a damage assessment in affected areas and helps those communities to identify necessary mitigation measures for implementation before a future damaging flood event occurs.	County funding, SWCD funding
22	Flood	Structure & Infrastructure Projects	**STORMWATER MANAGEMENT** Continue maintenance of the County's stormwater management system and make improvements as needed to handle future high rain events.	Yes *(Stormwater System Infrastructure)*	On-going	High	2020-2025	LOTW Public Works Dept. in cord. with LOTW SWCD	LOTW County maintains a Stormwater Management Plan and County Local Water Management Plan. Improvement measures are identified and addressed as needed on an ongoing basis. This work is under the directive of the LOTW Public Works department in coordination with LOTW Soil & Water Conservation District.	County funding, SWCD Cost Share funding

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
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
23	Wildfire	Local Planning & Regulations	**FIREWISE OUTREACH & EDUCATION** Engage the residents and resort owners of the Northwest Angle (NWA) and other high-risk wildfire areas of the county to promote the application of Firewise mitigation strategies.	Yes *(Existing & New Development)*	On-going	High	2020-2025	LOTW-EM in cord. with MN DNR and local Fire Depts.	This effort will continue for the Northwest Angle and other parts of the county. LOTW County has developed and maintains an active Firewise program for the Northwest Angle. From approximately 2014 the county additionally worked with residents on information for external wildfire sprinkler systems, dry hydrants and water pumps for properties in high-risk wildfire areas. Outside funding for eligible wildfire mitigation projects may come from the MN DNR Firewise Program of FEMA HMA grant program.	MN DNR Firewise Funding, FEMA HMA grant funding.
24	Wildfire	Local Planning & Regulations	**CWPP EXPANSION** Expand the Lake of the Woods Community Wildfire Protection Plan (CWPP) for the Northwest Angle to address other high-risk wildfire areas of the County.	Yes *(Existing & New Development)*	On-going	High	2020-2025	LOTW-EM in cord. with MN DNR and local Fire Depts.	The CWPP for the Northwest Angle is completed (NWACWPP). The CWPP will be expanded to address other high-risk wildfire areas in the county. Work on the CWPP is under the directive of LOTW Emergency Management in coordination with the MN DNR Firewise Program Coordinator. The plan will prioritize hazardous fuel reduction treatments and outline measures for reducing fire danger to structures throughout at-risk communities in LOTW County.	MN DNR Firewise grant funding

LAKE OF THE WOODS COUNTY								Mitigation Action Chart	
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
25	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	On-going	High	2020-2025	LOTW-EM in cord with FD's, MN DNR and USFS	This is an ongoing effort of the LOTW-EM Director, local Fire Departments, MN DNR and the U.S. Forest Service. All communication channels are used to help promote wildfire risk awareness, including outdoor signage, social media posts and news in local media.	
26	Wildfire	Structure & Infrastructure Projects	**INSTALL DRY HYDRANTS** Identify locations for dry hydrants to support wildland wildfire fighting.	n/a	On-going	High	2020-2025	LOTW-EM in cord. with MN DNR and local Fire Depts.	LOTW-EM Director will continue to work with local Fire Departments and the MN DNR to identify where it is needed and also feasible to install dry hydrants where municipal water access is limited or does not exist. Dry hydrants can be installed with funding from hazard mitigation grant programs.	MN DNR Firewise Program, FEMA HMA grant funding

5.3.2 Mitigation Actions by Community

This plan is a multi-jurisdictional plan that covers Lake of the Woods County, its school districts and the cities of Baudette, and Williams. Planning team members from each community participated directly in the development of local mitigation action charts for implementation. The Lake of the Woods County risks and mitigation activities identified in this plan also incorporate the concerns and needs of townships and other entities participating in this plan. Mitigation actions are separated by jurisdiction in Appendix G.

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

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

Name Of Jurisdiction	Name Of Representatives, Title & Time
Lake of the Woods County	*County Staff:* Jill Hasbargen Olson, Emergency Management Director Gary Fish, County Sheriff Josh Stomlund, Land & Water Planning Director Anthony Pirkl, County Engineer Eric Solo, GIS/IT Specialist Julie Berggren, Administrative Assistant Marti Carlson, County Hwy. Dept. Boyd Johnson, County Hwy. Dept. Mary Jo Otten, County Assessor Lorene Hanson, County Auditor-Treasurer Ted Ferbish, Solid Waste Director Marty Mollberg, Operations Director Brad Abby, Sargent, LOW Sheriff's Office *Other Stakeholders:* Jeff Nelson, Superintendent, Lake of the Woods School Brian Novak, High School Principal, Lake of the Woods School Nick Able, MN DNR Forester Brian McKeever, Fire Chief Northwest Angle Fire Dept.
City of Baudette	Tina Rennemo, Clerk/Treasurer Marla Carlson, City Councilor Roger Schotl, Public Utilities Superintendent Brad Levasseur, Fire Chief Chris Plourd, Fire Dept. Training Officer Don Castle, Ambulance Director
City of Williams	Verna McKay, Mayor Leslie Nicholson, City Clerk Mike Baldwin, Fire Chief

Section 6 – Plan Maintenance

6.1 Monitoring, Evaluation, and Updating the Plan

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

The Lake of the Woods 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 Lake of the Woods County Emergency Management Director will work with the Lake of the Woods County Emergency Management Group (EMG) to serve as the committee to help monitor, review, evaluate, and update the Multi-Hazard Mitigation Plan. The EMG normally meets quarterly and consists of Lake of the Woods County Emergency Management and other county departments, as well as representatives from the cities of Baudette and Williams. Additional stakeholders will be added based on need. If necessary, the Lake of the Woods 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 Lake of the Woods 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 Lake of the Woods 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 Lake of the Woods County Emergency Management Director so that progress notes may be maintained for the next plan update.

6.2 Implementation

Lake of the Woods County and its included municipalities share a common Multi-Hazard Mitigation Plan and work together closely to develop, revise, and implement it. This MHMP provides a comprehensive chart of mitigation actions for Lake of the Woods County and its jurisdictions (see Section 5.3.1, *Hazard Mitigation Actions*). The cities of Baudette and Williams 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 Lake of the Woods 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 Lake of the Woods County. Regulation plays a particularly important role for land use, access to structures and the protection of water resources and public health.

6.3 Continued Public Involvement

Continued public involvement is critical to the successful implementation of the Multi-Hazard Mitigation Plan (MHMP). The Lake of the Woods County Emergency Management Director and the Lake of the Woods County Emergency Management Group (EMG) 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, Lake of the Woods County will take the following measures:

- The plan will be posted on the Lake of the Woods 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, Lake of the Woods 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., Emergency Management 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 Lake of the Woods 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 – Lake of the Woods County Maps
Appendix B – Lake of the Woods County Critical Infrastructure
Appendix C – Lake of the Woods 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
Appendix I – Works Cited
Appendix J – Lake of the Woods County Plans & Programs In Place
Appendix K – Local Mitigation Survey Report
Appendix L – Minnesota Department of Health Climate & Health Report

Appendix A
Lake of the Woods County Maps

Figure A - 1. Hydrography of Lake of the Woods County

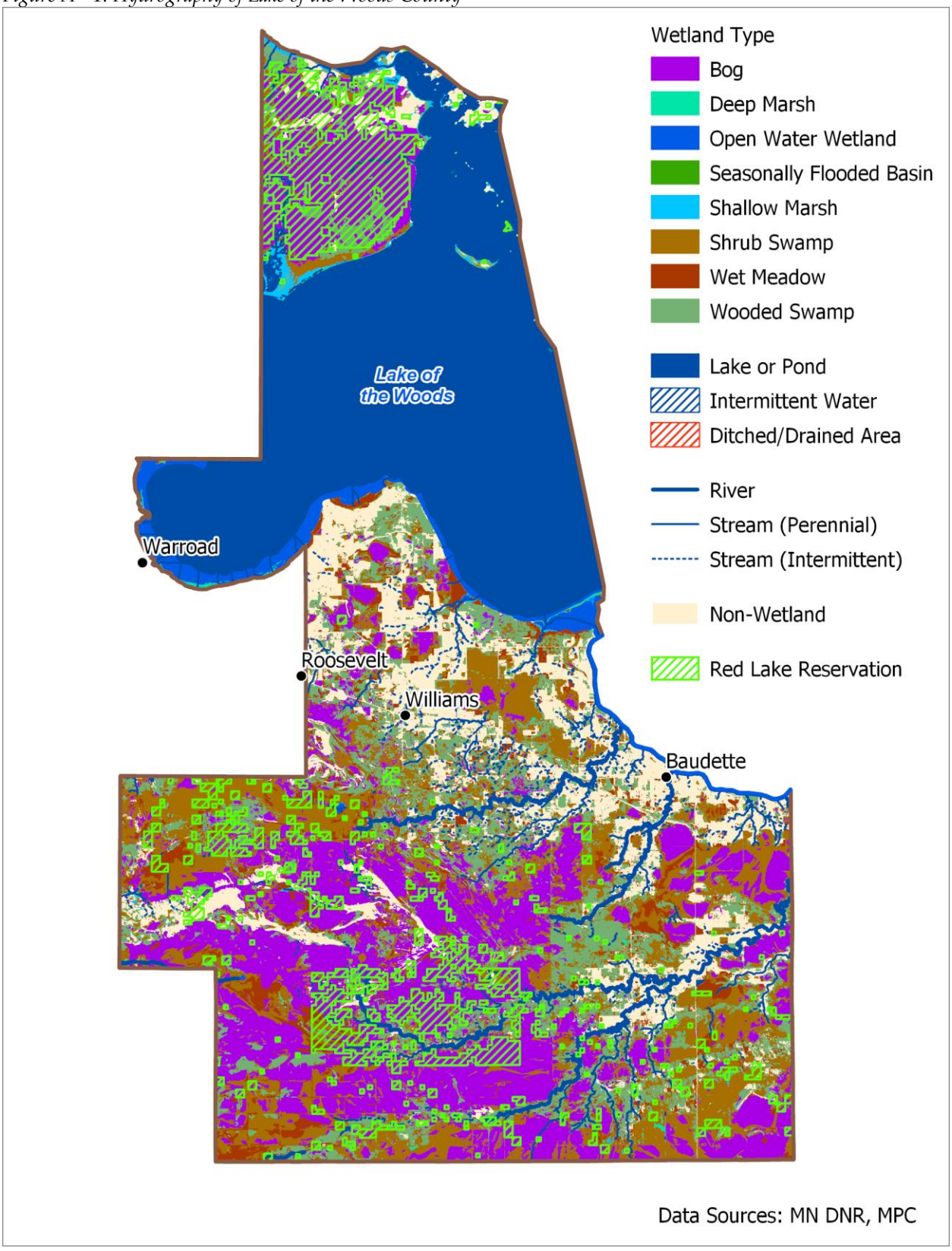


Figure A - 2. Percent Population Change by Minor Civil Division, 2000-2010.

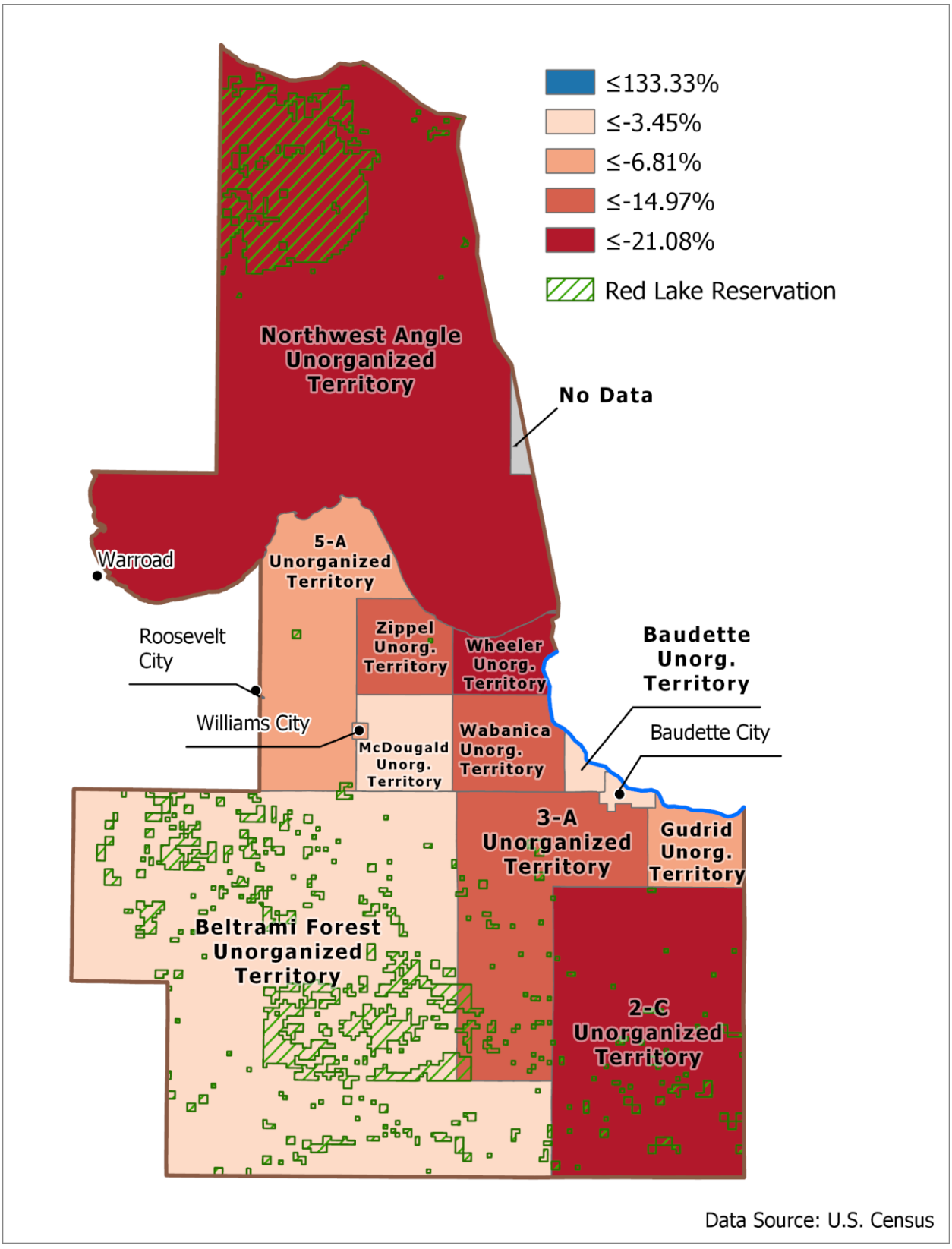


Figure A - 3. Emergency Facilities in Baudette

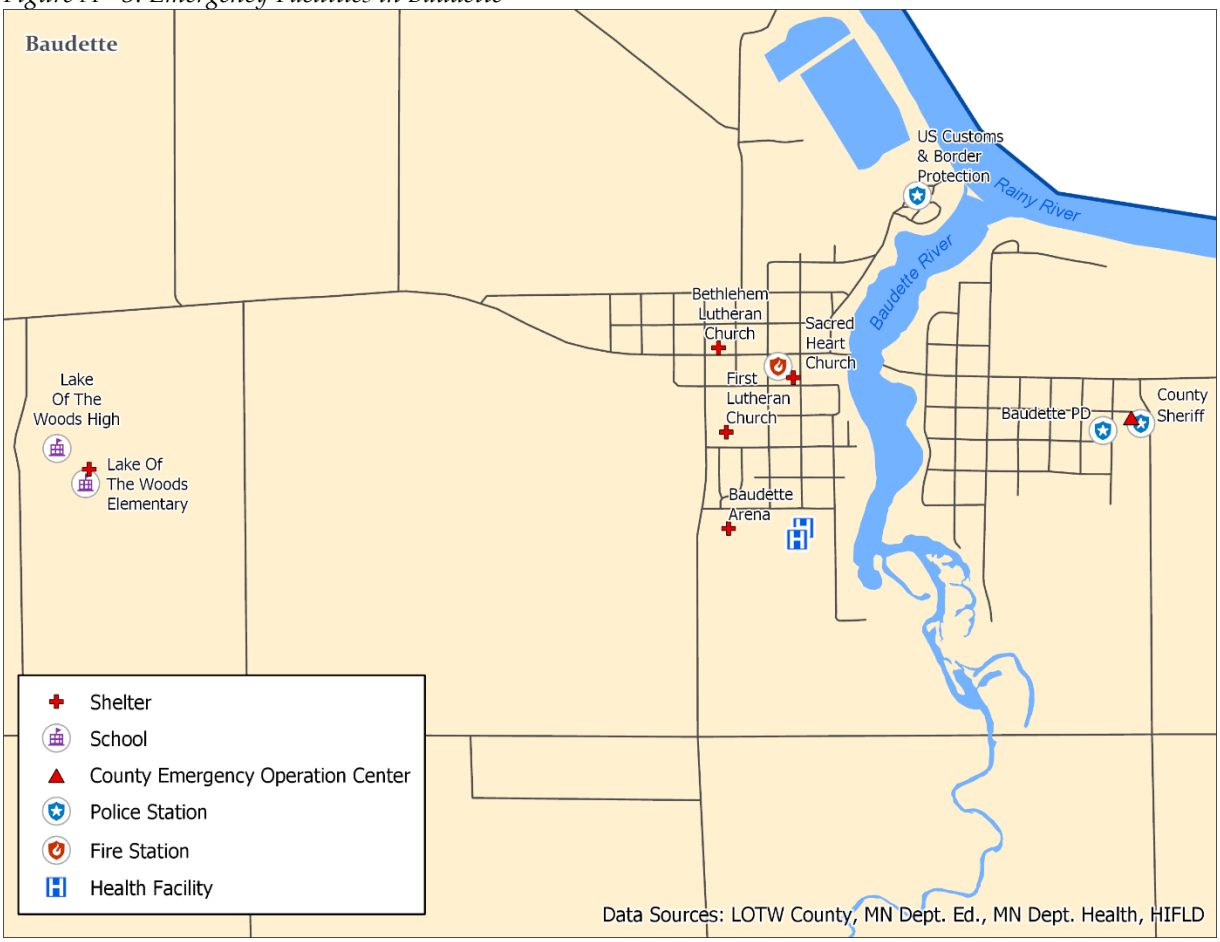


Figure A - 4. Emergency Facilities in Angle Inlet and Williams

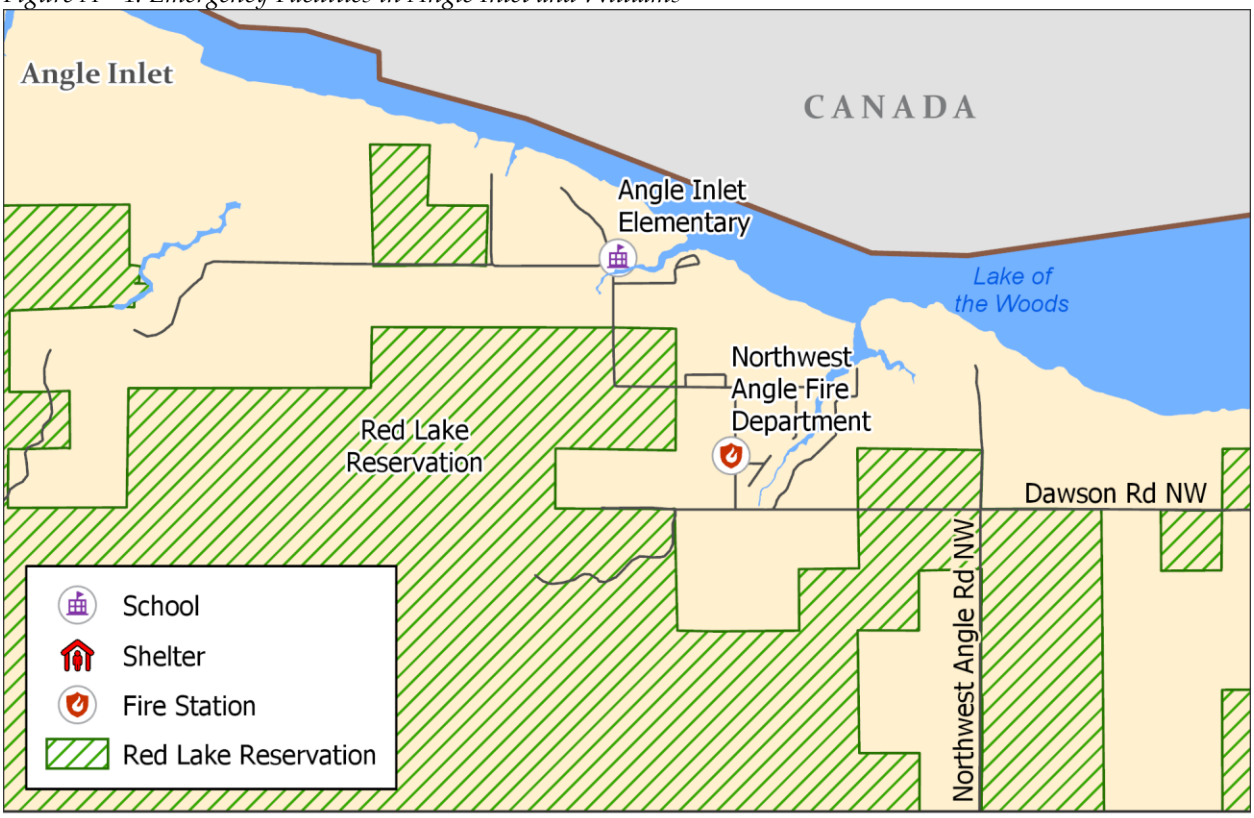


Figure A - 5. Lake of the Woods County's Transportation Infrastructure

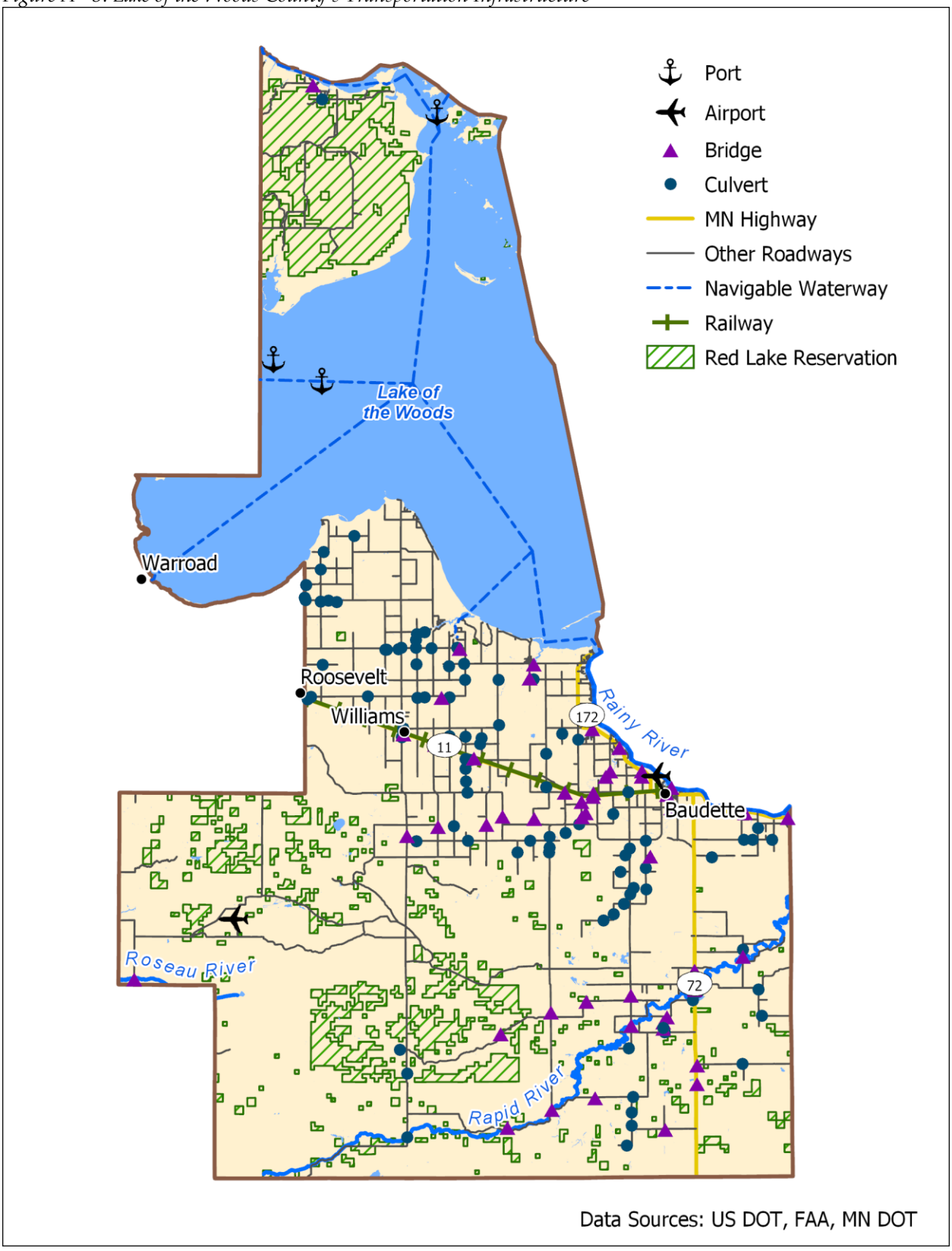


Figure A - 6. Lake of the Woods County's Utilities Infrastructure

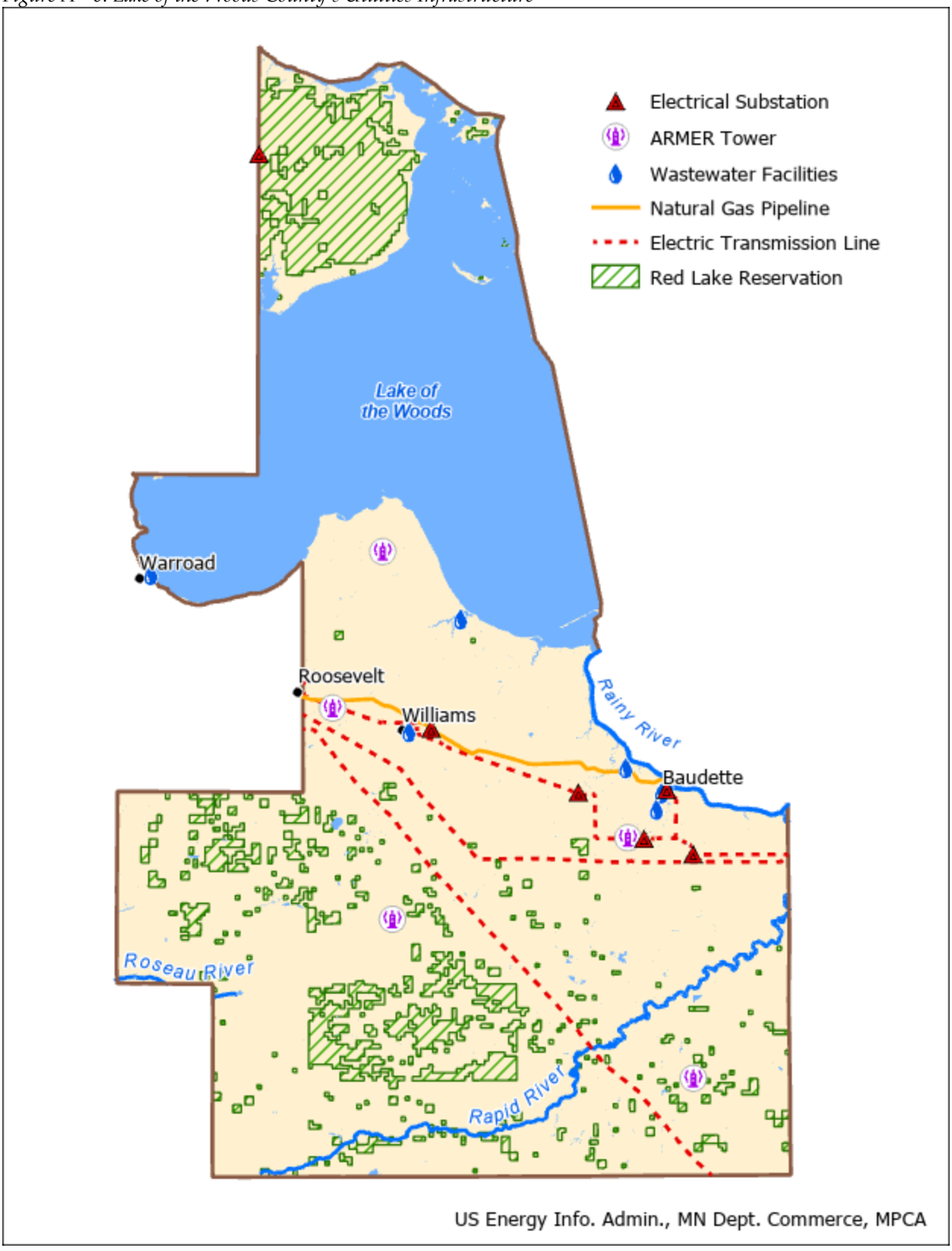


Figure A - 7. High Loss Structures in Lake of the Woods County

Figure A - 8. Lake of the Woods County's Land Cover, 2011

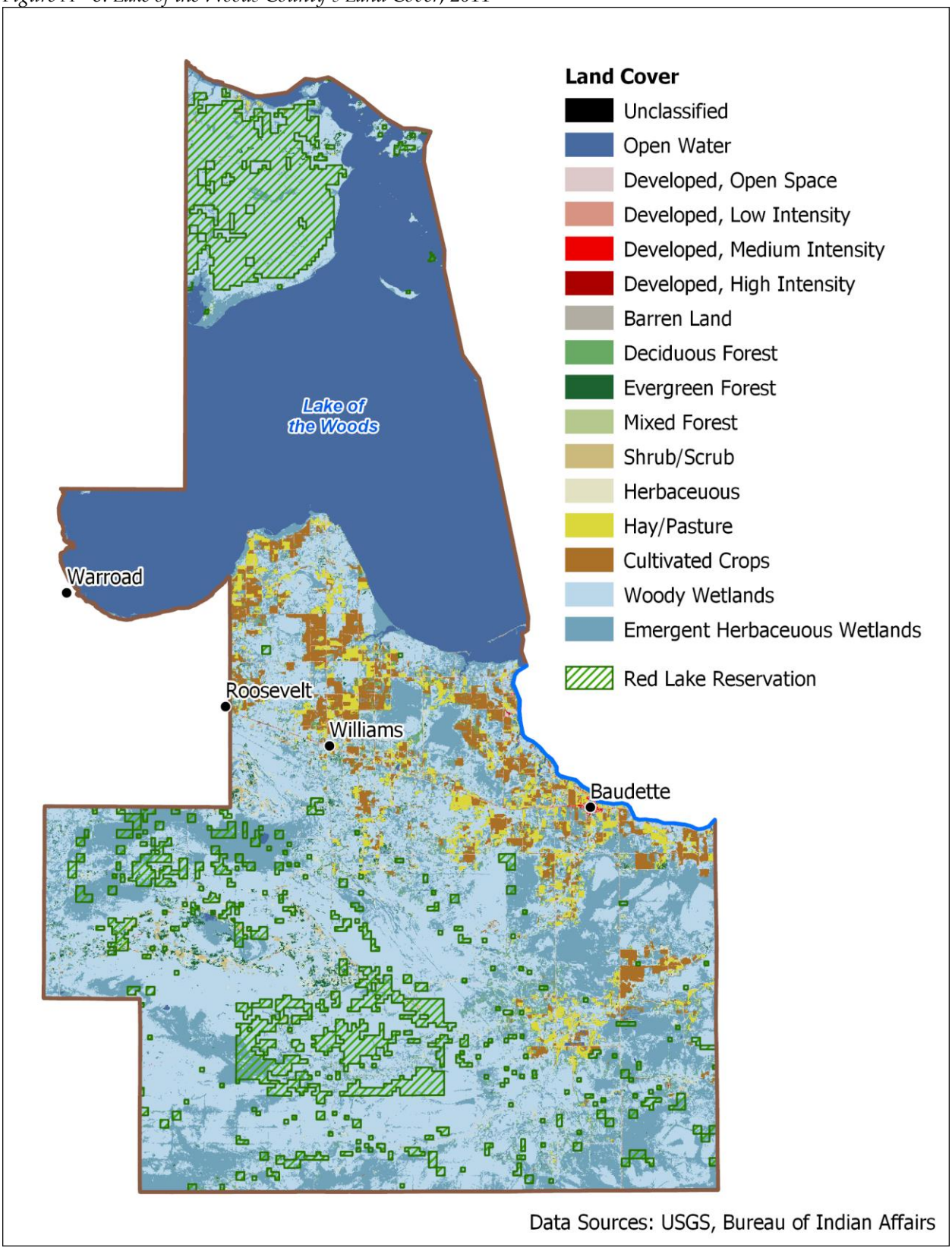


Figure A - 9. Lake of the Woods County Land Ownership by Agency

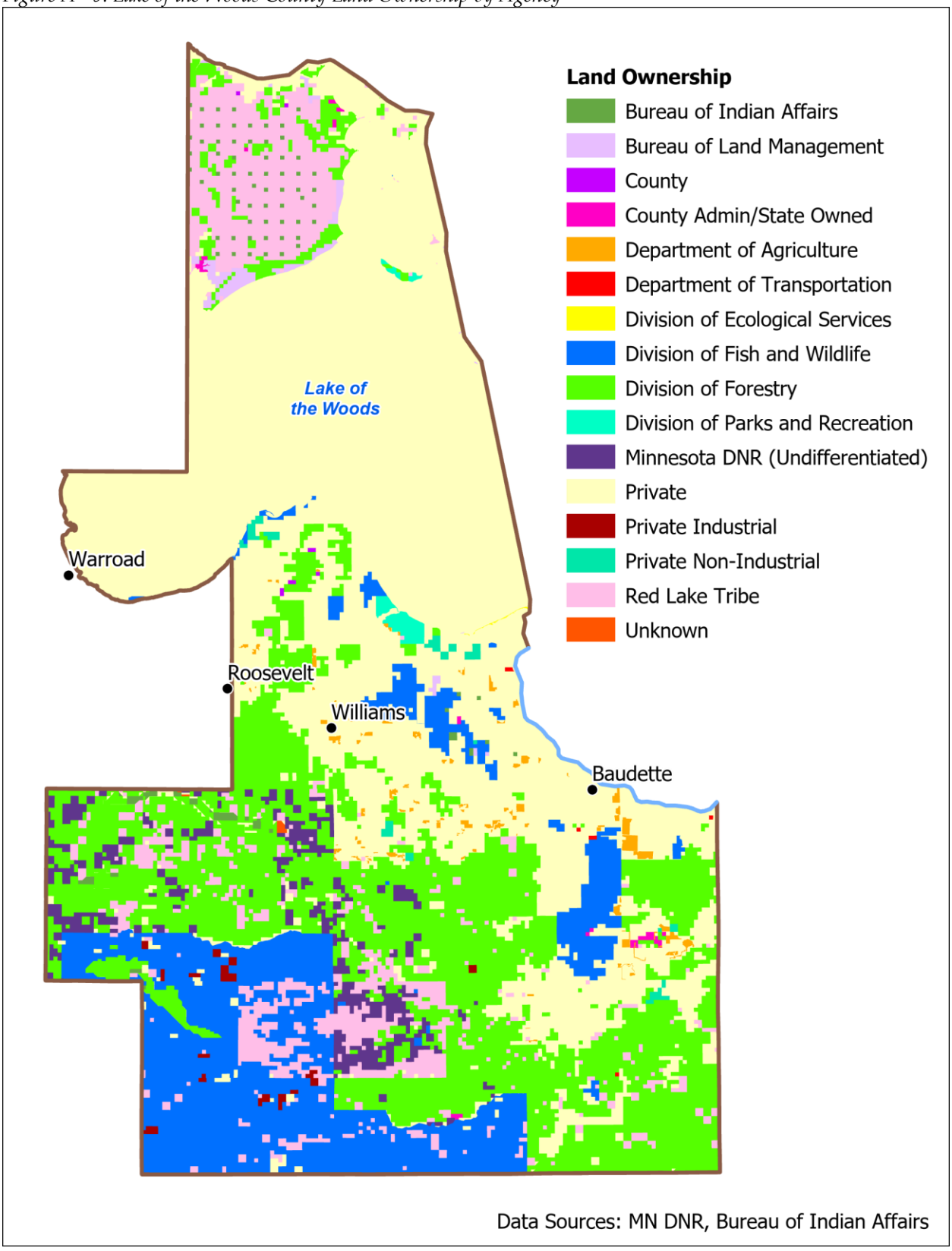


Figure A - 10. Feedlots in Lake of the Woods County

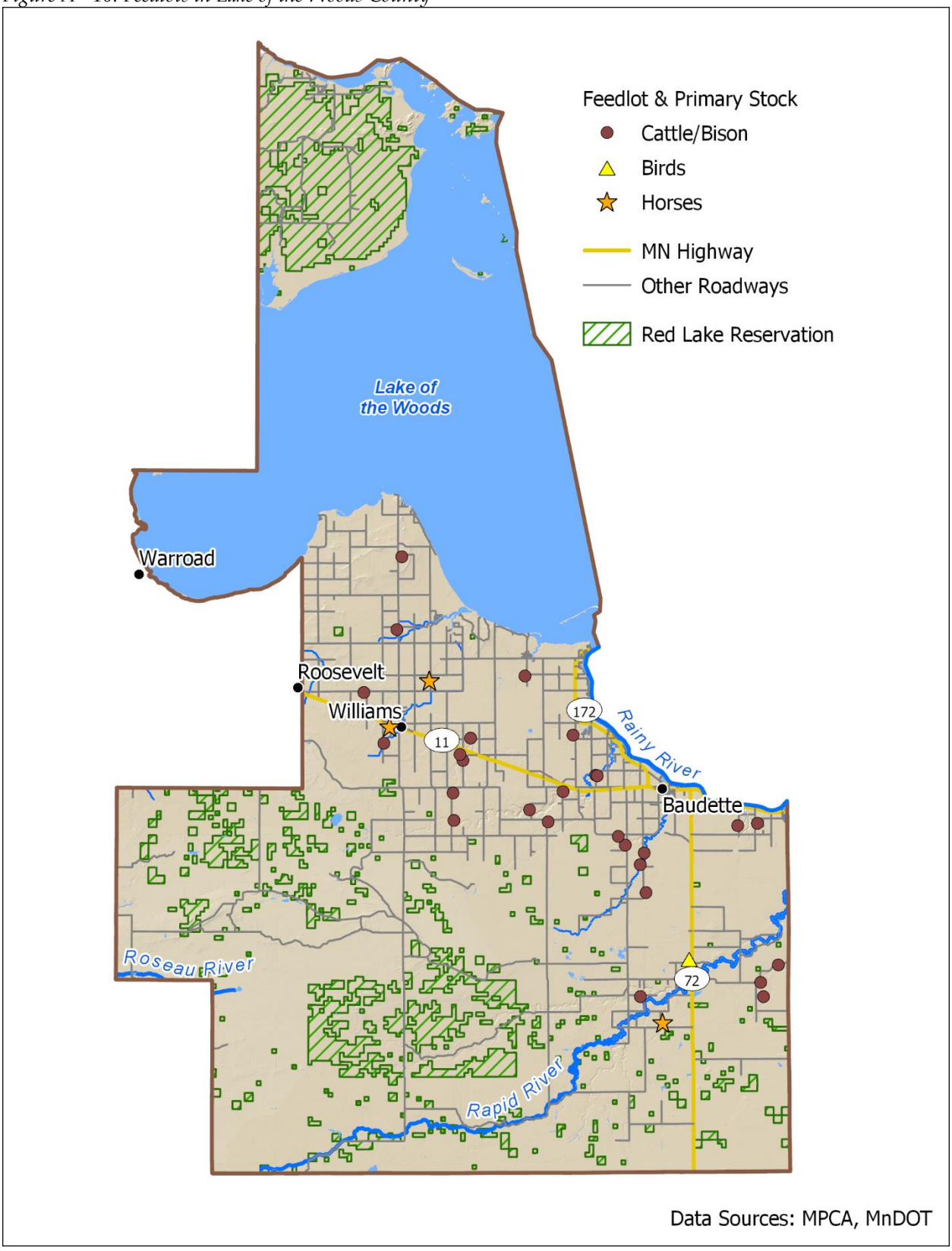


Figure A - 11. Mobile Home Parks in Lake of the Woods County

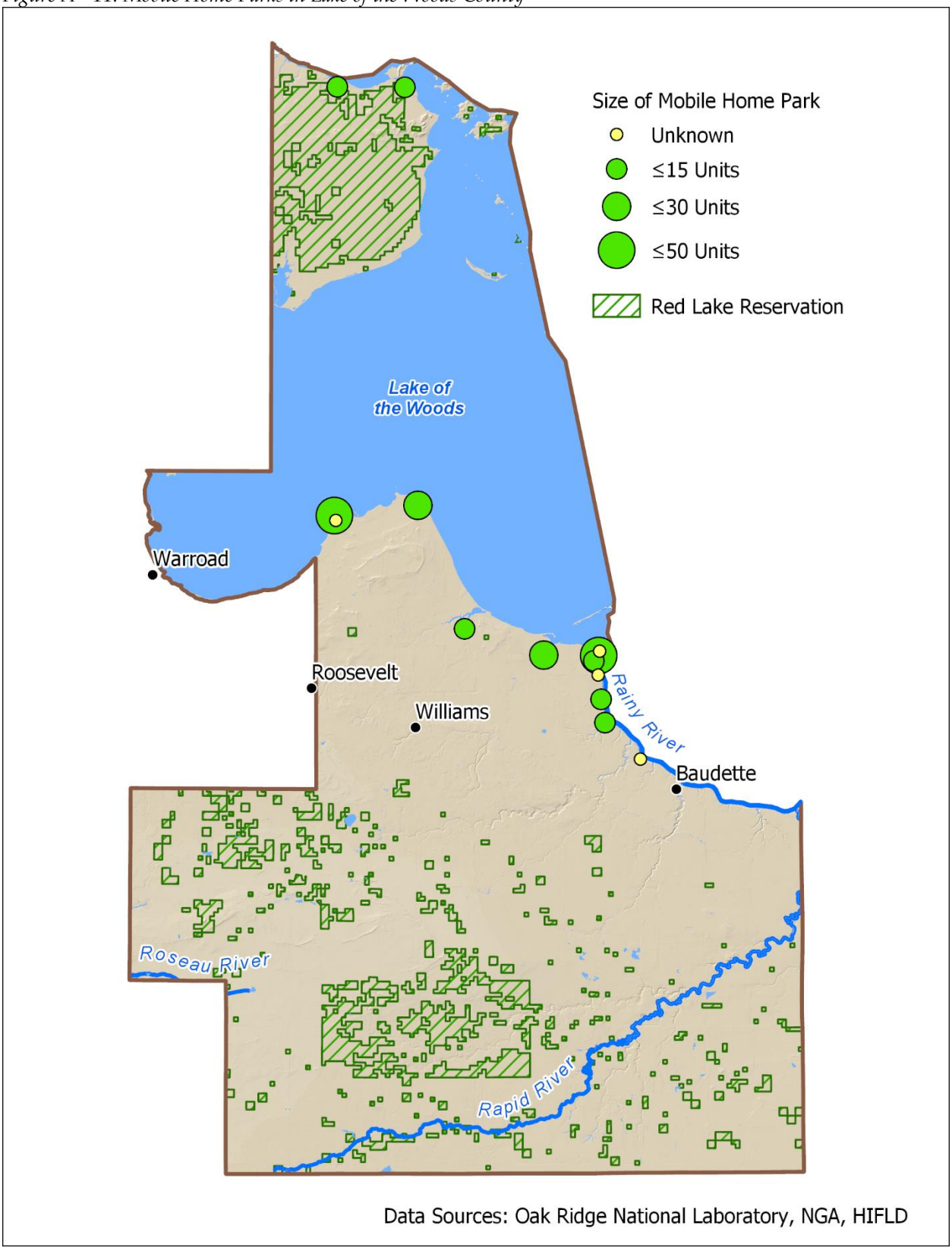
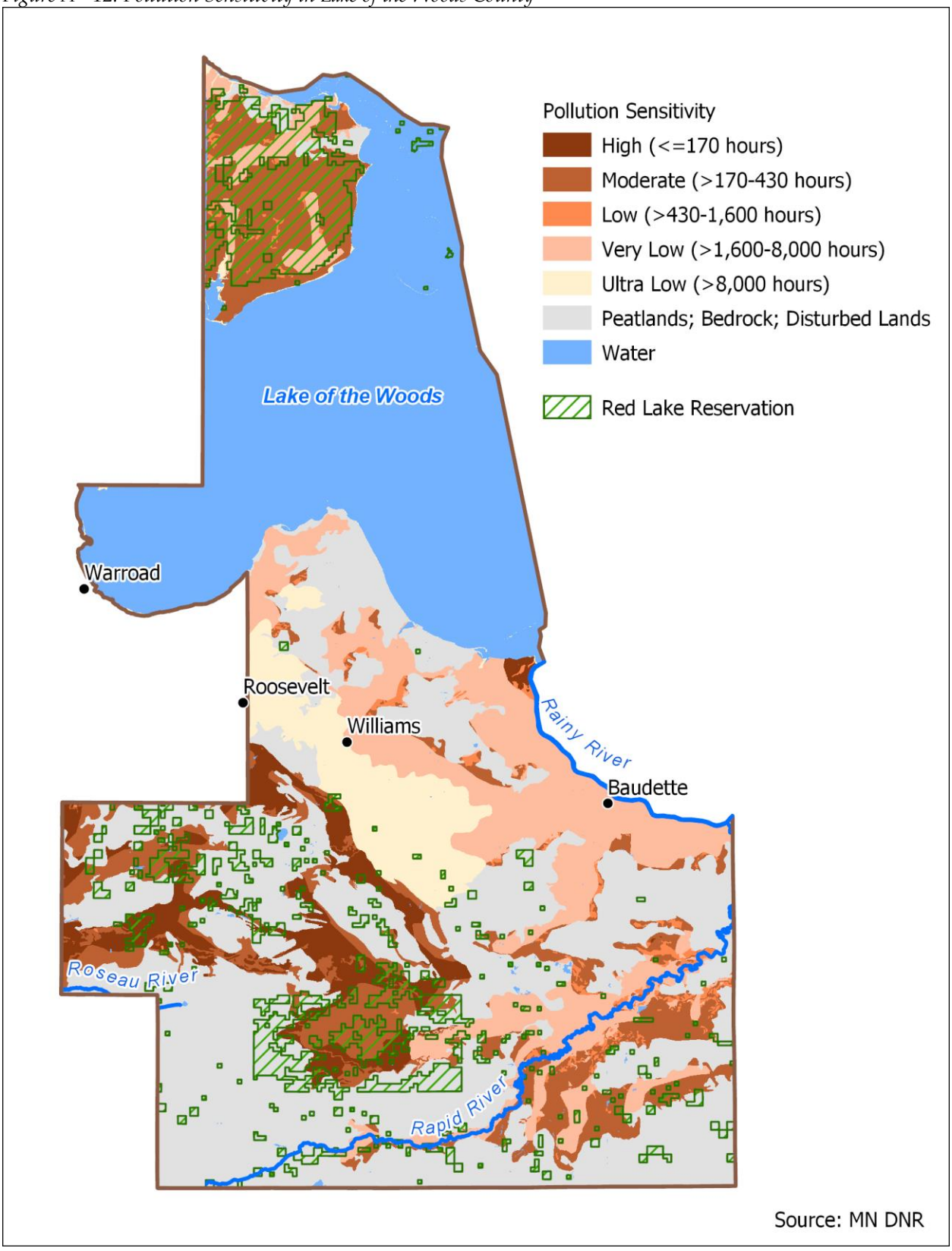


Figure A - 12. Pollution Sensitivity in Lake of the Woods County



Appendix B
Lake of the Woods County
Critical Infrastructure

Healthcare Facilities				
Name	**Address**	**City**	**Zip**	**Type**
Lakewood Care Center	600 Main Avenue	Baudette	56623	Nursing Home
Lakewood Health Center	600 Main Avenue	Baudette	56623	Hospital

Emergency Services			
Name	**Address**	**City**	**Zip**
Baudette Police Department	219 8th Avenue SE	Baudette	56623
Baudette Volunteer Fire Department	108 1st Ave SW	Baudette	56623
Lake of the Woods County Emergency Operations Center	206 8th Avenue SE	Baudette	56623
Lake of the Woods County Emergency Operations Center-Alternate	206 8th Avenue SE	Baudette	56623
Lake of the Woods County Sheriff	206 8th Avenue SE	Baudette	56623
Northwest Angle Fire Department	County Road 332	Angle Inlet	56711
United States Customs And Border Protection	State Highway 72 North	Baudette	56623
Williams Volunteer Fire Department	220 Main Street	Williams	56686

Schools & Shelters				
Name	**Address**	**City**	**Zip**	**Type**
Angle Inlet Elementary	17606 Inlet Rd NW	Angle Inlet	56763	School
Baudette Arena	Wilderness Dr & 5th St SW	Baudette	56623	Shelter
Bethlehem Lutheran Church	310 W Main St	Baudette	56623	Shelter
First Lutheran Church	312 3Rd Ave SW	Baudette	56623	Shelter

Schools & Shelters				
Name	**Address**	**City**	**Zip**	**Type**
Lake of the Woods Elementary	236 15th Ave SW	Baudette	56623	School & Shelter
Lake of the Woods High	236 15th Ave SW	Baudette	56623	School
Sacred Heart Church	104 1St Street SW	Baudette	56623	Shelter
Williams Arena	Pine Street	Williams	56686	Shelter
Williams City Hall/Senior Center	150 Main Street	Williams	56686	Shelter
Williams Municipal Liquor Store	Highway 11 And County Road 2	Williams	56686	Shelter
Williams Waste Water Treatment Plant	Spina Street	Williams	56686	Shelter

Transportation			
Name	**Address**	**City**	**Zip**
Baudette International Airport	1103 Airport Rd NW	Baudette	56623
Canadian National Railway Rainy River Section	935 de La Gauchetière Street West	Montreal, Canada	NA
Cox-Coyour Memorial Air Field	NA	Roosevelt	56673
Lake of the Woods Highway Department	306 8th Ave SE	Baudette	56623

Utilities			
Name	**Address**	**City**	**Zip**
ANI Pharmaceuticals Inc	210 Main St	Baudette	56623
ANIP Acquisition Company	210 Main St	Baudette	56623
Baudette	106 Main St	Baudette	56623
Centra Pipelines	2324 Main Street	London, Ontario	N6P 1A9
Minnkota Power Cooperative	5301 32nd Avenue South	Grand Forks, ND	58201
Xcel Energy, Inc.	404 Nicollet Mall	Minneapolis	55401
Baudette Municipal Light & Water	PO Box 548	Baudette	56623
Roseau Electric Coop	1107 3rd St NE	Roseau	56751
North Star Electric Cooperative	441 State Hwy 172 NW	Baudette	56623

Dams & Levees				
Name	**Type**	**Owner/Sponsor**	**Waterway**	**Location**
Brown's Lake	Dam	MNDNR - Wildlife	Judicial Ditch 62	Beltrami Forest Unorganized Territory
Hansen Creek	Dam	MNDNR - Wildlife	Hansen Creek	Beltrami Forest Unorganized Territory
Keller	Dam	MNDNR - Fisheries	Winter Road River-TR	Beltrami Forest Unorganized Territory
Roseau River	Dam	MNDNR - Wildlife	Roseau River	Beltrami Forest Unorganized Territory

Hazardous Materials Facilities			
Name	**Address**	**City**	**Zip**
858450-Ccatt-Zod-Alltel-Baudette-Usid107922	1773 28Th Ave NW	Baudette	56623
Ani Pharmaceuticals	210 Main St W	Baudette	56623
Ani Pharmaceuticals Hormone Facility	455 Idc Rd SW	Baudette	56623
Ballard's Resort	3314 Bur Oak Rd NW	Baudette	56623
Baudette Well House	52 14Th Ave NW	Baudette	56623
Erickson Timber Products	1801 State Hwy 72 SE	Baudette	56623
Ferrellgas/Williams	333 State Hwy 11 NW	Williams	56686
Lake Of The Woods School	236 15Th Ave SW	Baudette	56623
Lakes Gas Co.	101 3Rd Ave NE	Baudette	56623
Lakewood Health Center	600 Main Ave S	Baudette	56623
Mndot Baudette Truck Station	504 Main St E	Baudette	56623
Rocky Point Rock Harbor Lodge	6760 Rocky Point Rd NW	Roosevelt	56673
Sportsman's Lodge	3244 Bur Oak Rd NW	Baudette	56623
West Central Ag Services Williams	258 State Hwy 11 NW	Williams	56686

Major Employers			
Name	**Address**	**City**	**Zip**
AET	1420 County Rd 1 SW	Baudette	56623
ANI Pharmaceuticals	210 Main St W	Baudette	56623
Bosch, Robert Corp.	904 Airport Rd NW	Baudette	56623
Cenex Co-Op Services Inc	903 Main St W	Baudette	56623

Major Employers			
Name	**Address**	**City**	**Zip**
Chi Lakewood Care Center, Clinic, Health Center	600 Main Ave S	Baudette	56623
Lake of the Woods County	206 8Th Ave SE	Baudette	56623
Lake Of The Woods Foods/Fuel Max	108 Main St E	Baudette	56623
Lake of the Woods School	236 15Th Ave SW	Baudette	56623
Lakes Gas Co.	101 3Rd Ave NE	Baudette	56623
North Star Electric Co-Op	441 State Hwy 172 NW	Baudette	56623

Government Buildings			
Name	**Address**	**City**	**Zip**
Lake Of The Woods County Highway Dept.	306 8Th Ave SE	Baudette	56623
Lake Of The Woods County Government Building	206 8Th Ave SE	Baudette	56623
Lake Of The Woods County Court House	206 8Th Ave SE	Baudette	56623
Lake Of The Woods County Emergency Management	208 8Th Ave SE	Baudette	56623
Lake Of The Woods County Sheriff's Office	208 8Th Ave SE	Baudette	56623
Lake Of The Woods County Jail	208 8Th Ave SE	Baudette	56623
Baudette City Hall	106 Main St W	Baudette	56623
Williams Fire Dept.	220 Main St	Williams	56686
Williams City Hall	450 Main St	Williams	56686
Lake Of The Woods County Soil & Water	119 1St Ave NW	Baudette	56623
Post Office-Baudette	119 1St Ave NW	Baudette	56623
Us Department Of Agriculture	119 1St Ave NW	Baudette	56623
Baudette Fire Department	106 1St Ave SW	Baudette	56623
Lake Of The Woods Ambulance Svc	113 1St Ave SW	Baudette	56623
Port Of Entry-Baudette International Bridge Customs	600 International Dr NE	Baudette	56623
MN Dept. Of Highway Maintenance Garage	504 Main St E	Baudette	56623
MN Dept. Of Natural Resources Fisheries	204 Main St E	Baudette	56623
MN Dept. Of Natural Resources Forestry	206 Main St E	Baudette	56623

Cultural Resources	
Name	**Location**
Baudette Public Library	110 1St St SW, Baudette, MN 56623
Baudette Train Depo Cn	402 Main St N, Baudette, MN 56623
Carp Hall	6023 County Rd 1 SW, Baudette, MN 56623
Fort St. Charles	Magnuson'S Island, Angle Inlet, MN 56711
Lake Of The Woods County Historical Society-Museum	119 8Th Ave SE, Baudette, MN 56623
Norris Camp	11536 Faunce Butterfield Rd Sw, Williams, MN 56686
Northwest Point	7600 Young'S Bay Dr NW, Angle Inlet, MN 56711
Rex Hotel	103 1St St NW, Baudette, MN 56623
Williams Public Library	350 Main St, Williams, MN 56686
Willy Walleye	Corner Of Main St & International Dr, Baudette, MN 56623

Appendix C
Lake of the Woods County Hazard Events

The National Centers for Environmental Information Storm Events Database was queried for all events that occurred in Lake of the Woods County since 1950. Some event categories do not have records prior to 1996. Data was available through April 2019.

Table C - 1 Tornadoes, 1950 - April 2019

Date	Begin Location	End Location	Magnitude	Deaths	Injuries	Total Damages
7/17/2019	FAUNCE	BAUDETTE	EF1	0	1	Unknown
6/19/2016	FAUNCE	FAUNCE	EF1	0	0	Unknown
9/11/2013	WILLIAMS	GRACETON	EF0	0	0	Unknown
6/24/2007	ARNESEN	ARNESEN	EF1	0	0	Unknown
8/5/2006	WILLIAMS	WILLIAMS	F0	0	0	Unknown
8/5/2006	FAUNCE	FAUNCE	F1	0	0	Unknown
6/23/2005	ANGLE INLET	OAK IS	F1	0	0	Unknown
5/5/2005	BAUDETTE	BAUDETTE	F0	0	0	$5,000
5/5/2005	CARP	CARP	F0	0	0	Unknown
7/18/2001	LUDE	LUDE	F0	0	0	Unknown
7/31/2001	GRACETON	GRACETON	F0	0	0	$100,000
7/15/1999	LUDE	LUDE	F0	0	0	Unknown
6/8/1985	No Data	No Data	F0	0	0	Unknown
6/25/1963	No Data	No Data	F2	0	0	$25,000
9/1/1961	No Data	No Data	F1	0	1	$25,000

Table C - 2. Hail Events, 1955 - April 2019

Date	Location	Hailstone Diameter (inches)	Deaths	Injuries	Total Damages
9/12/2018	WILLIAMS	1	0	0	No Data
8/31/2018	CLEMENTSON	1	0	0	No Data
7/4/2017	LUDE	1.5	0	0	No Data
7/4/2017	CARP	1	0	0	No Data
7/20/2016	CARP	2	0	0	No Data
6/19/2016	BAUDETTE AFS	2.5	0	0	No Data
6/19/2016	(BDE)BAUDETTE INTL A	0.75	0	0	No Data
6/19/2016	CLEMENTSON	1.75	0	0	No Data
6/19/2016	ARNESEN	1.75	0	0	No Data
6/19/2016	LUDE	2.75	0	0	No Data
8/22/2015	ARNESEN	0.75	0	0	No Data
8/6/2015	FAUNCE	1	0	0	No Data
7/12/2015	CARP	1	0	0	No Data
5/28/2015	ARNESEN	2	0	0	No Data
9/11/2013	(BDE)BAUDETTE INTL A	0.75	0	0	No Data
9/11/2013	WILLIAMS	1	0	0	No Data
9/11/2013	WILLIAMS	1.5	0	0	No Data

Date	Location	Hailstone Diameter (inches)	Deaths	Injuries	Total Damages
9/11/2013	GRACETON	1	0	0	No Data
8/31/2013	HACKETT	0.88	0	0	No Data
7/22/2012	LUDE	1	0	0	No Data
7/22/2012	HACKETT	1	0	0	No Data
7/22/2012	(BDE)BAUDETTE INTL A	1.75	0	0	No Data
5/28/2011	WILLIAMS	1	0	0	No Data
5/24/2010	BAUDETTE AFS	0.88	0	0	No Data
5/24/2010	BAUDETTE AFS	1.75	0	0	No Data
5/24/2010	CARP	1.25	0	0	No Data
4/2/2010	LUDE	0.88	0	0	No Data
7/20/2008	CARP	0.88	0	0	No Data
7/11/2008	BAUDETTE AFS	0.75	0	0	No Data
7/1/2008	CARP	0.75	0	0	No Data
6/19/2008	LUDE	0.88	0	0	$0
6/12/2008	WILLIAMS	0.75	0	0	$0
5/25/2008	CLEMENTSON	0.88	0	0	$0
9/21/2007	FAUNCE	0.88	0	0	$0
9/21/2007	CARP	0.75	0	0	$0
8/10/2007	LUDE	1	0	0	$0
7/22/2007	ARNESEN	0.75	0	0	$0
7/4/2007	LUDE	1.75	0	0	$0
6/24/2007	ARNESEN	2	0	0	$0
6/24/2007	LUDE	1.25	0	0	$0
8/5/2006	WILLIAMS	2	0	0	No Data
8/5/2006	LUDE	0.88	0	0	No Data
8/5/2006	CARP	0.75	0	0	No Data
7/31/2006	BAUDETTE	0.75	0	0	No Data
6/26/2006	ANGLE INLET	1	0	0	No Data
6/26/2006	ANGLE INLET	2	0	0	No Data
8/17/2005	CARP	0.88	0	0	No Data
7/19/2005	OAK IS	1.5	0	0	No Data
7/3/2005	ANGLE INLET	1	0	0	No Data
7/3/2005	OAK IS	0.88	0	0	No Data
6/23/2005	ANGLE INLET	1	0	0	No Data
6/23/2005	ANGLE INLET	1.75	0	0	No Data
6/23/2005	WILLIAMS	0.75	0	0	No Data
6/23/2005	BAUDETTE	1	0	0	No Data
5/5/2005	BAUDETTE	0.75	0	0	No Data
5/5/2005	CARP	1	0	0	No Data
5/5/2005	CARP	2	0	0	No Data
4/18/2005	LUDE	0.88	0	0	No Data
7/21/2004	WILLIAMS	0.88	0	0	No Data
7/10/2004	LUDE	0.75	0	0	No Data

Date	Location	Hailstone Diameter (inches)	Deaths	Injuries	Total Damages
6/5/2004	WILLIAMS	0.75	0	0	No Data
9/17/2003	ANGLE INLET	0.75	0	0	No Data
9/17/2003	WILLIAMS	1.5	0	0	No Data
9/17/2003	ARNESEN	0.75	0	0	No Data
7/14/2003	OAK IS	0.75	0	0	No Data
7/14/2003	WILLIAMS	1	0	0	No Data
7/14/2003	CLEMENTSON	0.75	0	0	No Data
7/6/2003	BAUDETTE	0.75	0	0	No Data
7/6/2003	BAUDETTE	0.75	0	0	No Data
8/14/2002	BAUDETTE	0.75	0	0	No Data
8/14/2002	BAUDETTE	1	0	0	No Data
7/1/2002	WILLIAMS	1	0	0	No Data
7/1/2002	LUDE	1	0	0	No Data
6/9/2002	BAUDETTE	1	0	0	No Data
6/9/2002	CLEMENTSON	0.75	0	0	No Data
5/29/2002	FAUNCE	0.75	0	0	No Data
7/31/2001	PITT	1	0	0	No Data
7/18/2001	BAUDETTE	1	0	0	No Data
7/17/2001	GRACETON	0.75	0	0	No Data
7/17/2001	WILLIAMS	1	0	0	No Data
5/15/2001	FAUNCE	0.88	0	0	No Data
7/31/2000	WILLIAMS	0.75	0	0	No Data
7/31/2000	WILLIAMS	0.75	0	0	No Data
7/31/2000	WILLIAMS	0.88	0	0	No Data
9/7/1999	WILLIAMS	0.75	0	0	No Data
8/17/1999	ANGLE INLET	0.75	0	0	No Data
6/25/1999	WILLIAMS	0.75	0	0	No Data
6/6/1999	BAUDETTE	1.25	0	0	No Data
6/6/1999	BAUDETTE	1	0	0	No Data
6/6/1999	BAUDETTE	1	0	0	No Data
8/26/1998	BAUDETTE	1.75	0	0	$20,000
8/26/1998	BAUDETTE	1.75	0	0	No Data
7/20/1998	WILLIAMS	0.75	0	0	No Data
6/27/1998	WILLIAMS	1	0	0	No Data
5/15/1998	BAUDETTE	1	0	0	No Data
7/1/1997	CARP	0.75	0	0	No Data
7/1/1997	BAUDETTE	0.75	0	0	No Data
9/15/1995	Cass Lake	1.5	0	0	$0
7/30/1991	No Data	1.75	0	0	$0
7/11/1973	No Data	2	0	0	$0

Table C - 3. Windstorm Events, 1955 - April 2019

Date	Location	Type	Magnitude (knots)	Deaths	Injuries	Total Damage
8/26/2018	FAUNCE	Thunderstorm Wind	70	0	0	No Data
8/26/2018	CARP	Thunderstorm Wind	70	0	0	No Data
8/26/2018	CLEMENTSON	Thunderstorm Wind	70	0	0	No Data
8/26/2018	CLEMENTSON	Thunderstorm Wind	70	0	0	No Data
6/13/2017	No Data	High Wind	50	0	0	No Data
6/17/2016	CARP	Thunderstorm Wind	56	0	0	No Data
8/1/2015	WILLIAMS	Thunderstorm Wind	56	0	0	No Data
9/11/2013	ARNESEN	Thunderstorm Wind	52	0	0	No Data
9/11/2013	PITT	Thunderstorm Wind	55	0	0	No Data
8/31/2013	LUDE	Thunderstorm Wind	55	0	0	No Data
7/22/2013	CLEMENTSON	Thunderstorm Wind	91	0	0	$500,000
7/20/2011	LUDE	Thunderstorm Wind	55	0	0	No Data
5/29/2009	LUDE	Thunderstorm Wind	51	0	0	$0
1/31/2009	No Data	High Wind	40	0	0	No Data
7/11/2008	(BDE)BAUDETTE INTL A	Thunderstorm Wind	50	0	0	$20,000
7/11/2008	BAUDETTE AFS	Thunderstorm Wind	65	0	0	$20,000
8/10/2007	ARNESEN	Thunderstorm Wind	52	0	0	$0
8/10/2007	LUDE	Thunderstorm Wind	52	0	0	$0
8/5/2006	ARNESEN	Thunderstorm Wind	50	0	0	No Data
8/5/2006	BAUDETTE	Thunderstorm Wind	60	0	0	No Data
11/8/2005	No Data	High Wind	40	0	0	No Data
10/5/2005	No Data	High Wind	40	0	0	No Data
7/3/2005	ARNESEN	Thunderstorm Wind	50	0	0	No Data
7/3/2005	CARP	Thunderstorm Wind	50	0	0	No Data

Date	Location	Type	Magnitude (knots)	Deaths	Injuries	Total Damage
6/23/2005	ANGLE INLET	Thunderstorm Wind	78	0	0	No Data
6/23/2005	BAUDETTE	Thunderstorm Wind	70	0	0	No Data
9/1/2002	WILLIAMS	Thunderstorm Wind	No Data	0	0	$5,000
9/1/2002	BAUDETTE	Thunderstorm Wind	51	0	0	No Data
7/7/2002	BAUDETTE	Thunderstorm Wind	No Data	0	0	$200
4/16/2002	BAUDETTE	Thunderstorm Wind	No Data	0	0	$500
2/11/2002	No Data	High Wind	56	0	0	No Data
8/8/2001	BAUDETTE	Thunderstorm Wind	No Data	0	0	$1,000
8/14/2001	CARP	Thunderstorm Wind	No Data	0	0	$500
7/17/2001	CARP	Thunderstorm Wind	No Data	0	0	$4,000
7/18/2001	LUDE	Thunderstorm Wind	No Data	0	0	$1,000
7/18/2001	LUDE	Thunderstorm Wind	No Data	0	0	$5,000
7/18/2001	LUDE	Thunderstorm Wind	No Data	0	0	$50,000
7/18/2001	BAUDETTE	Thunderstorm Wind	No Data	0	0	$2,000
7/18/2001	BAUDETTE	Thunderstorm Wind	No Data	0	0	$500
7/31/2001	BAUDETTE	Thunderstorm Wind	No Data	0	0	$100,000
7/31/2001	CARP	Thunderstorm Wind	No Data	0	0	$100,000
7/31/2001	PITT	Thunderstorm Wind	No Data	0	0	$50,000
12/25/1999	No Data	High Wind	75	0	0	No Data
11/1/1999	No Data	High Wind	60	0	0	No Data
7/15/1999	ANGLE INLET	Thunderstorm Wind	No Data	0	0	$2,000
7/15/1999	WILLIAMS	Thunderstorm Wind	No Data	0	0	$5,000
7/15/1999	ANGLE INLET	Thunderstorm Wind	No Data	0	0	$500
7/15/1999	BAUDETTE	Thunderstorm Wind	No Data	0	0	$500

Date	Location	Type	Magnitude (knots)	Deaths	Injuries	Total Damage
6/6/1999	BAUDETTE	Thunderstorm Wind	52	0	0	No Data
6/25/1999	PITT	Thunderstorm Wind	No Data	0	0	$3,000
7/1/1997	BAUDETTE	Thunderstorm Wind	No Data	0	0	$500
9/5/1995	Baudette	Thunderstorm Wind	50	0	0	$0
8/18/1995	No Data	Thunderstorm Wind	51	0	0	$0
8/22/1995	Baudette	Thunderstorm Wind	56	0	0	$0
6/27/1992	No Data	Thunderstorm Wind	0	0	0	$0
7/30/1991	No Data	Thunderstorm Wind	0	0	0	$0
6/25/1991	No Data	Thunderstorm Wind	0	0	0	$0
8/3/1989	No Data	Thunderstorm Wind	74	0	0	$0
7/8/1984	No Data	Thunderstorm Wind	0	0	0	$0
9/8/1983	No Data	Thunderstorm Wind	63	0	0	$0
8/27/1983	No Data	Thunderstorm Wind	61	0	0	$0
8/29/1983	No Data	Thunderstorm Wind	0	0	0	$0
7/7/1974	No Data	Thunderstorm Wind	0	0	0	$0
7/7/1974	No Data	Thunderstorm Wind	50	0	0	$0
7/11/1973	No Data	Thunderstorm Wind	0	0	0	$0
7/10/1967	No Data	Thunderstorm Wind	50	0	0	$0
8/5/1962	No Data	Thunderstorm Wind	57	0	0	$0

Table C - 4. Flood Events, 1996 - April 2019

Date	Location	Type	Deaths	Injuries	Total Damage
3/25/2009	WILLIAMS	Flood	0	0	$5,000
4/1/2004	No Data	Flood	0	0	No Data
3/28/2004	No Data	Flood	0	0	No Data

Date	Location	Type	Deaths	Injuries	Total Damage
6/22/2002	ARNESEN	Flash Flood	0	0	No Data
6/10/2002	BAUDETTE	Flash Flood	0	0	No Data
6/10/2002	No Data	Flood	0	2	$500,000
6/9/2002	BAUDETTE	Flash Flood	0	0	No Data
7/31/2001	BAUDETTE	Flash Flood	0	0	$2,000
7/31/2001	WILLIAMS	Flash Flood	0	0	$10,000
7/31/2001	GRACETON	Flash Flood	0	0	$150,000
7/31/2001	BAUDETTE	Flash Flood	0	0	$10,000
7/18/2001	LUDE	Flash Flood	0	0	$5,000
7/18/2001	BAUDETTE	Flash Flood	0	0	$10,000
7/17/2001	CARP	Flash Flood	0	0	No Data
7/1/2001	No Data	Flood	0	0	$250,000
5/17/1996	BAUDETTE	Flash Flood	0	0	$10,000

Table C - 5. Winter-Related Storm Events, 1996 - April 2019

Date	Type	Deaths	Injuries	Total Damage
3/9/2019	Heavy Snow	0	0	No Data
2/24/2019	Blizzard	0	0	No Data
2/23/2019	Heavy Snow	0	0	No Data
2/6/2019	Winter Storm	0	0	No Data
2/3/2019	Heavy Snow	0	0	No Data
12/26/2018	Heavy Snow	0	0	No Data
12/4/2017	Winter Storm	0	0	No Data
10/26/2017	Winter Storm	0	0	No Data
1/2/2017	Winter Storm	0	0	No Data
12/25/2016	Winter Storm	0	0	No Data
12/5/2016	Winter Storm	0	0	No Data
3/16/2016	Heavy Snow	0	0	No Data
2/23/2016	Heavy Snow	0	0	No Data
12/16/2015	Winter Storm	0	0	No Data
1/2/2015	Heavy Snow	0	0	No Data
4/1/2014	Winter Storm	0	0	$0
3/31/2014	Winter Storm	0	0	$0
3/21/2014	Winter Storm	0	0	$0
12/3/2013	Winter Storm	0	0	No Data
4/14/2013	Winter Storm	0	0	$0
3/17/2013	Winter Storm	0	0	$0
3/4/2013	Heavy Snow	0	0	$0
2/17/2013	Winter Storm	0	0	$0
2/10/2013	Winter Storm	0	0	No Data
1/11/2013	Winter Storm	0	0	No Data
1/1/2011	Winter Storm	0	0	No Data
12/31/2010	Heavy Snow	0	0	No Data

Date	Type	Deaths	Injuries	Total Damage
12/31/2010	Winter Storm	0	0	No Data
11/29/2010	Winter Storm	0	0	$0
1/22/2010	Winter Storm	0	0	No Data
12/23/2009	Heavy Snow	0	0	No Data
4/1/2009	Winter Storm	0	0	No Data
3/30/2009	Winter Storm	0	0	No Data
3/24/2009	Winter Storm	0	0	No Data
3/9/2009	Winter Storm	0	0	No Data
2/9/2009	Ice Storm	0	0	No Data
1/2/2009	Heavy Snow	0	0	No Data
12/13/2008	Winter Storm	0	0	No Data
4/25/2008	Winter Storm	0	0	$0
2/24/2007	Winter Storm	0	0	$0
12/30/2006	Winter Storm	0	0	$0
11/28/2006	Ice Storm	0	0	$0
3/1/2006	Heavy Snow	0	0	No Data
11/27/2005	Winter Storm	0	0	No Data
1/1/2005	Winter Storm	0	0	No Data
12/31/2004	Winter Storm	0	0	No Data
12/29/2004	Winter Storm	0	0	No Data
12/11/2004	Winter Storm	0	0	No Data
1/24/2004	Winter Storm	0	0	No Data
1/13/2004	Heavy Snow	0	0	No Data
1/2/2004	Winter Storm	0	0	No Data
12/15/2003	Winter Storm	0	0	No Data
4/4/2003	Heavy Snow	0	0	No Data
3/27/2003	Heavy Snow	0	0	No Data
3/8/2002	Winter Storm	0	0	No Data
12/5/2001	Winter Storm	0	0	No Data
11/24/2001	Winter Storm	0	0	No Data
10/24/2001	Winter Storm	0	0	No Data
2/23/2001	Winter Storm	0	0	No Data
12/20/2000	Winter Storm	0	0	No Data
12/16/2000	Winter Storm	0	0	No Data
4/3/1999	Winter Storm	0	0	No Data
3/17/1999	Winter Storm	0	0	No Data
11/18/1998	Winter Storm	0	0	No Data
11/10/1998	Blizzard	0	0	No Data
1/9/1997	Blizzard	0	0	No Data
11/16/1996	Blizzard	0	0	No Data
10/17/1996	Heavy Snow	0	0	No Data
4/25/1996	Heavy Snow	0	0	No Data

Table C - 6. Cold Events, 1996 - April 2019

Date	Type	Deaths	Injuries	Total Damage
3/2/2019	Extreme Cold/Wind Chill	0	0	No Data
2/24/2019	Extreme Cold/Wind Chill	0	0	$0
2/7/2019	Extreme Cold/Wind Chill	0	0	No Data
1/28/2019	Extreme Cold/Wind Chill	0	0	No Data
1/26/2019	Extreme Cold/Wind Chill	0	0	No Data
1/1/2019	Extreme Cold/Wind Chill	0	0	No Data
12/31/2018	Extreme Cold/Wind Chill	0	0	No Data
1/12/2018	Extreme Cold/Wind Chill	0	0	No Data
1/1/2018	Extreme Cold/Wind Chill	0	0	No Data
12/29/2017	Extreme Cold/Wind Chill	0	0	No Data
12/24/2017	Extreme Cold/Wind Chill	0	0	No Data
12/17/2016	Extreme Cold/Wind Chill	0	0	No Data
1/16/2016	Extreme Cold/Wind Chill	0	0	$0
2/21/2015	Extreme Cold/Wind Chill	0	0	No Data
1/6/2015	Extreme Cold/Wind Chill	0	0	$0
1/3/2015	Extreme Cold/Wind Chill	0	0	$0
3/1/2014	Extreme Cold/Wind Chill	0	0	$0
2/28/2014	Extreme Cold/Wind Chill	0	0	$0
2/26/2014	Extreme Cold/Wind Chill	0	0	$0
1/26/2014	Extreme Cold/Wind Chill	0	0	$0
1/22/2014	Extreme Cold/Wind Chill	0	0	$0
1/4/2014	Extreme Cold/Wind Chill	0	0	$0

Date	Type	Deaths	Injuries	Total Damage
12/28/2013	Extreme Cold/Wind Chill	0	0	$0
1/20/2013	Extreme Cold/Wind Chill	0	0	$0
2/10/2012	Extreme Cold/Wind Chill	0	0	$0
1/18/2012	Extreme Cold/Wind Chill	0	0	$0
1/21/2011	Extreme Cold/Wind Chill	0	0	No Data
1/15/2009	Cold/Wind Chill	0	0	No Data
1/14/2009	Cold/Wind Chill	0	0	No Data
1/14/2009	Cold/Wind Chill	0	0	No Data
12/15/2008	Extreme Cold/Wind Chill	0	0	No Data
2/19/2008	Extreme Cold/Wind Chill	0	0	$0
2/9/2008	Extreme Cold/Wind Chill	0	0	$0
1/29/2008	Extreme Cold/Wind Chill	0	0	$0
1/17/2008	Extreme Cold/Wind Chill	0	0	$0
2/16/2006	Cold/Wind Chill	0	0	No Data
1/13/2005	Cold/Wind Chill	0	0	No Data
8/19/2004	Cold/Wind Chill	0	0	No Data
6/23/2004	Cold/Wind Chill	0	0	No Data
1/26/2004	Cold/Wind Chill	0	0	No Data
1/21/2004	Cold/Wind Chill	0	0	No Data
1/4/2004	Cold/Wind Chill	0	0	No Data
3/8/2003	Cold/Wind Chill	0	0	$21,000
12/21/1996	Cold/Wind Chill	0	0	No Data
11/25/1996	Cold/Wind Chill	0	0	No Data
2/1/1996	Cold/Wind Chill	0	0	No Data

Table C - 7. Heat Events, 1996 - April 2019

Date	Type	Deaths	Injuries	Total Damage
8/4/2001	Heat	0	0	No Data

Table C - 8. Droughts, 1996 - April 2019

Date	Type	Deaths	Injuries	Total Damage
10/1/2012	Drought	0	0	No Data
9/1/2012	Drought	0	0	No Data
8/1/2012	Drought	0	0	No Data

Date	Type	Deaths	Injuries	Total Damage
7/17/2012	Drought	0	0	$0
10/1/2007	Drought	0	0	$0
9/18/2007	Drought	0	0	$0
6/1/2007	Drought	0	0	$0
5/1/2007	Drought	0	0	$0
4/1/2007	Drought	0	0	$0
3/1/2007	Drought	0	0	$0
2/1/2007	Drought	0	0	$0
1/1/2007	Drought	0	0	$0
12/1/2006	Drought	0	0	$0
11/1/2006	Drought	0	0	$0
10/1/2006	Drought	0	0	$0
9/1/2006	Drought	0	0	No Data
8/1/2006	Drought	0	0	No Data
7/18/2006	Drought	0	0	No Data

Appendix D
Adopting Resolutions

Resolutions to be added to Appendix D by Lake of the Woods County following final approval of the plan by FEMA.

Appendix E
Steering Committee Meetings

8/9/2017

Minnesota 7-County Multi-Hazard Mitigation Update Project

Kick-off Orientation Webinar

UNIVERSITY OF MINNESOTA GEOSPATIAL ANALYSIS CENTER

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

Webinar Purpose & Goals

Purpose:

The purpose of this webinar is provide an orientation kick-off meeting for the Emergency Managers participating in the Minnesota 7-County Multi-Hazard Mitigation Plan Update project.

Goals:

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

Introductions

Who We Are (UMD Project Team)


Stacey Stark, Director, Geospatial Analysis Center (GAC)


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


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


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

Who You Are (County Emergency Managers):

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

Minnesota HSEM:

Jennifer Nelson, MN HSEM
State Hazard Mitigation Officer

Project Overview

- **7 Counties**

Jurisdiction	FEMA's Expiration Date
Waseca	3/26/2017
Rice	5/22/2017
Carver	10/17/2017
Winona	11/8/2017
Ramsey	12/3/2017
Todd	4/15/2018
Nicollet	5/24/2018

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

1

8/9/2017

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 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 under your own direction (i.e., posting an online survey, providing an update 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 Strategy

Key activities to support the update of the Mitigation Strategy 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 Capabilities Assessment (LMCA) for jurisdictional-level 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:

- This step is often a difficult challenge for Emergency Managers after the plan is completed, and can bog down the process of final plan adoption and thus eligibility for applying for FEMA HMA funding.
- Engaging 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.

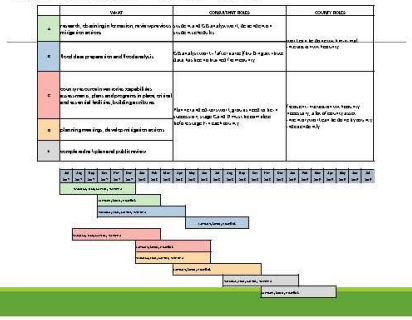
2

8/9/2017

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.

Estimated Time-line



Our Recent Experience

These things *really* help speed up the update process!

The UMD Team provides you with prepared communications & formats.

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

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

- *The quicker you get them back to us with complete information, the faster we can work with them, and we don't have to follow up to ask for help in filling in gaps.*

EM's help coordinate getting information that we need.

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

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

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

EM Tasks

- All county Emergency Managers will be provided with resources to complete the following tasks:

✓Plans & Programs in Place Checklist
✓Capabilities Assessment by each Natural Hazard
✓ Past Mitigation Action Review (Status Update)
✓ Public News Releases
✓ Compilation of Critical & Essential Facilities in Each Jurisdiction
✓ Coordination of Local Mitigation Capabilities Assessment
✓ Building Attribute Checklist for Flood Economic Loss Analysis

Next Steps

UMD Team members (Bonnie/Micaella) will follow up with each EM to provide & discuss the following assignments you can begin to work on:

- Plans & Programs in Place Checklist
- Capabilities Assessment (CA)
- Past Mitigation Action Review (PMAR)
- Listing of Critical Facilities
- "Section 6" text *(How the plan will be monitored, evaluated and updated within a 5-year cycle, and how public participation will continue).*
- Scheduling of 1st Planning Team Meeting

Questions?

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

3

8/9/2017

Contact Information

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

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

4

Lake of the Woods County
Multi-Hazard Mitigation Plan Update

Tuesday, June 4, 2019 MHMP Planning Team Meeting #1
Lake of the Woods Ambulance Garage – Baudette, MN
2:00 p.m. – 4:00 p.m.

Meeting Summary:

On Tuesday, June 4, 2019, key county, city, and township representatives, as well as other stakeholders were convened to participate in a Planning Team Meeting for the update of Lake of the Woods 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 Lake of the Woods County MHMP. A total of **13** people attended the meeting.

The opening presentation covered 6 key areas:

1. The purpose of hazard mitigation planning.

2. The role & responsibilities of the Planning Team.

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

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

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

    Planning Team Discussion Notes:

    - ***Severe winter storms on Lake of the Woods continue to be a high priority. Winter storm of late 2018 had lots of people ice fishing stranded after white out blizzard conditions. No fatalities occurred. Lessons learned – increase education and public awareness to people, particularly visitors, on winter hazards and personal preparedness.***

    - ***The City of Baudette uses the basement of City Hall as the community storm shelter, but it is problematic as it is not ADA accessible. The city wishes to have a better community storm shelter or safe room facility to accommodate all residents.***

    - ***Flooding continues to be a high priority with an increase in noted high rain and flooding events in the last 5 years. More road and facility damage experienced rather than building structure damage. The County has done a lot of ditch work in the past to help mitigate against flooding.***

    - ***Extreme Heat/Cold – no change to probability levels.***

- ***Erosion, Landslide, and Subsidence – Increase awareness to property owners on things to mitigate against erosion***
- ***Wildfire – Last big fire was in neighboring Roseau County in 2018. LOTW is impacted by air pollution due to fires in Canada to the north.***
- ***Drought – Goes in cycles. It's a concern but not a high priority.***
- ***School representatives asked about the possibility of retrofitting flat roofs on school buildings that are at risk to collapse from heavy snow.***
- ***City of Williams' biggest issue is wildfire and water storage to fight wildfires.***
- ***LOTW County – Concerns that there are not adequate storm shelters for the golf course, campgrounds and up in the Northwest Angle.***

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:

- 6-4-19 Planning Team Meeting Stakeholder Invite List
- 6-4-19 Lake of the Woods County Meeting Email Invite
- 6-4-19 Meeting Agenda
- 6-4-19 Meeting Sign-in Sheets (Scan of hardcopy & Excel copy)
- 6-4-19 Power Point Presentation Slides
- 6-4-19 Meeting Handouts (Mitigation Strategies, HMA Grants, Mitigation Ideas Worksheet)
- 6-4-19 Mitigation Ideas Working Session Notes

Meeting Summary Prepared By: Bonnie Hundrieser, UMD Project Team

Lake of the Woods County 2019 MHMP Update

6-4-19 Planning Team Meeting Stakeholder Invite List

Following is the list of stakeholders that were invited via email to attend the Lake of the Woods County MHMP Update Planning Team Meeting #1 held on June 4, 2019.

ID	Contact	Company/Agency	Title	Last name	First Name	Email Address
City of Baudette	City Contact	City Baudette Mayor	Mayor	Rone	Rick	rickrone@mncable.net
City of Baudette	City Contact	City of Baudette Administration	Clerk/treasurer	Rennemo	Tina	tinar@ci.baudette.mn.us
City of Baudette	City Contact	City of Baudette Public Works	Director of Public Works	Schotl	Roger	rogers@ci.baudette.mn.us
City of Baudette	City Contact	City of Baudette Zoning and Planning	Zoning and Planning Administrator	Eaton	Tom	New Hire
City of Baudette	City Contact	City of Baudette Library	Library Director	Pelland	Kelli	kellip@ci.baudette.mn.us
City of Baudette	City Contact	City of Baudette Airport	The airport person	Forsberg	Adam	rogers@ci.baudette.mn.us
City of Baudette	City Contact	City of Baudette Council Member	City Council Member	Carlson	Marla	marlac@ci.baudette.mn.us
City of Williams	City Contact	Williams Mayor	Mayor	McVay	Vera	vimcvay@gmail.com
Lake of the Woods County	County Contact	LOW County Commissioner	County Commissioner	Nordlof	Buck	buck_n@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Commissioner	County Commissioner	Hasbargen	Cody	cody_h@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Commissioner	County Commissioner	Arneson	Ed	ed_a@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Commissioner	County Commissioner	Waibel	Jon	jon_w@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Commissioner	County Commissioner	Grund	Joseph	joseph_G@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW Social Services	Director of Social Services	Ballard	Amy	amy_b@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Auditor	County Auditor Treasurer	Hanson	Lorene	lorene_h@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff	Sheriff	Fish	Gary	gary_f@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff	Emergency Management Director	Hasbargen Olson	Jill	jill_o@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff	Sergeant	Abby	Brad	Brad_a@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff	Administrative Assistant	Berggren	Julie	julie_b@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff	PSAP Manger	Sipe	Larry	larry_s@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff	Jail Administrator	Peterson	Sandy	sandy_p@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW Public Works	County Engineer	Erickson	Tim	tim_e@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW SWCD	Land & Water Planning Director	Stromlund	Josh	josh_s@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Assessor	County Assessor,	Otten	Mary Jo	maryjo_o@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Treasure	Deputy Auditor/Treasurer	Hasbargen	Rita	rita_h@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Auditor	Deputy Auditor/Treasurer	Rudd	Janet	Janet_R@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW Human Services	County Human Resources Director	Slick	Savanna	savanna_s@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW Land and Water Planning	Land & Water Planning Director	Stromlund	Josh	josh_s@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Attorney	County Attorney	Austed	James	James_A@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW MIS-GIS	GIS/IT Specialist	Solo	Eric	eric_o@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW MIS	Director of MIS	Hovland	Peder	Peder_h@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW Recorder	County Recorder	Ney	Susan	susan_n@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW Solid Waste	Solid Waste Director	Furbish	Ted	solidwaste@co.lake-of-the-woods.mn.us
Lake of the Woods County	County Contact	LOW County Sheriff NWA	Deputy Sheriffs Office	Goulet	Jason	redfoxfishing@yahoo.com
Lake of the Woods County	County Contact	LOW Public Works	County Engineer	Johnson	Boyd	boydj@co.lotw.mn.us
City of Williams	Other Stakeholder	Williams Fire	Fire Chief	Baldwin	Mike	williamsfiredept@wiktel.com
City of Baudette	Other Stakeholder	City of Baudette Fire	Fire Chief	Levasseur	Brad	bradl@ci.baudette.mn.us
City of Baudette	Other Stakeholder	City of Baudette Fire	Fire training Officer	Plourde	Chris	baudette491@gmail.com
CHI Lakewood Health	Other Stakeholder	CHI Lakewood Health	Infection Prevention, Employee Healt	Loughrey	Jenny	jennyloughrey@catholichealth.net
CHI Lakewood Health	Other Stakeholder	CHI Lakewood Health	CHFM Facilities Manager	Davis	Gary	garydavis@catholichealth.net
CHI Lakewood Health	Other Stakeholder	CHI Lakewood Nursing Service/Public H	Public Health	Schell	Kay	kayschell@catholichealth.net
City of Williams	Other Stakeholder	Williams Fire	Asst. Chief	Huerd	Roger	rogerh@wiktel.com
Lake of the Woods Ambulance	Other Stakeholder	Ambulance	Ambulance Sectary	Castle	Bobby Jo	Bobbyjocastle@catholichealth.net
Lake of the Woods Ambulance	Other Stakeholder	Ambulance Director	Ambulance Director	Castle	Don	donaldcastle@catholichealth.net
LOW School Superintendent	Other Stakeholder	LOW School	Director of Transportation	McFarlane	Reed	reed_m@lakeofthewoodsschool.org
LOW School Superintendent	Other Stakeholder	LOW School High School Principal	High School Principal	Novak	Brian	brian_n@lakeofthewoodsschool.org
LOW School Superintendent	Other Stakeholder	LOW School Superintendent	Superintendent	Nelson	Jeff	jeff_n@lakeofthewoodsschool.org
MN DNR	Other Stakeholder	DNR	Forester	Abel	Nick	nick.abel@state.mn.us
Northstar Electric	Other Stakeholder	Northstar Electric	Operations Manager	Mollberg	Marty	marty.m@northstar.net
NWA	Other Stakeholder	NWA Fire	Fire Chief	Mckeever	Brian	jackandjilltrades56711@gmail.com
US Customs	Other Stakeholder	US Customs	Port Director	Kraft	Shelly	Shelly.Kraft@DHS.gov
Northstar Electric	Other Stakeholder	Northstar Electric	Editor	Holen	Kevin	kevin.h@northstarelectric.coop
Northstar Electric	Other Stakeholder	Northstar Electric	General Manager	Ellis	Ann	ann.e@northdtarelectric.coop
CHI Lakewood Health	Other Stakeholder	CHI Lakewood Health	Maintenance Director	Bowman	Christopher	cbowman@catholichealth.net

From:	Jill Olson
To:	Amy Ballard; Ben Duick; Bobby Jo Castle (Bobbyjocastle@catholichealth.net); Brad Abbey; Brad Levasseur (blevasseur55@yahoo.com); Brian McKeever (info@youngsbayresort.com); Brian Novak; Buck Nordlof; Chris Plourde; Cody Hasbargen; Don Castle Ambulance; Don McKay (hovdemckay@hotmail.com); Ed Arnesen; Eric Solo; Gary Davis; Gary Fish; James Austad; Janet Rudd; jeff_n@lakeofthewoodsschool.org; Jenny Loughrey; Joe Grund; Jon Waibel; Josh Stromlund; Julie Berggren; Kay Schell (kayschell@catholichealth.net); Lorene Hanson; Marla Carlson (marlacarlson@catholichealth.net); Marty Mollberg (martynsec@wiktel.com); Mary Jo Otten; Mike Baldwin; Nick Abel (nick.abel@state.mn.usmndnr.gov); Peder Hovland; Rick Rone; Roger Huerd ; Roger Schotl; Sandy Peterson; Shelly Kraft; Tim Erickson; tinar@ci.baudette.mn.us; Verna McVay (vjmcvay@gmail.com)
Cc:	Bonnie Hundrieser (hundrieserconsulting@outlook.com)
Subject:	2019 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION
Date:	Tuesday, April 16, 2019 1:09:30 PM

LAKE OF THE WOODS COUNTY

2019 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

Greetings,

Your presence is requested at a Planning Team Meeting for the update of the **2019 Lake of the Woods 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: Tuesday, June 4, 2019

Time: 2:00 p.m. – 4:00 p.m.

Location: Lake of the Woods Ambulance Garage 111 1st St SW Baudette, MN 56623

About the Plan

The update of the Lake of the Woods County Multi-Hazard Mitigation Plan (MHMP) is a requirement by the State of Minnesota Department of Homeland Security & Emergency Management (HSEM) as well as the Federal Emergency Management Agency (FEMA) every 5 years. Our 2013 plan is due for an update and our planning is currently underway. The plan addresses the natural hazards that face Lake of the Woods County 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 or summer storms.

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

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

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

3. Mitigation planning is necessary to keep our communities resilient against future disasters and reduce the costs of recovery.

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

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

Please RSVP

Please RSVP back to me to indicate your 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.

Thank you,

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lake-of-the-woods.mn.us

Lake of the Woods County

2019 Multi-Hazard Mitigation Plan Update

Planning Team Meeting

Tuesday, June 4, 2019, 2:00 p.m. – 4:00 p.m.
Lake of the Woods Ambulance Garage– Baudette, 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:
Jill Hasbargen Olson
Lake of the Woods County Emergency Management Director
Phone: 218-634-4547
Email: jill_o@co.lake-of-the-woods.mn.us

Lake of the Woods County
6/4/19 MHMP Planning Team Meeting #1
List of Participants *(13)*

Lake of the Woods County MHMP Update - Planning Team Meeting #1 Tuesday, June 4, 2019 - 2:00 p.m. - 4:00 p.m. Participant Sign-in List			
Name	**Agency/Organization**	**Title**	**Email**
Jill Hasbargen Olson	Lake of the Woods County	Emergency Management Director	jill_o@co.LOTW.mn.us
Heather Winkleblack	HSEM	RPC	Heather.Winkleblack@state.mn.us
Julie Berggren	Lake of the Woods County	Administrative Assistant	julie_b@co.lotw.mn.us
Mary Jo Otten	Lake of the Woods County	County Assessor	maryjo_o@co.lotw.mn.us
Verra McVay	City of Williams	Mayor	vjmcvay@gmail.com
Jenny Loughrey	CHI Lakewood Health	RN	jennyloughrey@catholichealth.net
Chris Plourde	Baudette Fire Department	Training Officer	baudette491@gmail.com
Marla Carlson	City of Baudette	City Council Member	marlac@ci.baudette.mn.us
Brian Novak	Lake of the Woods School	High School Principal	brian_n@lakeofthewoodsschool.org
Jeff Nelson	Lake of the Woods School	Superintendent	jeff_n@lakeofthewoodsschool.org
Marty Mollberg	Northstar Electric	Operations Manager	marty_m@northstarelectric.coop
Amy Ballard	Lake of the Woods County	Social Service Director	amy_b@co.lotw.mn.us
Kay Schell	CHI Lakewood Health	Public Health	kayschell@catholichealth.net

Lake of the Woods County – Multi Hazard Mitigation Plan Update
Planning Team Meeting #1 – Tuesday, June 4, 2019 – 2:00 p.m. – 4:00 p.m.

PARTICIPANT SIGN IN SHEET

Name	Agency/Organization	Title	Email
1. Jill Hasbargen Olson	Lake of the Woods County	Em.	jill-o@co.lotw.mn.us
2. Heather Winkelblack	HSEM	RPC	heather.winkelblack@state.mn.us
3. Julie Beraggren	Lake of the Woods County	Administrative Assistant	Julie-b@co.lotw.mn.us
4. Mary Jo Otte	Lake of the Woods City	City Assessor	maryjo.o@lotw.mn.us
5. Verna McVay	Williams (City of)	Mayor	vjmcvay@gmail.com
6. Jenny Loughrey	CHI Lake Wood Health	RN	jennyloughrey@catholichealth.net
7. Chris Plourde	Baudette Fire Dept	Training officer	baudette4910@gmail.com
8. Maria Carlson	City of Baudette	Contact person	mariacarlson@
9. Brian Novak	L/Woods School	HS Principal	briann@lakeofthewoodsschool.org
10. Jeff Nelson	LW Schools	Superintendent	jeff-n@lakeofthewoodsschool.org
11. MARTY Mollberg	North Star Electric	Operations MGR	MARTY.M@northstarelectric.coop
12. Amy BALLARD	L.O.W. County	SOCIAL SERV. DIRECTOR	Amy-b@co.lotw.mn.us
13. Kay M Schell	CHI Lakewood - Public Health	PHN community health manager	kayschell@catholichealth.net
14.			
15.			
16.			
17.			
18.			
19.			
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21.			
22.			

6/25/2019

Lake of the Woods County

2019 MULTI-HAZARD MITIGATION PLAN UPDATE
PLANNING TEAM MEETING #1
JUNE 4, 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


July, 2014 Flooding Bostic Bay


July, 2014 NW Angle Shoreline Damage

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

6/25/2019

Who the Plan Covers

This is a **multi-jurisdictional plan** that covers Lake of the Woods County, including the cities of Baudette and Williams.

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

The City of Roseau is covered under the Roseau County plan but may also participate in and adopt the LOTW plan.

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

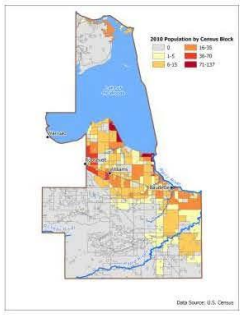
July, 2013, Straight line winds Highway 172

Led by HC
Led by UMD

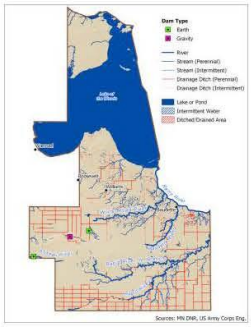
Role of GAC

- Project Management and communication with HSEM
- Technical writing, editing of plan
- Research to create/update the county profile
  - characteristics of county: physical, environmental, economic, demographic
  - work with county to identify Critical Infrastructures
- Research to create/update hazard profiles
  - hazard history; frequency of the hazard; who's most vulnerable to the hazard; influence climate change has on hazard
- GIS is used to inform our research

County Profile: Pop. by Census Block

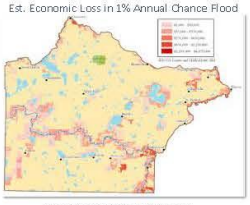


County Profile: Dam Inventory



Vulnerability Analysis: Flood Modeling

Est. Economic Loss in 1% Annual Chance Flood



County-wide analysis by census block

Parcels in floodplain

Jurisdictions at risk

HAZUS

6/25/2019

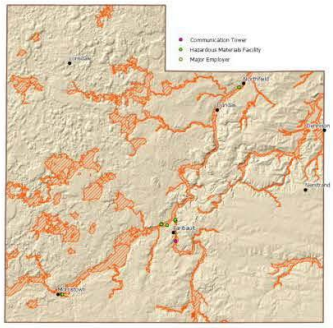
Critical Infrastructure (CI)

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, Communication: 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

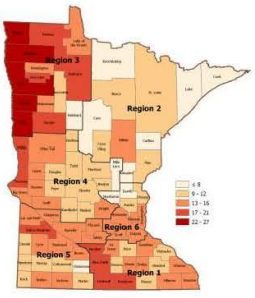


UMD – County Coordination

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 Lake of the Woods County



Lake of the Woods County has been part of **14** FEMA-declared disasters & emergencies.

Most Recent:

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 LOTW County

The MHMP update needs to include a review of the following:

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

Main Risk Factors:

Probability & Severity (Impacts)

Severe Winter Storms

- ***Probability:*** **High**
- ***Possible Impacts:***
  - Danger to Life Safety (road passage, homes)
  - Interruption to Transportation and Community Services
  - Damage to Property
  - ***Cascading Effects*** such as downed power lines & extended power outages to homes and critical facilities.

Severe Summer Storms

- ***Probability:*** **High**
- ***Possible Impacts:***
  - Danger to Life Safety
  - Damage to Natural Resources
  - Damage to Property
  - ***Cascading Effects*** such as flooding to roads, area lakes & streams, downed power lines & extended power outages to homes and critical facilities.

Flooding

Flash Flood & Riverine Flood

- ***Probability:*** **High**
- ***Possible Impacts:***
  - Danger to Life Safety (road passage, flooding of homes)
  - Interruption to Transportation and Community Services
  - Flooding of ag land and lost harvest / tiled land run-off
  - Damage to Property
  - ***Cascading Effects*** such as pump station failure or dam failure; displacement of residents.

Extreme Temperatures

- ***Probability:*** **Moderate (heat) / High(cold)**
- ***Possible Impacts:***
  - Danger to Life Safety
  - Potential impact to critical infrastructure / energy supply failure
  - ***Cascading Effects*** such as need provide temporary mass care sheltering for vulnerable populations.

Erosion, Landslides & Land Subsidence

- ***Probability:*** **Moderate**
- ***Possible Impacts:***
  - Erosion of slopes, streambanks, riverbanks, lake edges
  - Sediment load to lakes
  - Damage to Property or Imminent Risk
  - ***Cascading Effects*** such as road closures and impacted storm water systems from sediment load

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Wildfire

- ***Probability:*** **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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6/25/2019

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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6/25/2019

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)

6/25/2019

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 LOTW County resulting from Hazard Mitigation funding

DR Year	Project Description	Funding Type	Sub-Grantee	Federal Share
2010	Lake of the Woods County Plan Update	PDM		$25,500

Mitigation Action Working Session

- Review feedback from Lake of the Woods 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.

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Mitigation Strategies & Action Types

Following are the five types of mitigation strategies that will be used in the update of the Multi-Hazard Mitigation Plan with examples of related mitigation actions. Minnesota HSEM recommends the use of these mitigation strategies to be in alignment with the State plan and those recommended by FEMA. The first four strategies listed are taken from the FEMA publications *Local Mitigation Planning Handbook* (2013) and *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* (2013). The fifth strategy type was determined by Minnesota HSEM for use within the state.

These strategies will provide the framework for identification of new jurisdictional-level mitigation actions for implementation over the next 5-year planning cycle.

Mitigation Strategy	Description	Example Mitigation Actions
Local Planning and Regulations	These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.	• Comprehensive plans • 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.

- **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

LAKE OF THE WOODS COUNTY

June 4, 2019 MHMP Planning Meeting #1

Mitigation Ideas Worksheet Notes

Following are notes from the **Lake of the Woods County 6-4-19 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 Lake of the Woods County MHMP 2019 Update.

Lake of the Woods County (Social Services Dept.)
Submitted by: Amy Ballard, Social Services Director

Hazard: Straight Line Winds/Tornado
Action: Safe room (construction or retrofit) in areas of the county that have none.

Hazard: Straight Line Winds/Tornado
Action: Public awareness (radio/local TV spots) on tornado shelter sites.

City of Baudette
Submitted by: Marla Carlson, City Council Member

Hazard: Extreme Weather (Cold, Storms)
Action: Utility undergrounding.
Structural retrofits.
Floodwalls & retaining walls.
Culvert installation/modify.
Safe room.
Green infrastructure methods.
Roads & bridges.

Hazard: Extreme cold / Winter Storms
Action: Education and awareness programs. Use of websites & mailings. Promotion of sign-up for emergency warnings. Education of tourist community.

City of Baudette Fire Department
Submitted by: Chris Plourde, Training Officer

Hazard: Severe Storms and Weather
Action: Safe room located out at the lake for the resorts and people that live out there. (Northwest Angle)

Hazard: Wildland fire/structure fire (water access)
Action: Dry hydrants located up at the lake to make turn around time faster.

CHI Lakewood Health
Submitted by: Jenny Loughrey, RN & Kay M. Schell, Public Health Nurse

Hazard:	Summer Storms/High Winds
Action:	Shelters or safe rooms for campground in East Baudette, Northwest Angle, and Roosevelt. Lake of the Woods Campground was recently expanded with new sites.
Hazard:	Severe Storms
Action:	Do more education and awareness programs about safety on Lake of the Woods during white/blizzard conditions (ice fishing) or summer storms that come up quick (for boaters).
Hazard:	Wildfire (air quality)
Action:	Continue public notification on air quality hazards during wildfire events (either local or Canadian fires).

Lake of the Woods School
Submitted by: Brian Novak, Principal and Jeff Nelson, Superintendent

Hazard:	Severe Wind Storm/Tornado
Action:	Provide safe room for staff and students. Potential safe room retrofit for small gym.
Hazard:	Heavy Snowfall (roof collapse)
Action:	Overload of snow on roof could lead to roof collapse. Look into roof retrofit.
Hazard:	All-Hazards
Action:	Improve school website with emergency information such as numbers and websites (i.e., County numbers and websites)

Lake of the Woods County Multi-Hazard Mitigation Plan Update
Planning Team Meeting #2
May 13, 2020, 2:00 p.m. – 4:00 p.m.
Remote Meeting via Zoom Video/Phone Conference

Meeting Summary:

On Wednesday, May 13, 2020 Lake of the Woods County Emergency Management convened representatives from Lake of the Woods County, cities, townships and other key stakeholders to participate in the 2nd Planning Team Meeting for the Lake of the Woods County Multi-Hazard Mitigation Plan (MHMP) Update for 2020-2025. The meeting was held remotely via Zoom video/phone conferencing from 2:00 p.m. – 4:00 p.m. and a total of **18** 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 Lake of the Woods 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:

- *The Mayor of Baudette asked if individual structures were mapped in the 1% annual chance flood boundary flood plain (i.e., lift stations). The maps in the plan include the critical infrastructure that was provided by Lake of the Woods County. Local-level structures may not be mapped if they were not included in the CI list provided for consideration.*

- *There were no other questions about the information presented.*

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:
- 5-13-20 Planning Team Meeting Stakeholder Invite List
- 5-13-20 Email Invites to Planning Team & Neighboring Jurisdictions
- 5-13-20 Meeting Agenda
- 5-13-20 List of Meeting Participants
- 5-13-20 Power Point Presentation Slides

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

Lake of the Woods County 2020 MHMP Update

5-13-20 MHMP Planning Team Mtg. #2 (Virtual)

Stakeholder Invite List

Following is the list of stakeholders that were invited via email to attend the Lake of the Woods County MHMP Update Planning Team Meeting #2 held via Zoom Video/Phone Conferencing on May 13, 2020.

Company/Agency	Contact2	Title	Last name	First Name	Email Address
City of Baudette Airport	City Contact	The airport person	Forsberg	Adam	rogers@ci.baudette.mn.us
City of Baudette Fire	City Contact	Fire Chief	Levasseur	Brad	bradl@ci.baudette.mn.us
City of Baudette Fire	City Contact	Fire training Officer	Plourde	Chris	baudette491@gmail.com
City of Baudette Library	City Contact	Library Director	Pelland	Kelli	kellip@ci.baudette.mn.us
City of Baudette Council Member	City Contact	City Council Member	Carlson	Marla	marlac@ci.baudette.mn.us
Williams Fire	Other Stakeholder	Fire Chief	Baldwin	Mike	williamsfiredept@wiktel.com
City Baudette Mayor	City Contact	Mayor	Rone	Rick	rickrone@mncable.net
City of Baudette Public Works	City Contact	Director of Public Works	Schotl	Roger	rogers@ci.baudette.mn.us
City of Baudette Administration	City Contact	Clerk/treasurer	Rennemo	Tina	tinar@ci.baudette.mn.us
City of Baudette Zoning and Planning	City Contact	Zoning and Planning Administrator	Eaton	Tom	contacts@ci.baudette.mn.us
LOW Social Services	County Contact	Director of Social Services	Ballard	Amy	amy_b@co.lake-of-the-woods.mn.us
LOW Public Works	County Contact	County Engineer	Pirkle	Anthony	anthony_p@co.lotw.mn.us
LOW Sheriff	County Contact	Sargent	Duick	Ben	ben-D@co.lotw.mn.us
LOW County Sheriff	County Contact	Sargent	Abby	Brad	Brad_a@co.lake-of-the-woods.mn.us
LOW County Commissioner	County Contact	County Commissioner	Nordlof	Buck	buck_n@co.lake-of-the-woods.mn.us
LOW County Commissioner	County Contact	County Commissioner	Hasbargen	Cody	cody_h@co.lake-of-the-woods.mn.us
LOW County Commissioner	County Contact	County Commissioner	Arneson	Ed	ed_a@co.lake-of-the-woods.mn.us
LOW MIS-GIS	County Contact	GIS/IT Specialist	Solo	Eric	eric_o@co.lake-of-the-woods.mn.us
LOW County Sheriff	County Contact	Sheriff	Fish	Gary	gary_f@co.lake-of-the-woods.mn.us

LOW County Attorney	County Contact	County Attorney	Austed	James	james_A@co.lake-of-the-woods.mn.us
LOW County Auditor	County Contact	Deputy Auditor/Treasurer	Rudd	Janet	Janet_R@co.lake-of-the-woods.mn.us
LOW County Sheriff NWA	County Contact	Deputy Sheriffs Office	Goulet	Jason	redfoxfishing@yahoo.com
LOW County Sheriff	County Contact	Emergency Management Director	Hasbargen Olson	Jill	jill_o@co.lake-of-the-woods.mn.us
LOW County Commissioner	County Contact	County Commissioner	Waibel	Jon	jon_w@co.lake-of-the-woods.mn.us
LOW County Commissioner	County Contact	County Commissioner	Grund	Joseph	joseph_G@co.lake-of-the-woods.mn.us
LOW Land and Water Planning	County Contact	Land & Water Planning Director	Stromlund	Josh	josh_s@co.lake-of-the-woods.mn.us
LOW County Sheriff	County Contact	Administrative Assistant	Berggren	Julie	julie_b@co.lake-of-the-woods.mn.us
LOW County Auditor	County Contact	County Auditor Treasurer	Hanson	Lorene	lorene_h@co.lake-of-the-woods.mn.us
LOW County Assessor	County Contact	County Assessor	Otten	Mary Jo	maryjo_o@co.lake-of-the-woods.mn.us
LOW MIS	County Contact	Director of MIS	Hovland	Peder	Peder_h@co.lake-of-the-woods.mn.us
LOW County Treasure	County Contact	Deputy Auditor/Treasurer	Hasbargen	Rita	rita_h@co.lake-of-the-woods.mn.us
LOW County Sheriff	County Contact	Jail Administrator	Peterson	Sandy	sandy_p@co.lake-of-the-woods.mn.us
LOW Human Services	County Contact	County Human Resources Director	Slick	Savanna	savanna_s@co.lake-of-the-woods.mn.us
LOW Recorder	County Contact	County Recorder	Ney	Susan	susan_n@co.lake-of-the-woods.mn.us
LOW Solid Waste	County Contact	Solid Waste Director	Ferbish	Ted	solidwaste@co.lake-of-the-woods.mn.us
Beltrami County	Other County	Emergency Management Director	Muller	Chris	chris.muller@co.beltrami.mn.us
Roseau County	Other County	Emergency Management Director	Grafstrom	Sue	sue.grafstrom@co.roseau.mn.us
Koochiching County	Other County	Emergency Management Director	Kostiuk	Willi	willi.kostiuk@co.koochiching.mn.us
Northstar Electric	Other Stakeholder	President	Eillis	Anne	ann.e@northstarelectric.coop
Lake of the Woods Ambulance	Other Stakeholder	Ambulance Sectary	Castle	Bobby Jo	Bobbyjocastle@catholichealth.net
LOW School High School Principal	Other Stakeholder	High School Principal	Novak	Brian	brian_n@lakeofthewoodsschool.org

NWA Fire	Other Stakeholder	Fire Chief	McKeever	Brian	jackandjilltrades56711@gmail.com
CHI Lakewood Health	Other Stakeholder	Maintenance Director	Bowman	Chris	cbowman@catholichealth.net
Lake of the Woods Ambulance Director	Other Stakeholder	Ambulance Director	Castle	Don	donaldcastle@catholichealth.net
CHI Lakewood Health	Other Stakeholder	CHFM Facilities Manager	Davis	Gary	garydavis@catholichealth.net
LOW School Superintendent	Other Stakeholder	Superintendent	Nelson	Jeff	jeff_n@lakeofthewoodsschool.org
CHI Lakewood Health	Other Stakeholder	Infection Prevention, Employee Health, Utilization Review, Emergency Preparedness	Loughrey	Jenny	jennyloughrey@catholichealth.net
CHI Lakewood Nursing Service/Public Health	Other Stakeholder	Public Health	Schell	Kay	kayschell@catholichealth.net
Northstar Electric	Other Stakeholder	Operations Manager	Holen	Kevin	kevin.h@northstarelectric.coop
Northstar Electric	Other Stakeholder	Operations Manager	Mollberg	Marty	marty.m@northstar.net
DNR	Other Stakeholder	Forester	Abel	Nick	nick.abel@state.mn.us
Williams Fire	Other Stakeholder	Asst. Chief	Huerd	Roger	rogerh@wiktel.com
US Customs	Other Stakeholder	Port Director	Kraft	Shelly	Shelly.Kraft@DHS.gov
City of Williams Mayor	Other Stakeholder	Mayor	McVay	Vera	vjmcvay@gmail.com

From: Jill Olson
To: Bonnie Hundrieser (hundrieserconsulting@outlook.com); Amy Ballard; Ann Ellis; Anthony Pirkl; Brad Abbey; Brad Levasseur (blevasseur@mmua.org); Brian Novak; Chris Plourde (cm_plourde@hotmail.com); City of Williams; Cody Hasbargen; Don Castle Ambulance; Donald Castle; Ed Arnesen; FULTON, CHAD; Gary Davis; Gary Fish; Jeff Nelson; Jennifer Hovde; Jenny Loughrey; Jill Olson; Julie Berggren; Kay Schell (kayschell@catholichealth.net); Lorene Hanson; Marla Carlson (marlacarlson@catholichealth.net); Marty Mollberg; Mike Baldwin; Nick Abel (nick.abel@state.mn.usmndnr.gov); Peder Hovland; RASMUSSEN-MURRAY, HEATHER L (HEATHER.L.RASMUSSEN@cbp.dhs.gov); Rick Rone; Roger Huerd ; Roger Schotl; Sandy Peterson; Shelley Pepera; Shelly Kraft; TUTTLE, ROBERT J; Verna McVay (vjmcvay@gmail.com)
Subject: LOTW County 2020 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION
Date: Wednesday, May 6, 2020 12:46:20 PM
Attachments: City of Baudette MAC.pdf
Lake of the Woods County MAC.pdf
City of Williams MAC.pdf

LAKE OF THE WOODS COUNTY

2020 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

Greetings,

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

MEETING DETAIL

Date: Wednesday, May 13, 2020
Time: 2:00 – 4:00 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 Lake of the Woods 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 Lake of the Woods County and the cities of Baudette and Williams. We will be referencing these during the meeting. The draft Lake of the Woods 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.

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

Thank you,

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lake-of-the-woods.mn.us

From: Jill Olson
Sent: Tuesday, March 17, 2020 10:03 AM
Subject: RE: LOTW County 2020 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

The Lake of the Wood County 2nd planning team meeting scheduled on March 30th for the multi-hazard mitigation plan will be postponed to a later date.
Thank you,
Jill

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lotw.mn.us

From: Jill Olson
Sent: Thursday, January 23, 2020 11:22 AM
Subject: LOTW County 2020 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

LAKE OF THE WOODS COUNTY

2020 MULTI-HAZARD MITIGATION PLAN UPDATE – MEETING INVITATION

Greetings,

Your presence is requested at the **2nd Planning Team Meeting** for the update of the **Lake of the Woods County Multi-Hazard Mitigation Plan (MHMP).** You are requested to participate in this vital meeting because you have a position of administrative or departmental responsibility within either the County, a municipal government, or are a key stakeholder related to the planning process.

Meeting Detail
Date: **Monday, March 30, 2020**
Time: **2:00 p.m. – 4:00 p.m.**
Location: **Lake of the Woods County Government Center Commissioners Room**
206 8th Ave. SE, Baudette, MN 56623

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 Lake of the Woods 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. The draft Lake of the Woods County MHMP is underway and will be ready for review by planning team members and the public following this meeting.

Meeting Attendance: Please RSVP your attendance to me via email. You are encouraged to bring associate staff with you. If you cannot attend, please seek to send someone else in your stead for your representation.

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

Thank you,

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lotw.mn.us

From:	Jill Olson
To:	Willi Kostiuk (willi.kostiuk@co.koochiching.mn.us); Susan L. Grafstrom; Chris Muller
Cc:	Bonnie Hundrieser (hundrieserconsulting@outlook.com)
Subject:	2nd Planning Team meeting for the update of the Lake of the Woods County Multi-Hazard Mitigation Plan
Date:	Wednesday, May 6, 2020 12:50:23 PM
Attachments:	City of Baudette_MAC.pdf Lake of the Woods County_MAC.pdf City of Williams_MAC.pdf

To: Willi Kostiuk, Koochiching County EM Coordinator
Sue Grafstrom, Roseau County EM Director
Chris Muller, Beltrami County EM Director

Greetings,

We have rescheduled the 2nd Planning Team meeting for the update of the Lake of the Woods 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 Lake of the Woods County you are invited to our next Multi-Hazard Mitigation Planning Team Meeting:

MEETING DETAIL
Date: Wednesday, May 13, 2020
Time: 2:00 – 4:00 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 Lake of the Woods 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,

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lake-of-the-woods.mn.us

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lotw.mn.us

Lake of the Woods County

2020 Multi-Hazard Mitigation Plan Update

Planning Team Meeting #2

Wednesday, May 13, 2020, 2:00 p.m. – 4:00 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:
Jill Hasbargen Olson
Lake of the Woods County Emergency Management Director
Phone: 218-634-4547
Email: jill_o@co.lake-of-the-woods.mn.us

Lake of the Woods County
5/13/20 MHMP Planning Team Meeting #2
List of Participants *(18)*

Lake of the Woods County MHMP Update - Planning Team Meeting #2 Wednesday, May 13, 2020 - 2:00 p.m. - 4:00 p.m. Participant Sign-in List			
Name	**Agency/Organization**	**Title**	**Email**
Jill Hasbargen Olson	Lake of the Woods County	Emergency Management Director	jill_o@co.LOTW.mn.us
Julie Berggen	LOTW Sheriff's Office	Administrative Assistant	julie_b@co.lake-of-the-woods.mn.us
Vera McVay	City of Williams	Mayor	vjmcvay@gmail.com
Marla Carlson	City of Baudette	City Councilor	marlac@ci.baudette.mn.us
Jeff Nelson	Lake of the Woods School	Superintendent	jeff_n@lakeofthewoodsschool.org
Marty Mollberg	Northstar Electric	Operations Manager	marty.m@northstar.net
Kay Schell	CHI Lakewood Nursing Service	Public Health Nurse	kayschell@catholichealth.net
Donald Castle	LOTW Ambulance	Ambulance Director	donaldcastle@catholichealth.net
Sandy Peterson	LOTW Sheriff's Office	Jail Administrator	sandy_p@co.lake-of-the-woods.mn.us
Nick Able	MN DNR	Forester	nick.abel@state.mn.us
Jodi Ferrier	LOTW Social Services	Social Work Supervisor	jodi_F@co.lotw.mn.us
Jennifer Hovde	LOTW Ambulance	Ambulance Secretary	jenniferhovdee@catholichealth.net
Anthony Pirkl	LOTW Public Works	County Engineer	anthony_p@co.lotw.mn.us
Brad Levasseur	Baudette Fire Department	Fire Chief	bradl@ci.baudette.mn.us
Chris Muller	Beltrami County	Emergency Management Director	chris.muller@co.beltrami.mn.us
Lorene Hanson	Lake of the Woods County	Auditor/Treasurer	lorene_h@co.lake-of-the-woods.mn.us
David Dragon	MN DNR	Baudette Forestry Supervisor	david.dragon@state.mn.us
Rick Rone	City of Baudette	Mayor	rickrone@mncable.net

5/13/2020

Lake of the Woods County

2020 MULTI-HAZARD MITIGATION PLAN UPDATE
PLANNING TEAM MEETING #2
May 13, 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

- Lake of the Woods 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 Lake of the Woods County, including the cities of Baudette and Williams.

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

The City of Roseau is covered under the Roseau County plan

Who Needs to Participate

Stakeholder Participation

It is required to provide an opportunity for local county & municipal government, related agency stakeholders and neighboring jurisdictions to participate in the plan update.

- 2 Planning Team Meetings
- Local Mitigation Survey
- Provision of key data
- MAC Review & Feedback
- Review of Draft Plan

Public Participation

It is required to provide an opportunity for the public to learn about the plan update, ask questions and provide input that may be incorporated into the plan update.

- 2 News Releases
- Outreach conducted via websites, social media and local media
- Online public review & comment period for draft plan

5/13/2020

Prioritization of Hazards for Lake of the Woods County

Prioritization of hazards by the Lake of the Woods 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 (Lightning, Hailstorms, Windstorms, Tornadoes)	High
Flash Flooding & Riverine Flood	High
Wildfire	High
Erosion/Landslides	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

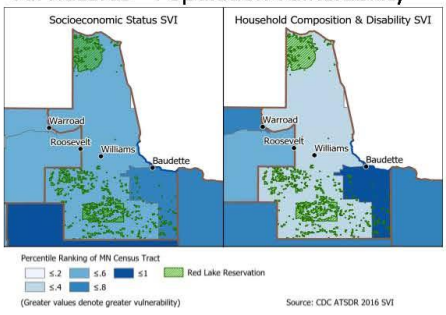
U-Spatial@UMD Team has worked closely with personnel from the County to collect key information for the plan update.

- County Emergency Management Director
- County GIS Specialist
- County Assessor
- County Departments (i.e. Highway, Planning & Zoning, SWCD, others).

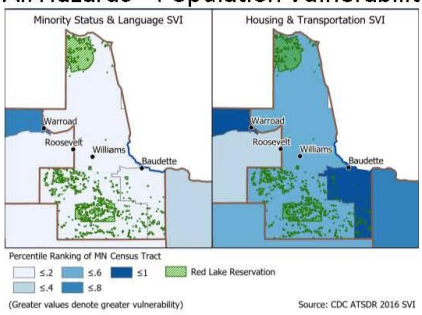
All Hazards – Critical Infrastructure

- 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

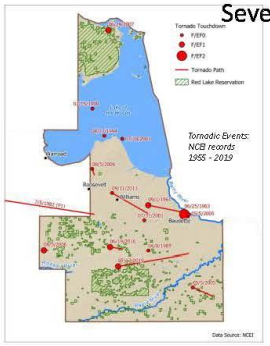


All Hazards – Population Vulnerability



5/13/2020

Severe Summer Storms
(Lightning, Hailstorms, Windstorms, Tornadoes)



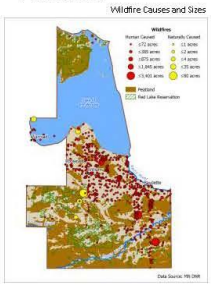
Winter Storms

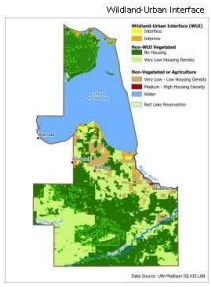
Associated Press

Blizzards
Heavy Snow
Ice Storms
Winter Storms

Program Gaps and Deficiencies:
Back-up Power
Communications
Radar
Emergency Operations Center

Wildfire





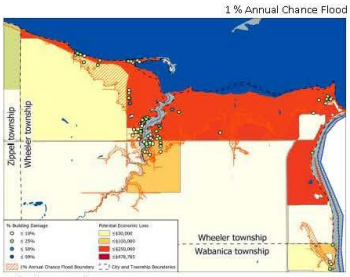
Flash Flooding & Riverine Flood

- Obtained FEMA Flood Insurance Rate Maps
- Obtained building and parcel values from County
- Used statewide building footprint data
- Ran flood model to estimate economic loss
- Identified Critical Infrastructure in flood zone

Flash Flooding & Riverine Flood

Jurisdiction (county subdivision)	Count of Buildings in Floodplain	Estimated Building and Contents Loss*
Angle township	40	$1,116,364
Baudette city	1	$79,048
Baudette township	1	$86,733
Gudrid township	5	$155,673
Kiel township	1	$2,544
Lakewood township	14	$136,646
McDougald township	3	$14,758
Prosper township	1	$919
Rapid River township	2	$4,340
Spooner township	3	$137,239
Swiftwater township	4	$46,205
Victory township	2	$140,772
Wabanica township	6	$161,763
Walhalla township	3	$27,076
Wheeler township	96	$1,977,323
Zippel township	117	$1,296,528
Totals	299	$5,383,938

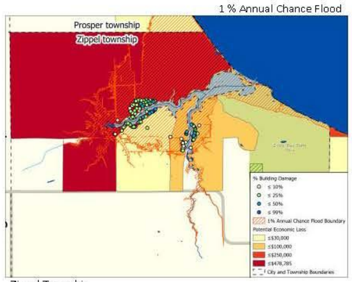
Flash Flooding & Riverine Flood



Wheeler Township

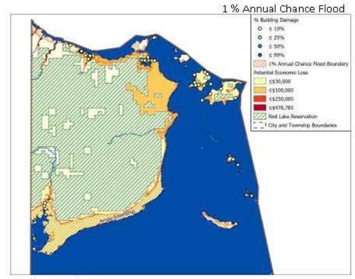
5/13/2020

Flash Flooding & Riverine Flood



Zippel Township

Flash Flooding & Riverine Flood



Angle Township

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

LAKE OF THE WOODS COUNTY
Mitigation Action Chart

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 the County's CodeRED Emergency Notification System.	n/a	On-going	High	2020-2025	LOTW EM (Lake of the Woods County Emergency Mgmt.)	The LOTW Sheriff's Office Website has an LOTW Emergency Management Program page that provides information on CodeRED and a link for residents to sign up. We will continue to promote residents to sign up for the system through our Lake of the Woods County Sheriff's website as well as the LOTW County Facebook page, as well as through local media and during events or presentations.	County funding
2	All-Hazards	Mitigation Preparedness & Response Support	**EOP UPDATES** Update the Lake of the Woods County Emergency Operations Plan (EOP) to ensure it adequately details the needed steps to respond to all potential hazards.	n/a	On-going	High	2020-2025	LOTW EM	LOTW Emergency Management 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

Mitigation Strategy #1

Local Planning & Regulations

- Comprehensive plans
- Land use, floodplain ordinances
- Planning and zoning
- Building codes and enforcement
- 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

Mitigation Strategy #2

Structure and Infrastructure Projects

- Property Acquisitions and elevations of structures in flood prone areas
- Utility undergrounding (i.e. power lines)
- 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

4

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5/13/2020

Mitigation Strategy #3

Natural Systems Protection

- 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

Mitigation Strategy #4

Education and Awareness Programs

- 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

Mitigation Strategy #5

Mitigation Preparedness and Response Support

- Emergency Operations Plan
- Flood fight plans and preparedness measures
- Dam emergency action plans
- Emergency Warning Systems (i.e., CodeRed, sirens)
- Generator backup power
- NWS Storm Spotter Training
- Training and education for local elected officials and key partners.

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 7, 2019, "Public Feedback and Participation Invited for Lake of the Woods 2019 Multi-Hazard Mitigation Plan Update"

On January 7, 2019, Lake of the Woods 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 Lake of the Woods County Emergency Management website, Facebook, local newspapers as well as posting of flyers on community bulletin boards. 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.

Lake of the Woods 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 Lake of the Woods 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:
Lake of the Woods County Emergency Management did not receive any public input following News Release #1.

News Release #2 – June 2, 2020, "Public Feedback Sought for Draft Lake of the Woods County Multi-Hazard Mitigation Plan"
On June 2, 2020 Lake of the Woods County Emergency Management put out a news release announcing the completion of the draft Lake of the Woods 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 Lake of the Woods County website, Lake of the Woods County Emergency Management website & Facebook and via city postings. In addition, the Lake of the Woods County Emergency Management Director also encouraged county staff, city representatives and other stakeholders 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://z.umn.edu/lakeofthewoods. The public feedback period for the draft plan was open from June 2, 2020 to June 17, 2020, for a total of 15 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 Lake of the Woods County Emergency Management Director. Following is a record of public input received and description of how the feedback was incorporated into the plan, and if not, why.

- **Online Comments –** There were no public responses submitted via the online comment form.

- **Comments Submitted Directly to County EM** – There were no comments received directly by Lake of the Woods County Emergency Management Director.

(218) 634-4547 - Phone
(218) 634-1144 - Fax

LAKE OF THE WOODS COUNTY

Emergency Management Director
Jill Hasbargen Olson

206 8TH AVE. S.E.
SUITE 300
BAUDETTE, MN 56623

LAKE OF THE WOODS COUNTY NEWS RELEASE
January 7, 2019

Public Feedback and Participation Invited for Lake of the Woods County 2019 Multi-Hazard Mitigation Plan Update

The Lake of the Woods 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 Lake of the Woods County MHMP is a multi-jurisdictional plan that covers Lake of the Woods County, including the cities of Baudette and Williams. The Lake of the Woods County MHMP also incorporates the concerns and needs of townships, school districts, and other stakeholders participating in the plan.

Lake of the Woods 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 Lake of the Woods County Emergency Management Director, Jill Hasbargen Olson, "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 hazardevent.

Public Feedback and Participation is Encouraged
As part of the planning process, gathering input from the public is an important and required step. Lake of the Woods 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 feelwould help to reduce the damages of potential future events for your personal property, your community, or the County as a whole?

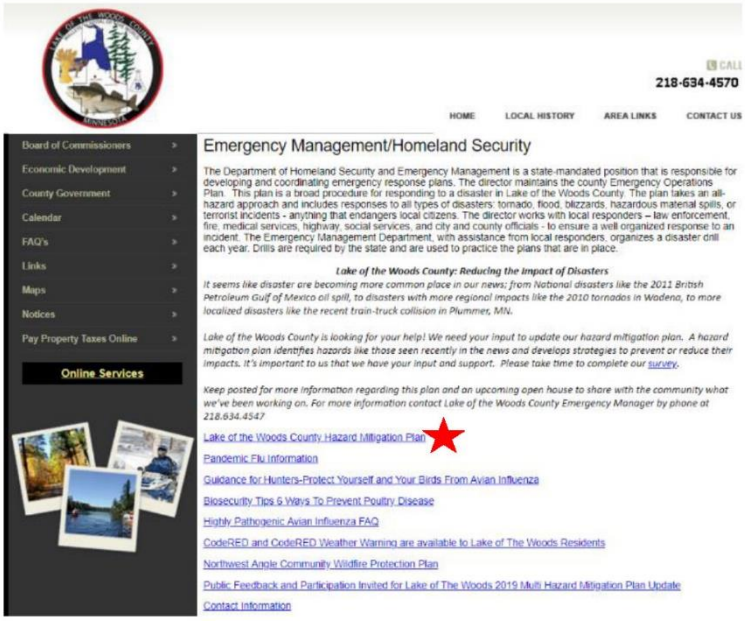
The public is strongly encouraged to submit your comments, concerns, or questions regarding natural disasters and potential mitigation actions to be included into the plan update process. Please submit your feedback to Lake of the Woods County Emergency Management Director, Jill Hasbargen Olson at 218-634-4547 or jill_o@co.lake-of-the-woods.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.

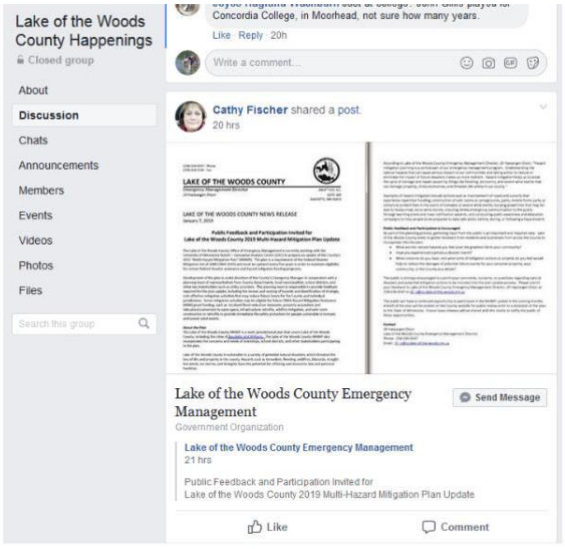
Contact
Jill Hasbargen Olson
Lake of the Woods County Emergency Management Director
Phone: 218-634-4547
Email: jill_o@co.lake-of-the-woods.mn.us

Lake of the Woods County MHMP News Release #1 - Public Outreach
Lake of the Woods Emergency Management Website Posting
January 8, 2019

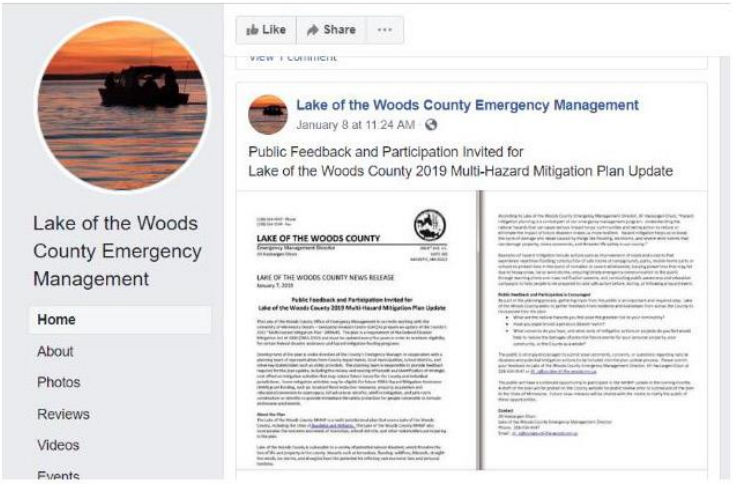
http://www.co.lake-of-the-woods.mn.us/EmMgt.aspx



Lake of the Woods County MHMP News Release #1 - Public Outreach
Lake of the Woods County Happenings Facebook Posting
January 8, 2019



Lake of the Woods County MHMP News Release #1 - Public Outreach
Lake of the Woods Emergency Management Facebook Posting
January 8, 2019



Lake of the Woods County MHMP News Release #1 - Public Outreach
Lake of the Woods County - Northern Light region newspaper
January 16, 2019

COMMUNITY FOCUS

How about some Super Sundae family fun?

Super Sundaes will be on the menu for some fantastic family football fun on SUNDAY, FEBRUARY 3rd from 1:00-3:00 PM at the Brink Senior Center in Baudette.

Bring the whole gang and enjoy a delicious sundae that you create yourself from our extensive SUNDAE BAR.

The cost is only $5.00 per sundae to enjoy two scoops of ice cream, covered in toppings of your choice.

There will be some fun football activities for the kids to do too.

Make sure to come on out on Sunday, February 3rd from 1:00-3:00 PM for some pre-Super Bowl Sundae Fun!

Teacher of the Year Tea is January 17

A tea to honor Lake of the Woods School's Teacher of the Year Colleen Stanton will be held Thursday, January 17 at 4:00 p.m. in the ITV Room at the school. All are welcome to attend and join in the celebration.

Public feedback and participation invited for Lake of the Woods County 2019 Multi-Hazard Mitigation Plan Update

The Lake of the Woods 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.

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School Lunch Menu

Lake of the Woods

BREAKFAST

Thursday, January 17: Ce- maine lettuce, garlic toast, ba- nana, pears, milk

WINTER IS HERE! ARE YOU READY?

I See by the...

Northern Light Region

Mental Health Crisis Phone Numbers

Children and Teens Mental Health Crisis Line: 218-395-0177; Adult Mental Health Crisis Line: 218-434-0101; Sanford Health Crisis Line: 1-800-422-6863 (Thief River Falls)

Williams Arena Association Annual Meeting

The annual meeting of the Williams Ice Arena Association will be held on January 26 at the arena at 7:00 p.m.

Attention Baudette Class of 1969

50 Year Anniversary: 4th of July Parade, 5th of July get together at the Moose Lodge. Please contact Doug Anderson at danderson642@outlook.com to with questions or to RSVP.

Lake of the Woods Food Shelf Distribution

January 17, February 21, March 21, April 18, May 23, June 20, July 18, August 22, September 19, October 17, November 21, December 19

Distribution will start around 2:00 and continue until 4:00 p.m. in Baudette at the Lighthouse on 2nd Street NE. The doors will be opened for food shelf clients after the truck is unloaded (around 1:30), please make arrangements accordingly. Seniors may also pick up their NAPS boxes during food shelf distribution. If you are over 60 and interested in the NAPS program, call Lori Tate at (877) 281-3272 (toll free) to see if you qualify. Call Sue at 634-3275 if you have any questions, or on the day of distribution, call the Lighthouse at 634-3295. Volunteers needed 12:30 to 4:15 on distribution day to help unload trucks, help people get food and take it to their vehicles, and clean up.

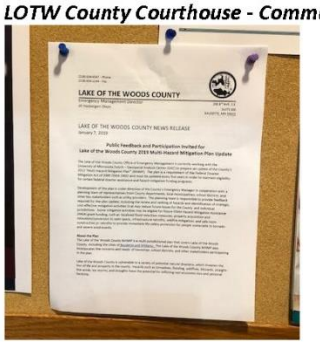
VFW Auxiliary Meetings

VFW Auxiliary of Baudette meets the first Monday of each month at 6 p.m. Everyone welcome.

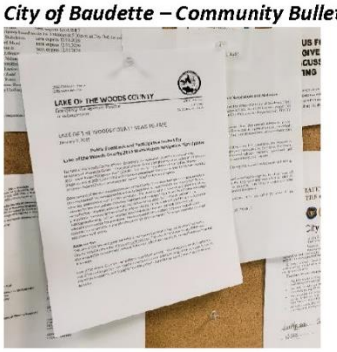
Williams Gardeners Meetings

Lake of the Woods County MHMP News Release #1 - Public Outreach
Lake of the Woods – Community Bulletin Board Postings of News Release
January, 2019

LOTW County Courthouse - Community Bulletin Board



City of Baudette – Community Bulletin Board



City of Baudette Public Library – Community Bulletin Board

Lake of the Woods County MHMP News Release #1 - Public Outreach
Lake of the Woods Emergency Management Email to County Commissioners and Sheriff
January 14, 2019

Mon 1/14/2019 6:02 AM
Jill Olson
LOW Hazard Mitigation News Release
To Ed Arnesen (ed_a@co.lake-of-the-woods.mn.us); Cody Hasbargen
Cc Gary Fish

Message LOW County MHMP New Release #1 January 2019.pdf (132 KB)

Good Morning,
Attached is the Hazard Mitigation News release that will published this week. The current 5 year plan has expired and we are beginning the process of updating the plan.

Let me know if you have any questions.
Thanks
Jill

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lake-of-the-woods.mn.us

218) 634-4547 - Phone
(218) 634-1144 - Fax

LAKE OF THE WOODS COUNTY

Emergency Management Director
Jill Hasbargen Olson

206 8TH AVE. S.E.
SUITE 300
BAUDETTE, MN 56623

LAKE OF THE WOODS COUNTY NEWS RELEASE

June 2, 2020

Public Review and Feedback Invited for Lake of the Woods County's Multi-Hazard Mitigation Plan

Lake of the Woods County has completed an updated draft of the of the County's Multi-Hazard Mitigation Plan (MHMP) as required by the Federal Disaster Mitigation Act of 2000 (DMA 2000). Local jurisdictions are required to update the plan every five years to remain eligible for federal hazard mitigation grant programs.

Community involvement and feedback are vital to the success of the plan. Lake of the Woods County invites public review and feedback of the draft plan prior to submitting it to the State of Minnesota and the Federal Emergency Management Agency (FEMA) for review. A copy of the draft MHMP and a survey for public feedback is available online at https://z.umn.edu/lakeofthewoods. The plan review and comment period will be open until Wednesday, June 17, 2020.

About the Plan

The Lake of the Woods County MHMP is a multi-jurisdictional plan that covers Lake of the Woods County, including the cities of Baudette and Williams. The Lake of the Woods County MHMP also incorporates the concerns and needs of townships, school districts, and other stakeholders participating in the plan.

Lake of the Woods County is vulnerable to a variety of potential natural disasters, which threaten the loss of life and property in the county. The plan addresses how to mitigate against hazards such as tornadoes, flooding, wildfires, blizzards, straight-line winds, ice storms, and droughts which have the potential for inflicting vast economic loss and personal hardship.

Update of the plan has been under direction of Lake of the Woods County Emergency Management in cooperation with U-Spatial at the University of Minnesota Duluth and representatives from County departments, city and township governments, school districts, and other key stakeholders. Together, the planning team worked to identify cost-effective and sustainable actions to reduce or eliminate the long-term risk to human life or property from natural hazards. Some examples include improvement of roads and culverts that experience repetitive flooding; construction of safe rooms at campgrounds,

public parks, mobile home parks or schools to protect lives in the event of tornados or severe wind events; burying powerlines that may fail due to heavy snow, ice or wind storms; ensuring timely emergency communication to the public through warning sirens and mass notification systems, and conducting public awareness and education campaigns to help people be prepared to take safe action before, during, or following a hazard event.

The Benefits of Hazard Mitigation Planning

Hazard mitigation planning ultimately helps us protect Lake of the Woods County residents. By working with local communities, we can identify vulnerabilities and develop strategies to reduce or eliminate the effects of a potential hazard. In addition, increasing public awareness of local hazards and disaster preparedness helps to create a community that is resilient to disaster, and breaks the cycle of response and recovery. Update of the plan will further allow the County and its jurisdictions to apply for eligible projects under future Hazard Mitigation Assistance (HMA) grant funding from FEMA for projects that are cost-effective and will help to reduce or eliminate impacts of future natural disaster events.

Contact:

Jill Hasbargen Olson
Lake of the Woods County Emergency Management Director
Phone: 218-634-4547
Email: jill_o@co.lake-of-the-woods.mn.us

From:	Jill Olson
To:	tinar@ci.baudette.mn.us; City of Roosevelt (cityclerk@wiktel.com); Verna McVay (vjmcvay@gmail.com)
Cc:	Bonnie Hundrieser (hundrieserconsulting@outlook.com)
Subject:	Please Post Emergency Management LOW County News Release #2 MHMP
Date:	Monday, June 8, 2020 10:29:21 AM
Attachments:	LOTW_MHMP News Release #2 (6022020).pdf

Good Morning City of Baudette and the City of Williams,

Please post the attached news release for Lake of the Woods County Hazard Mitigation plan review and feedback document in the city office and or on the website.

Thanks
Jill

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lotw.mn.us

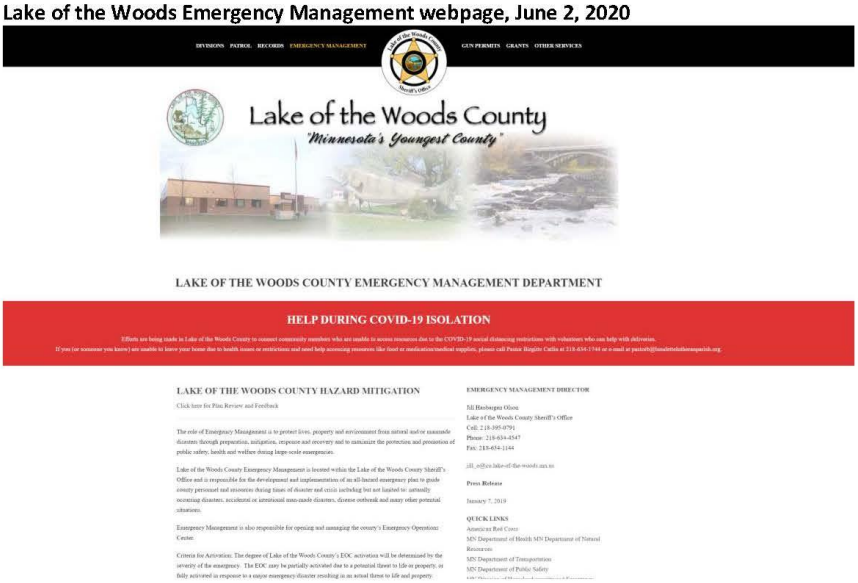
From: Jill Olson
To: Doris Knutson; Mike Hovde
Cc: Bonnie Hundrieser (hundrieserconsulting@outlook.com)
Subject: LOW County News Release #2 MHMP
Date: Tuesday, June 2, 2020 2:51:42 PM
Attachments: LOTW_MHMP News Release #2 (6022020).pdf

Good Afternoon,
Please publish the attached news release for Lake of the Woods County Hazard Mitigation plan review and feedback.
Thanks
Jill

Jill Hasbargen Olson
Emergency Manager Director
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144
jill_o@co.lotw.mn.us

Lake of the Woods County MHMP News Release #2 - Public Review & Comment Period Documentation of News Release Postings

Lake of the Woods Emergency Management webpage, June 2, 2020



DIVISIONS PATROL RECORDS EMERGENCY MANAGEMENT GUN PERMITS GRANTS OTHER SERVICES

Lake of the Woods County

"Minnesota's Youngest County"

LAKE OF THE WOODS COUNTY EMERGENCY MANAGEMENT DEPARTMENT

HELP DURING COVID-19 ISOLATION

Efforts are being made in Lake of the Woods County to connect community members who are unable to access resources due to the COVID-19 social distancing restrictions with volunteers who can help with deliveries.
If you (or someone you know) are unable to leave your home due to health issues or restrictions and need help accessing resources like food or medication/medical supplies, please call Prairie Birgitte Catlin at 218-634-1744 or e-mail at pacioli@lunaletteloisbarquinh.org

LAKE OF THE WOODS COUNTY HAZARD MITIGATION

Click here for Plan Review and Feedback

The role of Emergency Management is to protect lives, property and environment from natural and/or manmade disasters through preparation, mitigation, response and recovery and to maximize the protection and promotion of public safety, health and welfare during large-scale emergencies.

Lake of the Woods County Emergency Management is located within the Lake of the Woods County Sheriff's Office and is responsible for the development and implementation of an all-hazard emergency plan to guide county personnel and resources during times of disaster and crisis including but not limited to: naturally occurring disasters, accidental or intentional man-made disasters, disease outbreak and many other potential situations.

Emergency Management is also responsible for opening and managing the county's Emergency Operations Center.

Criteria for Activation: The degree of Lake of the Woods County's EOC activation will be determined by the severity of the emergency. The EOC may be partially activated due to a potential threat to life or property, or fully activated in response to a major emergency/disaster resulting in an actual threat to life and property.

EMERGENCY MANAGEMENT DIRECTOR

Jill Hesbergen Olson
Lake of the Woods County Sheriff's Office
Cell: 218-395-0791
Phone: 218-634-4547
Fax: 218-634-1144

jill_o@co.lake-of-the-woods.mn.us

Press Release

January 7, 2019

QUICK LINKS

American Red Cross
MN Department of Health MN Department of Natural Resources
MN Department of Transportation
MN Department of Public Safety

Lake of the Woods Emergency Management Facebook Page, June 2, 2020

Home
About
Photos
Reviews
Videos
Events
Posts
Services
Shop
Groups
Notes
Offers
Jobs
Community
Promote

Posts

Lake of the Woods County Emergency Management
2 mins ·

Public Review and Feedback Invited for
Lake of the Woods County's Multi-Hazard Mitigation Plan

Community involvement and feedback are vital to the success of the plan. Lake of the Woods County invites public review and feedback of the draft plan prior to submitting it to the State of Minnesota and the Federal Emergency Management Agency (FEMA) for review.

A copy of the draft MHMP and a survey for public feedback is available online at https://z.umn.edu/lakeofthewoods

The plan review and comment period will be open until Friday, June 17, 2020.

SITES.GOOGLE.COM
Lake of the Woods County
Lake of the Woods County is currently in the process of updating its Multi-Hazard Mitigation Plan. Before the plan is submitted to the State of Minnesota and FEMA for approval, we need

Lake of the Woods Website – Public notices section, June 2, 2020

SOCIAL SERVICES:

Minnesota Family Investment Program (MFIP) Biennial Service Agreement

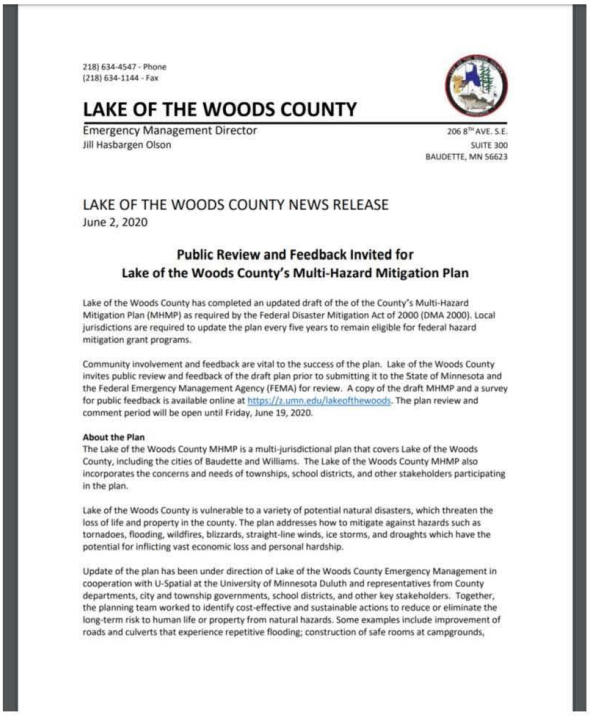
Energy Assistance Program And Changes Made To Help Durring COVID-19

LAND AND WATER PLANNING:

Subsurface Sewage Treatment System Ordinance

Emergency Management:

Public Review and Feedback Invited for Lake of the Woods County's Multi-Hazard Mitigation Plan



218) 634-4547 - Phone
(218) 634-1144 - Fax

LAKE OF THE WOODS COUNTY

Emergency Management Director
Jill Hasbargen Olson

206 8TH AVE. S.E.
SUITE 300
BAUDETTE, MN 56623

LAKE OF THE WOODS COUNTY NEWS RELEASE
June 2, 2020

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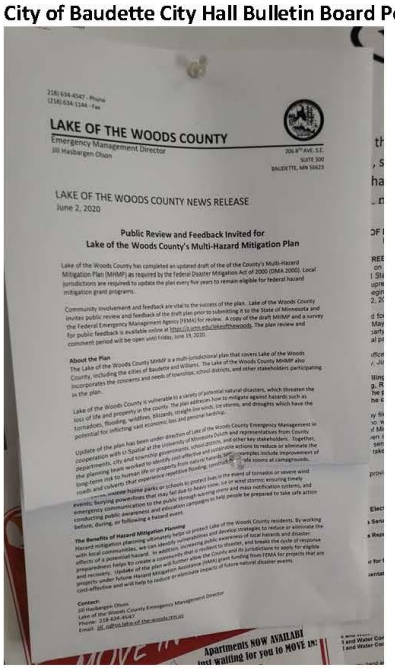
City of Baudette City Hall Bulletin Board Posting, June 8, 2020



LAKE OF THE WOODS COUNTY
Emergency Management Director
Jill Hasbargen Olson

LAKE OF THE WOODS COUNTY NEWS RELEASE
June 2, 2020

Public Review and Feedback Invited for
Lake of the Woods County's Multi-Hazard Mitigation Plan

City of Williams Website Posting, June 8, 2020

Lake of the Woods County 2020 MHMP Update Public Review Website & Comment Form
URL: https://sites.google.com/d.umn.edu/lakeofthewoods

The Lake of the Woods County 2020 MHMP Update was made available for public review online with a website hosted by U-Spatial at the University of Minnesota Duluth (U-Spatial@UMD). The website provided a full draft of the 2020 MHMP update and individual excerpts of the Mitigation Action Charts for the County and each city jurisdiction. An online comment form was also provided for the submission of public comments or questions.

Public Review Website

Lake of the Woods County MHMP Feedback & Comment Form
The online comment form provided an opportunity for reviewers to submit feedback on the plan. Feedback submitted was collected by U-Spatial@UMD and reviewed for incorporation into the plan. The form included the following:

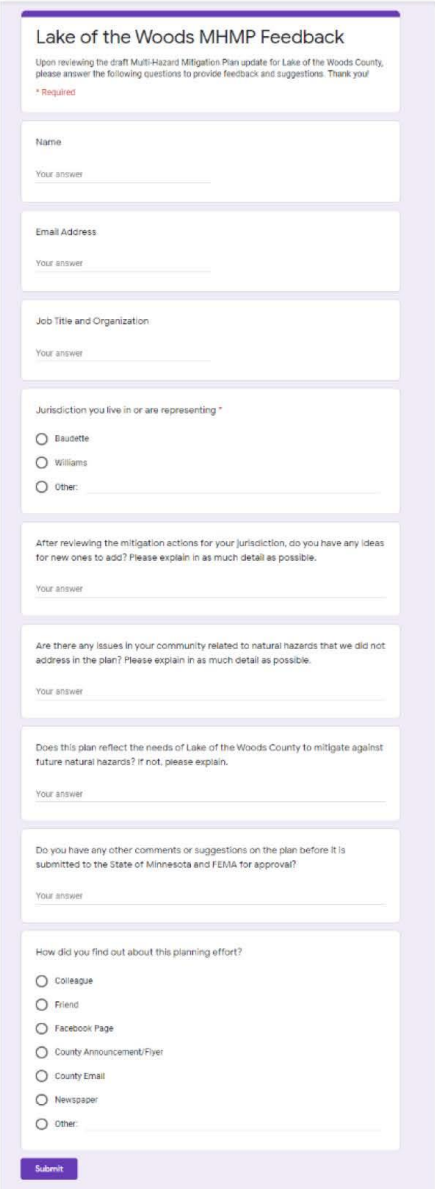
Instructions
Upon reviewing the draft Multi-Hazard Mitigation Plan update for Lake of the Woods County, please answer the following questions to provide feedback and suggestions. Thank you!

Reviewer Information

- Name
- Email
- Job Title and Organization
- Jurisdiction (drop down menu)

Questions

- After reviewing the mitigation actions for your jurisdiction, do you have any ideas for new ones to add? Please explain in as much detail as possible.
- Are there any issues in your community related to natural hazards that we did not address in the plan? Please explain in as much detail as possible.
- Does this plan reflect the needs of Lake of the Woods County to mitigate against future natural hazards? If not, please explain.
- Do you have any other comments or suggestions on the plan before it is submitted to the State of Minnesota and FEMA for approval?
- How did you find out about this planning effort? (Selection menu)



Appendix G
Mitigation Actions by Jurisdiction

Table G-1. Lake of the Woods County Mitigation Action Chart (2020-2025)

LAKE OF THE WOODS COUNTY									Mitigation Action Chart	
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 the county's CodeRED Emergency Notification System.	n/a	On-going	High	2020-2025	LOTW-EM (Lake of the Woods County Emergency Mgmt.)	The LOTW Sheriff's Office Website has an LOTW Emergency Management Program page that provides information on CodeRED and a link for residents to sign up. We will continue to promote residents to sign up for the system through our Lake of the Woods County Sheriff's website as well as the LOTW County Facebook page, as well as through local media and during events or presentations.	County funding
2	All-Hazards	Mitigation Preparedness & Response Support	**EOP UPDATES** Update the Lake of the Woods County Emergency Operations Plan (EOP) to ensure it adequately details the needed steps to respond to all potential hazards.	n/a	On-going	High	2020-2025	LOTW-EM	LOTW Emergency Management 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

LAKE OF THE WOODS COUNTY									Mitigation Action Chart	
A	B	C	D	E	F	G	H	I	J	K
#	Hazard	Mitigation Strategy	Mitigation Action	Reduces Risk to New / Existing Buildings or Infrastructure	Status	Priority	Expected Time-frame	Responsible Party	Comments on Implementation, Administration & Integration into Local Planning Mechanisms	Possible Funding
3	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	On-going	High	2020-2025	LOTW-EM in cord. with Lake of the Woods-Mahnomen Public Health	LOTW 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 via our website, social media pages, classroom training and local media sources. The LOTW-EM website provides website links on personal planning, school plans and business planning for emergencies.	County funding
4	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**GENERATOR BACKUP POWER** Identify Lake of the Woods County critical buildings and facilities that do not have backup power and obtain appropriate generators to install at those locations.	n/a	On-going	High	2020-2025	LOTW-EM	Generator backup power is in place for the Courthouse, Jail, Sheriff's Office and Dispatch. The county will work to purchase and install generators for other buildings or infrastructure as funding allows. Outside grant funding may be necessary to acquire needed generators.	County funding, Other funding TBD

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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 Winter & Summer Storms	Mitigation Preparedness & Response Support	**NOAA WEATHER RADIOS** Promote the use of NOAA weather radios by County staff, community facilities (i.e., schools, nursing homes) and by local residents to receive severe weather alerts from the NWS.	n/a	On-going	Mod.	2020-2025	LOTW-EM	This is an ongoing effort of the LOTW Emergency Management program. We continue to promote the use of NOAA weather radios in schools, facilities that house vulnerable populations (such as hospitals and nursing homes), county buildings and by the public. We promote use of these radios in advance of and during our severe weather months and also during the NWS severe weather awareness weeks.	County funding
6	Severe Winter & Summer Storms	Structure & Infrastructure Projects	**BURY/STRENGTHEN POWERLINES** Work with rural & municipal electrical coops to identify where it is feasible and cost effective to bury or strengthen powerlines to mitigate against power line failure and implement measures.	Yes *(Power System Infrastructure)*	On-going	High	2020-2025	LOTW-EM, LOTW Hwy. Dept in cord. with utility provides	LOTW Emergency Management and the Hwy. Dept, in conjunction with our local municipalities and electrical cooperatives will continue address upgrades as needed and as feasible. During severe weather events such as ice storms, blizzards and high wind events, many power lines and poles can be damaged or destroyed.	Rural or Municipal Coop funding, FEMA HMA Grant funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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	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 powerlines due to falling limbs.	Yes *(Power System Infrastructure and Roads)*	On-going	Mod.	2020-2025	LOTW Hwy. Dept. / Utility Providers	This is an ongoing part of the of the LOTW Hwy. Dept maintenance of county roads and vegetation within the county right-of-way. Our electrical providers within the county also manage vegetation near the powerlines that they own and maintain. Trees are trimmed or removed as deemed necessary to reduce risk of falling on roads or powerlines due to high wind, ice or snow buildup.	County funding, Electrical Coop funding
8	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**RADAR TOWER COVERAGE** Work with the NWS to improve radar coverage for LOTW County.	n/a	**New**	High	2020-2025	LOTW-EM	Weather radar by both the Grand Forks and Duluth NWS areas are not able to read weather conditions in LOTW County due to radar gaps and high level of off-the-ground reading. The LOTW-EM Director will continue to encourage the NWS to address improved radar coverage for our county.	NWS funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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 Winter & Summer Storms	Mitigation Preparedness & Response Support	**CELL PHONE COVERAGE** Encourage cell phone carriers to improve coverage on the Lake of the Woods, taking advantage of already existing towers.	n/a	**New**	High	2020-2025	LOTW-EM	Gaps in cell phone coverage exist in parts of the county, which prohibits the public being able to receive CodeRED notifications. The LOTW-EM Director will continue to encourage cell phone providers to address improved tower coverage for our county.	Cell Provider funding
10	Severe Winter & Summer Storms	Mitigation Preparedness & Response Support	**OUTREACH TO RESORTS** Work with Resort Owners to provide guidance on severe weather awareness and emergency preparedness for their facilities and visitor services.	n/a	On-going	High	2020-2025	LOTW-EM	The LOTW-EM Director maintains good relationships with local resort owners and works to provide critical information regarding severe weather and steps they can take for preparedness to protect their visitors and facilities.	County funding
11	Severe Summer Storms / Tornado	Mitigation Preparedness & Response Support	**SKYWARN TRAINING** Continue to offer annual SKYWARN training to local fire & law departments and the public, and utilize our Lake of the Woods County storm spotter network.	n/a	On-going	Mod.	2020-2025	LOTW-EM in cord. with NWS	LOTW-EM Director works with the NWS on an annual basis to offer SKYWARN training to local fire and law enforcement as well as to community members wishing to become volunteer Storm Spotters.	County, funding, NWS funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
12	Severe Summer Storms / Tornado	Mitigation Preparedness & Response Support	**WARNING SIRENS** Install new outdoor warning sirens in key areas where sirens currently are not located (this includes Lake of the Woods School in Baudette, the Northwest Angle, and at local resort areas).	n/a	**New**	High	2020-2025	LOTW-EM	The LOTW EM Director will seek to apply for funding from outside grant sources (such as USDA Rural Development or FEMA HMA 5% Initiative funding) to purchase and install outdoor warning sirens for these critical areas where there is no current warning siren coverage. Warning sirens are an important communication tool in the event of dangerous high wind events.	County funding, USDA Rural Dev. Grant
13	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	**STORM SHELTERS / TORNADO SAFE ROOMS** Construct storm shelters or tornado safe rooms in the county where people are vulnerable to severe wind events. Examples include public campgrounds, mobile home parks and resorts.	n/a	**New**	High	2020-2025	LOTW-EM in cord. with City Govt's and Local Resorts	LOTW-EM Director will work to assist facilities that have identified a need for a storm shelter or tornado safe room. The LOTW EM Director will provide assistance as needed on any tornado safe room projects pursued by those entities, including possible application to FEMA for HMA grant funding to support construction.	County funding, Local funding, FEMA HMA Grant funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart	
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
14	Extreme Temps (Heat / Cold)	Mitigation Preparedness & Response Support	**EXTREME COLD AWARENESS** Expand outreach and information on the risks of extreme cold (often coupled with blizzard conditions) to county residents, especially the elderly and anglers ice fishing on Lake of the Woods.	n/a	On-going	High	2020-2025	LOTW-EM in cord. with Resort Owners	LOTW-EM Director will continue to work actively to promote awareness of dangerous extreme cold conditions for local residents as well as visitors. This is done via our website, social media and local media sources, as well as by being in contact directly with resort owners that cater to winter anglers on Lake of the Woods.	County funding
15	Flood	Education & Awareness Programs	**FLOOD SAFETY EDUCATION** Conduct public outreach in advance of and during heavy rain and flood events to educate residents on personal actions to take to reduce damages to property and protect life safety.	Yes *(Existing Buildings)*	On-going	High	2020-2025	LOTW-EM	LOTW Emergency Management regularly incorporates public outreach & education on flooding during Severe Weather Awareness Week and during actual storm events during the year. Outreach methods include the county website, social media, local media and CodeRED if needed.	County funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
16	Flood	Local Planning & Regulations	**FLOODPLAIN & SHORELAND ORDINANCES** Administer and enforce the county's Floodplain and Shoreland ordinances.	Yes *(New & Existing Buildings)*	On-going	Mod.	2020-2025	LOTW Land & Water Planning	LOTW Land and Water Planning Office administers land use and zoning ordinances for rural and unincorporated portions of the county, including for floodplains and shoreland. LOTW County Zoning Ordinance Article 9 addresses Shoreland Management Regulations including building regulations to mitigate against flooding during high-water elevation (for structures along lakes, ponds, flowages, rivers and streams).	County funding
17	Flood	Education & Awareness Programs	**HOMEOWNER FLOOD INSURANCE** Encourage homeowners to purchase private NFIP flood insurance.	n/a	**New**	Mod.	2020-2025	LOTW Land & Water Planning	LOTW Land & Water Planning will encourage the cities of Baudette & Williams to promote purchase of private NFIP flood insurance by property owners in advance of future severe flood events.	County funding
18	Flood	Local Planning & Regulations	**PROPERTY ACQUISITION (BUYOUTS)** Conduct voluntary buyouts of residential properties that repetitively flood and convert to open space for perpetuity.	Yes *(Existing Properties)*	On-going	High	2020-2025	LOTW Land & Water Planning	Lake of the Woods County has not conducted any property buyouts in the past, but may do so in the future depending on the severity of future flood events.	County funding, FEMA HMA Grant funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
19	Flood	Structure & Infrastructure Projects	**LOCALIZED FLOOD RISK REDUCTION PROJECTS** Identify and address mitigation measures for transportation and drainage system infrastructure damaged by heavy rain events (such as culverts, roads and bridges) and implement projects that reduce risk of future flood damages.	Yes *(Transportation & Drainage System Infrastructure)*	On-going	High	2020-2025	LOTW Public Works Dept.	The LOTW Highway Department maintains a 5-year transportation improvement plan which prioritizes and details the improvement projects for roads, culvers, bridges, sidewalks and more. Funding is secured for projects from County, Federal, State and local resources. Current priority projects include: - Repair Ditch along CR 80 to reduce flooding to Holte residence during high-rain events. Divert water to the north along CR 11. - Address drainage improvements along VandeHay at CR 180 and northbound ditch on CSAH 3.	County funding, other Federal and State sources, FEMA HMA grant funding
20	Flood	Structure & Infrastructure Projects	**DRAINAGE SYSTEM IMPROVEMENTS** Further explore the need for improved drainage on the east side of Williams, connecting to the county drainage system without further impacting private property owners.	Yes *(Drainage System Infrastructure)*	On-going	High	2020-2025	LOTW Public Works Dept.	The LOTW Public Works Dept is working on development of a Drainage Management Plan that will include drainage system improvement planning for the east side of Williams.	County funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
21	Flood	Local Planning & Regulations	**COMMUNITY ASSISTANCE** Work with cities and townships and private land owners within the county to identify flood & erosion mitigation solutions for damaged areas.	Yes *(New/Existing Buildings & Transportation Infrastructure)*	On-going	High	2020-2025	LOTW-EM & LOTW SWCD	The LOTW Soil & Water Conservation District has an ongoing program of technical assistance to land owners for the restoration of damaged areas and can recommend best practices to manage stormwater, erosion control and shoreland restoration. In addition, following each major flood event, the LOTW-EM Director conducts a damage assessment in affected areas and helps those communities to identify necessary mitigation measures for implementation before a future damaging flood event occurs.	County funding, SWCD funding
22	Flood	Structure & Infrastructure Projects	**STORMWATER MANAGEMENT** Continue maintenance of the county's stormwater management system and make improvements as needed to handle future high rain events.	Yes *(Stormwater System Infrastructure)*	On-going	High	2020-2025	LOTW Public Works Dept. in cord. with LOTW SWCD	LOTW County maintains a Stormwater Management Plan and County Local Water Management Plan. Improvement measures are identified and addressed as needed on an ongoing basis. This work is under the directive of the LOTW Public Works department in coordination with LOTW Soil & Water Conservation District.	County funding, SWCD Cost Share funding

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
23	Wildfire	Local Planning & Regulations	**FIREWISE OUTREACH & EDUCATION** Engage the residents and resort owners of the Northwest Angle (NWA) and other high-risk wildfire areas of the county to promote the application of Firewise mitigation strategies.	Yes *(Existing & New Development)*	On-going	High	2020-2025	LOTW-EM in cord. with MN DNR and local Fire Depts.	This effort will continue for the Northwest Angle and other parts of the county. LOTW County has developed and maintains an active Firewise program for the Northwest Angle. From approximately 2014 Lake of the Woods County additionally worked with residents on information for external wildfire sprinkler systems, dry hydrants and water pumps for properties in high-risk wildfire areas. Outside funding for eligible wildfire mitigation projects may come from the MN DNR Firewise Program of FEMA HMA grant program.	MN DNR Firewise Funding, FEMA HMA grant funding.

LAKE OF THE WOODS COUNTY									Mitigation Action Chart
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
24	Wildfire	Local Planning & Regulations	**CWPP EXPANSION** Expand the Lake of the Woods Community Wildfire Protection Plan (CWPP) for the Northwest Angle to address other high-risk wildfire areas of the county.	Yes *(Existing & New Development)*	On-going	High	2020-2025	LOTW-EM in cord. with MN DNR and local Fire Depts.	The CWPP for the Northwest Angle is completed (NWACWPP). The CWPP will be expanded to address other high-risk wildfire areas in Lake of the Woods County. Work on the CWPP is under the directive of LOTW Emergency Management in coordination with the MN DNR Firewise Program Coordinator. The plan will prioritize hazardous fuel reduction treatments and outline measures for reducing fire danger to structures throughout at-risk communities in LOTW County.	MN DNR Firewise grant funding
25	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	On-going	High	2020-2025	LOTW-EM in cord with FD's, MN DNR and USFS	This is an ongoing effort of the LOTW-EM Director, local Fire Departments, MN DNR and the U.S. Forest Service. All communication channels are used to help promote wildfire risk awareness, including outdoor signage, social media posts and news in local media.	

LAKE OF THE WOODS COUNTY									Mitigation Action Chart	
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
26	Wildfire	Structure & Infrastructure Projects	**INSTALL DRY HYDRANTS** Identify locations for dry hydrants to support wildland wildfire fighting.	n/a	On-going	High	2020-2025	LOTW-EM in cord. with MN DNR and local Fire Depts.	LOTW-EM Director will continue to work with local Fire Departments and the MN DNR to identify where it is needed and also feasible to install dry hydrants where municipal water access is limited or does not exist. Dry hydrants can be installed with funding from hazard mitigation grant programs.	MN DNR Firewise Program, FEMA HMA grant funding

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

Table G-2. City of Williams Mitigation Action Chart (2020-2025).

CITY OF WILLIAMS								Mitigation Action Chart	
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 Lake of the Woods County's CodeRED emergency notification system.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Williams participates in the county's CodeRED emergency notification system and encourages residents to sign up for it. The city has a website and also has a city Facebook page where information on the CodeRED system with a link could be posted and residents encouraged to sign up. We can also post flyers in key community facilities, such as the Williams City Hall, Library and Senior Citizens Center.	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 will work to pass along information that we receive from LOTW County Emergency Management to our residents via our city FB page, community flyers or announcements at City Council meetings.	City funding
3	Severe Winter / Summer Storms	Mitigation Preparedness & Response Support	Regularly remove risk trees that may fall during severe storm events (i.e., ice storms, blizzards, high winds).	Yes *(Existing Buildings)*	On-going	Mod.	2020-2025	City Public Works	The city of Williams has many empty lots that have been abandoned that have dead and dying trees that pose hazards as winter blizzards and summer storms could easily knock them into neighboring lots and roadways. The city will work to	City funding

CITY OF WILLIAMS							Mitigation Action Chart		
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
									remove at-risk trees these vacant lots.	
4	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	Work with LOTW-Emergency Management to upgrade the city's outdoor warning siren.	n/a	**New**	High	2020-2025	City Emergency Mgmt. in cord with LOTW-EM	The city of Williams will work with the LOTW-EM Director to upgrade our existing warning siren. Outside grant funding will be necessary in order to purchase and install a new siren. The USDA Rural Development Grant Program is a potential source of funding that we would seek grant funding from.	USDA Rural Dev grant funding
5	Wildfire	Structure & Infrastructure Projects	Install new water reservoirs in the city for fighting fires or fix the ones we have access to.	Yes *(Existing Buildings & Infrastructure)*	**New**	High	2020-2025	City Public Works in cord with LOTW-EM and MN DNR	The city of Williams will work with the LOTW-EM Director to see how we can address this need for our community. The water has frozen at times in winter and leaking tanks has caused lower water levels than desired. We will work with LOTW-EM to determine where potential funding can come from to help us replace our water reservoirs. Potential funding sources might be MN DNR, USDA or a FEMA hazard mitigation grant.	City funding, USDA Rural Dev grant funding, MN DNR grant funding

*The mitigation activities listed in the **City of Williams Mitigation Action Chart** were identified for inclusion in the Lake of the Woods 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 Baudette Mitigation Action Chart (2020-2025)

CITY OF BAUDETTE									Mitigation Action Chart	
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 Lake of the Woods County's CodeRED emergency notification system.	n/a	On-going	High	2020-2025	City Admin / Emergency Mgmt.	The city of Baudette participates in the county's CodeRED emergency notification system and encourages residents to sign up for it. The city also has a website and city Facebook page where information on the CodeRED system with a link could be posted. We can also promote sign-up at special community events during the year.	City funding
2	Severe Winter / Summer Storms	Education & Awareness Programs	Provide education and outreach to residents and visitors on personal preparedness for severe weather events or emergencies.	n/a	**New**	High	2020-2025	City Admin / Emergency Mgmt.	The city of Baudette will work to promote residents and visitors to be ready for the severe winter and summer storms that we get every year. We will work to pass along information that we receive from LOTW County Emergency Management, as well as the NWS by using our city website, city Facebook page and also encourage the LOTW Tourism FB page to post information. We will especially work to promote safety & readiness by winter anglers on Lake of the Woods to be prepared for extreme cold and dangerous windy, blizzard conditions that can leave people stranded.	City funding

CITY OF BAUDETTE									Mitigation Action Chart	
A	B	C	D	E	F	G	H	I	J	K
#	Hazard	Mitigation Strategy	Mitigation Action	Reduces Risk to New / Existing Buildings or Infrastructure	Status	Priority	Expected Time-frame	Responsible Party	Comments on Implementation, Administration & Integration into Local Planning Mechanisms	Possible Funding
3	Severe Winter / Summer Storms	Mitigation Preparedness & Response Support	Regularly remove risk trees that may fall during severe storm events (i.e., ice storms, blizzards, high winds).	Yes *(Existing Buildings)*	On-going	Mod.	2020-2025	City Public Works	The Public Works Dept. consistently works to remove trees that pose a danger in the event of severe storm weather. The PW Dept. will continue to address at-risk trees on city property.	City funding
4	Severe Summer Storms / Tornado	Structure & Infrastructure Projects	Construct a storm shelter or tornado safe room in areas within the city where there are people vulnerable to severe summer storms and high wind events. These include the city's Timber Mill Park Campground, the Anchor Bay Manufactured Home Park and in West Baudette to replace the use of the City Hall basement as a storm shelter.	n/a	**New**	High	2020-2025	City Emergency Mgmt. in cord with LOTW-EM	The city of Baudette Emergency Manager will work with the LOTW Emergency Management Director to assess the potential for construction of storm shelters or tornado safe rooms at noted key locations in the city. Outside grant funding will be needed to help the city be able to implement any construction projects. Possible funding sources may include USDA Rural Development grant funds, FEMA HMA grant funding, and other funding not yet identified.	City funding, USDA Rural Dev grant funding, FEMA HMA grant funding, other funding TBD

CITY OF BAUDETTE									Mitigation Action Chart
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	Work with LOTW-Emergency Management to upgrade the city's outdoor warning siren.	n/a	**New**	High	2020-2025	City Emergency Mgmt. in cord with LOTW-EM	The city of Baudette will work with the LOTW-EM Director to upgrade our existing warning siren. Outside grant funding will be necessary in order to purchase and install a new siren. The USDA Rural Development Grant Program is a potential source of funding that we would seek grant funding from.	USDA Rural Dev grant funding
6	Flood	Structure & Infrastructure Projects	Improve stormwater management in the City through installation of more storm water outlets in SE Baudette and include drain tiling in future street reconstruction projects.	Yes *(Transportation Infrastructure)*	**New**	High	2020-2025	City Public Works Dept.	In 2017 the City completed street reconstruction on Hwy. 11 through town, adding storm and catch basins. Improving the city's roads & stormwater system with new infrastructure will be addressed by Public Works as funds are available to do so.	City funding

*The mitigation activities listed in the **City of Baudette Mitigation Action Chart** were identified for inclusion in the Lake of the Woods 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)

Lake of the Woods County MHMP Update

Past Mitigation Action Review (2013-2019)

Following is a report on the status of mitigation actions listed for natural hazards listed in *Section IV: The Plan for Action* in the Lake of the Woods County Hazard Mitigation Plan Update 2013. This report describes those actions that have been completed, are being deleted, or are ongoing and carried over into the 2019 plan update.

Hazard	Mitigation Action	Status	Comments
Flooding	**Objective 1, Strategy A:** Create a drainage policy to manage the recently increased drainage caused by demand for increased agricultural productivity.	Delete	The County has no drainage policy in place and does not plan to create one. LOW Public Works is working on a drainage management plan that will help to address drainage issues.
Flooding	**Objective 1, Strategy B:** Install a centerline culvert under County RD 4 to resolve road bed deterioration and overtopping issues from regularly occurring seasonal flooding.	Delete	Objective is complete. Since the box culvert was installed in fall of 2013, we have noted zero instances of water overtopping the road. Prior to this construction, water overtopped the road during spring run-off in 8 out of 10 previous years.
Flooding	**Objective 1, Strategy C:** Continue maintenance of the stormwater management system in the County per the prescription of the Lake of the Woods County Stormwater Management Plan and County Local Water Management Plan.	Ongoing	**Ongoing – revise as needed for plan update.** This work is under the directive of the LOW Public Works department in coordination with LOW Soil & Water Conservation District.
Flooding	**Objective 1, Strategy D:** Further explore the need for improved drainage on the east side of Williams, connecting to the County drainage system without further impacting private property owners.	Ongoing	**Ongoing – revise as needed for plan update.** The LOW Public Works Dept is working on development of a Drainage Management Plan in 2019.
Flooding	**Objective 1, Strategy E:** Include curb, gutter, and drain tiling in street reconstruction projects in the City of Baudette.	Ongoing	**Ongoing – revise as needed for plan update.** The City of Baudette identifies transportation improvement projects as needed on an annual basis. New flood mitigation projects will be added to the LOW hazard mitigation plan update.

Hazard	Mitigation Action	Status	Comments
Wildfire	**Objective 2, Strategy F** Create a Community Wildfire Protection Plan focusing on the Northwest Angle and other higher risk wildfire areas in the County. This planning can be funded through the federal Firewise grant program administered by the MN DNR.	Completed Ongoing	Community Wildfire Protection for the Northwest Angle is completed. **Ongoing – revise as needed for plan update.** The CWPP will be expanded to address other high-risk wildfire areas in Lake of the Woods County. Work on the CWPP is under the directive of LOW Emergency Management in coordination with the MN DNR Firewise Program Coordinator.
Wildfire	**Objective 2, Strategy G:** Engage the residents and resort owners of the Northwest Angle in October of 2013 to discuss hazard mitigation strategies with an emphasis on wildfire.	Ongoing	**Ongoing – revise as needed for plan update.** This effort will continue for the Northwest Angle and other parts of the county. LOW County has developed and maintains an active Firewise program for the Northwest Angle. From approximately 2014 Lake of the Woods County additionally worked with residents on information for external wildfire sprinkler systems, dry hydrants and water pumps for properties in high-risk wildfire areas.
Wildfire	**Objective 2, Strategy H:** Identify locations for dry hydrants pertinent to areas where water access is limited and wildfire risk is relatively higher than in other areas of the County. Dry hydrants can be installed with funding from hazard mitigation grant programs.	Ongoing	**Ongoing – revise as needed for plan update.** LOW County has developed and maintains an active Firewise program for the Northwest Angle. From approximately 2014 Lake of the Woods County additionally worked with residents on information for external wildfire sprinkler systems, dry hydrants and water pumps for properties in high-risk wildfire areas.
Extreme Weather	**Objective 3, Strategy I:** Create a memorandum of understanding between resort owners and the County to ensure that the good will of resort owners is supported by the County. This is to reinforce existing favorable behavior that promotes tourism and safety of visitors.	Ongoing	**Ongoing – revise as needed for plan update.** The mitigation action is an ongoing effort that will be carried over into the next 5-year plan cycle.
Extreme Weather	**Objective 3, Strategy J:** Proactively encourage cell phone carriers to improve coverage on the Lake of the Woods, taking advantage of already existing towers.	Ongoing	**Ongoing – revise as needed for plan update.** Gaps in coverage remain throughout LOW County
Extreme Weather	**Objective 3, Strategy K:** Identify a safe room type of shelter for emergency storm	Ongoing	**Ongoing – revise as needed for plan update** The mitigation action is an ongoing effort that

Hazard	Mitigation Action	Status	Comments
	sheltering on the east side of Baudette for residents of apartments and the manufactured home park.		will be carried over into the next 5-year plan cycle.
All-Hazards	**Objective 4, Strategy L:** Identify a funding mechanism and the funding level necessary to improve emergency services coverage in the Wheeler's point area.	Ongoing	**Ongoing – revise as needed for plan update** Working to improve our emergency services coverage in the Wheeler's point area, continue to look for a funding mechanism.
Hazardous Materials	**Objective 5, Strategy M:** Continue to maintain the current levels of local response resources while exploring collaborative ways with other private and public sector partners to improve response capacity.	Ongoing	**Ongoing – revise as needed for plan update.** The mitigation action is an ongoing effort that will be carried over into the next 5-year plan cycle. Maintain and strengthen their local-level emergency response capabilities.
Hazardous Materials	**Objective 5, Strategy N:** Demolish the old Williams school building. The old school building poses a health and safety threat because of the environmental contaminants, including lead and asbestos, use as building materials.	Ongoing	**Ongoing – revise as needed for plan update.** The mitigation action is an ongoing effort that will be carried over into the next 5-year plan cycle. Discussions continue – cost of project and funding are issues.
Water Contamination (potable)	**Objective 6, Strategy O:** Construct fences around the City of Baudette municipal wells. Add this work to work program of the next capital improvement project.	Completed	This project was completed 2014.
Water Contamination (potable)	**Objective 6, Strategy P:** Continue to pursue the construction of a sanitary sewer system in the Wheeler's Point area.	Ongoing	Expected completion Summer 2019. This work is under the directive of LOW Public Works department.
Active Shooter	**Objective 7, Strategy Q:** Develop a program for reducing the potential for an active shooter incident through awareness and education, and ensure institutions and employers have response plans.	Ongoing	**Ongoing – revise as needed for plan update.** The mitigation action is an ongoing effort that will be carried over into the next 5-year plan cycle.

Appendix I
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Works Cited

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Appendix J
Lake of the Woods County Plans & Programs in Place

Planning & Regulatory

Plans/Programs	*Yes/No*
Comprehensive/Master Plan	Yes
Capital Improvements Plan	Yes
Economic Development Plan	
Emergency Operations Plan	Yes
Climate Adaptation Plan	No
Continuity of Operations Plan	Yes
Transportation Plan	Yes
Stormwater Management Plan	Yes
Community Wildfire Protection Plan	Yes
FireWise Program	Yes
Water Conservation/Emergency Preparedness Plan	No
Wellhead Protection Plan	No
Database of dry hydrants/well access	No
Burning permits/restrictions	Yes-DNR
Water Management Plan	Yes
Zoning ordinance	Yes
Subdivision ordinance	Yes
Floodplain ordinance	Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No
Flood insurance rate maps	Yes
Acquisition of land for open space and public recreation uses	No
School closing policy/communications plan in event of inclement weather/temperatures	Yes
Storm shelters (list all locations)	Yes
Warning sirens (list all locations)	Yes
SKYWARN Program	Yes
CodeRED Mass Notification System	Yes
Severe Weather Awareness Week	Yes
Winter Weather Awareness Week	Yes
NOAA Weather Radios	Yes
THIRA	Yes
*Comprehensive Land Use Plan	Yes

Administrative & Technical

Administration	*Yes/No*
Planning Commission	Yes
Mitigation Planning Committee	No
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Yes
Mutual aid agreements	Yes
Staff	*Yes/No*
Chief Building Official	No

Floodplain Administrator	Yes
Emergency Manager	Yes
Community Planner	No
Civil Engineer	No
GIS Coordinator	Yes
Technical	***Yes/No***
Warning systems/services (Reverse 911, outdoor warning signals)	Yes
Hazard data and information	No
Hazard analysis	No

Education & Outreach

Program/Organization	***Yes/No***
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	No
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes
Natural disaster or safety related school programs	Yes
StormReady certification	Yes
Firewise Communities certification	Northwest Angle (NWA)
Public-private partnership initiatives addressing disaster-related issues	No

Appendix K
Local Mitigation Survey Report

As part of Lake of the Woods County's 2019 Multi-Hazard Mitigation Plan update, participating jurisdictions and County personnel were asked to participate in filling out a two-part "Local Mitigation Survey" form. The purpose of the survey was to gather information needed to support update of the plan and development of local-level mitigation actions the next 5-year planning cycle. Following are the responses from the county departments and jurisdictions that participated in the survey.

LAKE OF THE WOODS COUNTY EMERGENCY MANAGEMENT

Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Yes. We have experienced heavy rain, wind damage to trees, hail damage, high-water event with shoreline wash out/damage, and power outages. Storms have caused damage to city roads and culverts as well as to private properties. We experienced several severe storms in June and July 2014 resulting in a federal disaster declaration DR-4182.

   We have also had numerous thunderstorms that have damaged trees and power lines, resulting in power outages and tree damage to vehicles and homes. A local resort and campground experienced damages due to high winds and falling trees. Cars and cabins were damaged and the safety of occupants and campers was at risk due to no storm shelter on site.

   In January 2014 we had a propane shortage, which was caused by a combination of the shutdown of a gas pipeline, transportation resources being utilized for the movement of oil and extreme prolonged cold weather. The limited availability of propane caused an increase in pricing, concern of running out of heating fuel and posed an immediate threat to human life and public welfare in Minnesota.

   In Winter 2018 we experienced extreme low temperatures and high winds, causing white out ground blizzard conditions on Lake of the Woods.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** The City of Baudette has completed street reconstruction Highway 11, adding storm and catch basins as well as doing tree removal on city streets.

   The County completed construction of a sanitary sewer system in the Wheeler's Point area.

   Continued restoration in areas that are vulnerable to shoreline erosion utilizing a robust shoreline stabilization practice.

   Our Public Works Dept. has made some culvert improvements.

We have encouraged business and residents to enroll in the county emergency alert system CodeRED so they will be aware when severe weather notifications and instructions.

The County Sheriff's Office also has had an increased use of our website and Emergency Management Facebook page to communicate with residents on emergency preparedness.

In 2017, Lake of the Woods County met the requirements to become StormReady. We developed a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

The County has also rebuilt the Emergency Management Department

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** In 2018 there was a new development project adding a 24-unit apartment building and Hockey Arena in the city of Baudette, which would increase the cost of damage due to a tornado, wind or hail. Businesses are expanding and growing.

   In general we have noticed an increase in more frequent high-rain events in the last 5 years.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Upgrading emergency sirens to City of Baudette and City of Williams. Upgrades on communication systems.

   We would like to add warning sirens and need a storm shelter constructed at the lake area and West Baudette.

   A sister site for the Baudette Fire Department to hold equipment and reduce long response times to this populated area.

   Potential hazards within the parks and especially in the campgrounds should be identified in the renewed HMP. County Officials have started discussing the addition of storm shelters, protocols, and emergency notification in our county parks with campgrounds. The county desires to construct storm shelter-rated facilities as it replaces restrooms and comfort stations within the park system. Priorities will be given to parks with campground facilities.

   Continue to stabilize vulnerable shoreline.

   The City of Baudette still has a need for additional storm water outlets.

   Additional training and equipment to support Search & Rescue on Lake of the Woods and within State forests.

Part B: Local Mitigation Capabilities Assessment

1. What plans, authorities, or policies are in place to help accomplish mitigation in your community?

Emergency Operations Plan

Evacuation Plan

Severe Weather Plan

Comprehensive Land Use Plan

Comprehensive Local Water Management Plan

County-wide Zoning Ordinance

We do participate in the National Flood Insurance Program (NFIP)

Ordinances to prevent the construction of homes and buildings in proximity to rivers and areas of erosion.

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

Emergency Manager

The County has a GIS Specialist/I.T. position that can support the emergency management team, plus additional GIS resources available in various county Departments.

EM Group has representation from Law Enforcement, Fire, PSAP, public health, Hospital, and DNR.

Land & Water Planning Office – 3 staff

Soil and Water Conservation District – 3.5 staff and access to engineers

The utility superintendent and fire chief attend training and meetings.

The City of Baudette has an engineer who assists the Superintendent to address road maintenance and troubleshoot issues.

Other staff include:

Chris Bowman, Facility Manager

Jeff Stampohar, VP of Operations,

Jodi Wilder, VP of Patient Services

Jenny Loughrey RN Emergency Preparedness

Kay Schell, RN Public Health Nurse

3. **What <u>programs</u> are in place to help accomplish mitigation in your community?** The County adopted the CodeRED emergency alert system. We have a link on our websites for residents to sign up for the system.

The County participates in the annual Severe Winter/Spring Weather Awareness Week by posting severe weather awareness information out on our city Facebook page.

Our Fire Department has open houses on fire safety and presents in the schools.

Our local school practices tornado drills on an annual basis.

Each fall & spring we do active outreach to homeowners to clear leafy and woody debris from roadside gutters to prevent clogging and over the road flooding and wildfire in these areas.

Weather Ready Community, offers annual SKYWARN training.

Emergency Preparedness Program – including mitigation

Ambulance (EMS) services

Rural Health Clinic Nursing service

The City of Baudette office building is a designated storm shelter for the community.

CHI LakeWood participates with the county in a community-wide full-scale exercise

We have an emergency siren that notifies the community along with a community call system that advises residents county-wide.

4. **What <u>funding or other resources</u> are available to help accomplish mitigation in your community?**

DNR Firewise Grant.

We have used MN DNR money for equipment.

Researching a MN WARN membership.

The Soil and Water Conservation District has successfully applied for and received grants to accomplish shoreline stabilization projects.

The Soil and Water Conservation District received disaster funding to repair damaged shoreline.

The Soil and Water Conservation District and the Land & Water Planning Office have worked with the Public Works Department to accomplish maintenance on Public Drainage System projects

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Funding would be the biggest barrier.

Funding assistance is need to build storm shelters and sister fire station location. To receive FEMA mitigation funds for storm shelters it needs to be outlined in the HMP.

Not all residents are signed up for CodeRED, in fact some have opted out and funding is needed for IPAWS. We struggle to effectively engage people to convince them of danger. Many ignore early warnings and travel advisories that put themselves and emergency personnel at risk.

Part C: Contributors & Time

Jill Hasbargen Olson, Lake of the Woods County Emergency Manager, 2 hours

Julie Berggren, Lake of the Woods County Administrative Assistant, 1 hour

LAKE OF THE WOODS COUNTY SHERIFF'S OFFICE

Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** Flooding issues.

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?** Lake of the Woods County hired a full-time, top notch emergency management director. This is a crucial piece to keeping all emergency plans up to date and key community leaders pro-active in planning and readiness.

3. **In the past 5 years, has anything, especially related to zoning or development, changed that you feel has increased your community's vulnerability to future severe weather or disaster events?** We have fixed and upgraded emergency sirens. We have also made several upgrades to the communications system and interoperability.

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 feel our most vulnerable and logistical challenges will occur on Lake of the Woods during severe weather. Our local EMS and fire/rescue squad need to be better equipped to handle these situations.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Evacuation plans, emergency operation plans, and several policies.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** Leaders from all key disciplines, including but not limited to from financial, law enforcement, and medical.

3. **What programs are in place to help accomplish mitigation in your community?** CodeRED alerts, planning meetings, and trainings.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Some grants and local funding.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Funding for equipment and training.

Part C: Contributors & Time

Gary Fish, Sheriff, 1 hour

LAKE OF THE WOODS COUNTY LAND & WATER 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, during the spring/summer of 2014 we experienced a high-water event that caused extensive shoreline damage.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** Yes, the Soil and Water Conservation District received disaster funds to repair and stabilize the shoreline damage occurring as a result of the high-water event. The Soil and Water Conservation District worked with the Army Corps of Engineers to achieve a more robust shoreline stabilization practice.

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 aware of any.

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 stabilize vulnerable shoreline.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?**

   Comprehensive Land Use Plan

   Comprehensive Local Water Management Plan

   County-wide Zoning Ordinance

   We do participate in the National Flood Insurance Program (NFIP)

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

   Land & Water Planning Office – 3 staff

   Soil and Water Conservation District – 3.5 staff and access to engineers

3. **What programs are in place to help accomplish mitigation in your community?** I don't believe this question pertains to this office.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The Soil and Water Conservation District has successfully applied for and received grants to accomplish shoreline stabilization projects.

   The Soil and Water Conservation District received disaster funding to repair damaged shoreline.

   The Soil and Water Conservation District and the Land & Water Planning Office have worked with the Public Works Department to accomplish maintenance on Public Drainage System projects.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Not aware of any.

Part C: Contributors & Time

Josh Stromlund – Land & Water Planning Director, 30 minutes

CITY OF BAUDETTE

Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** No.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** In 2017 the City completed street reconstruction on Highway 11 through town—adding storm and catch basins.

   In addition, the Public Works Department has consistently worked to remove trees that pose a danger in the event of severe storm weather.

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?** We need a storm shelter at the campground and an additional site in West Baudette as the former use of the City Hall basement is not safe with the amount of stairs and lack of acceptable space to wait the storm out.

   More storm water outlets in SE Baudette.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** We work closely with the county and other emergency response teams to train and remain vigilant of potential issues.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** The utility superintendent and fire chief attend training and meetings.

   The city has an engineer who assists the Superintendent to address road maintenance and troubleshoot issues.

3. **What programs are in place to help accomplish mitigation in your community?** The school holds drills.

   We have an emergency siren that notifies the community along with a community call system that advises residents county-wide.

   The Fire Department hosts open houses and presents at the school annually.

4. **What funding or other resources are available to help accomplish mitigation in your community?** We have used MN DNR money for equipment.

   We are researching a MN WARN membership.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** I would say funding would be the biggest barrier.

Part C: Contributors & Time

Tina Rennemo, Clerk/Treasurer, 30 minutes

Roger Schotl, Public Works Director, 30 minutes

Brad Levasseur, Fire Chief, 30 minutes

CITY OF WILLIAMS

Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** We have faced minor issues due to storms, but nothing that caused threat to life or major property damages.

2. **In the last 5 years, has your community taken any particular actions to reduce the vulnerability of your community against future severe weather or disaster events?** No steps have been taken to improve vulnerability to hazards such as wildfire and severe wind.

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?** The increased number of empty/abandoned homes has created hazardous conditions; empty lots that have been abandoned have dead and dying trees that pose hazards as winter blizzards and summer storms could easily knock them into neighboring lots and roadways. Lightning strikes could easily set the trees and empty structures on fire, which

would be hard on our community as we do not have enough water storage units for our fire department to handle a larger fire.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** We need water reservoirs for fighting fires, or the ability to fix ones we have access to. They are not in the best shape, and winter/cold weather has caused issues with them. The water has frozen at times. And leaking tanks has caused lower water levels than desired.

   Due to inclement weather conditions, we also have roadways that are in need of repairs, as well as some sewer lines that could use repairs. The cold weather plus some heavier snowstorms have created cracks and humps in several city streets.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** Our fire department would help with maintenance and repair, as well as the city maintenance supervisor. We are willing to set ordinances in place to continue with a care plan as needed. We have some in place now.

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

3. **What programs are in place to help accomplish mitigation in your community?** The city participates in the LOTW County emergency alert system. We receive calls for situations that could require intervention on our part as well as emergency preparedness due to natural disasters such as tornados.

   We have started a Facebook page that will update the community on severe weather/fire situations that arise.

   The fire department has an emergency alert system in place.

4. **What funding or other resources are available to help accomplish mitigation in your community?** The city receives funding from the county and state. We work with the county and state to deal with issues regarding road erosion and other issues requiring outside attention.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Our city has been focused on too many projects in house the last six years. We have faced internal issues that needed attention, and are just recently looking at what is needed in the way of physical/disaster protection. As we are such a small community, we haven't had a great need, but the time has come to look at what is necessary to protect and provide for ourselves in the case of fire or other natural disasters. As the mayor and clerk are

both new, they are looking into what has been put into place and what is still needed, but this is a slow process due to lack of documentation.

Part C: Contributors & Time

Verna McVay, Mayor, 1 hour

Leslie Nicholson, City Administrator, 30 minutes

Leslie Huerd, City Councilor, 30 minutes

NORTHWEST ANGLE (Resort: Angle Inlet)

Part A: Past Events & Vulnerability Assessment

1. **In the last 5 years, has your community experienced any severe weather or disaster events that posed risk to life safety, caused property damage, or incurred costs for recovery?** We've experienced more power outages than we can count. Also wind damage to trees, shingled roofs, docks etc.

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?** Nothing has been done on a community level regarding these issues.

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?** We need a tornado shelter in Angle Inlet. At this time not a single shelter exists for such an event.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?** None to my knowledge.

2. **What staff (organizational capacity) are in place to help accomplish mitigation in your community?** None that I know of.

3. **What programs are in place to help accomplish mitigation in your community?** Nothing that we know of.

4. **What funding or other resources are available to help accomplish mitigation in your community?** Don't know.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** We could use some culvert upgrades and ditch cleaning. We are also in great need of a tornado shelter.

Part C: Contributors & Time

Rick McKeever, Young's Bay Resort, 30 minutes

CHI LAKEWOOD HEALTH

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 winter of 2018-19 had extreme low temperatures in the 40-60 below range with high winds. This weather caused people on Lake of the Woods to be stranded out on the lake where local law enforcement and resort personnel to rescue. There were multiple days (approximately 60 days) of below zero temperatures. The 4 years prior were not much different. The hospital was not impacted.

   There were numerous thunderstorms with high winds that damaged trees but not risk to life safety or property damage to the hospital.

   There were forest fires in Canada that caused high smoke volume in the air quality.

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?** CHI LakeWood Health Center is built to withstand the extreme cold and heat temperatures. We have back up power generator that will run on back up fuel for several days that will both heat and cool our building.

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 at CHI LakeWood Health and Care Center has changed in the past 5 years. There is a new hockey arena built at the school that would increase the cost of damage due to severe weather or disaster. ANI Pharmaceuticals is expanding both at the hormone plant and in town.

4. **What concerns do you have / what mitigation actions do you think would help your community to reduce or eliminate risk against future severe weather or disaster events?** Public education is needed to promote individual families to be prepared for emergencies.

   Promote all citizens of Lake of the Woods County to be on the Code Red Alert system as there are many that don't have local telephone any longer or local TV stations so they can be notified of severe weather.

   The Waste Water treatment area by the airport should be moved more out of town.

Part B: Local Mitigation Capabilities Assessment

1. **What plans, authorities, or policies are in place to help accomplish mitigation in your community?**

   We have emergency plans at LakeWood Health Center. We have plans or initiatives for growth but do not include structural changes.

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

   Chris Bowman, Facility Manager.

   Jeff Stampohar, VP of Operations,

   Jodi Wilder, VP of Patient Services

   Jenny Loughrey RN Emergency Preparedness

   Kay Schell, RN Public Health Nurse

3. **What programs are in place to help accomplish mitigation in your community?** Emergency Preparedness Program – including mitigation.

   Ambulance (EMS) services.

   Rural Health Clinic Nursing service.

   We are a designated shelter for severe weather to the community.

   CHI LakeWood participates with the county in a community-wide full-scale exercise.

4. **What funding or other resources are available to help accomplish mitigation in your community?** We are members of the grant-funded NW Region Emergency Preparedness Coalition.

   We work closely with our Emergency Manager for assistance with state and federal partners.

5. **What program gaps or deficiencies do you feel exist that are a barrier to accomplishing mitigation in your community?** Not all residents are signed up for the county's emergency alert system.

   Resources are limited in our community due to our location.

Part C: Contributors & Time

Jenny Loughrey, RN Emergency Preparedness, 1 hour

Chris Bowman, Facilities Manager, 1 hour

Jodi Wilder, VP Patient Services, 1 hour

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:
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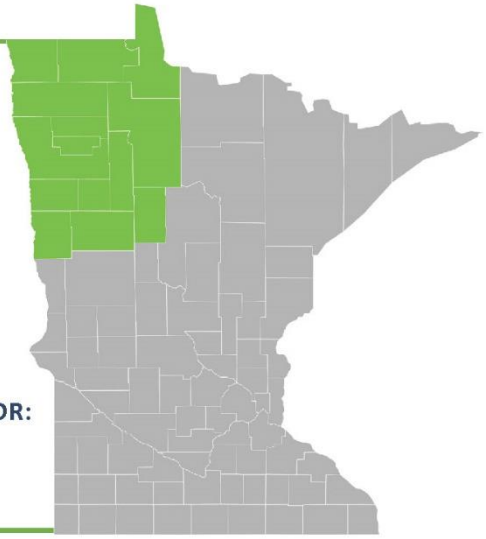


MINNESOTA CLIMATE & POPULATION TRENDS

OUR KNOWLEDGE OF CLIMATE CHANGE IS EXPANDING RAPIDLY

Climate records show that across the Midwest and here in Minnesota we are experiencing an increase in warmer, wetter conditions as well as an increase in extreme weather events and related natural disasters. Experts expect these conditions to continue well into the future. By mid-century, Minnesotans can expect much warmer winters, more severe summer heat waves, a higher frequency of very heavy rain events and a higher frequency of late growing season drought conditions.

Many communities in Minnesota rely on economies rooted in agriculture and outdoor recreation, such as wintertime tourism, including snowmobiling, ice fishing, and skiing. Future climate conditions may stress agricultural economies by delaying planting and fieldwork, increasing disease and pest pressure, and reducing crop yields due to cycles of flooding and dry spells. Rapidly warming winter temperatures will turn snowfall into rain and reduce the depth and timing of lake ice cover, affecting winter recreation.

Extreme rainfall events will increase flood risk, particularly in floodplain areas, disrupting transportation and utility service, and damaging property and infrastructure. In addition, surface runoff may lead to soil erosion, lake pollution, and reduced drinking water quality. Nutrient runoff in particular, along with warmer temperatures, are likely to contribute to a larger occurrence of harmful algal blooms on waters, many valued for recreation. Changing climate conditions are likely to strain the viability of native species, including popular recreational fish, invite encroachment by invasive species, and increase the geographic range and types of ticks and mosquitoes.

Some of these trends are evident in the current climate projection data that are available. However, because these data are often averaged or summarized for large areas over large time periods, they can mask the local peaks in temperature and precipitation that can trigger disasters. Until more finely-scaled climate projection data become available to Minnesota planners and decision-makers, the current data still remain useful for exploring the future ahead and establishing a baseline understanding of what our weather challenges may be moving forward.

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

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.

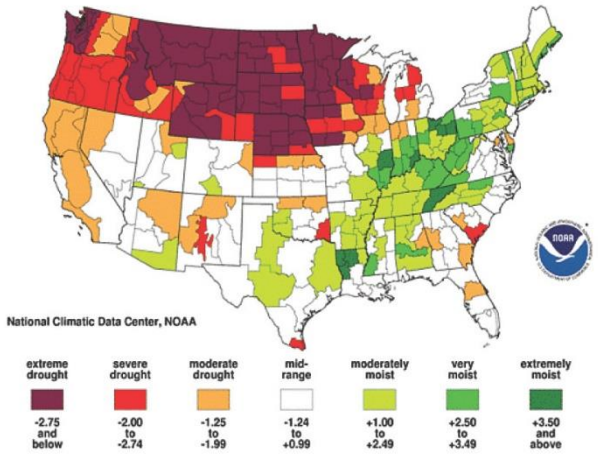
WATER LEVELS: Water levels fell in response to dry, hot weather. Unusually warm lake water temperatures were also deemed responsible for some fish kills. The U.S. Geological Survey (USGS) and Minnesota Department of Natural Resources (MNDNR) reported extremely low stream discharge values in late September,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

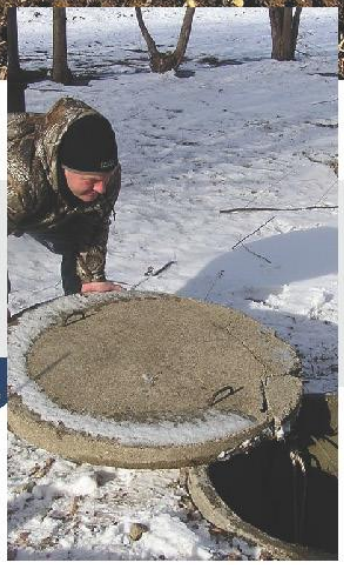
PERMIT SUSPENSION: To safeguard water availability, the MNDNR suspended 16 surface water appropriation permits across the state, including a mining operation, golf courses, a sugar processing plant, and other public and private sector entities. By the end of October, roughly 50 surface water appropriation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

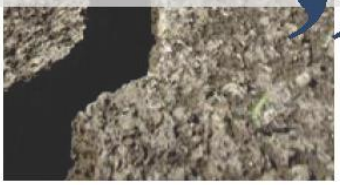
DEPLETED WELL WATER: A number of complaints were filed with the state when private wells went dry. Neighboring production wells were suspected of amplifying the problems related to the drought.

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)





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

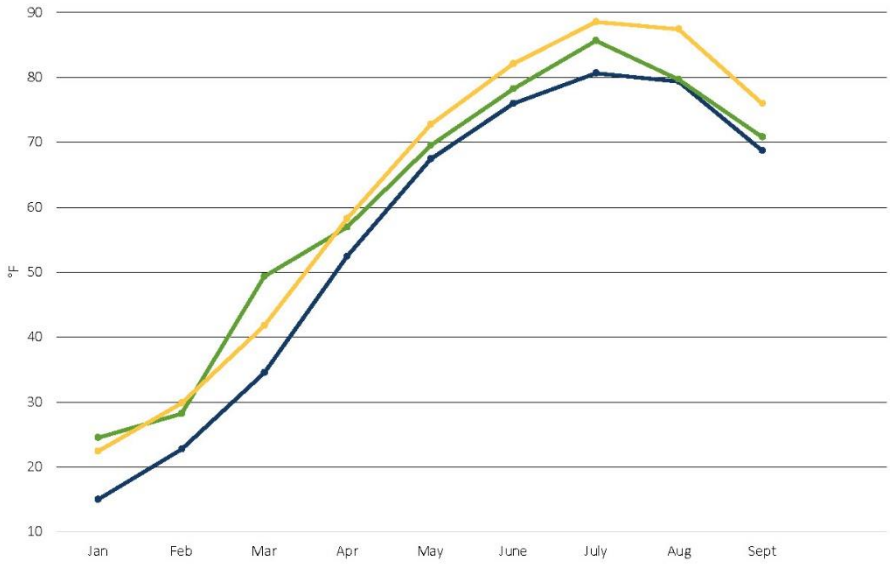
Top: Farm fields (Mark Steil, 2012)
Bottom left. Dry cattle pasture (Seth Perlman, AP, 2012)
Bottom right: Dry well (Mark Steil, 2012)

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.

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

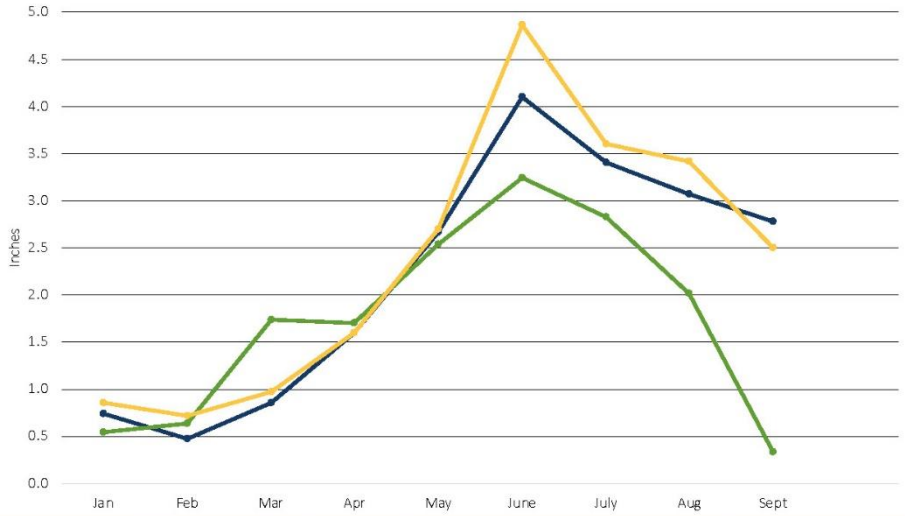
Minimum Temperature

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

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/

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  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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