GOGEBIC COUNTY

2021-2026 Hazard Mitigation Plan

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U.S. Department of Homeland Security
FEMA Region 5
536 S. Clark St., 6th Floor
Chicago, IL 60605

FEMA

September 15, 2021

Mr. Matt Schnepp
State Hazard Mitigation Officer
Michigan State Police
Emergency Management and
Homeland Security Division
P.O. Box 30634
Lansing, MI 48909

Dear Mr. Schnepp:

Thank you for submitting adoption documentation for the Gogebic County Hazard Mitigation Plan. The plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. The plan met the required criteria for a multi-jurisdictional hazard mitigation plan and the plan is now approved for the cities of Bessemer and Ironwood, and the townships of Bessemer, Ironwood, Marenisco, Watersmeet, and Erwin. Please submit adoption resolutions for any remaining jurisdictions who participated in the planning process.

The approval of this plan ensures continued availability of the full complement of Hazard Mitigation Assistance (HMA) Grants. All requests for funding, however, will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted.

We encourage the participating communities to follow the plan's schedule for monitoring and updating the plan, and to continue their efforts to implement the mitigation measures. The expiration date of the Gogebic County Hazard Mitigation Plan is June 14, 2026. The plan must be reviewed, revised as appropriate, resubmitted, and approved no later than the plan expiration date.

Please pass on our congratulations to the approved communities for completing this significant action. If you or the communities have any questions, please contact Lorena Reyes at (312) 408-5270 or Lorena.reyes@fema.dhs.gov.

Sincerely,

John Wethington
Acting Chief, Risk Analysis Branch
Mitigation Division

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SECTION 1: Introduction

This section provides a general introduction to the Gogebic County Hazard Mitigation Plan. It consists of the following four subsections:

- Background
- Purpose
- Scope
- Authority

Background

Natural hazards, such as floods, severe winter storms, and wildfires are naturally occurring physical phenomena caused either by the rapid or slow onset of events which can have a negative effect on humans or the environment. Every year in the United States (U.S.), natural hazards threaten lives and livelihoods and result in billions of dollars in damage.

Hazard Mitigation: Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards

Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce the risk to human life and property from natural, technological or human-related hazards. This is accomplished through coordination of resources, programs, and authorities. When successful, mitigation will lessen the impacts to such a degree that future events will remain only incidents and not become disasters.

Mitigation is an essential part of the emergency management process. When a disaster strikes and a community responds, often the focus of repairs and reconstruction is to restore damaged property to pre-disaster conditions as quickly as possible. These efforts expedite a return to "normalcy," yet replication of pre-disaster conditions leaves the community vulnerable to the same hazards, resulting in a cycle of damage, reconstruction, and damage again. Hazard mitigation allows this cycle to be broken by ensuring that post-disaster repairs and reconstruction take place after damages are analyzed and that sounder, less vulnerable conditions are produced.

Mitigation planning allows a community to identify potential hazards, assess vulnerability/risk, and develop prioritized mitigation strategies to deal with those hazards long before an event occurs. The hazards and vulnerabilities are determined based on historical events, incidents in nearby communities, and scientific data and trends. Mitigation measures can be implemented systematically, based on assessed priorities, or, in the worst case, through repair and reconstruction after a hazard event occurs.

Gogebic County is vulnerable to a wide range of natural, technological, and human-related hazards, including flooding, infrastructure failure, structural fires, winter storms, subsidence, and hazardous material spills due to transportation accidents. While the threat from hazardous events may never be fully eliminated, there is much that can be done to lessen their potential impact

upon the community. The Gogebic County Hazard Mitigation Plan (hereinafter referred to as "Hazard Mitigation Plan" or "Plan") is the logical first step toward incorporating hazard mitigation principles and practices into the routine government activities and functions of Gogebic County and its municipalities. At its core, the plan recommends specific actions to protect its residents from losses to hazards that pose the greatest risk. These mitigation actions go beyond simply recommending structural solutions to reduce existing vulnerabilities. They also include local policies on community growth and development, incentives for natural resource protection, and public education activities are examples of other actions considered to reduce Gogebic County's future vulnerabilities to identified hazards. The Plan is designed to be a living document, with implementation and evaluation procedures included to help achieve meaningful objectives and successful outcomes over time.

Disaster Mitigation Act of 2000 and National Flood Insurance Reform Act of 2004

To reduce natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (42 U.S. Code § 5165) to invoke new and revitalized approaches to mitigation planning. Section 322 of this Act emphasizes the need for state and local government to closely coordinate on mitigation planning activities and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation (PDM) Program, all of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security.

This Plan was prepared in coordination with FEMA, the State Hazard Mitigation Office in Michigan, and the Gogebic County Emergency Coordinator to ensure that it meets all applicable Disaster Mitigation Act planning requirements. The Local Mitigation Plan Review, found in Appendix G, provides a summary of FEMA's current minimum standards of acceptability and notes the location within the Plan where each planning requirement is met.

Purpose

The general purpose of this Hazard Mitigation Plan is to:

- Protect life and property by reducing the potential for future damages and economic losses that result from natural hazards.
- Qualify for additional grant funding, such as pre-disaster mitigation.
- Speed recovery and redevelopment following future disaster events.
- Demonstrate a firm local commitment to hazard mitigation principles.
- Comply with federal and state legislative requirements for local hazard mitigation plans.

Scope

Beginning in March 2019, this plan was updated as required by the State Hazard Mitigation Office and FEMA. After review of FEMA's requirements for local hazard mitigation plan updates, the Local Planning Team (LPT) reviewed and analyzed each section of the plan and

determined that each section needed to be updated to some degree to meet the requirements. Changes made to each section were clearly marked until such time that it was determined that all parties agreed on the changes.

This plan will be updated and maintained to continually address those hazards determined to be of high and moderate risk through the detailed vulnerability assessment for Gogebic County (see Section 6: *Risk Assessment*). Other hazards that are considered low or negligible risk will continue to be evaluated during future updates to the plan, but they may not be fully addressed until they are considered high or moderate risk to Gogebic County. The geographic scope (i.e. planning area) for the plan includes the entire area of Gogebic County.

Authority

Gogebic County municipalities and townships have adopted this Hazard Mitigation Plan. Local resolutions to adopt the Plan are compiled in Appendix F.

This plan was developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The document shall be monitored and updated on a five-year basis to maintain compliance with the following legislations:

- Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and by FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201.
- National Flood Insurance Act of 1968, as amended 42 U.S. Const 4001 et seq.
- Michigan General Statutes: Emergency Management Act 390 of 1976.

SECTION 2: Planning Process

This section of the Plan describes the mitigation planning process completed by Gogebic County in preparation of the Hazard Mitigation Plan. It consists of the following subsections:

- Overview of Hazard Mitigation Planning
- History of Hazard Mitigation Planning in Gogebic County
- Preparing the 2020 Plan
- The Planning Team
- Local Planning Team (LPT) Meetings
- Involving the Public
- Involving Stakeholders

Overview of Hazard Mitigation Planning

Local hazard mitigation planning is a process of organizing community resources, developing the goals for hazard mitigation in the county, identifying and assessing local hazard risks, and determining how best to minimize/manage those risks. The process results in a hazard mitigation plan that identifies special mitigation actions that achieve both short- and long-term planning objectives for a community-based vision. Plan maintenance procedures are established for routine monitoring of implementation progress, as well as evaluation and enhancement of the Plan itself. These procedures ensure that Gogebic County's Plan remains a current, dynamic, and effective planning document over time.

Mitigation planning offers many benefits to the local community such as:

- Protect public safety and prevent loss of life and injury.
- Reduce harm to existing and future development.
- Maintain community continuity and strengthen the social connections that are essential for recovery.
- Prevent damage to the community's unique economic, cultural, and environmental assets.
- Minimize operational downtime and accelerate recovery of government, organizations, and business after disasters.
- Reduce the costs of disaster response and recovery and the exposure to risk for first responders.
- Help accomplish other community objectives, such as capital improvements, infrastructure protection, open space preservation, green infrastructure installation, and economic resiliency.

Having a hazard mitigation plan will increase awareness of hazards, risk, and vulnerabilities; identify actions for risk reduction; focus resources on the greatest risks; and communicate priorities to state and federal offices.

History of Hazard Mitigation Planning in Gogebic County

Gogebic County's first formal hazard mitigation planning efforts started in 2005 with preparation of the County's first FEMA-approved Hazard Mitigation Plan. These efforts were in response to the Federal Disaster Mitigation Act of 2000, a new requirement at the time to obtain funds through FEMA. The mitigation planning team first led the initial plan, formally named the *Gogebic County Ad-hoc Committee* and organized by the *Gogebic County Emergency Management Office.* The committee included planning professionals from the Western U.P. Planning & Development Region (WUPPDR), the County Emergency Coordinator, the City of Wakefield's manager, and Gogebic County sheriff. The final plan was adopted on December 14, 2005. FEMA approved the plan in Fall 2005, validating it until 2010.

In 2012, Gogebic County contracted WUPPDR to update the 2005 plan. This plan update began with a review of the 2005 plan and gathering new data and information from local sources, including the State to update the hazard risks to municipalities within the County. The Ad-hoc Committee then met to identify new projects to address existing and newly identified hazards. A public meeting was held during the planning process on August 14, 2013. The final plan was adopted by the Gogebic County Board of Commissioners on October 23, 2013, and subsequently adopted by the participating jurisdictions.

Preparing the 2020 Plan

Hazard mitigation plans are required to be updated every five years to remain eligible for certain State and Federal mitigation funding. In preparation of the 2020 Hazard Mitigation Plan update, Gogebic County and WUPPDR determined the best approach would be for WUPPDR to apply to be a subrecipient of grant funding to assist the County to update its plan. WUPPDR followed the mitigation planning process recommended by FEMA (Local Mitigation Planning Handbook, March 2013) and the Michigan State Police.

44 CFR Requirement

201.6(c)(1): The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

This section of the Plan provides a description of the process that was used to develop the 2020 plan update. For information about how previous versions of the plan were developed, previous versions of this plan should be reviewed.

Plan update and review procedures were established in the previous versions of this plan and were used, in addition to the requirements discussed above, to prepare the 2020 update. These procedures provide the general guidelines for updating and reviewing the plan on a five-year basis. These steps also state that the plan will be evaluated for effectiveness and appropriateness by addressing the following questions:

A. Do Hazard Mitigation Plan goals and objectives continue to address current and expected conditions?
B. Has the nature or magnitude of risks changed?
C. Are current resources enough and appropriate for Hazard Mitigation Plan implementation?
D. Are there any implementation problems that impede the action plan?
E. What implementation outcomes have been completed?
F. Have other agencies, organizations, and jurisdictions participated as proposed in the previous plan?

These questions were considered and addressed by the local planning team during the 2020 plan update process. Each section of the updated plan includes information the plan was reviewed and updated with the identified results. The State of Michigan Hazard Mitigation Plan was reviewed extensively to incorporate relevant material into the Gogebic County Hazard Mitigation Plan update.

The planning process included several steps that were completed over the course of several months. These steps are illustrated in **Figure 2.1**.

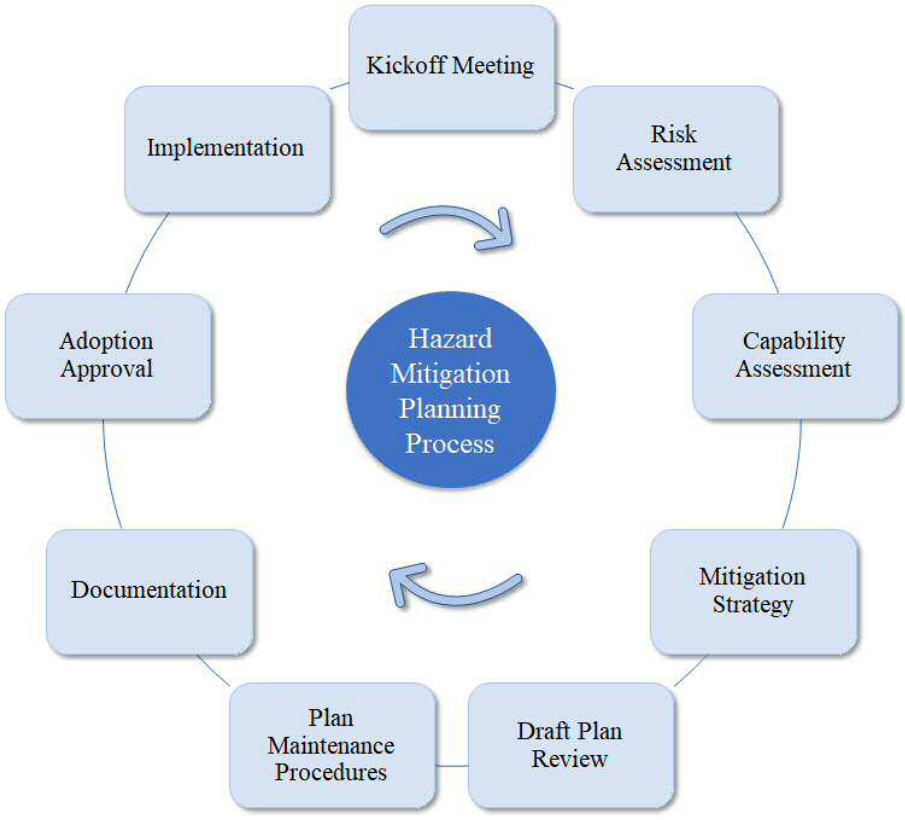


Figure 2.1: Hazard Mitigation Planning Process

Each step of the planning process illustrated in **Figure 2.1** resulted in outcomes that make up the Plan. These elements have been integrated into this document and are further explained here for introductory purposes.

The *Community Profile*, located in Section 3, provides a general overview of Gogebic County and includes information on relevant topics such as geography, transportation, environment, population, demographics, housing, infrastructure, and land use. Specifics about declared disasters in the county can also be found.

The *Risk Assessment* (Section 6) summarizes the hazards identified (Section 4: *Hazard Identification*) and analyzed (Section 5: *Hazard Analysis*) in Gogebic County. It also assesses the overall risk to hazards in the county. For hazards that impact individual jurisdictions, the *Risk Assessment* aims to identify the vulnerabilities that are found in those jurisdictions. Additionally, this section prioritizes and ranks countywide hazards from high to low risk.

Section 7: *Hazard Mitigation* determines the capability of a local jurisdiction to implement a comprehensive mitigation strategy and identify potential opportunities to establish or enhance mitigation policies, programs, or projects. Capabilities are detected by identifying existing strengths and weaknesses with ongoing government activities that have a direct impact on the community's vulnerability to hazards. This helps to identify what gaps or shortfalls need to be addressed and which positive mitigation measures already in place should continue to be supported. Coupled with the *Risk Assessment*, the *Capability Assessment* helps identify and target meaningful mitigation actions for incorporation in the Mitigation Strategy portion of the Hazard Mitigation Plan. Together, The *Community Profile, Risk Assessment,* and *Capability Assessment* help to determine the Hazard Mitigation Plan goals.

Mitigation Strategies, also found in Section 7, consist of a comprehensive strategy that looks to develop overarching goals addressing hazard mitigation, economic, environmental and social factors. Mitigation *Action Plans* (Section 8) were created for the county and some specific jurisdictions. The action plans identify specific plans for actions to reduce or eliminate the impacts from hazards. Both Section 7 and 8 work to make the Hazard Mitigation Plan comprehensive by identifying long-term and short-term goals that will influence day-to-day decision making and project implementation.

The maintenance schedule for the plan is embedded in Section 8 and describes in detail the procedures as a final action item for Gogebic County to keep up to date with the hazard mitigation plan.

The Planning Team

The Gogebic County Emergency Management Coordinator convened a Local Planning Team (LPT) to guide the development of the plan update. While remaining consistent with the initial plan, it was important to reach out to more stakeholders to get a representative sample of critical facility staff, local officials, emergency personnel, and citizens. The LPT coordinated together on all aspects of the plan development process. Additional participation and input from county

residents and other identified stakeholders were sought through the distribution of surveys and the facilitation of a public meeting.

Jurisdictional Involvement

All municipalities in Gogebic County (**Table 2.1**) have participated in the development of the 2020 Gogebic County Hazard Mitigation Plan as required for pre-disaster federal mitigation funds under Section 104 of the Disaster Mitigation Act of 2000 (42 U.S. Const. 5165). These same jurisdictions also participated in the 2005 and 2012 Plan updates.

Table 2.1: Participating Local Units of Government and Representatives

Jurisdiction	Representative	Title
Gogebic County	Heidi DeRosso	Emergency Management Coordinator
City of Bessemer	Charly Loper	City Manager
City of Ironwood	Andrew DiGiorgio	City of Ironwood Public Safety Department
City of Wakefield	Robert Brown	City Manager
Bessemer Township	Jeff Randall	Township Supervisor
Erwin Township	Larry Grimsby	Township Supervisor
Ironwood Township	Maria Graser	Township Treasurer
Marenisco Township	Richard Bouvette	Township Supervisor
Wakefield Township	John Cox	Township Supervisor
Watersmeet Township	Mike Rogers	Township Supervisor

Gogebic County Local Planning Team

The participants listed in **Table 2.2** represent the members of the Gogebic County LPT who participated in the development of the plan. The planning process was led at the county level by the Gogebic County Emergency Management Coordinator. WUPPDR provided a team of planners and a Geographic Information Systems coordinator to facilitate all LPT meetings.

Table 2.2: Gogebic County Local Planning Team

Name	Agency/Jurisdiction
Heidi DeRosso	Gogebic County Emergency Management Coordinator
Barry Bolich	Gogebic County Road Commission
Robert Brown	City of Wakefield
John Cox	Wakefield Township
Andrew DiGiorgio	City of Ironwood Public Safety Department
Maria Graser	Ironwood Township
Larry Grimsby	Erwin Township
Charly Loper	City of Bessemer
Mike Rogers	Watersmeet Township
Greg Ryskey	Gogebic County Forestry and Parks
Brandon Snyder	IPSD, LEPC, 9-1-1

Local Planning Team (LPT) Meetings

The preparation of the Plan required a series of meetings for facilitating discussion and initiating data collection efforts with local officials. The meetings also prompted continuous input and feedback from local officials throughout the drafting stages of the Plan.

Below is a summary of the key meetings for the LPT. Copies of the agendas, sign-in sheets, and handout materials for all meetings can be found in Appendix F.

First Local Planning Team Meeting

The first meeting of the LPT was held on May 14, 2019, during which the mitigation plan update process was presented. The intent of this meeting was to educate team members and guests about the planning process and requirements according to the law. The meeting also served to initiate the preliminary data collection efforts for the risk and capability assessment tasks associated with the development of the Plan.

Second Local Planning Team Meeting

The second LPT meeting was held on August 20, 2019. The meeting began with a detailed presentation by WUPPDR on the findings of the risk assessment and capability assessment. By providing the county and municipal officials with a more thorough understanding of hazard risks in their communities, along with the varied levels of capabilities available to address them, the audience was prepared for the next step in the update process: to review the expired mitigation planning goals and list specific mitigation actions designed to reduce future impacts of the identified hazards.

To summarize, the following general findings were presented and discussed at the second LPT meeting:

Risk Assessment Findings

- The total projected asset counts and values for Gogebic County public institutions were assessed. The five highest value assets are the following: 1) Bessemer Housing Commission - $9.5M; 2) Electric Substations - $4M per station; 3) Wakefield Housing Commission - $3.2M; 4) Gogebic County Courthouse - $3M, and; 5) Gogebic-Iron County Airport and Runway - $2.5M. The full list of assets is in **Table 3.7** of Section 3.
- The top five hazards in Gogebic County based on the quantitative prioritized risk assessment are the following: 1) Riverine and Urban Flooding; 2) Snowstorms and Blizzards; 3) Invasive Species; 4) Extreme Temperatures, and 5) Public Health Emergencies.

Capability Assessment Discussion

In Gogebic County, the Cities of Bessemer, Wakefield, and Ironwood as well as Ironwood Township actively participate in the National Flood Insurance Program (NFIP). Marenisco Township filed to participate in the NFIP on January 16, 2019 and has limited emergency coverage. Erwin Township did the same on May 28, 2019 and has limited emergency coverage.

- All municipalities in Gogebic County have adopted, implemented, and are enforcing a comprehensive land use plan, building codes, and zoning ordinances.
- The Cities of Ironwood and Wakefield have prepared and adopted a Stormwater Management Plan.
- Local units of government in Gogebic County have varying degrees of administrative and technical capability, with adequate staff resources to implement local government programs.

Review of Existing Mitigation Plan Goals, Objectives, and Actions

The existing goals from the 2013 Gogebic County Hazard Mitigation Plan were presented to the LPT during the second meeting focusing on mitigation strategies. The committee agreed that these goals were still appropriate for the plan update. The goals are listed in Section 8 of this plan.

Prior to the meeting, each municipality was asked to send updates on their current mitigation actions from 2013, and to develop any new actions that should be included in the plan. The group spent time brainstorming ideas and discussing these possible new actions.

Involving the Public

Public participation is one of the fundamental components of the community-based mitigation planning process for Gogebic County. Individual citizen involvement provides the LPT with a greater understanding of local concerns and ensures a higher degree of mitigation success by developing community buy-in from those directly affected by the hazards in the region. Public awareness is a key part of the overall mitigation strategy aimed at making communities safer from the potential risks that hazard effects.

For the 2020 plan update, public input was sought using multiple methods: (1) public and government/institutional surveys; (2) posting the draft on the WUPPDR website and providing a copy at the Gogebic County Courthouse, and (3) open public meetings with opportunities for hearing public comments prior to adoption.

Summary of Public Participation Survey

The 2019 Gogebic County Hazard Mitigation Public survey received 47 responses. All nine Gogebic County jurisdictions were represented. About 43% of respondents said they or someone in their household experienced a hazard in the last five years. Of those, most experienced severe winds or windstorms (60%) and flooding (50%). Respondents were also asked whether they had taken any actions to make their home or community more resistant to hazards. 43% of respondents said yes. Other questions were flood-related, asking respondents to report if their property is in a floodplain, flood frequency near their property, if they had flood insurance, and effective ways to receive hazard emergency information. A summary of public survey results is available of review in Appendix E.

Summary of Draft Locations

A list of locations where the draft plan was located is available in Appendix E.

Summary of Public Meeting and Comments Received

A summary of public meeting and comments received are available in Appendix F.

Involving Stakeholders

A range of stakeholders were invited and encouraged to participate in the Gogebic County Hazard Mitigation Plan by joining the LPT meetings. The invitations were sent to the following individuals, most of whom participated on the team:

- Heidi DeRosso, Gogebic County Emergency Coordinator
- Barry Bolich, Gogebic County Road Commission
- Greg Ryskey, Gogebic County Forestry and Parks
- Charly Loper, City of Bessemer
- Cari DiGiorgio, Western Upper Peninsula Health Department
- John Cox, Wakefield Township
- Maria Graser, Ironwood Township
- Robert Brown, City of Wakefield
- Ross Solberg, Gogebic County Sheriff's Department
- Brandon Snyder, Ironwood Public Safety Department/Hazardous Materials Response Team
- Mike Rogers, Watersmeet Township

In addition to the LPT meetings, Gogebic County encouraged more open and widespread stakeholder participation through the design and publication of newspaper advertisements for the public survey, draft comment period, and public hearing. Local officials and institutions were also engaged to fill out a different survey to glean information about their respective organizations.

These media advertisements and survey tools provide local units of government, residents, businesses, academic organizations, and other private interests in Gogebic County the opportunity to be involved and offer input throughout the planning process.

SECTION 3: Community Profile

This section of the Plan provides a general overview of Gogebic County. It consists of the following seven subsections:

- Geography and the Environment
- Population and Demographics
- Housing, Infrastructure, and Land Use
- Employment and Industry
- Police, Fire, and Emergency Services
- Critical Facilities and Cultural Assets
- Disaster Declarations

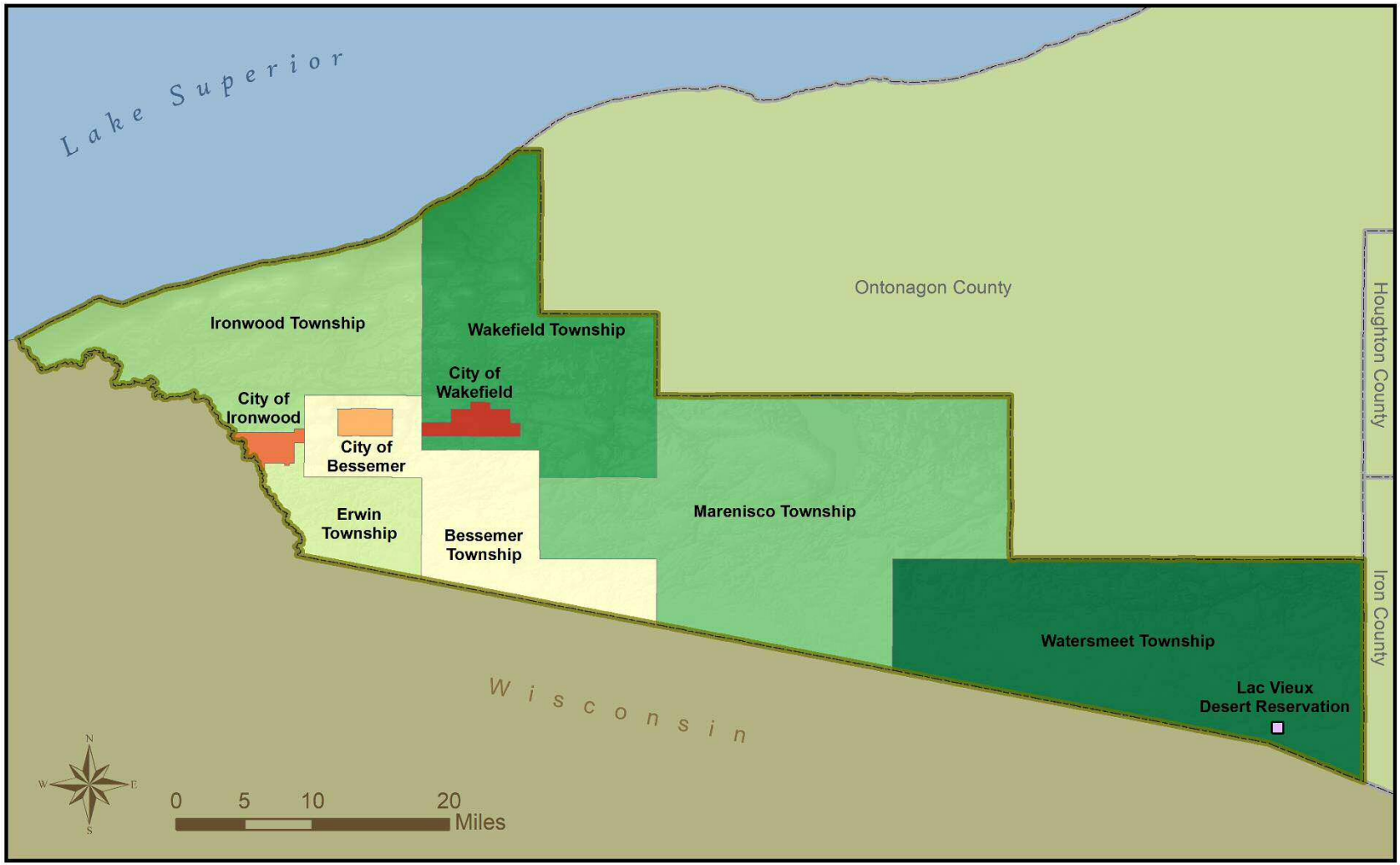
Geography and the Environment

Gogebic County is located on the far west end of Michigan's Upper Peninsula, on the southern coast of Lake Superior and bordering Wisconsin. The name comes from the Chippewa word "agogebic," which means "a body of water hanging on high." In 1887, the Michigan Legislature officially created Gogebic County after breaking away from Ontonagon County, which originally extended all the way to the Wisconsin border. The City of Bessemer serves as the County seat. **Map 3.1** shows a map of Gogebic County with the locations of its municipal jurisdictions. The Lac Vieux Desert Indian Reservation is also located in Gogebic County, near Watersmeet Township.

The total area of Gogebic County is 1,107 square miles that are comprised most of forestlands. Over 90% of the land is covered by forests, mainly upland hardwoods. The county contains 1,200 rivers and streams, over 300 inland lakes, and 30 miles of Lake Superior shoreline.

Gogebic County lies within the Lake Superior Basin, which has a typical humid continental climate characterized by cold dry winters and warm humid summers. However, the lake exerts a strong microclimate influence on the immediate shoreline, generally resulting in cooler summers and milder winters than those experienced just a few miles inland. This is due to the impact of Lake Superior on the air temperatures and the prevailing westerly winds. The moderating effect of the lake is experienced in spring and summer months when the cool water tends to level out temperature extremes and reduces the likelihood of frost. Another effect of the lake is the formation of considerable cloudiness when cold air passes over the lake in late fall and early winter. This causes early and heavy snow possibilities, referred to as the lake effect. Both these effects lessen with increasing distance from Lake Superior.

The western part of the Upper Peninsula experiences frequent and sometimes rapid weather changes caused by storms from the west and southwest. It is also characterized by extreme seasonal temperature variations, a uniform annual distribution of precipitation, and large amounts of snow in the winter months.



Local Units of Government
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal and the Bureau of Indian Affairs; DEM was derived from elevation data available through the USGS; Created by WUPPDR April 2019

Cities	Townships		American Indian Reservation
Bessemer	Bessemer	Marenisco	Lac Vieux Desert (LVD) Band of Lake Superior Chippewa Indians
Ironwood	Erwin	Wakefield	
Wakefield	Ironwood	Watersmeet	

Map 3.1: Gogebic County Municipalities

The growing season in Gogebic County is roughly 100 days. Average temperatures in January are a low 3 degrees Fahrenheit and a high of 20 degrees Fahrenheit. In July, average temperatures are a low of 56 and a high of 76.[1] Annual rainfall averages 35 inches, while snowfall averages 188 inches, though it can vary widely. The large amount of winter snowfall can often result in heavy spring runoffs. Weather conditions can vary greatly in different portions of the County.

Land use and development in Gogebic County (**Map 3.2**) is directed by planning and/or zoning regulations in all municipalities except Erwin Township. Residential development, which accounts for about 2% of county land use, is concentrated in established communities along US 2, with largest numbers in the cities of Bessemer, Ironwood, and Wakefield.

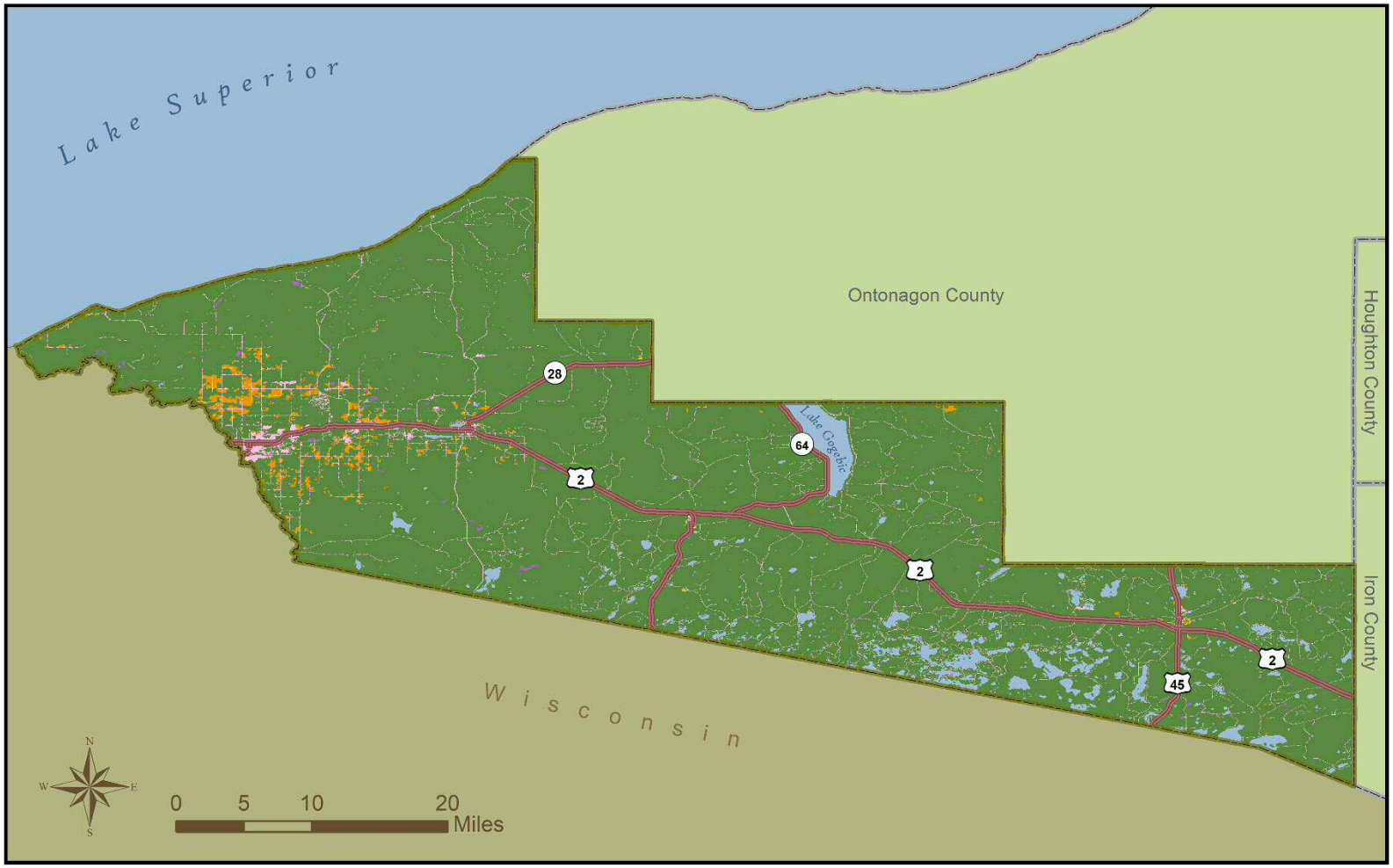
Several major rivers flow through Gogebic County. The Montreal, Black, and Presque Isle Rivers all flow north into Lake Superior (**Map 3.3**). The southern half of Lake Gogebic, Michigan's largest inland lake which covers 13,380 acres, is located within the county. The Cisco Chain of Lakes near the Wisconsin border is made up of 15 lakes with over 271 miles of shoreline.

Gogebic County contains two mountainous (by regional standards) belts. The southern belt is the Gogebic Range, which consists of igneous formations and contains iron ore bodies extending from the Montreal River to Lake Gogebic. The northern chain of mountains, the Gogebic Highlands, consists of steep-sloped clay bluffs extending from Little Girl's Point to the Porcupine Mountains.

Much of Gogebic County is forested, with only one-half percent classified farmland. Due to the steep slopes and rockiness much of the soil of the county is best suited for forestation rather than farmland. There are roughly 91 different types of soil in Gogebic County; the various soil associations found in Gogebic County have been placed under six categories by the U.S. Soil Conservation Service. They are the following:

1. Loamy soils on uplands.
2. Loamy soils on uplands, with associated rock outcrops.
3. Loamy soils on uplands, with associated sandy soils.
4. Organic soils on uplands, with associated wet loams.
5. Heavy loamy soils on uplands.
6. Clayey, lacustrine soils on uplands.

[1] NOAA-NCDC. 1981-2010 Summary of Normals, Ironwood, MI, US.



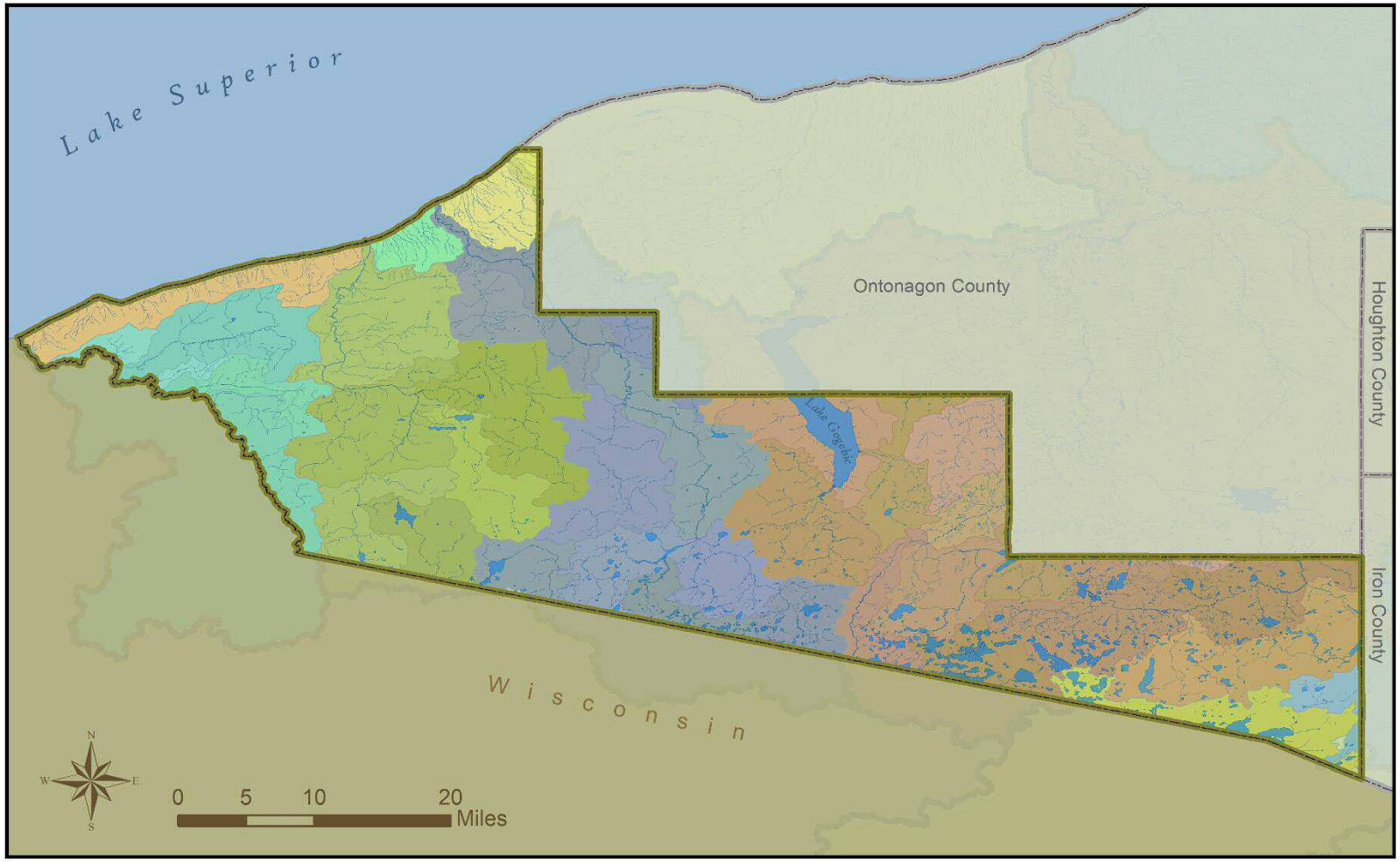
Land Use/Land Cover
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal; Land Use/Land Cover data downloaded from the USGS;
Created by WUPPDR April 2019

Land Use/Land Cover

- Forest & Woodland
- Shrub & Herb Vegetation
- Agricultural & Developed Vegetation
- Recently Disturbed or Modified
- Open Water
- Developed & Other Human Use

Map 3.2: Land Use/Cover in Gogebic County



Watersheds
Gogebic County, Michigan

Boundary and watershed data was taken from Michigan's Open Data Portal;
Created by WUPPDR June 2019

Watershed/Basin

Black (Gogebic Co)	Montreal (Lake)	Presque Isle
Black (Gogebic Co, Lake)	Ontonagon	Presque Isle (Lake)
Montreal	Paint*	Upper Wisconsin**

*Drains to Lake Michigan **Drains to Mississippi River All other watersheds drain to Lake Superior

WUPPDR of Michigan

Map 3.3: Watersheds in Gogebic County

Population and Demographics

Gogebic County is comprised of six townships, three incorporated cities, and the Lac Vieux Desert Reservation. There are also several unincorporated small former mining communities where populations remain concentrated. These communities are remnants of much larger settlements founded during the iron mining era. The county's total 2017 estimated population was 15,577 with most of the population in the western portion of the county; about 32% of the population lived in the City of Ironwood (**Table 3.1**). Since the last hazard mitigation plan update, the population of the county has decreased by 4.4%. The township and the city of Wakefield both experienced a growth in population. Future population estimates for Gogebic County and particularly Marenisco Township are expected to decline due to the 2018 closure of the Ojibway Correctional Facility.

Table 3.1: Municipal Populations for Gogebic County, 1960-2017

Unit of Government	U.S. Census (Decennial)					ACS (5-Year Estimates)		
	1960	1990	2000	2010	1960-2010 Change	2012	2017	2012-2017 Change
Bessemer Twp.	2,083	1,374	1,270	1,176	-43.5%	1,148	1,149	-0.1%
Erwin Twp.	641	477	357	326	-49.1%	353	340	-3.7%
Ironwood Twp.	2,537	2,303	2,330	2,333	-8.0%	2,273	2,213	-2.6%
Marenisco Twp.	832	959	1,051	1,727	107.6%	1,694	1,623	-4.2%
Wakefield Twp.	613	452	364	305	-50.2%	256	304	18.8%
Watersmeet Twp.	864	1,048	1,472	1,417	64.0%	1,222	1,322	-8.2%
City of Bessemer	3,304	2,272	2,148	1,905	-42.3%	2,154	1,908	-11.4%
City of Ironwood	10,265	6,849	6,293	5,387	-47.5%	5,366	5,051	-5.9%
City of Wakefield	3,231	2,318	2,085	1,851	-42.7%	1,831	1,667	9.0%
Lac Vieux Desert Reservation[2]	-	-	135	137	-	83	227	
Gogebic County	24,370	18,052	17,370	16,427	-32.6%	16,297	15,577	-4.4%

Source: U.S. Census and ACS

[2] Estimated 2017 population from U.S. Census Bureau My Tribal Area dataset: www.census.gov/tribal

According to the American Community Survey (ACS) for 2017, the median age for persons in Gogebic County was 48.7 years. 24% of the population in the county is comprised of persons 65 years old and over. The poverty rate for persons within Gogebic County was estimated at 20.4%. People that identified as white consisted of 90.4% of population; next was black which comprised of 4.3% of the population. **Table 3.2** displays the most recent estimates for demographic data on race distribution and ethnicity in Gogebic County.

Table 3.2: Race and Ethnicity Percentages in Gogebic County, 2017[3]

Race/Ethnicity	People	Percent
White	14,075	90.4
Black	671	4.3
American Indian/Alaska Native	428	2.7
Asian	43	0.3
Pacific Islander	11	0.1
Other	28	0.2
Two or More Races	321	2.1
Total Latinx Population (*ethnicity*)	195	1.3

Housing, Infrastructure, and Land Use

In 2017, there were 10,797 housing units in Gogebic County, a 0.1% decrease from 2012. Of these, 6,660 were inhabited, comprised of 5,138 owner occupied units (77.1%) and 1,522 renter occupied units (22.9%). The average household size was two persons. The median home value in Gogebic County in 2017 was $70,100 for owner-occupied units, a 3.9% increase from 2012.

Schools

Schools are some of the largest institutions in the county and could potentially see great impacts from the hazards discussed in this plan. Gogebic County is comprised of four separate public-school districts, all of which are part of the Gogebic-Ontonagon County Intermediate School District. **Table 3.3** shows the school districts, grade levels, number of students, and number of instructors at each of the schools in Gogebic County.[4]

Gogebic Community College in Ironwood offers one- and two-year technical programs in addition to four-year college transfer programs. Much of the curriculum is designed to meet area business and industry needs, including one of a few ski area management programs in the nation. Enrollment is approximately 1,400 students taught by approximately 100 instructors.

[3] Data based from the 2013-2017 American Community Survey 5-year Estimates.
[4] MI School Data. Student Enrollment Counts and Staffing Information. www.mischooldata.org

Table 3.3: Public Schools in Gogebic County, 2019

School District/School Name	Location	Grades	Students	Instructors
Bessemer Area School District				
Washington Elementary School	Bessemer	K-6	208	22
A.D. Johnston Junior/Senior High School	Bessemer	7-12	200	19
Ironwood Area Schools				
Luther L. Wright K-12 School	Ironwood	Pre-K - 12	722	52
Wakefield-Marenisco School District				
Wakefield-Marenisco School	Wakefield	K-12	286	22
Watersmeet Township Schools				
Watersmeet Township School	Watersmeet	K-12	134	18

Public Works

The Gogebic County Road Commission and municipal public work agencies are responsible for maintenance and development of transportation and other infrastructure on county roadways in the cities of Bessemer, Ironwood, and Wakefield. The Gogebic County Road Commission operates from two locations: their headquarters and garage in Bessemer and an additional garage in Watersmeet. Several townships also have staff for maintenance of facilities and utilities. All such agencies are resources for implementation of related mitigation actions.

Roads

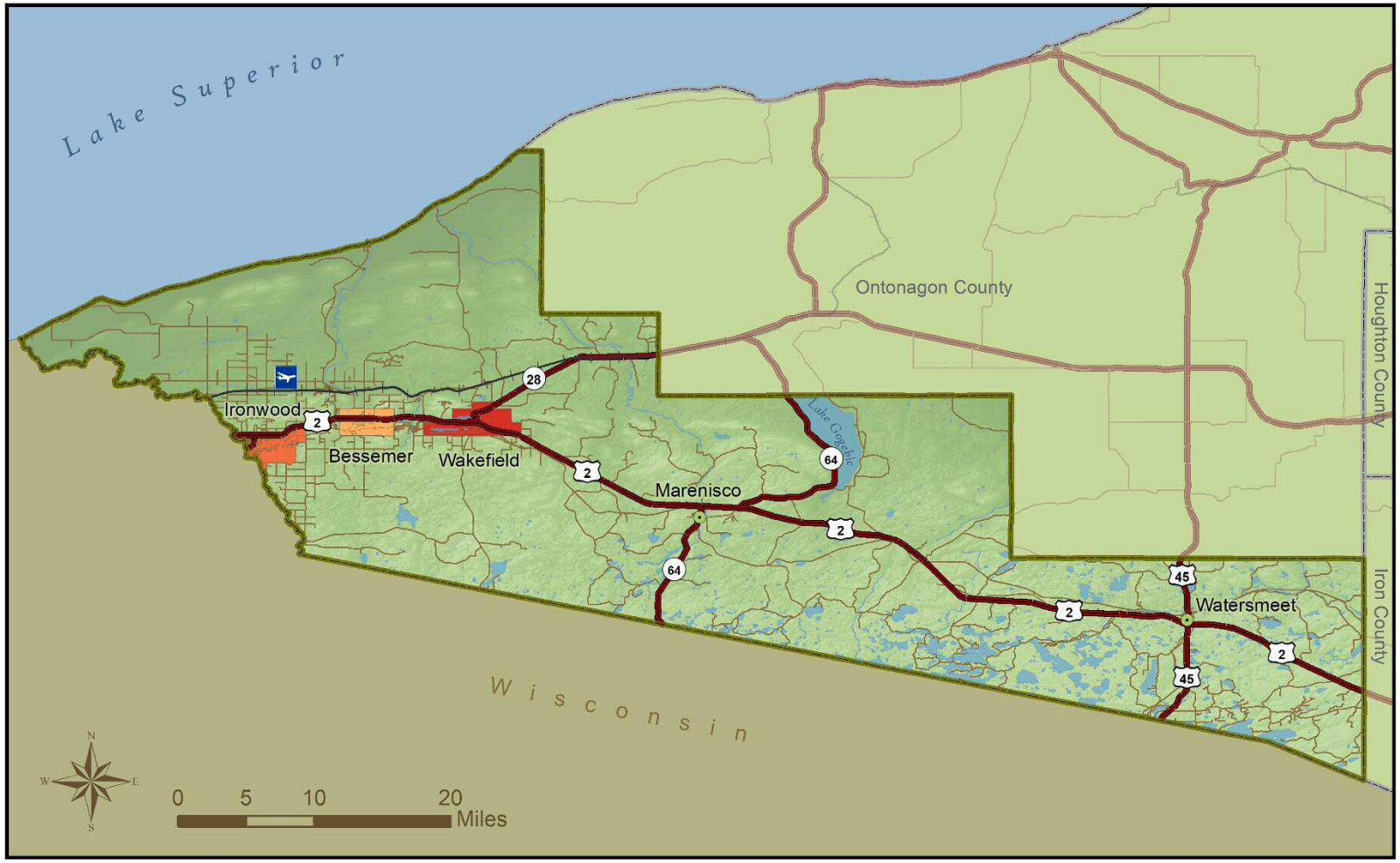
Several primary highways pass throughout the County, including US 2 and M-28 from east to west, US 45, and M-64 (**Map 3.4**). The county also contains many miles of seasonal roads with several of them built and maintained by the U.S. Forest Service. Each city owns and maintains the local street networks within its limits. The Black River National Scenic Byway, which follows County Road 513 (Black River Road), starts in Bessemer and runs north 11 miles to Black River Harbor. County Road 519 traverses the county from the Porcupine Mountains south to Wisconsin and provides access to the proposed Copperwood Mine project.

Rail

The Canadian National Railroad passes through Gogebic County, but there is no rail freight services and parts of the track are scheduled for dismantlement. Most tracks that connected population centers, mines, and ports have been removed. Many of these corridors serve as snowmobile, off-road vehicle, and hiking and biking trails.

Port

The nearest port suitable for commercial use is in the Village of Ontonagon on Lake Superior in Ontonagon County, about 45 miles north of Gogebic County.



Transportation
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal; DEM was derived from elevation data available through the USGS; Created by WUPPDR March 2019

Gogebic-Iron County Airport
State Highway
Railroad
Road

WUPPDR of Michigan

Map 3.4: Gogebic County Transportation

Airports

The Gogebic-Iron County Airport (IWD), owned by Gogebic County and open year-round, is located seven miles northeast of Ironwood at an elevation of 1,230 feet. The single runway is 6,500 feet long and paved with grooved asphalt. The airport has no tower but is attended year-round. Approach and departure services are provided by Minneapolis Air Traffic Control. Airport services include terminal facilities, fuel, tie-down parking, hangars, on-call mechanics, and rental cars. The airport was serviced by Air Choice One, which provided regular passenger service of two flights a day to and from Chicago – O'Hare and one flight a day to Minneapolis/St. Paul. On August 1, 2020, Boutique Airlines began providing service at the airport for two years and will also provide passenger service to Chicago and Minneapolis.[5] Aircraft operation averaged 111 flights per week, with 35 percent being local general aviation, 30 percent commercial, 27 percent transient general aviation, 9 percent air taxi service, and less than one percent military. 19 aircraft are based at the field.

Transit

Indian Trails Bus Company provides regularly scheduled long-distance passenger service, with a daily trip to Duluth, Minnesota and connections to other U.P. communities. The Gogebic County Transit Authority provides local flex-route and on-demand bus transportation and is available for mass transit in the event of an evacuation.

Land Use

Land use is greatly influenced by the extensive forests within the county. Outside of these areas, developed "urban" land use is focused in the three cities of Ironwood, Bessemer, and Wakefield. Outlying residential development is found along numerous lakes, along Lake Superior, and in numerous scattered townsites throughout the county. Land use and development is directed by local zoning regulations in all the cities and townships.

Over 90% of the acreage in the county is within the boundaries of the Ottawa National Forest, most of which is open to the public. In total, Ottawa National Forest encompasses over 954,000 acres and spans six counties. The forest contains trails, developed recreation areas, wilderness areas, and lands harvested for timber. The Sylvania Wilderness, located south of US 2 about five miles west of Watersmeet, is part of the Ottawa National Forest. This 18,324-acre wilderness is part of the National Wilderness Preservation System. Transportation throughout the Wilderness is by foot or canoe, with motorized boats only allowed on Crooked Lake.

The Gogebic County Forest was established in 1943 and has grown into a 50,000-plus acre forest that provides multiple use forest opportunities. It is the only County Forest Program of its kind in Michigan and is completely self-supporting. The Gogebic County Forestry and Parks Commission manages county lands and includes three county parks: Lake Gogebic, Little Girl's Point, and McDonald Lake.

[5] Laventure, Tom. (2020, January 7). "Airport board recommends Boutique Air for EAS." *Daily Globe*. https://www.yourdailyglobe.com/story/2020/01/07/news/airport-board-recommends-boutique-air-for-eas/13291.html

Gogebic County is also home to two state parks. The first is Lake Gogebic State Park, located on the western shore of Lake Gogebic. It covers 360 acres and offers hiking, camping, fishing, swimming, a boat ramp, and playground. Northwestern Gogebic County is home to a small section of the Porcupine Mountain Wilderness State Park complex, also known as the Porkies, which contain 60,000 acres, several campgrounds, and 90 miles of hiking trails. The Presque Isle State Campground, which is part of the Porkies, is in the county and located at the mouth of the Presque Isle River.

The Black River National Scenic Byway of the Ottawa National Forest is also located in Gogebic County. The byway runs from US 2 near Bessemer to the Black River Harbor on the Lake Superior shore. The Iron Belle Trail, a designated state trail, begins in Ironwood and passes east-west through the county. The multi-use trail incorporates sections of the existing North Country National Scenic Trail and follows US 2, a designated national biking route in the U.P.

Employment and Industry

In 2017, the median household income for Gogebic County was $36,689 and median worker income was $21,375. The state unemployment rate for 2017 was 7.4%, and for Gogebic County the rate was 6.7%.

The economy in Gogebic County during 2016 was comprised of three dominant sectors: educational services/healthcare and social assistance, manufacturing, and service industries (**Table 3.4**). One of the largest employers was Lac Vieux Desert Tribal Enterprises (including the Northern Waters Resort Casino) in Watersmeet, operated by the Lac Vieux Desert Band of Lake Superior Chippewa Indians. The tribe employed about 300 persons in its resort-casino and tribal government systems, such as housing and health care. Aspirus Ironwood Hospital has around 330 employees. Other significant employers were Ironwood Area Schools, Gogebic Community College, and other government entities.

Manufacturing was dominated by forest related industries, including logging, sawmills, and dimension mills. Ironwood Plastics, Inc. and Jacquart Fabric Products were the largest manufacturers in Gogebic County. Non-forest industries include precision tool making, plastic injection molding, industrial sewing operations, and electronic assembly.

The tourism industry focuses primarily on the natural resources located in the county. Big Snow Resort, which includes Indianhead and Blackjack mountains, and Big Powderhorn Mountain are beneficiaries of strong winter tourism and employ hundreds of persons. Ottawa National Forest offers year-round opportunities, including hiking, camping, hunting, biking, canoeing, snowshoeing, and Nordic skiing.

Table 3.4: Employment by Sector for Gogebic County, 2016

Employment Sector	Percentage
Educational Services; Healthcare & Social Assistance	22.5
Manufacturing	15.4
Arts, Entertainment, Recreation; Accommodation & Food Service	13.3
Retail Trade	11.2
Public Administration	7.7
Construction	6.3
Professional, Scientific, Management, and Administrative and Waste management services	5.1
Agriculture, Forestry, Fishing, Hunting, and Mining	4.7
Other services, except public administration	4.2
Transportation & Warehousing; Utilities	3.5
Finance & Insurance; Real Estate, Rental & Leasing	3.3
Wholesale Trade	1.9
Information	1.0

Source: ACS

Police, Fire, and Emergency Services

Police, fire, and other emergency agencies are vital community resources not only for emergency response but for implementation of mitigation actions.

Police

The Gogebic County Sheriff's Department and Jail is in Bessemer. Staff consists of the Sheriff, Undersheriff, road patrol, and desk/correction officers. The current staff includes 24 full-time officers and a part-time Animal Control officer. The Department provides services to all of Gogebic County and provides primary law enforcement services, on a contractual basis, to both the Cities of Bessemer and Wakefield and the Gogebic-Iron County Airport during scheduled flights. Patrols are done in the Department's fleet of five standard squad cars, four 4-wheel drive trucks, an Animal Control truck, one side-by-side, two 4-wheelers, two rescue snowmobiles, and a Marine Patrol boat. In addition to the County Sheriff, Marenisco Township and Lac Vieux Desert Reservation have their own officers. Michigan State Police operate within Gogebic County. Ironwood Public Safety and Watersmeet Township also have their own Police Department.

The Gogebic County Jail holds all prisoners arrested within the County and can accommodate a total of 24 inmates. Jail operations are handled by the Sheriff Department's Jail Administrator and Desk and Corrections officers, who serve dual roles as dispatchers and jailers.

The Sheriff Department also acts as an after-hours paging site for both the State of Michigan, Family Independence Agency Child Protective Services and the Community Mental Health Crisis Line. The Sheriff's Office provides court ordered transportation service to Gogebic County Community Mental Health patients at various institutions both in and out of the state.

Fire

Eight fire departments serve Gogebic County (**Table 3.5**). Most fire departments in Gogebic County are volunteer. The Michigan Department of Natural Resources and U.S. Forest Service also have wildfire-dedicated resources in the county.

Table 3.5: Fire Departments in Gogebic County

Fire Department	Location	Service Area		Staff*
		Sq. Miles	Population	
Bessemer FD	Bessemer	5	2350	20
Bessemer Twp. FD	Ramsay	110	1500	18
Ironwood PS FD	Ironwood	60	6000	27
Ironwood Twp. VFD	Ironwood	188.8	2303	20
Lake Gogebic VFD	Marenisco	330	1000	10
Marenisco VFD	Marenisco	360	650	25
Wakefield FD	Wakefield	275	3000	21
Watersmeet Twp. VFD	Watersmeet	288	1050	20

** Staff includes paid, part-time, and volunteers*

Medical

Aspirus Ironwood Hospital (formerly the Grand View Hospital) is a 25-bed facility which offers 24-hour, physician-staffed emergency services. An infection isolation room is also available. Current equipment includes: CT scanner, two digital X-ray rooms, digital portable X-ray, 3D mammography unit, general ultrasound machine, echo/vascular ultrasound machine, fluoroscopy unit, nuclear medicine camera, surgery C-arm, and a bone density machine. Mobile MRI and PET scanner services are also available.

Inpatient services include obstetrics and a coronary intensive care unit. Community health education programs are also available, which include support groups, women's wellness seminar series, and senior programs. The Aspirus Ironwood Clinic is also located near the hospital and offers a walk-in clinic, family medicine care, and, mental health treatment. These services as well as dental care and vision services are offered at the Lac Vieux Desert Health Center in Watersmeet.

Gogebic County Community Mental Health in Wakefield provides a complete range of services for all residents of Gogebic County who have a serious emotional disturbance or mental illness. In addition, services are available for persons with developmental disabilities or substance abuse.

Gogebic County is serviced by the Western Upper Peninsula Health Department (WUPHD) from its Bessemer office. The WUPHD is a special governmental unit that meets public health needs in the Western Upper Peninsula through education, advocacy, and disease prevention. It provides state mandated public health services and a variety of additional programs aimed at community health. The county is also serviced by the Gogebic Medical Care Facility, a 109-bed nursing facility located in Wakefield.

Domestic Violence Shelter
Domestic Violence Escape (DOVE), Inc. in Ironwood provides services to victims of domestic violence and sexual assault to residents of Gogebic County and Iron County, Wisconsin. The center offers a crisis hotline, emergency shelter, counseling, support groups, and advocacy.

Office of Emergency Management
The Gogebic County Office of Emergency Management (OEM) is in Bessemer at the County Courthouse. The office promotes emergency and disaster education and awareness. The office serves as a dispatcher and ensures interagency coordination before, during, and after disasters or emergencies.

Siren Coverage
Gogebic County is serviced by three sirens in the County. The sirens are currently used to alert the local fire departments of emergencies and as timers, not as public warning systems. They are set on timers to sound at noon and 9:00 PM curfew. In the event of an emergency, the sirens are manually activated. The current coverage would only cover about three miles. Each siren's activation switch is located on the buildings at the siren sites. **Table 3.6** shows the siren locations, range, and estimated population coverage for Gogebic County.

Table 3.6: Siren Locations in Gogebic County

Siren Site	Remote Activation	Range (radius - miles)	Estimated Population Covered	Location
Bessemer City Hall	Yes/On Timer	1.0	2,100	411 S. Sophie St.
Bessemer Twp. FD	Yes/On Timer	1.0	1,200	10338 E. Mill St
Marenisco Town Hall	Yes/On Timer	1.0	1,000	314 Hall St.

Critical Facilities and Cultural Assets

Even a slight chance of exposure to hazards is too great a threat to the delivery of services offered by the maintenance and operation of a community's critical facilities. A critical facility provides services and functions essential to a community, especially during and after a disaster. If these facilities cannot operate as usual, it will have a debilitating impact on local communities. Examples of critical facilities requiring special consideration include:

- Police stations, fire stations, critical vehicle and equipment storage facilities, and emergency operations centers needed for response activities before, during, and after an incident
- Medical facilities, including hospitals, long term care facilities, blood banks, and health care facilities (including those storing vital medical records) likely to have occupants who may not be sufficiently mobile to avoid injury or death during an incident

- Schools and day care centers, especially if designated as shelters or evacuation centers
- Power generating stations and other public and private utility facilities vital to maintaining or restoring normal services to impacted areas before, during, and after an incident
- Drinking water and wastewater treatment plants
- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials

Table 3.7 lists the critical facilities in Gogebic County, grouped by type of facility. Facility location, estimated age of structure, and estimated cost of potential facility loss is also included. Estimate ages and costs were not available for all facilities. For a critical facility to function, building systems and equipment must remain operational. Furthermore, it must be supplied with essential utilities (typically power, water, waste disposal, and communications, but occasionally natural gas or steam). The loss of municipal utilities has prevented some critical facilities from functioning during and immediately after major floods, and in some cases, loss of municipal water and waste disposal has prevented facilities from operating for weeks after an event.

Additionally, this section has been modified to include cultural assets of importance to Gogebic County. Understanding and inventorying the important and visited locales of Gogebic County provides a more thorough understanding of assets to the community that go beyond basic infrastructure. This section not only highlights tourism potential and important economic development projects for the future, but also shows the community's rich history, culture, and vitality.

Table 3.7: Critical Facilities in Gogebic County

Facility Name	Location	Est. Age	Est. Costs
Emergency Services			
Bessemer City Hall/Fire Department	Bessemer	85	$2M
Bessemer Twp. Hall/Fire Department	Bessemer Township	100	
Gogebic County Sheriff	Bessemer	54	$5M
Ironwood DPS	Ironwood	30	
Ironwood Twp. Hall/Fire Department	Ironwood		
Ironwood National Guard Amory	Ironwood	65	
Ironwood Public Safety Department/Fire Department	Ironwood	40	
Lake Gogebic Fire Department	Marenisco Township	3	
Michigan State Police Post	Wakefield	82	
U.S. District Ranger Station	Watersmeet		
Wakefield Fire Department	Wakefield	94	
Marenisco Town Hall/Fire Department	Marenisco	108	
Watersmeet Fire Department	Watersmeet	15	
Equipment Storage Facilities			
Bessemer Garages (6 Total)	Bessemer	20	$3.63M
Ironwood Garages (3 Total)	Ironwood		$412K

Watersmeet Garages (3 Total)	Watersmeet		$505K
Marenisco Garages (4 Total)	Marenisco		$380K
Ramsay Garages (4 Total)	Ramsay		$869K
Medical Facilities			
Aspirus Ironwood Hospital and Clinic	Bessemer Township	96	
Gogebic Community Mental Health	Wakefield	17	$3M
Gogebic Medical Care Facility	Wakefield	56	
Keen Ager Adult Foster Care Home	Wakefield		
Lac Vieux Desert Health Center	Watersmeet	10	$13.5M
VA Ironwood Clinic	Ironwood	13	
Westgate Living Center	Ironwood		
Daycare Centers/Schools			
A.D. Johnston Junior/Senior High School	Bessemer	133	
Ark Christian Day Care	Bessemer	13	
All Saints Catholic Academy	Ironwood	63	
Bluff View Christian School	Bessemer	13	
Gogebic Community College	Ironwood	53	
Gogebic County Head Start	Bessemer	61	
Luther L. Wright K-12 School	Ironwood	95	
Shoots and Ladders Learning Through Play Childcare	Ironwood	8	
Trinity Lutheran Preschool	Ironwood	12	
Wakefield-Marenisco School	Wakefield	110	
Washington Elementary School	Bessemer	100	$1M
Watersmeet Township School	Watersmeet	115	
Waste/Utility/Drinking Water/Wastewater Services			
Electric Substation	Ironwood Township		$4M
Electric Substation	Wakefield Township		$4M
Electric Substation	Marenisco Township		$4M
Gogebic-Iron Wastewater Treatment Facility	Ironwood	36	$2.3M
Gogebic Range Solid Waste Management	Ironwood	30	$1.1M
Gogebic Range Water Authority	Bessemer	17	$1.8M
Great Lakes Gas Transmission	Wakefield Township	52	$2M
Ironwood City Water & Sewer	Ironwood	96	$750K
Other Notable/Vulnerable Structures			
Ironwood Memorial Building	Ironwood	96	$1.86M
Gogebic County Courthouse	Bessemer	132	$3M
Gogebic-Iron County Airport & Runway	Ironwood	7	$2.5M
Erwin Township Office	Erwin Township	110	
Gogebic County Transit	Ironwood	23	$750K
Ottawa National Forest – Supervisor's Office	Ironwood	82	

Wakefield City Hall	Wakefield	104	
Wakefield Twp. Hall	Wakefield Twp.	99	$655K
Wakefield Housing Commission	Wakefield	50	$3.2M
Bessemer Housing Commission	Bessemer	68	$9.5M
Watersmeet Township Office	Watersmeet	133	
Public Works Department	Wakefield		$75.4K
Western Upper Peninsula Health Department/ Road Comm Offices/Friend of Court Office	Bessemer	49	$2M

Cultural Assets

There are several State and National Register Historic Sites in Gogebic County:

- *Keystone Bridge:* This is a one-arch railroad bridge located over the Black River at Ramsay in Bessemer Township, near the Bessemer Township Park. It is a 45-foot by 44-foot stone arch structure, 57-feet from the rail to flow line. The bridge was constructed in 1891 of limestone quarried in Kaukauna, Wisconsin. The foundation of the bridge is solid rock. There are only three other bridges of its kind in the U.S. The bridge features a stone called the "keystone" which is the last stone set and ties the two other sections together, helping equalize pressure on all sides of the arch.
- *Main Street-Black River Bridge:* This bridge is located over the Black River on Main Street in Ramsay (Bessemer Township). It is listed on the National Register of Historic Places in 1999. The Main Street-Black River Bridge was built in 1923 and has remained relatively unaltered since its construction. It is a historically important transportation bridge as it allowed workers to commute to and from the Castile Mining Company during the 1920s.
- *Chicago and Northwestern Railroad Depot (Ironwood Depot & Museum):* The Chicago and Northwestern Railroad Depot is in Ironwood, MI and served multiple purposes when still in use. It was originally used as a train depot in 1892, then passenger traffic until 1970 and served freight trains until 1981. The Downtown Ironwood Development Authority purchased the depot in 1983 and it currently houses the Ironwood Area Historical Society.

- *Copper Peak:* Copper Peak is a sky flying hill located in Ironwood and is the largest artificial ski jump in the world. It was built in 1969 and listed on the National Register of Historical Places in 1973. It was also designated as a Michigan State Historic Site in 1971. It is the only ski flying facility in the Western Hemisphere. Ski jumping has not occurred at Copper Peak since 1994, but there are plans to revive the hill to support ski jumping again.

Copper Peak Ski Flying Hill
(Photo: Cbradshaw)

- *Solomon S. Curry House:* The Curry House is in Ironwood and currently a private residence. The house is named after Solomon S. Curry, the president of Metropolitan Iron and Land Company, which mined in the Gogebic Range during the early 1880s.
- *Ironwood Carnegie Library:* The library was built in 1901 and is the oldest continuously operating Carnegie Library in the State of Michigan. It is in Ironwood and made of brownstone and brick. The library still has its original chairs, tables, and circulation desk.
- *Mt. Zion Ski Hill:* Located in Ironwood, Mt. Zion public ski hill is owned and operated by Gogebic County Community College as part of their Ski Area Management Program. Activities at the Mt. Zion include downhill and cross-country skiing, snowboarding, snowtubing, and snowshoeing. Mt. Zion is the highest hill in Ironwood and is considered the older winter recreation complex in the county. The first tow ropes in the U.P. were established there in 1937.
- *Ottawa National Forest Black River Recreation Area:* The Black River originates in Wisconsin and flows north towards Lake Superior through forested areas of large pine, hemlock, and hardwood trees. The river has a series of five waterfalls as it drops in elevation as it reaches the lake. The Black River is named after the dark color of the water due to tannins leaching into the water from the bark of the hemlock trees. Near the river is the Black River National Scenic Byway, which is car friendly. The mouth of the Black River is only one of two harbors in the Ottawa National Forest System.
- *Rice Bay:* Rice Bay is a 6.6 square mile lake on the border between Michigan and Wisconsin, in the Michigan side of Lac Vieux Desert. The lake contains a significant stand of wild rice that is managed and harvested by the Lac Vieux Desert Band of Lake Superior Chippewa Indians. Wild rice is harvested annually from Rice Bay.

- *Gogebic County Courthouse*:
  Located in Bessemer, the Gogebic County Courthouse was originally built in 1888 out of red sandstone and is a detailed example of the Romanesque sandstone building style popular in the Western Upper Peninsula during the 1880s and 1890s. It is considered a regional landmark, built when the county was a booming mining area, and reflects a collaborative effort between area industries, private individuals, and building trades people. The courthouse was enlarged in 1915 and is the same structure still in daily use by county officers and commissioners.

Gogebic County Courthouse, Bessemer, MI
(Photo: Skye Marthaler)

Disaster Declaration

Since 1965, Gogebic County has experienced a total of nine presidential disaster declarations, shown in **Table 3.8**. Four new disasters occurred since the completion of the 2013 plan. The county has also experienced additional emergencies and disasters that were not severe enough to require federal disaster relief through a presidential declaration.

Table 3.8: Presidential Disaster Declarations for Gogebic County, 1965-2020

Event	Declaration Date	Declaration Number
Drought	March 2, 1977	3035
Blizzards and Snowstorms	January 27, 1978	3057
Severe Freeze	May 10, 1994	1028
Flooding	May 6, 2002	1413
Hurricane Katrina Evacuation*	September 7, 2005	3225
Flooding	June 18, 2013	4121
Severe Storms, Flooding, Landslides, and Mudslides	August 2, 2018	4381
COVID-19	March 13, 2020	3455
COVID-19 Pandemic	March 27, 2020	4494

*This declaration applied to all 83 counties in Michigan for Emergency Protective Measures only (to aid in direct relief efforts for Hurricane Katrina evacuees).
Source: Federal Emergency Management Agency

SECTION 4: Hazard Identification

The U.S. and its communities are vulnerable to a wide array of hazards that threaten life and property. Upon review of the natural hazards suggested under FEMA planning guidance and the State of Michigan's Hazard Mitigation Plan, Gogebic County has identified 26 hazards that are addressed in this Plan. Following the State of Michigan's listed hazards, the 2020 update features two new hazards (Fog and Invasive Species). The hazard analysis component of this plan includes three major divisions that correspond to three major hazard classifications: Natural, Technological, and Human-Related Hazards. Each of these three major sections have been further organized so that readers and responders can more easily find information about hazards that are closely related. The three major hazard divisions and subsections addressed in this plan include:

- **Natural Hazards**
  - **Weather Hazards**
    - Extreme Temperatures
    - Fog
    - Hail
    - Ice and Sleet Storms
    - Lightning
    - Severe Winds
    - Snowstorms and Blizzards
    - Tornadoes
  - **Hydrological Hazards**
    - Dam Failure
    - Riverine and Urban Flooding
    - Shoreline Flooding and Erosion
    - Drought
  - **Ecological Hazards**
    - Wildfires
    - Invasive Species
  - **Geological Hazards**
    - Earthquakes
    - Subsidence (Ground Collapse)
- **Technological Hazards**
  - **Industrial Hazards**
    - Scrap Tire Fires
    - Structural Fires
    - Hazardous Materials: Fixed Site Incidents
    - Hazardous Materials: Transportation Incidents
    - Petroleum and Natural Gas Incidents

44 CFR Requirement

201.6(c)(2)(i): The risk assessment shall include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

  - **Infrastructure Hazards**
    - Infrastructure Failure and Secondary Technological Hazards
    - Transportation Accidents
- **Human-Related Hazards**
  - Civil Disturbances
  - Public Health Emergencies
  - Sabotage and Terrorism

Some of these hazards are interrelated (i.e., snowstorms can consist of ice and sleet) and some consist of hazardous elements that are not listed separately (i.e., extreme hot temperatures can lead to drought conditions). It should be noted that some hazards, such as snowstorms and blizzards, may impact a large area yet cause little damage, while other hazards, such as a tornado, may impact a small area yet cause extensive damage. **Table 4.1** provides a brief description of the hazards listed above.

Table 4.1: Descriptions of Identified Hazards

Hazard	Description
NATURAL HAZARDS	
WEATHER	
Extreme Temperatures	Prolonged periods of exceptionally low or extremely high temperatures, often exacerbated by conditions such as high humidity with lack of rain or heavy snowfalls with high winds. Extreme cold is classified as any period of low temperatures or wind chill of -35°F or colder. Extreme heat is characterized by a combination of remarkably high temperatures and humid conditions. Temperatures and the heat index values meet or exceed 90°F.
Fog	Condensed water vapor in cloudlike masses lying close to the ground and limiting visibility. Fog itself is not a hazard, but it is the interaction between humans and fog that can be a dangerous situation. However, freezing fog can cause direct harm by causing slickness on roadways and serious transportation accidents.
Hail	Hail is a type of precipitation that is formed when updrafts in thunderstorms carry raindrops upwards to parts of the atmosphere where temperatures are below freezing. The water freezes and can form ice pellets that can range from pea sized to as large as grapefruits.
Ice and Sleet Storms	Ice storms (freezing rain) are the result of cold rain that freezes upon contact with a cold surface and results in accumulation of at least 0.25” of ice on exposed surfaces. Sleet is small ice pellets that fall from the sky and bounce when hitting the ground or other surfaces.

Lightning	The random and unpredictable discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm. It creates a "bolt" when charge buildup is strong enough.
Severe Winds	Sustained non-tornadic, forceful winds of 58-mph or greater for any duration of time. Includes thunderstorm winds which can cause similar damage as high winds. Also known as straight line winds.
Snowstorms and Blizzards	A snowstorm is a period of rapid accumulating snow accompanied by high winds, low visibility, and cold temperatures. This includes lake-effect and heavy snowfall. It can also consist of a "wintry mix" of snow, sleet, ice, and freezing rain. Blizzards are the most dangerous of all winter storms. It combines low temperatures and heavy snow with winds of at least 35-mph. This reduces visibility to only a few yards.
Tornadoes	A tornado is a violently rotating column of air that extends from the base of a thunderstorm and has contact with the ground. It is hard to see unless it forms a condensation funnel made up of water droplets, dust, and debris. The funnel may have winds that range from 40 to 300-mph and interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere.
HYDROLOGICAL	
Dam Failure	The collapse, breach, or other failure of a dam structure resulting in downstream flooding. Dam failure can result in severe property damage and loss of life.
Riverine and Urban Flooding	Overflowing of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt, or ice. Floodplains, the lands that are adjacent to rivers, streams, and lakes, are becoming more highly developed, increasing the potential for serious flooding. Urban flooding is due to the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. It usually involves low-lying areas that collect runoff waters even though they are not adjacent to drains or bodies of water.
Shoreline Flooding and Erosion	While shoreline flooding and erosion are natural processes along Lake Superior, during periods of high water, flooding and erosion are more frequent. Strong, onshore winds can also cause shoreline flooding and erosion due to vertical rise of water above normal level and increased wave action.
Drought	A drought occurs when there has been a prolonged period of well-below average precipitation. Common effects of drought include crop failure, water supply shortages, and fish/wildlife mortality. Drought

	conditions can be worsened by high temperature, winds, and low humidity.
ECOLOGICAL	
Wildfires	An uncontrolled fire in grass, brush, or forested areas.
Invasive Species	A species that has been introduced by human action to a location where it did not previously occur natural. It can establish a breeding population in its new location without further intervention by humans and becomes a pest by threating local biodiversity. It can also cause human health impacts, significant economic costs, and/or harmful ecological effects. Species can include animals, plants, and other organisms (e.g., microbes).
GEOLOGICAL	
Earthquakes	Shaking or trembling of the Earth's crust caused by the breaking and shifting of rock beneath the surface. Also caused by an abrupt release of slowly accumulating strain resulting in ground shaking, surface faulting or ground failures.
Subsidence (Ground Collapse)	Ground settling or sudden sinking due to subsurface movement of earth materials. Depressions, cracks, and sinkholes in the ground surface that can threaten people and property. The greatest risk of subsidence in Michigan is associated with underground mining or improper stabilization of mine openings.
TECHNOLOGICAL HAZARDS	
INDUSTRIAL	
Scrap Tire Fires	A large, uncontrolled fire that burns scrap tires that are being stored for recycling or reuse.
Structural Fires	Any instance of uncontrolled burning resulting in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas. This fire can ignite one or more structures and cause loss of life and/or property.
Hazardous Materials: Fixed Site Incidents	An uncontrolled release of hazardous materials from a **stationary location** that can pose a risk to health, safety, property, and the environment. This is a particular risk for locations that store or have higher quantities of hazardous materials. This includes industrial businesses, agriculture, universities, and hospitals.
Hazardous Materials: Transportation Incidents	An uncontrolled release of hazardous materials during **transport** that can pose a risk to health, safety, property, or the environment. Hazardous materials are transported over highway, railway, seaway, airway, and pipeline systems.

Petroleum and Natural Gas Incidents	The uncontrolled release of petroleum, natural gas, or hydrogen sulfide, a poisonous by-product.
INFRASTRUCTURE	
Infrastructure Failure and Secondary Technological Hazards	Infrastructure failure is a failure of critical public or private transportation or utility infrastructure resulting in temporary loss of essential functions and/or services. This includes electric power, water, storm drainage, communications and transportation. If infrastructure failure results from a natural hazards event, it is termed a **secondary** or **cascading technological hazard.**
Transportation Accidents	A crash or accident involving air, land, or water-based commercial passenger carrier resulting in death or serious injuries.
HUMAN-RELATED HAZARDS	
Civil Disturbances	A public demonstration or gathering, or an uprising in a prison or other institution that results in some disruption of essential community function. Includes rioting, looting, arson, or other unlawful behavior. May be the result of labor disputes, controversial judicial proceedings, resource shortages, or perceived unjust injury or death of a person held in high regard.
Public Health Emergencies	A situation that presents a danger or negatively impacts the general health and wellbeing of the public. Examples include disease epidemics, water contamination, harmful exposure to chemical, radiological, or biological agents, or infestation of disease carrying insects or rodents. May also be considered a secondary event caused by other emergencies (e.g., floods).
Sabotage and Terrorism	An intentional, unlawful use of force or violence against persons or property to intimidate or coerce the government, civilian population, or any segment for political, social, or religious objectives.

Data Sources

Michigan Hazard Mitigation Plan, Emergency Management and Homeland Security Division, Michigan Department of State Police: www.michigan.gov/documents/msp/MHMP_480451_7.pdf

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA): www.ncdc.noaa.gov

National Centers for Environmental Information Storm Events Database, U.S. Department of Commerce, NOAA: www.ncdc.noaa.gov/stormevents

National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, NOAA: www.nssl.noaa.gov

National Weather Service (NWS), U.S. Department of Commerce, NOAA: www.nws.noaa.gov

Storms Events Database, National Centers for Environmental Information (NCEI), U.S. Department of Commerce, National Oceanic and Atmospheric Administration: www.ncdc.noaa.gov/stormevents

Storm Prediction Center, NOAA/NWS: www.spc.noaa.gov

SECTION 5: Hazard Analysis

The section of the Plan describes the hazards identified by Gogebic County that pose a threat to people and the property located within the county and participating jurisdictions. An assessment of risk has been developed, which includes hazard descriptions and background, climate change considerations, notable historical occurrences[6], and the probability of occurrences for each hazard. Information has also been included about local jurisdictions or critical facilities where the hazard vulnerability is higher than that of the county. Readily available online information from reputable sources such as Federal and State agencies were also evaluated to supplement information from these key sources. Once the hazards have been analyzed, conclusions on hazard risk are presented. This includes the extent of each hazard as it pertains to Gogebic County and the priority risk index which assigns a risk level to each hazard in the county. The hazards listed in Section 4 were identified and analyzed.

Study Area

To a large extent, historical records are used to identify the level of risk within the planning area, with the methodological assumption that the data sources cited are reliable and accurate. This section also provides a series of maps that illustrate the location and spatial extent for those hazards within Gogebic County and its participating jurisdictions that have a recognizable geographic boundary (i.e., hazards that are known to occur in certain areas of Gogebic County, such as the 100- and 500-year floodplains, shoreline erosion areas, etc.). For those hazards not confined to a specific geographic area, such as thunderstorms and snowstorms, general information on the applicable intensity of these events across the entire planning area is provided.

Natural Hazards: Weather Hazards

The following outline summarizes the significant weather hazards covered in this section:

1. Extreme Temperatures
2. Fog
3. Hail
4. Ice and Sleet Storms
5. Lightning
6. Severe Winds
7. Snowstorms and Blizzards
8. Tornadoes

Weather hazards are the primary hazards in most areas and are of growing concern due to climate change. Climate change is a significant variation in either the mean state of climate or in its variability, persisting for an extended period. Most authorities predict rising temperatures in

[6] Historical occurrences for hazards were sourced from NOAA's Storm Events Database, unless indicated otherwise.

all areas, with warm temperatures coming from the equator and pushing various flora and fauna further north. Along with these temperatures come overall changing weather patterns, causing events such as more frequent and severe storms and winters that fluctuate towards either extreme, warm with light snowfall or cold with heavy snowfall.

In Gogebic County, weather hazards typically vary greatly by season and from year to year. In winter, Gogebic County has a reputation for heavy and frequent snowfalls, especially throughout interior parts of the county. Residents are acclimated to severe winter weather. However, transportation is a hazard and is discouraged during severe winter weather events. Collapsing roofs are another of the primary winter hazards. When it is not winter, thunderstorms, hail, high winds, and extreme temperatures are more variable and less location dependent. Due to the variably and inability to control these types of storm events, response plans are the best mitigation.

For weather hazards in Gogebic County, it may make sense to think in terms of two parts of the year: winter and non-winter. A general distinction can be made between the "winter weather risk season" and the "non-winter weather risk season." The winter weather risk season is defined in terms of historically documented events involving extreme cold and significant snowstorms.

Extreme Temperatures

Hazard Description

Temperature extremes are broken down into two categories: extreme heat or extreme cold. In both instances there are extended periods of either abnormally low or high temperatures worsened by conditions such as high humidity with lack of rain or heavy snowfalls with high winds. Both extremes can last for weeks without any advance warning and in the middle of a seemingly normal weather pattern. Extreme heat and extreme cold can cause loss of life to vulnerable population (e.g., elderly, young children, impoverished individuals, and those in poor health), damage to infrastructure, and disruptions to schools and businesses.

Extreme heat or a "heat wave" occurs mainly during late May to early September in the Upper Peninsula and is marked by temperatures above 90°F. Individuals working outdoors, the elderly, and children need to be accounted for during oppressively hot conditions. Extreme hot temperatures also put a strain on the energy demands for an area, as air conditioning becomes a necessity for vulnerable populations. The National Weather Service (NWS) devised the Heat Index as a mechanism to better inform the public of heat dangers, The Heat Index Chart, shown in **Figure 5.1**, uses air temperature and humidity to determine the heat index or apparent temperature. The major threats of extreme heat are heat exhaustion and heatstroke (a major medical emergency). **Table 5.1** shows the dangers associated with different heat index temperatures.

Figure 5.1: NOAA's National Weather Service Heat Index Chart[7]

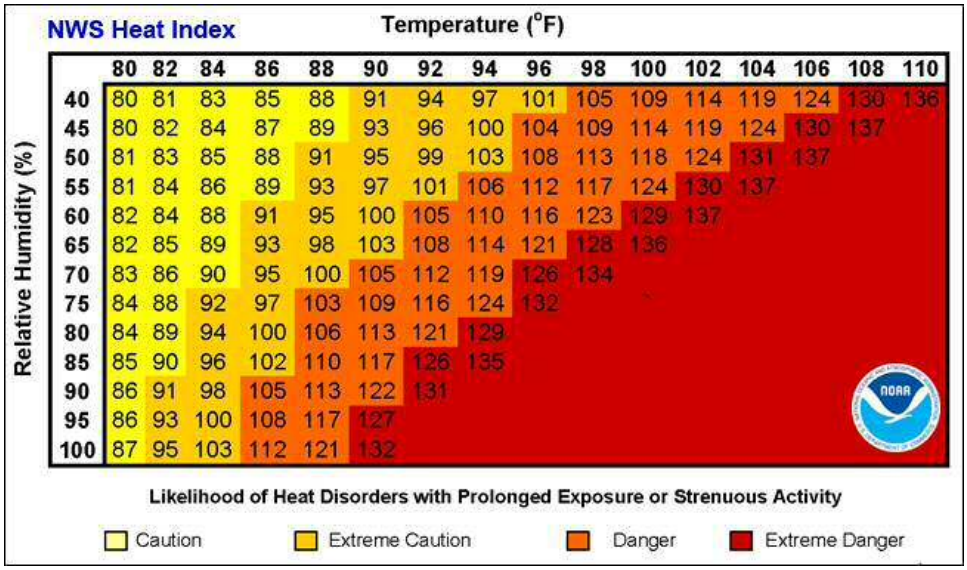


Table 5.1: Heat Index and Related Heat Disorders

Heat Index (°F)	Possible Heat Disorders
80°F - 90°F	Possible fatigue with prolonged exposure and/or physical activity
90°F - 105°F	Heat exhaustion, heat cramps, and heat stroke possible with prolonged exposure and/or physical activity
105°F -130°F	Heat exhaustion and heat cramps likely; heat stroke possible with prolonged exposure and/or physical activity
130°F or higher	Heat stroke exceedingly likely with continued exposure

Source: NOAA – National Weather Service

Extreme cold is primarily associated with the wintery months of late September through May in the Upper Peninsula and categorized by temperatures plunging near or below 0°F. Period of extreme cold are risky for those in both rural and urban areas. An extreme cold event to the NWS can refer to a single day of extreme or record-breaking day of sub-zero temperatures. Extended or single day extreme cold temperatures can be hazardous to people and animals, and cause problems with buildings and transportation. **Table 5.2** lists the threats associated with extreme cold, such as hypothermia, which is a medical emergency and is a concern for individuals living in inadequately heated apartments or rooms. The use of space heaters during these cold periods also increase the risk of injuries and structure fires. Loss of life can occur with this situation. Damage to buildings and pipelines can also occur in the bitter cold conditions, resulting in expensive repairs and potential days of business and school shutdowns.

[7] National Weather Service (NWS). Heat Index – Weather.gov. www.weather.gov/safety/heat-index

Table 5.2: Cold Hazards Associated with Extreme Cold Temperatures

Cold Hazard	Definition
Wind Chill	Temperature based upon how wind and cold feel on exposed skin. As wind increases, it draws heat from the body, which drives down skin temperature and internal body temperature. Animals are also affected by wind chill.
Frostbite	Damage to body tissue when exposed to cold temperatures for a long period of time. A wind chill of -20°F will cause frostbite in 30 minutes. Frostbite is most susceptible to fingers, toes, ear lobes, and the tip of the nose. Signs of frostbite include loss of feeling and a white or pale appearance. Animals are also affected by frostbite.
Hypothermia	A condition that occurs when body temperature falls below 95°F and, if not properly treated, can result in death. Warning signs include uncontrollable shivering, memory loss, disorientation, slurred speech, drowsiness, and exhaustion. Most commonly occurs in very cold temperatures, but it can also occur at cool temperatures (above 40°F) if an individual is not properly clothed. Animals are also affected by hypothermia.

Climate Change Considerations

Certain indicators of climate change in Michigan and Gogebic County have already been observed. In Michigan, new heat records outnumbered new cold records by 3 to 1 during the 1990s and 6 to 1 in the 2000s. The frequency of extreme heat events is expected to increase in the future. Although the winter season in Michigan has been shortening, there have been lessened differences in temperature between polar and temperate regions (due to warming of polar regions), making it easier for a polar weather front to swing southward across the U.S. Instances of persistently cold temperatures, ice storms, freezing rain, and heavy snowstorms are affecting the state with increasing frequency. Historical facts show that Michigan has experienced colder temperatures in the past, but one of the new patterns connected with climate change involves lesser amount of time for persons to become acclimated to the cold weather. Increasingly mild fall months from October to early December will suddenly give way to bitter cold, winds, ice, and snow, with the shorter winter season providing less time for people to adjust to the frigid weather.

Historical Occurrences

Extreme temperatures typically cover a large area and cannot be confined to any geographic or political boundaries. All areas of Michigan are subject to extreme temperatures. Gogebic County's inland locations can experience high temperatures and severe cold temperatures. Monetary damages are generally minimal, though schools are often closed during these events.

From 1996-2019, nine instances of extreme cold and wind chill (not including 28 less extreme events) were recorded. No damages were recorded. In multiple events, wind chills reached 40 degrees Fahrenheit below 0 and colder. There were two instances of heat or excessive heat. The first was on July 31, 2006, where temperatures throughout Gogebic County were in the 90s, with dew points in the low to mid-70s. Heat indices were 100 to 105 degrees Fahrenheit. The second excessive heat event was part of an Upper Michigan heat wave that occurred from July 13-19,

2013.[8] Over a period of six days, temperatures stayed well over 80 degrees Fahrenheit, accompanied by high humidity. In Ironwood, temperatures reached 91 degrees Fahrenheit, with heat indices near 100 degrees Fahrenheit.

Occurrence Probability and County Vulnerability
The probability of an extreme temperature event is highly likely as it can occur anytime during the year. In the last ten years, there have been four extreme cold/wind chill events and one extreme heat event – a frequency of 0.5 extreme temperature events per year. While there is a likelihood that these events will occur any given time during the year, severity is low countywide as resident behaviors are effective in limiting damage to life and property due to extreme temperatures.

All Gogebic County communities are vulnerable to both extreme heat and cold events. Vulnerability to extreme heat primarily impacts the elderly and persons with pre-existing health problems who live in housing with inadequate ventilation or cooling systems. Extreme heat can also have impact demand on electric utilities and may cause power outages to critical facilities. Critical facilities vulnerable to the extreme cold include drinking water services, such as the Gogebic Range Water Authority and Ironwood City Water & Sewer. If water mains were to break, these facilities would be unable to provide water to residents.

Fog

Hazard Description
Fog forms near the ground when water vapor condenses into tiny liquid droplets that remain suspended in the air. Many different processes can lead to the formation of fog, but the main factor is saturated air. Two ways that air can become saturated are by cooling it to its dew point temperature or by evaporating moisture into it to increase its water vapor content. Fog itself is not a hazard because it does not actually apply destructive forces, but the interaction between humans and fog can be a dangerous situation, sometimes resulting in disastrous consequences. However, freezing fog (NWS does issue special statements for this hazard) can cause direct harm by causing slickness on roadways and thus leading to serious transportation accidents.

Fog has played a contributing role in several multi-vehicle accidents over the past several years. It can be dangerous because it reduces visibility. Although some forms of transport can penetrate fog using radar, road vehicles must travel slowly and use more lights. Localized fog is especially dangerous because it catches drivers by surprise.

Historical Occurrences
Four dense fog were reported in Gogebic County from 1996-2019. There were no reported incidences of freezing fog. While no property damages or injuries were reported as a result from these events, the low visibility was attributed to longer commute times in the area.

[8] National Weather Service – Marquette, MI. Upper Michigan Heat Wave July 13 – July 19, 2013. www.weather.gov/mqt/Upper_Michigan_Heat_Wave_2013

Occurrence Probability and County Vulnerability
While only four fog events were reported, one was in the past 10 years (frequency of 1 event per 0.1 years from 2010 through 2019). However, fog is a common occurrence in Gogebic County. The probability of a fog event is relatively high. It does typically dissipate by mid-morning. Fog and hazards associated with fogs are assumed to uniformly impact the county. Only when fog and humans interact on transportation corridors, people and facilities become vulnerable to fog.

Hail

Hazard Description
Hail is produced by thunderstorms when strong updrafts among the clouds carry water droplets above the freezing level and cause the formation of ice pellets around some nucleus, such as a water crystal or a speck of dust. Frozen droplets gradually accumulate on the ice crystals until having developed enough weight and they fall in the form of a ball or irregularly shaped ice masses greater than 0.75 inches in diameter. Falling hailstones batter crops, home roofs, dent autos, and injure wildlife and people. Approximately $1 billion in damages occur annually across the U.S. In Michigan, there is usually at least one intense hailstorm per year that causes significant damages. Unfortunately for many hailstorms, the total property damages go unreported.

As a product of strong thunderstorms, the size of hail is usually proportional to the intensity of the storm cell that generates it. As a thunderstorm passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Whether in predictable locations or not, instances of hail can be very localized – to an area as small as a few city blocks.

Damaging hail is much less frequent than thunderstorms and only a fraction of these storms produces damaging hail. Hail is more likely to occur when severe thunderstorms also produce great amounts of precipitation. Although damaging hail has occurred throughout Michigan, the events that have produced the largest sized hail are not always the most damaging; small-sized hail often causes more damaging impacts. Hail reported in Michigan range in size from a pea (¼" diameter) to a golf ball (1 ¾" diameter), but hailstones larger than baseball (2 ¾" diameter) have occurred with the most severe thunderstorms. **Table 5.3** provides official classifications of hail magnitude as often used in weather reporting and event records.

Table 5.3: Hail Size Reference Chart

Descriptive Size of Hail	Diameter (inches)	Descriptive Size of Hail	Diameter (inches)
Pea	¼”	Golf ball	1 ¾”
Marble or mothball	½”	Hen’s egg	2”
Penny or Dime	¾”	Tennis ball	2 ½”
Nickel	0.9”	Baseball	2 ¾”
Quarter	1”	Teacup	3”
Half-dollar	1 ¼”	Softball	4”
Walnut/Ping-pong ball	1 ½”		

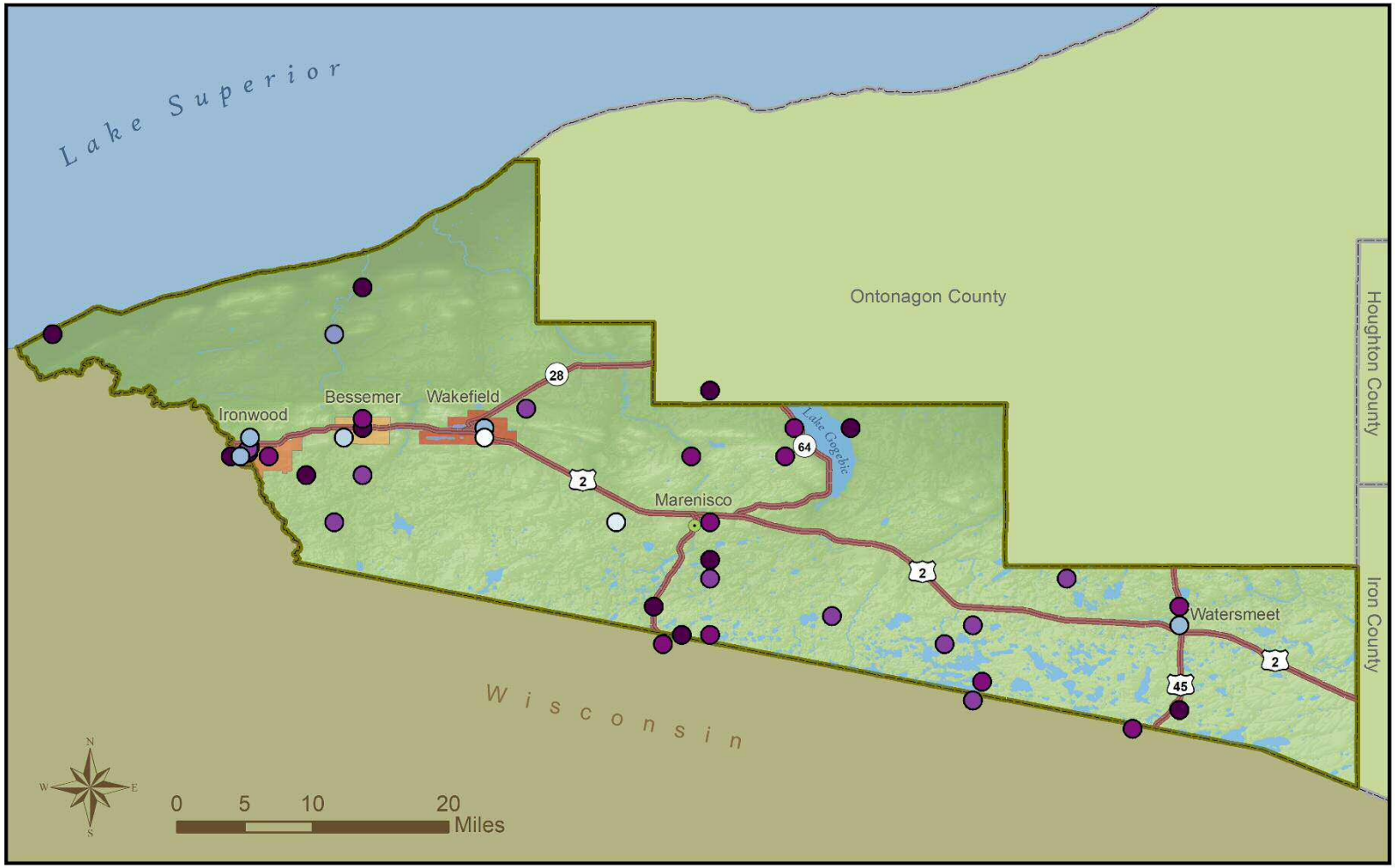
Source: National Severe Storms Laboratory

Historical Occurrences

A hail event may occur anywhere throughout the county and is not confined to any geographic boundaries. Often accompanying thunderstorms, hail events are typically widespread and can affect areas outside of the county. **Table 5.4** provides an overview of hail events in Gogebic County from 1955-2019. 58 hail events were reported during that period (**Map 5.1**). The most significant hailstorm event in Gogebic County occurred on July 28, 2006 in Wakefield where severe thunderstorms throughout the county that produced torrential downpours and minor flooding. Hail up to 4 inches in diameter caused significant damages to roofs, siding, and automobiles. Total estimated property damage of $750,000. Other than this event, there was no damage recorded as hail damages were minor and incurred by individual property owners.

Table 5.4: Reported Hail Events by Size, 1955-2019

Hail Size Reported	Number of Events
¾”	24
0.9”	10
1”	13
1 ¼”	1
1 ½”	1
1 ¾”	5
2”	2
2 ½”	1
4”	1
TOTAL	58



Recorded Hail Events 1950-2018
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal;
DEM was derived from elevation data available through the USGS;
Weather event data was downloaded from the National Weather Service
GIS Portal https://www.weather.gov/gis/
Created by WUPPDR May 2019

Hail Size (Inches)

0.75 0.88 1 1.25 1.5 1.75 2 2.5 4

WUPPDR of Michigan

Map 5.1: Hail Events in Gogebic County

Occurrence Probability and County Vulnerability
From 2010-2019, 11 hail events were reported. Based on this information, the frequency of a hail event within a year is approximately 1.1 events per year. Thus, probability of a hail event is likely, but the severity of damages due to a hailstorm is low to moderate. There are no known areas in the county that have a higher risk from hail, but some communities may have structures that are more vulnerable to hail damage than others. Damage to vehicles, homes, and buildings, such as broken windows, dented roofs, and damaged siding, is frequently reported. Critical facilities in all Gogebic County municipalities are vulnerable to receive similar damage from hail. However, hail should not negatively impact the services a facility provides.

Ice and Sleet Storms

Hazard Description
Severe winter weather hazards can include ice and sleet storms. Although these two types of winter storms have been combined, ice and sleet storms are two different phenomena. Ice storms, also known as freezing rain, coat roads, trees, power lines, and buildings with thick, heavy, and slick surfaces. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is small frozen raindrops or ice pellets that bounce when hitting the ground or other objects. Sleet is less dangerous than ice storms as it does not stick to trees and wires but can still cause hazardous driving conditions if there is measurable sleet on roads.

Ice storms are the result of cold rain that freezes on contact with a surface, coating the ground, trees, overhead wires, and other exposed objects with ice, sometimes causing extensive damage. Massive traffic accidents and power outages from downed tree limbs and utility lines are common when an ice storm occurs. Often, ice storms are accompanied by snowfall, in which the ice is camouflaged and covered up by snow, creating treacherous transportation conditions. Both storms occur when the temperature is close to 32°F but are far more severe when the temperature is in the 20s.

Climate Change Considerations
Climate change seems likely to cause an increase in the number of ice and sleet storm events. Average temperatures around the winter months are closer to the freezing point and at the temperature at which ice and sleet events typically occur, particularly early and near the end of the season. Instead of winter arriving or ending and precipitation turning into snow, Michigan winters have involved many thawing episodes followed by refreezing which cause treacherous ice cover on frozen surfaces, weigh down cables and tree branches, and cause infrastructure failures. Even though Michigan winters have been shortening a bit over time,[9] winters remain hazardous because the increasing level of precipitation more often takes the form of a major snow event and provides more moisture for refreezing after the warmer thawing periods occur.

Historical Occurrence
Ice storms usually have a regional effect and groups of counties are usually affected instead of

[9] Andresen, J., S. Hilberg, K. Kunkel, 2012: Historical Climate and Climate Trends in the Midwestern USA. In: U.S. National Climate Assessment Midwest Technical Report. http://glisa.msu.edu/docs/NCA/MTIT_Historical.pdf.

just one county or location when they occur. From 1996-2019, five ice storms were reported in Gogebic County. Only one storm had reported property damage. **Table 5.5** lists all ice storms in the county, along with descriptions about the storm and any reported damages.

Table 5.5: Reported Ice and Sleet Storms in Gogebic County, 1955-2019

Date	Type of Storm	Description and Location	Property Damages
12/18/2002	Ice Storm	Half inch of ice reported in Watersmeet.	No reported damages
12/30/2004	Ice Storm	Ice accumulation of a quarter inch or more on roads county wide.	No reported damages
01/01/2005	Ice Storm	Half inch of ice on Highway US 2 from Ironwood to Wakefield.	No reported damages
04/26/2017	Ice Storm	Moderate to heavy ice accumulation over higher terrain around Bessemer and Wakefield resulted in treacherous road conditions and extensive tree damage.	$100,000
02/04/2019	Ice Storm	A quarter inch of ice accumulation was reported in Ironwood and Watersmeet. Schools in the area were closed due to ice and slippery conditions.	No reported damages

Occurrence Probability and County Vulnerability

While ice and sleet storms do not appear to occur at a frequent rate, the probability of an event is likely to occur. Two ice storms were reported in the past ten years – a frequency of 0.2 events per year. Severity is also variable, but generally low to moderate. However, the county's vulnerability to such a storm is high, as little can be done to the impact of an ice and sleet storm, which primarily involve infrastructure and critical facility failures. Transportation and electric infrastructure are also vulnerable to ice storms, causing icy roadways or potential for power and communication outages. Notably, icy weather conditions can slow emergency response travel. Facilities with large concentrations of employees, such as local schools and universities, are more vulnerable during an ice or sleet storm due to temporary closures. Heavy volumes of employee traffic in and out of a facility may contribute to transportation mishaps on area roadways.

Lightning

Hazard Description

The discharge of electricity from a thunderstorm is called lightning. It is a random and unpredictable product of a thunderstorm's energy. Lightning strikes when a thunderstorm's electric potential (the difference between its positive and negative charges) becomes great enough to overcome the resistance of the surrounding air. In the U.S., approximately 100,000 thunderstorms occur each year and each of those storms generates lightning. It is not uncommon for a single thunderstorm to produce hundreds or even thousands of lightning strikes.

Lightning is often perceived as a minor hazard, but it damages many structures and kills and injures more people in the U.S. each year, on average, than tornadoes and hurricanes. From 2005-2014, Michigan ranked seventh in the nation in lightning fatalities.[10] Because it is virtually impossible to provide complete protection to individuals and structures from lightning, this hazard will continue to be a problem for Michigan's residents and communities. However, lightning deaths, injuries, and property damage can be reduced through a combination of public education, human vigilance, technology, proper building safety provisions, and simple common sense.

Historical Occurrence

Based on the frequency of cloud-to-ground flash density map from 2008-2017,[11] Gogebic County experiences approximately 1.5 to 3 strikes per square mile per year. Two lightning incidences occurred causing injury and death in Gogebic County. **Table 5.6** provides a description of these events. Lightning of a lower level does occur, but these events usually do not have any recordable damage.

Table 5.6: Lightning Events in Gogebic County

Date	Description
06/11/2005	Man struck by lightning while mowing lawn in Wakefield.
06/17/2006	Man struck by lightning and killed while standing under a tree near Sunday Lake in Wakefield.

Occurrence Probability and County Vulnerability

The probability of occurrence for future lightning events in Gogebic County is highly likely, but the probability of a lightning strike is low. No significant events were reported in the last ten years, but that does not mean that lightning strikes do not occur. Gogebic County is in an area that has low lightning strike density. Although the likelihood of the lightning event causing damage to human life or property is negligible, when a damaging event does occur its severity is extreme at the discharge site.

Most injuries or deaths due to lighting strikes occur on open fields and under trees as shown by the two deaths that have occurred in the county. Gogebic County parks, forests, and recreation areas contain most of these hazard-prone features and may contribute to or intensify the effects of lightning. Each municipality in the county has an equal vulnerability to lightning strikes as there is really no way to pinpoint exactly where, when, and to what extent lightning will cause damage. Critical facilities in the county are protected by lightning strikes through grounding and other protective measures. However, electrical substations, transformers, and power lines are still vulnerable to lightning strikes. A more specialized study will need to be done to determine what facilities in the county are a higher risk and might need greater protection.

[10] "Lightning Deaths the Last 10 years, Mapped." The Weather Channel, July 22, 2015. https://weather.com/storms/severe/news/lightning-deaths-by-state-2005-2014.
[11] Vaisala National Lightning Detection Network. https://www.vaisala.com/en/products/data-subscriptions-and-reports/data-sets/nldn

Severe Winds

Hazard Description

Severe wind, or straight-line winds, sometimes occurs during severe thunderstorms and other weather systems and can be very damaging to communities. Severe winds with velocities over 58 mph may be confused with tornado occurrence. Locally, lesser events termed high winds and thunderstorm winds can cause similar damage as severe winds. Severe winds can cause damage to homes and businesses, power lines, trees, and agricultural crops. Large scale power failures, with hundreds to thousands of customers affected, are common during straight-line wind events. Power outages can result in a need to shelter persons left without power for an extended time.

These wind events also have the potential to cause loss of life from breaking and falling trees, property damage, and flying debris, but tend not to cause as many deaths as tornadoes do. However, property damage from straight line winds can be more widespread than tornadoes, usually affecting multiple counties at a time. It is not rare to see severe wind events that produce wind-speeds of 60 and 70 miles per hour. Along the Great Lakes shoreline, high winds of lower magnitude occur regularly, as do hurricane-velocity gusts (over 74 miles per hour).

Microbursts are localized but powerful wind gusts that typically occur from a single storm. Microbursts result in what is often referred to as straight-line wind damage and usually result in damage like a brief, weak tornado. Derechos are usually large-scale storm systems that travel hundreds of miles and are many miles long. Damages from derechos can stretch statewide and often exceeds 250 miles in length. Derechos are most common in Michigan during the warmer half of the year. Wind speeds in derechos can exceed 100 mph at times. In the Upper Peninsula, a derecho can be expected once every 4 years.

Historical Occurrence

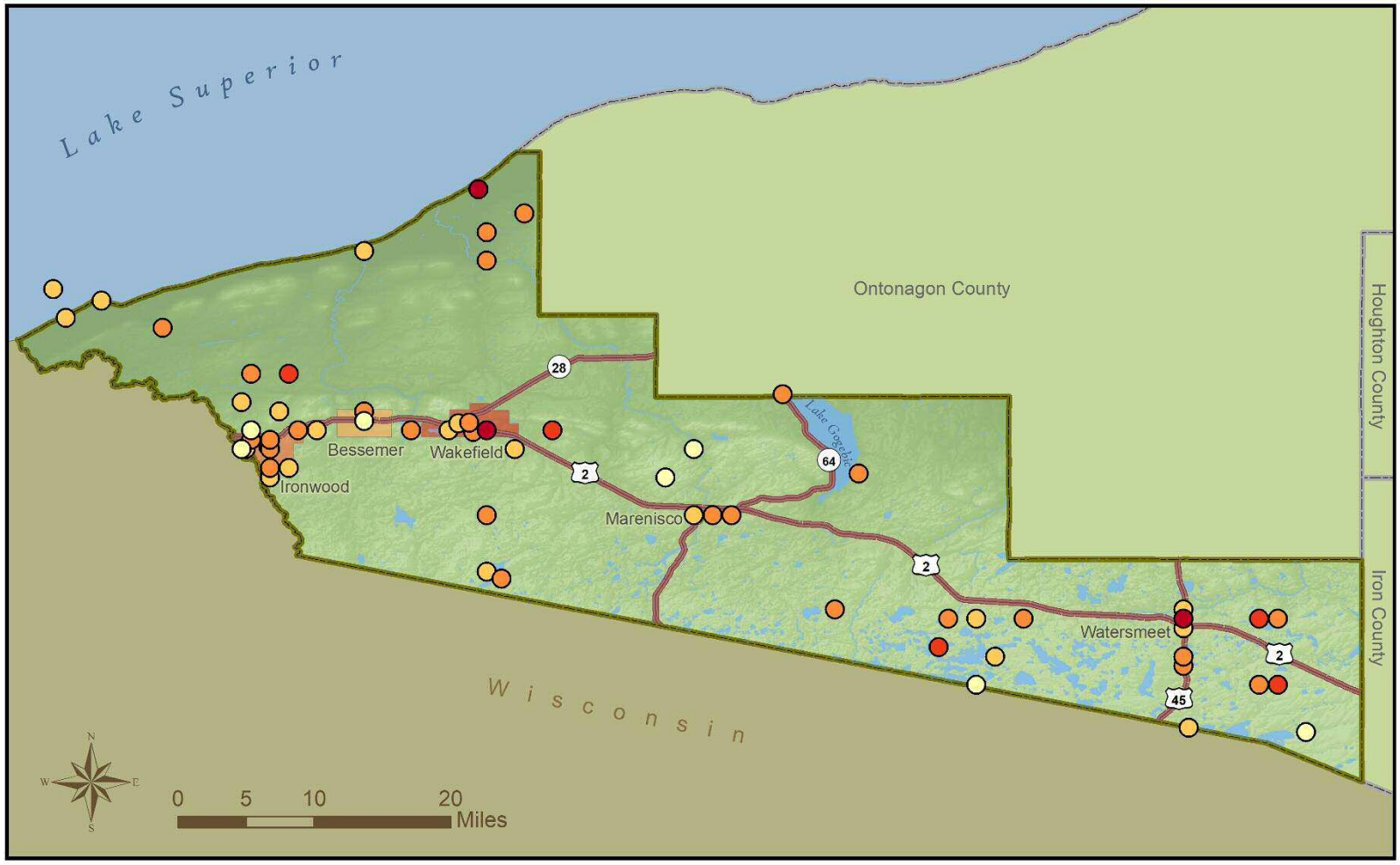
Historically in Gogebic County, windstorms are rarely a singular event. They usually accompany other severe weather – particularly thunderstorms and occasional blizzards. The strongest estimated wind gust recorded in Gogebic County since 1955 was 78 knots (90 miles per hour) on July 11, 2016 in Wakefield. This event was the result of a low-pressure system passing over the county which also resulted in a tornado touchdown in Bessemer. Details of the event are listed below in **Table 5.7**, including other severe wind events which resulted in reported property damage. From 1955-2018, total reported estimated property damages due to severe winds is $1.294 million and estimated crop damages at $1 million. During that timeframe, 122 severe wind events have been reported (**Map 5.2**).

Table 5.7: Significant Severe Wind Events in Gogebic County

Date	Event Description and Location	Property Damages
07/16/1997	Strong winds (63 mph) ahead of a line of thunderstorms damaged a boat dock at Black River Harbor on the Lake Superior shoreline.	$5,000
05/28/1998	Strong thunderstorms (58 mph) downed trees between Ironwood, Bessemer, and Wakefield. Downed trees damaged a pickup truck in Ironwood and a SUV in Wakefield.	$10,000
08/23/1998	Thunderstorm winds near 70 mph, blowing trees down. One tree fell on a fiber-glass camper resulting in a fatality at Imp Lake Campground in the Ottawa National Forest.	$5,000
11/11/1998	Affected the entire Upper Peninsula, with sustained wind gusts of 30 to 40 mph. Widespread power outages due to downed trees and broken lines. Significant timber losses in the Ottawa National Forest.	$1 million (crop damage)
07/05/1999	Winds near 70 mph from a thunderstorm down over 100 trees in Ironwood. Two houses and a car were damaged by fallen trees.	$15,000
07/30/1999	Strong thunderstorm winds (67 mph) blew down trees near Bessemer. Downed trees fell on camping vehicles and a satellite dish.	$15,000
08/04/2006	Thunderstorm winds (around 60 mph) across county, resulting in downed trees and power lines, particularly around the Gogebic County Airport.	$7,000
10/07/2007	Downed tree branches near Ironwood and Bessemer; Downed power lines in Wakefield.	$1,000
06/12/2008	Downed trees near Ironwood.	$2,000
07/11/2008	Thunderstorm wind damaged roofs and vehicles near Cisco Lake.	$40,000
10/26/2010	Downed trees and power lines throughout county; required temporary shelter.	$5,000
05/09/2011	Downed trees near Little Girls Point in western part of county.	$3,000
09/29/2011	Downed trees and power lines throughout county.	$10,000
06/14/2012	Downed trees in and around Watersmeet; also reported throughout the Western U.P.	$3,000
04/01/2015	Numerous downed trees and powerlines throughout Wakefield. A 300-foot radio tower collapsed near Bessemer.	$15,000

07/11/2016	Straight line thunderstorm winds of up to 90 mph near Wakefield overturned a camping trailer, ripped off the roof of the old skating rink, and damaged or destroyed outbuildings. Multiple trees were downed on houses and vehicles. Several large trees of more than 12" in diameter were down across Lake Road, 4 miles east-southeast of Little Girl's Point. Storm also produced a tornado near Bessemer.	$1.003 million
10/14/2016	Downed trees and powerlines along Highway US 2 between Wakefield and Marenisco.	$5,000
03/07/2017	Widespread power outages; uprooted and snapped large (50-70 feet long; 27-inch diameter) spruce trees in Marenisco.	$2,000
09/22/2017	Strong thunderstorms brought nickel to quarter sized hail and severe winds in the area, resulting in downed trees and power lines in Marenisco.	$1,000
06/17/2018	Strong thunderstorms with strong winds resulted in numerous downed trees and power lines near Ironwood, Bessemer, and Marenisco.	$24,000
08/27/2018	Isolated severe thunderstorms near Ironwood caused down trees in the area.	$2,000

Straight line wind damage on July 11, 2016 tore the roof off the old skating rink in Wakefield and destroyed outbuildings (Photo: NWS Marquette and Michigan State Police).



Recorded Wind Events 1950-2018
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal; DEM was derived from elevation data available through the USGS; Weather event data was downloaded from the National Weather Service GIS Portal https://www.weather.gov/gis/ Created by WUPPDR May 2019

Wind Velocity (mph)

Not Reported	50 - 60	61 - 70	71 - 80	81 - 90

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Map 5.2: Severe Wind Events in Gogebic County

Occurrence Probability and County Vulnerability
Most severe wind events are classified as thunderstorm winds. In the past ten years, there were 41 severe wind events with 34 associated with thunderstorms – a frequency of 4.1 severe wind events per year and 3.4 thunderstorm wind events a year. The probability of a future severe wind event is likely. Individual events have moderate severity throughout the county. The Lake Superior shoreline in Wakefield and Ironwood Township faces is highly vulnerable to damage, but severe wind events are far from being localized to that area and can affect inland areas of the county as well.

Critical infrastructure, such as power and communication lines, are also vulnerable to damage from severe wind events. Fallen trees can damage these lines, causing electrical and communication outages. Additionally, trees on roadways can delay emergency response capabilities.

Snowstorms and Blizzards

Hazard Description
Snowstorms are a period of rapid snow accumulation that is usually accompanied with high winds and cold temperatures. This event can be dangerous for a community over a period of days or weeks. Heavy snows can shut down towns and cities for several days if snow is persistent and cannot be cleared in a timely fashion. Rural areas may have inaccessible roads for some time but often have residents that are more equipped to independently deal with power outages and temporary isolation. Roof failures may occur as the weight of snow and area of snow can cause damage to homes and buildings.

Blizzards are the most dramatic of all snowstorms as it is characterized by low temperatures and strong winds of over 35 miles per hour. Most blizzard snow is in the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. The cost of clearing snow can be enormous.

Some areas suffer greater flood risks because thick snow cover can rapidly melt off during rainstorms, causing rapid drainage of water towards cities and into drains and rivers. Partially melted snow and ice may cause blockages within these water channels, causing water to back up or divert sideways and over banks where they damage property and roadways.

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall over relatively short geographic distances. The Western Upper Peninsula experiences the most snowstorms and snowfall in Michigan each year. One reason for this is the "lake effect," a process by which cold winter air moving across Lake Superior picks up moisture from the warmer lake waters, resulting in larger snowfall amounts. Due to weather patterns, severity of different types of snowstorms varies somewhat throughout the county. *Lake effect snow* is almost exclusively focused on areas close to Lake Superior. *System snow*, which includes heavy snow or snow associated with winter storm/weather, results from weather fronts moving across the country.

Climate Change Considerations

The effect of climate change upon Michigan is expected to cause an increase in the amount of severe precipitation events. Even though the length of Michigan winters has been decreasing, the season remains intense and periods of deep freeze may become more likely as arctic and polar air masses occur more frequently during the winter season. During the winter months, the increase in precipitation means that snowfall events will tend on average to be more intense. More snowfall is likely to happen at a time and take the form of significant snowstorm events (e.g., eight or more inches, higher snowdrifts, transportation disruptions, canceled school sessions, etc.).

Historical Occurrence

Deep snow drifts following a February 12-13, 2019 heavy snow event (Photo: NWS Marquette - April Fabbri)

Gogebic County has experienced 262 winter weather events (blizzard, heavy snow, lake effect snow, winter storm, and winter weather) from 1996-2019. Note that some winter weather events list freezing rain in addition to snow. **Table 5.8** summarizes the total number of winter storms events and associated deaths or injuries. Of these storms, six events had reported property damages. Snowstorm events with property damage are listed below:

May 11, 2006: **Heavy snow** and power outages reported throughout Gogebic County. Nearly 8 inches accumulated in Ironwood and 3 to 5 inches of snow reported over higher terrain locations to the west. $2,000 in property damages were reported in the county.

December 16, 2011: Slippery roads from several inches of lake effect snow (**winter storm)** contributed to numerous accidents from Ironwood to Wakefield over to Marenisco. One two-car accident in Bessemer resulted in injuries to a 44-year-old man. Estimated property damage of $40,000.

January 17, 2012: Moderate to heavy **lake effect snow** showers in Gogebic County. In Ironwood, an estimated 8 inches of snow fell in less than 12 hours. 1 inch per hour snowfall rates reported between 4am and 11am. Several car accidents were attributed to the snow and blowing snow from the storm. Estimated property damage was at $15,000.

January 30, 2013: A **winter storm** produced heavy snowfall of 7.5 inches in 24 hours in Bessemer. Poor visibility due to the heavy snow resulted in an accident involving a car and snowmobile. The man on the snowmobile was struck by a car while attempting to cross the highway and received a severe leg injury. Estimated property damage reported at $8,000.

December 5, 2017: A **winter storm** generated moderate to heavy lake effect snow. Ironwood receive 6 inches of snow in approximately 7 hours. Reported wind gusts of over 35 mph at times

caused blowing snow and reduced visibility. Multiple power outages reported. Estimated damages of $5,000.

December 30, 2017: **Winter storm** that resulted in moderate to heavy lake effect dropping 1 to 3 inches of snow across parts of Gogebic County. Gusty winds resulted in blowing snow and visibility restrictions throughout the day. This contributed to a fatal snowmobile accident near Bessemer. Estimated property damage of $5,000.

February 24-25, 2019: A bomb cyclone, or a low pressure system that rapidly decrease in pressure (24 millibars – a unit of pressure – within 24 hours), that developed over the Central Plains moved into the Great Lakes region, producing **heavy snow** and **blizzard** conditions throughout Upper Michigan. Reports from Wakefield to Watersmeet measured 7 to 9 inches of snow in less than 8 hours. Wind gusts of over 35 mph caused blowing and drifting snow and closed many roads. The NWS in Marquette recorded winds of up to 51 mph in Wakefield and 46 mph at the Gogebic-Iron County Airport. Schools throughout the region were closed on the 25th due to lingering effects from the storm.

Table 5.8: Snowstorms by Type in Gogebic County, 1996-2019

Snowstorm Type	Number of Events	Total Property Damage	Injuries	Deaths
Blizzard	3	0	0	0
Heavy Snow	44	$2,000	0	0
Lake Effect Snow	30	$15,000	0	0
Winter Storm	79	0	0	0
Winter Weather	106	$58,000	1	1[A]
TOTAL	262	$75,000	1	1

[A] Death is listed as indirect

Occurrence Probability and County Vulnerability

The probability of a snowstorm event in Gogebic County is very high. From 2010-2019, there were 155 snowstorm and blizzard related events reported in Gogebic County – a frequency of 15.5 events per year. However, the vulnerability of the community is low due to the preparedness of residents and their properties. The western portion of Gogebic County is more vulnerable to lake effect snow, and thus more snowfall, compared to the eastern part of the county due to its proximity to Lake Superior. Municipalities in the eastern portion of the county, such as Watersmeet and Marenisco Townships, receive less snow than the rest of the county.

Depending on type of snow (wet, heavy versus fine, powdery snow), snowstorms and blizzards may result in a variety of infrastructure problems. Snow accumulations on above-ground electrical lines often create power outages, which can vary from several hours to days. Dangerous driving conditions frequently occur during and shortly after severe snowstorms and blizzards. Some state and county roads experience drifting snow, which can result in greater vulnerability to accidents. When transportation is disrupted, schools close, emergency services

are delayed, some businesses close, and some government services are delayed. More rural areas in the county may experience impassable roads, such as Ironwood Township, preventing emergency services from reaching residences in rural locations.

Tornadoes

Hazard Description

A tornado is an intense rotating column of wind extending from the base of a severe thunderstorm to the ground. Tornadoes are high-profile hazards that can cause catastrophic damage to either a limited or an extensive area. A strong tornado can level everything in its path. Tornadoes can have winds of more than 300 miles per hour and can have widths of over one mile.

The mean national annual death toll due to tornados is 87 persons. Death and injuries associated with tornadoes have declined since the 1950s, thanks to advances in severe weather forecasting, but tornadoes can still be deadly. Although tornado deaths have decreased, tornado damages have increased in recent years, since a larger part of the country's land area contains developments with each passing year. Property damage resulting from tornadoes totals hundreds of millions of dollars every year.

Note that winds are invisible until they pick up enough material that can allow their patterns to be seen and it is this carried material that provides a tornado with a visible form that is easy to recognize. Funnel clouds can be invisible except for the liquid, dust, and debris that they carry. Therefore, a tornado can be present but not yet discernable to nearby persons.

Tornado intensity is measured on the Fujita and Enhanced Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita scale (**Table 5.9**). After 2005, the Enhanced Fujita Scale (**Table 5.10**) was utilized. The Enhanced Fujita Scale rates the intensity of a tornado based on damaged caused, not by its size. Tornado size is not necessarily an indication of its intensity.

Tornadoes in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with air from the polar regions to generate thunderstorms. These thunderstorms often produce the violently rotating columns of wind known as funnel clouds. Winds that converge from different directions, heights, or at different speeds are the source of the spinning pattern that gets concentrated as distinct funnels of wind. Michigan lies at the northeastern edge of the nation's primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio.

In Michigan, tornadoes occur more frequently in the southern half of the Lower Peninsula than any other area of the state. This area could be referred to as Michigan's "tornado alley." Since 1996, Michigan has averaged about 16 tornadoes per year.

Table 5.9: Fujita Scale with Associated Damages

F-Scale Number	Intensity	Wind Speed	Type of Damage
F0	Gale Tornado	40-72 MPH	Some damage to chimneys; branches break off trees; shallow-rooted trees blown over; damages to signs.
F1	Moderate Tornado	73-112 MPH	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving cars pushed off roadways.
F2	Significant Tornado	113-157 MPH	Considerable damage. Roofs torn off homes; mobile homes demolished; large trees snapped or uprooted; light objects can turn into missiles.
F3	Severe Tornado	158-206 MPH	Roofs and some walls torn off well-constructed homes; most trees uprooted.
F4	Devastating Tornado	207-260 MPH	Well-constructed homes leveled; structures with weak foundations blown away; cars thrown; large objects can turn into missiles.
F5	Incredible Tornado	261-318 MPH	Strong frame house lifted off foundations and carried considerable distances; automobile sized missiles can fly over 100 meters; trees debarked; steel reinforced concrete structures damaged.

Source: Storm Prediction Center

Table 5.10: Enhanced Fujita Scale with Associated Damages

EF-Scale Number	Intensity Phrase	3 Second Wind Gust	Type of Damage
EF0	Gale	65-85 MPH	Some damage to chimneys; branches break off trees; shallow-rooted trees blown over; damages to signs.
EF1	Moderate	86-110 MPH	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving cars pushed off roadways.
EF2	Significant	111-135 MPH	Considerable damage. Roofs torn off homes; mobile homes demolished; large trees snapped or uprooted; light objects can turn into missiles.
EF3	Severe	136-165 MPH	Roofs and some walls torn off well-constructed homes; most trees uprooted.
EF4	Devastating	166-200 MPH	Well-constructed homes leveled; structures with weak foundations blown away; cars thrown; large objects can turn into missiles.
EF5	Incredible	Over 200 MPH	Strong frame house lifted off foundations and carried considerable distances; automobile sized missiles can fly over 100 meters; trees debarked; steel reinforced concrete structures damaged.

Source: Storm Prediction Center

Climate Change Considerations

According to NOAA, there is no known way to predict whether or how climate change is affecting thunderstorm and tornado frequency or severity. These types of weather events involve a different scale of phenomenon than climate change and the models of the latter have not yet been able to predict local trends in the former.

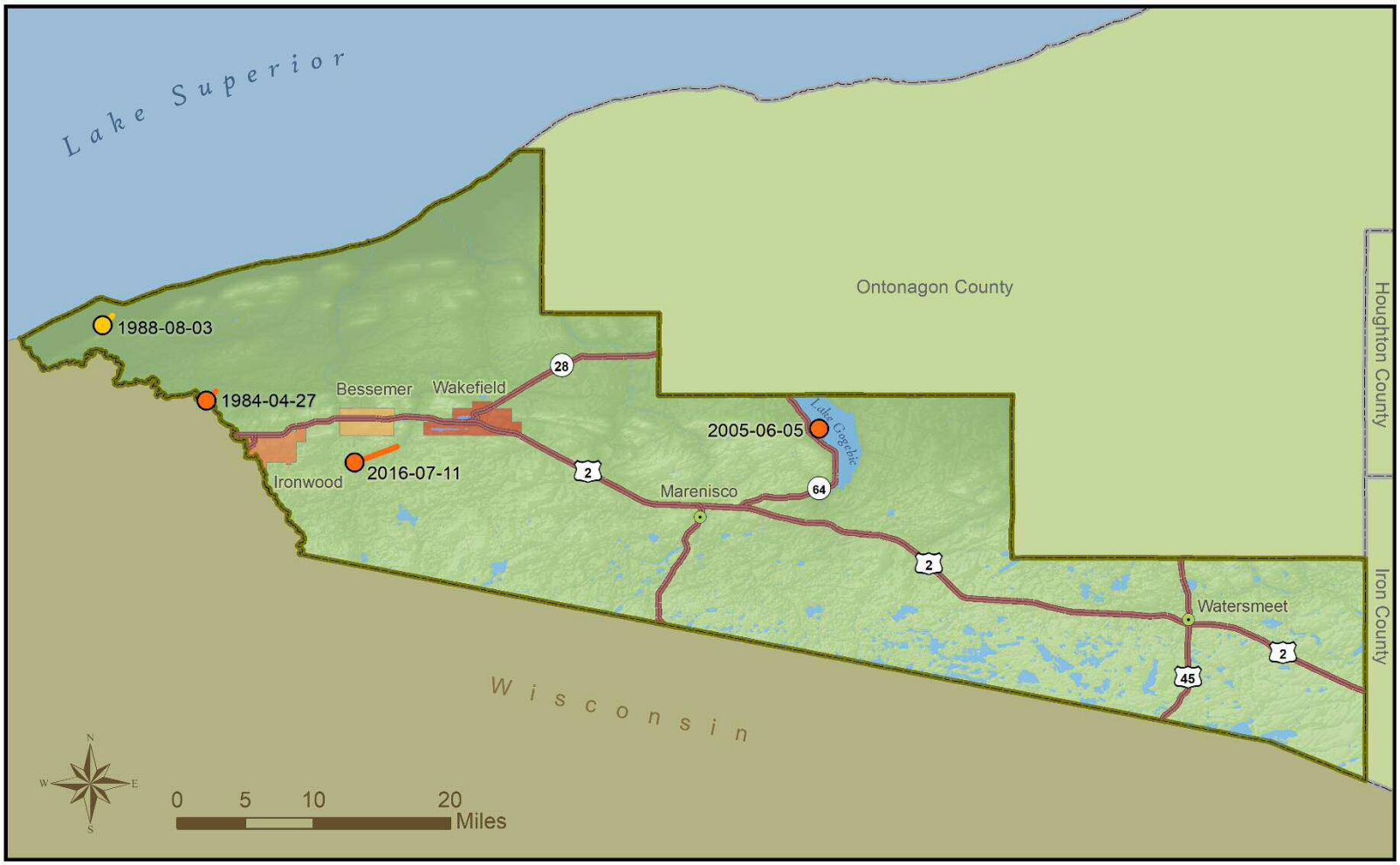
Historical Occurrences

In Gogebic County, there have been five tornadoes recorded since 1950 (**Map 5.3**). **Table 5.11** lists these events. The total reported property damages from these tornado events was $200,000.

Table 5.11: Tornado Events in Gogebic County, 1950-2019

Date	Magnitude	Description and Location	Property Damages
04/27/1984	F1	House trailer destroyed NW of Ironwood	$25,000
08/03/1988	F0	Occurred NE of Ironwood	$0
06/05/2005	F1	Brief touch down; flipped over pontoon boat, damaging boat, boat lift, and dock on Lake Gogebic (Marenisco)	$25,000
07/11/2016	EF1	Multiple trees down on a garage and half of a barn destroyed. Trees were uprooted or snapped. Touched down 3 miles south of Bessemer. Winds were estimated to be around 90 mph.	$150,000

Tornado damage south of Bessemer – July 11, 2016 (Photo: NWS Marquette Storm Survey)



Recorded Tornadoes 1950-2018
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal; DEM was derived from elevation data available through the USGS; Tornado location data was downloaded from the National Weather Service GIS Portal https://www.weather.gov/gis/ Created by WUPPDR May 2019

Tornado Magnitude* and Path

0 1

*Tornadoes are measured on the F-scale pre 2007 and the EF-scale after January 2007

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Map 5.3: Tornadoes in Gogebic County

Occurrence Probability and County Vulnerability
In Gogebic County, tornadoes occur with such infrequencies that the probability of such an event is low or unlikely to occur. There has been only one reported tornado from 2010 through 2019. However, if an event were to occur, the region's vulnerability to tornadoes is high due to their unpredictability and the lack of preparedness in the county. Tornadoes can hit anywhere in the county and forecasting where they may be located is difficult, making all critical facilities vulnerable to being impacted by a tornado. Schools throughout the county are a concern due to the large number of people present and the potential for these facilities to being used as a storm shelter.

Hydrological Hazards

The following outline summarizes the significant hydrological hazards covered in this section:

1. Flood Hazards
    a. Dam Failures
    b. Riverine and Urban Flooding
    c. Shoreline Flooding and Erosion
2. Drought

Michigan residents are largely impacted by flooding. The section, **Riverine and Urban Flooding**, focuses on inland areas, mapped floodplains, and urban areas. Not all flooding occurs within recognized floodplain areas or adjacent to rivers and lakes. In some cases, melting snow or other runoff waters pool in low-lying areas, damaging structures and obstructing roads and other infrastructure. In other cases, some type of breakdown in pumping or drainage infrastructure may result in a damaging flood. **Urban flooding** typically occurs in well-developed urban or suburban areas. It tends to occur due to either a breakdown in infrastructure or inadequate planning and design standards on the part of builders, engineers, architects, and planners.

Many flood mitigation activities have taken place in recent decades, including separation of combined sewer systems, installation of backflow preventers in houses, and dredging, expansion, and re-design of drainage systems. Throughout the state, communities have learned lessons from previous flood occurrences and taken steps to mitigate flood impacts in the future. More importance is now placed on the preventative role in coordinating land development plans with existing knowledge of local floodplains, wetlands, sewer capacity, and upstream development and hydrology.

<u>Overlap with Other Sections of Hazard Analysis</u>

Hydrological hazards stem from precipitation patterns, which are affected by the types of events described in **Weather Hazards** sections on thunderstorms, severe winter weather, and extreme temperatures. Thunderstorms, snowstorms, and ice/sleet storms produce precipitation that can cause or exacerbate flooding – either immediately or when frozen precipitation melts. Additionally, ice can build up and block critical parts of drainage-ways and cause flooding.

During extreme temperatures, freeze events have caused flooding when pipes and water mains have broken, while heat waves may worsen the impact of drought.

Technological Hazards can inhibit smooth functioning or drainage on water supply infrastructure and may cause or worsen flooding or drought hazards. For example, sewer pumps and lift stations can go out of operation during a power failure and cause flooding to occur or a reduction in water supply.

Dam Failures

Hazard Descriptions

Dams are structures that stretch across a stream or other water body to control its flow or to convert the energy within the water into more convenient forms, such as electricity. The impounded waters may be used for agriculture, flood-control, fire and farm ponds, irrigation diversion, fish and waterfowl habitat, municipal water supplies, recreation, mine waste retention, or for power generation by hydroelectricity. Some dams have become obsolete and should be removed to restore the natural water flow through the area. Otherwise, neglected dams will eventually fail, and would then be likely to cause a flash flood downstream, through the sudden release of their impounded waters. Some dams are constructed by wildlife instead of humans but can pose similar risks.

Dam failure is the breach or collapse of an impoundment resulting in flooding downstream. Dam failure can result in loss of life and in extensive property or natural resource damage for miles downstream from the dam. Failure can occur not only during flood events which cause overflowing of the dam, but also due to poor operation, lack of maintenance, and vandalism. Most dam failures are considered catastrophic because they occur unexpectedly, with no time for evacuation. As of 2014, there has been approximately 287 dam failures in Michigan since 1888[12].

Dams are officially classified into three categories of risk, based upon a wide array of potential impacts that can result from a dam's failure. The categories are as follow:

1. Low hazard potential dam: Failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
2. Significant hazard potential dam: Failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.
3. High hazard potential dam: Failure or mis-operation will probably cause loss of human life.

Gogebic County has several dams within its boundaries that have been built over the years for hydroelectric generation and recreation. The National Inventory of Dams lists nine dams located

[12] Michigan Department of Environment, Great Lakes, and Energy (EGLE)

in Gogebic County (**Map 5.4**). All are of low hazard potential. The following are documented dams in Gogebic County:

- Bessemer Township Park Dam
- Black River Dam
- Cisco River Dam
- McDonald Lake Dam
- Saxon Falls Dam
- Sunday Lake Dam
- Superior Falls Dam
- Wolf Lake Dam
- Wood-Bire – Presque Isle Wildlife Dam

Of these, the Cisco, Saxon Falls, and Superior Falls Dams are used for power generation. In addition to these known dams, there are also numerous beaver dams throughout the county which have not been inventoried. Beaver dam locations are typically reported by residents and done in an informal manner with the road commission due to the dams' threat to roadways.

Historical Occurrence

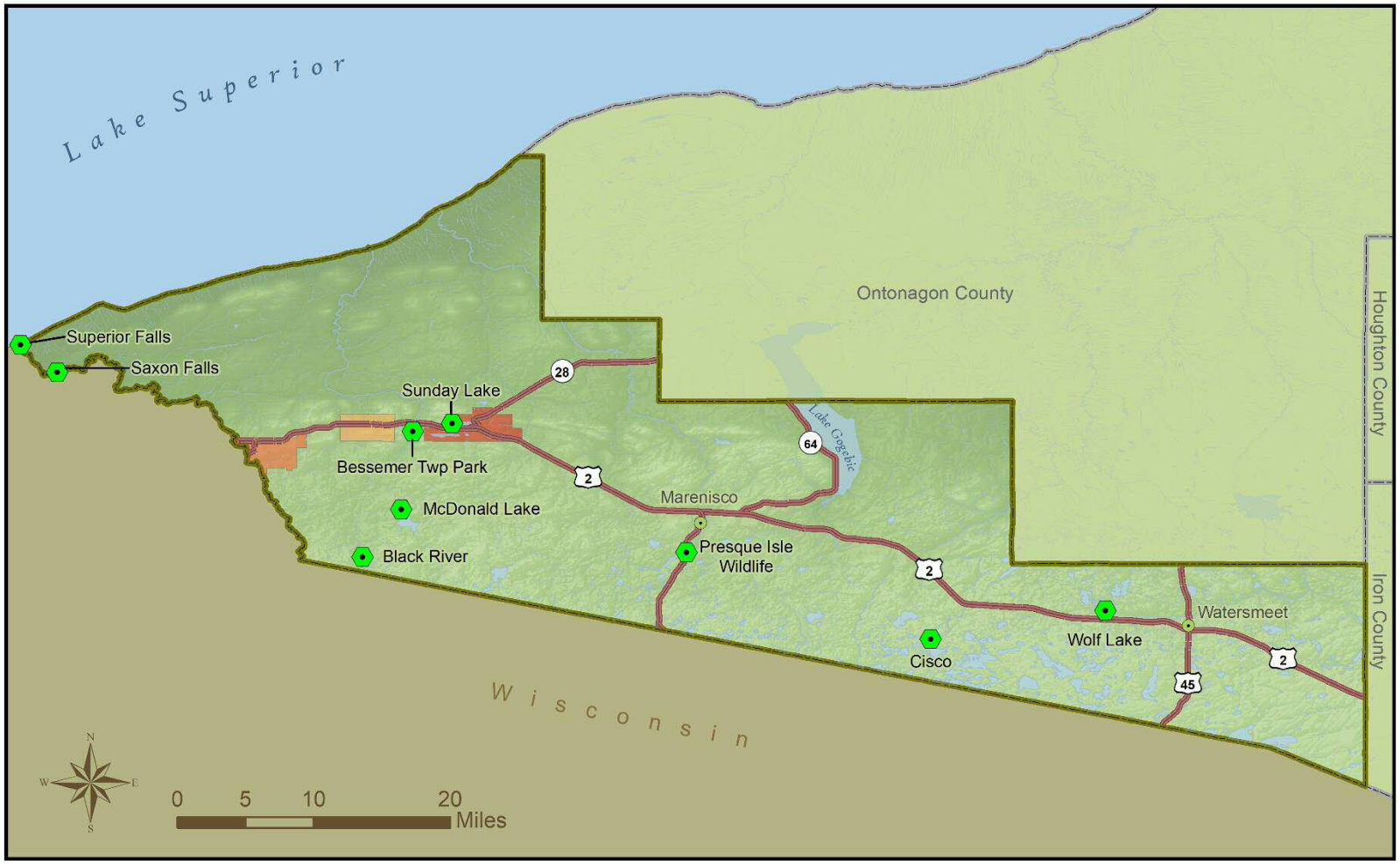
On April 17, 2002, when Gogebic County and seven other Upper Peninsula counties were inundated with springtime flooding, the Wood Bire – Presque Isle Wildlife Dam near Marenisco experienced a partial failure when a ten-foot section of the dam was washed out. While it was determined the failure caused increased flows on the Presque Isle River, damage estimates were impossible to separate from those caused by the preceding floodwaters. The McDonald Lake Dam in Erwin Township was also put at risk of failing during this event. During this time, the City of Wakefield experienced floods due to heavy rains and rapid spring melting of surrounding snowpack. The city's water treatment, wastewater treatment, and electric plant were all in danger of inundation and shutdown. The State Police Post was also evacuated due to flooding. In Gogebic County, 48 homes were destroyed, 91 suffered major damage, and 27 endured minor damage. Seven businesses were destroyed and 11 were damaged. Due to the flood damages following the dam failure, a federal Disaster Declaration was issued.

Smaller, old dams also have the possibility of failure. On April 22, 2019, a dam on the Montreal River failed after a snowmelt and heavy rain event. The failure resulted in a road closure.

Occurrence Probability and County Vulnerability

As required by the Federal Energy Regulatory Commission (FERC), evacuation plans are in place for those affected by failure of power generation dams with annual exercises and plan reviews taking place with the dam owner and local emergency management. Probability is highest along populated stream reaches and communities downstream from dams, such as Erwin, Ironwood, and Marenisco Townships. If there were a dam failure, it would be a high severity issue for these communities. If a failure occurred at the Sunday Lake floodgate, it could result in a high-severity flood event. This makes the City of Wakefield, as well as downstream Wakefield and Bessemer Townships, more vulnerable than most others to dam failure. Other jurisdictions are not as vulnerable, with low probability of experiencing a dam failure.

A vulnerability analysis for dam failure has not been conducted for all dams in Gogebic County due to insufficient data. Dam-breach analysis and mapping dam breach inundation areas (data not currently available) are the most appropriate means for examining the impact to people, property, and critical facilities. As individual dam failure analysis and inundation mapping become more available, Gogebic County intends to add this information and include a vulnerability analysis in future hazard mitigation plan updates.



Dam Inventory
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal
DEM was derived from elevation data available through the USGS
Dam locations and hazard level taken from the National Inventory of Dams
Created by WUPPDR April 2019

Hazard Potential

Low

WUPPDR of Michigan

Map 5.4: Dams in Gogebic County (NID)

Riverine and Urban Flooding

Hazard Description

Riverine flooding is defined as a periodic occurrence of overflow of streams and rivers resulting in an inundation of the adjacent floodplain. While flooding of land adjacent to streams and rivers is a natural occurrence, floodplains typically are not left in the natural state. Development in and near floodplains have increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via natural drainage now quickly runs off streets, parking lots, and rooftops, through man-made channels and pipes. This stormwater infrastructure may or may not be adequately maintained.

Riverine and urban floods are caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Bank overflows are natural and may occur on a regular basis on river systems that drain large geographic areas and many river basins. Floods on large river systems may extend several days. Many areas of Michigan are subject to riverine flooding.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams are another cause of flooding in winter and early spring. Log jams can also cause streams and rivers to be clogged up and backed-up waters to overflow the stream's banks. Either ice jams or log jams can cause dangerous flash flooding to occur if the makeshift dam-effect caused by the ice or logs suddenly gives way. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on areas with smaller drainage areas.

Urban flooding may involve low-lying area that collect runoff waters even though they are not adjacent to drains or bodies of water. It is usually due to the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are not in a floodplain. This risk does vary with topography, soil types, runoff rates, drainage basin size, drainage channel sizes, and impervious ground surfaces in each area. Other kinds of urban flooding stem from undersized or poorly designed sewer systems that cannot always process the amounts of precipitation and runoff that affects an area.

Both kinds of flooding can damage or destroy public and private property, disable utilities, make roads and bridges impassible, destroy crops and agricultural lands, cause disruptions to emergency services and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Long-term secondary dangers include potential disease outbreak, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

Climate Change Considerations

One of the Michigan trends connected with climate change is to experience increasing amounts of precipitation. This precipitation is considered more likely to take the form of acute and severe

weather events. This includes larger proportions of snow precipitation occurring in snowstorm events and cause more extensive snow accumulation, which may add to the drainage burdens of the normal melting and rainfall patterns of the spring season. Both spring and summer flood risks are likely to worsen, as are ice jam related flood risks.

Historical Occurrence

Gogebic County has been affected by several minor and major floods, most due to heavy rainfall or significant snowmelt. Flooding occurs more frequently in the western portion of Gogebic County. 11 flooding events have been reported and details of these events are listed below.

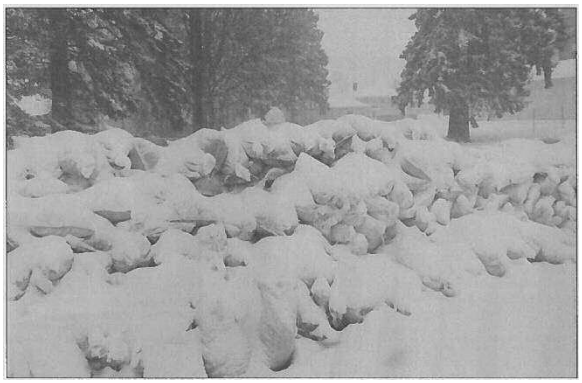
April 20-25, 1996: An ice jam at the Kimberly Road bridge on the Presque Isle River near Marenisco caused significant **riverine flooding**, causing a five-day road closure. No damages were reported.

Flooding in Ironwood due to riverine flooding, April 2002

April 14-20, 2002: Spring runoff due to record temperatures caused **riverine flooding** in the Black, Montreal, and Ontonagon Rivers to rise above flood stage. Ironwood and Wakefield were the hardest hit. Damage exceeding $1.2 million affected 166 homes and businesses, the vast majority of which were in Wakefield, and 200 people were evacuated. Highways US 2, M-28, M-64, and 25 local and county roads were closed. Partial failure of the Presque Isle Wildlife Dam occurred on the Presque Isle River. This flooding was a regional event, with over $10 million in damages to public infrastructure reported in five U.P. counties, including Gogebic. Total regional property damage was $18.5 million.

May 11-12, 2003: Significant rainfall in the western Upper Peninsula caused multiple rivers to flood. In Gogebic County, over three inches of rain was reported and caused **riverine flooding** on the Black River. No damages were reported in the county.

July 27, 2010: Nearly three inches of heavy rainfall caused **flash flooding** in Ironwood. Flooding occurred over US 2 and in several houses and buildings. Total estimated damages were $10,000.


Snow covered sandbags in Wakefield, April 2013.

May 30, 2011: Heavy rains caused **flash flooding** and washed out a road west of Little Girls Point near Junet. $1,000 in damages were reported.

Late April to mid-May 2013: Flooding throughout the county due to moderately fast melting of snowpack. The winter was characterized by much greater snowfalls than in recent years. M-28 was closed in the City of Wakefield for three days due

to inundation by Sunday Lake. Water was pumped past the lake's spillway and still-non-functioning floodgate to prevent backflow into the city along M-28. Also, in Wakefield, the sanitary sewer lift station was temporarily flooded. Some flooding and near flooding of streets occurred in the City of Ironwood. Public works employees battled flooding amid a snowstorm that dropped over a foot of snow on May 2 and 3. As in 2002, the Presque Isle Wildlife Dam in Marenisco Township suffered damage when a door broke on May 11. In Ironwood Township, many roadways were inundated throughout the county, and some culverts were washed out. By May 5, water levels had significantly fallen at Sunday Lake. By May 14, flooding had receded. A state disaster declaration was issued near the end of the flooding, and early damage estimates were $2 million for Gogebic County.

Aerial survey image of flash flooding near Saxon Harbor and Lake Road near Little Girls Point on July 11, 2016 (Photo: Michigan State Police)

July 11-12, 2016: Heavy rainfalls of 3 to 6-inches and strong winds resulted in **flash flooding** that washed out multiple roadways in Bessemer Township, Ironwood Township, and the City of Ironwood. Many people were stranded near Ironwood and Little Girls Point. The Montreal River flooded and washed out guardrails and a Gogebic County patrol car. The deputy driving the car had to be rescued. Saxon Harbor was a total loss. Damage also included a confirmed EF1 tornado in Bessemer, with unconfirmed reports of another one in Erin Township. There was loss of power throughout the county. In neighboring Iron County, Wisconsin, a 56-year old man died after his truck was swept away into a flooded creek. Total estimated flood damages were $5 million. Gogebic County declared a state of emergency on July 12, with Michigan Governor Rick Snyder declaring a state of emergency soon after.

August 10, 2017: Heavy rainfall resulted in **flash flooding**, with 6-8 inches of water over roads near the intersections of highways US 2 and M-28 in Wakefield. No damages were reported.

Flooding along US 2 in Ironwood on June 15, 2018 (Photo: WLUC-TV)

June 15-16, 2018: Significant **flash flooding** due to thunderstorms in the region. Estimates of upwards of 4 to 5-inches of rain fell in throughout Gogebic County. Roads throughout the area, including US 2 was closed due to water on the roadways. Vehicles were stranded on roads due to flooding. Multiple basements were flooded in the area. Many stores in Ironwood were without electricity for an evening. The storm did impact various counties throughout the region. A state of disaster was declared by Governor Snyder for Gogebic County. Damages are estimated at nearly $344,000.

April 22-24, 2019: Wet snowpack, along with periods of moderate to heavy rain caused widespread **riverine flooding** throughout the area. In Ironwood, Norrie Park Road was closed between Lime Street and Riverside Road due to the failure of a small, old dam on the Montreal River (also documented in dam failures). Water was also reported on Black River Road near McDonald Dam. On the 24th, numerous road closures were reported in the City of Wakefield. The Little Black River and Sunday Lake rose outside their banks. There were no reported damages.

Flood Insurance in Gogebic County

In Gogebic County, six communities participate in the FEMA National Flood Insurance Program (NFIP)[13]: the cities of Bessemer, Ironwood, and Wakefield and the Townships of Erwin, Ironwood, and Marenisco. Most other communities in Gogebic County do not regularly experience flooding, particularly to the extent that participation in the NFIP would be considered necessary. There are more than 21,800 communities nationwide that participate in the program. The NFIP provides federally funded flood insurance to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances. These communities must choose to participate in the flood insurance program. NFIP puts a special focus on mediation of insured structures that have suffered more than one loss of at least $1,000 within a rolling 10-year period since 1978; these are referred to as "repetitive loss properties." There currently are no repetitive loss or severe repetitive loss structures in Gogebic County.

Rates are determined based on a Flood Insurance Study and Flood Insurance Rate Map (FIRM), which FEMA develops during a flood hazard assessment. The FIRM is used by lenders to determine flood insurance requirements and by insurance agents to determine flood insurance premiums for specific properties. The FIRM includes areas within the 100-year flood boundary, which are termed "Special Flood Hazard Areas" (SFHAs). A 100-year flood does not refer to a flood that occurs every 100 years but refers to a flood level with a one percent or greater chance of being equaled or exceeded in any given year. In Gogebic County, the Cities of Bessemer and Ironwood and Ironwood Township have identified SFHAs. The City of Wakefield registered as a Non-Special Flood Hazard Area (NSFHA) on May 25, 1984. Both Marenisco and Erwin Townships have registered to participate in the NFIP and have limited emergency coverage granted on January 16 and May 28, 2019 respectively.

Occurrence Probability and County Vulnerability

Countywide, from 2010 to 2019, nine flood events were reported in Gogebic County – a frequency of nearly one flood event per year equating to a high probability of occurring during an average year. Of these nine events, six resulted in significant property damage, with an average of $1.063 million per event. Riverine and urban flooding is a high risk within Gogebic County because it can affect several major population areas. Most areas of Gogebic County have a moderate probability of low severity flooding, though higher occurrences of flooding typically occur in the western part of the county. The Montreal River in Ironwood (city and township) consistently causes seasonal spring flooding, which can cause trees to wash downstream and

[13] FEMA. Community Status Report Book – Communities Participating in the National Flood Program. https://www.fema.gov/cis/MI.html

create large log jams causing future flooding issues. These floods are typically of low severity, which can, under the right conditions, become highly severe and affect a larger region. To exacerbate this problem, Erwin Township is subject to lowland flooding that can submerge roads and hamper evacuation from the City of Ironwood. The City of Wakefield also has special potential for high severity flooding due to the non-functioning Sunday Lake floodgate, which could limit outflow of an overburdened Little Black River. Other areas of concern are along the Black River (City of Bessemer, Ironwood Township, and City of Wakefield) and Presque Isle River (Wakefield and Marenisco Townships) and their tributaries.

While flooding can impact a variety of critical facilities, identifying which specific facilities are most vulnerable to riverine and urban flooding is limited due to lack of available data. Critical facilities that are vulnerable to this kind of flooding include sewer and water treatment plants as well as septic and well systems. Any homes and business or industry facilities that rely on well or septic service may experience operational problems that force closure of the facility. If flood waters cover well heads, the well water is considered contaminated and no longer safe for human consumption. If grinder pumps in septic systems are inundated with water, the septic may overflow, causing additional human health issues.

Shoreline Flooding and Erosion

Hazard Description

Michigan has over 3,200 miles of coastline (the longest freshwater coastline in the world), and about 4.7 million persons live in the 41 shoreline counties of Michigan, which includes Gogebic County. Flooding and erosion along the Lake Superior shoreline are typically a result of high-water levels, storm surges, or high winds. These are natural processes that can occur at normal or even low water levels. However, during periods of high water, flooding and erosion are more frequent and serious, causing damage to homes, businesses, roads, water distribution and treatment facilities, and other structures in coastal communities. Seiches, which can drive lake water inland over large areas and may be caused by a storm surge, occur when windstorms and differences in atmospheric pressure temporarily tilt the surface of a lake up at one end. Water levels can rise to more than 10 feet. When the wind stops, lake water rebounds to the other side of the lake. This back and forth action, or oscillation, can occur for hours or even days[14].

Shoreline erosion hazards typically involve the loss of property as sand or soil is removed by water action and carried away over time. Erosion effects that are experienced along rivers may be included in this category of hazard. Shoreline erosion and flooding are natural processes, occurring at high, average, and even low Great Lakes water levels. During periods of high water, flooding and erosion are more obvious, causing serious damage to homes and businesses, roads, water and wastewater treatment facilities, and other structures near coastlines. Low lake levels can also pose a hazard as cargo ships are more prone to running aground and shorelines may become polluted from lake bottom debris.

[14] "Surges and Seiches." Michigan Sea Grant. https://www.michiganseagrant.org/lessons/lessons/by-broad-concept/earth-science/surges-and-seiches-2/

Lake Superior levels have fluctuated since prehistoric times and accurate measurements of this change are available for the last 160 years. According to the U.S. Army Corp of Engineers, the peaks of this fluctuation have been higher during this century than they were in the past. Current lake levels are over a foot or a half of meter above the average annual (1918-2018) and continue to rise. The modern range of fluctuation between periods of high and low water is 1-meter. Long-term and seasonal variations in precipitation and evaporation rates primarily control lake levels and their fluctuations.

The land in the Great Lakes region is slowly recovering from the last glacial period when ice loaded and depressed the land surface. The land is rebounding from the weight of the former glaciers at different rates. The outlet channel to Lake Superior at Sault Ste. Marie is rising more rapidly than most other points along the U.S. shore, resulting in a tilting of the lake. The amount of inundation is greatest at Duluth, Minnesota where as much as 5.4 meters of inundation has occurred over the past 2,000 years. Maximum inundation over this period for the Michigan shore occurred near Ontonagon where as much as three meters is noted.

Climate Change Considerations

Higher and lower water levels result from natural changes in climate in the region and will continue to occur. However, the impact from climate change on the magnitude and frequency of water-level change remains uncertain. Lake Superior water levels will continue to fluctuate, but the periods where it is either above or below average water levels may become prolonged.

Historical Occurrence

Gogebic County has a couple of areas with high-risk erosion identified by the Michigan EGLE (Appendix B) and local communities. These areas have mandatory and recommended setback regulations in place to mitigate losses due to erosion and shoreline flooding. Areas of concern include property along Little Girls Point and near the mouth of the Black River in Ironwood Township. There have been two reported shoreline flooding incidents at Little Girls Point. The first was on September 9, 2014 where substantial erosion occurred due to wave action. Winds were gusting over 40 mph at the park and threated park structures. There was an estimated $2,000 in property damages. The second event was on October 27, 2017, where wind gusts of over 50 mph caused lakeshore flooding at the park. Rocks and tree debris covered the park's parking lot. Estimated property damages were $10,000.

Occurrence Probability and County Vulnerability

Erosion is an ongoing and unavoidable process – one that has exceedingly high probability but low severity. Approximately two miles or 7% of the county's Lake Superior shoreline are officially designated as high-risk areas and long stretches of adjacent shoreline are also continually threatened by this hazard. Still, imminent risk of property damage is minimal. Even damage to the natural environment is generally gradual and a result of a natural process.

There have been two recent incidents of shoreline flooding in Gogebic County in the past ten years, thus the probability of occurrence is highly likely. However, shoreline flooding may become more frequent due to rising Lake Superior water levels. Coastal areas of both Ironwood and Wakefield Townships are potentially at risk from low-severity flooding. Mandatory setback

that are required for shoreline development minimize the vulnerability of this hazard in Gogebic County and keep flood risk low.

Drought

Hazard Description

Drought is a water shortage caused by unusual hydrologic conditions such as lack of rainfall and it generally lasts for an extended period, usually a season or more in length. Drought can be a normal part of an area's climate, including areas that have high or low average rainfall. The level of precipitation or runoff associated with a drought is substantially below an area's norms. The severity of a drought depends not only on its location, duration, and geographical extent, but also on an area's water supply needs for human activities and vegetation.

Drought differs from other natural hazards in several ways. First, there is no exact beginning and end point that is obvious for a drought; the effects may accumulate slowly and linger even after the event is believed to be over. Second, the lack of clearly visible and universal standards to define a drought can make it difficult to confirm in a timely manner if a drought exists and its degree of severity. Third, drought impacts are often less obvious than other natural hazards. Fourth, most communities do not have any contingency plans in place for addressing drought. This lack of pre-planning can hinder support for drought mitigation capabilities.

The severe impacts from droughts on communities and regions include water shortages for human consumption, power generation, industrial and agricultural use, and recreation; drop in quantity and quality of agricultural crops; lower water quality in lakes, rivers, and other water bodies; increase in wildfires; decline in land values; increase in insect infestation, plant disease, and wind erosion, and; possible human impacts such as food shortages, extreme heat, fire, and other health-related problems such as diminished sewage flows and increased pollutant concentrations in surface waters.

Despite thousands of miles of rivers and streams and the Great Lakes, Michigan can still experience occasional drought conditions. Most common are agricultural droughts, with severe soil-moisture deficits, which have serious consequences for crop production, particularly when coupled with extreme summer temperatures. Also, various water bodies, both inland lakes and the Great Lakes, cyclically go through periods of low-water levels. Michigan has emerged from its latest such period and is now experiencing high water levels.

Climate Change Consideration

While the effect of climate change on Michigan has involved an overall increase in precipitation and drought severity in the state has generally been decreasing, there will still be drought events and dryer seasonal phases, especially in areas that are locally more susceptible. Shorter duration seasonal droughts are expected to worsen during the warmer half of the year, even though overall annual averages of precipitation have increased. With enough planning and water infrastructure the climate change effects upon this hazard may be beneficial overall for a short period. However, the threat and hazards from drought will not disappear and in the long-term is expected to greatly worsen.

Historical Occurrence
Although Gogebic County has not had a localized drought severe enough to be recorded, the U.S. Midwest has been significantly affected by drought in five years since 1981. These wide-ranging droughts have little long-term impact on wild flora and fauna, and since Gogebic County has little cultivated land, the drought did not significantly affect agriculture. Although stream and reservoir levels may drop, the county has not faced a critical power shortage resulting from interruption of hydroelectric generation (the power grid has a high degree of regional interconnectivity). Furthermore, the county has no drinking water sources dependent on surface water, and temporary droughts have not diminished groundwater reserves to a notable extent. However, even a minor drought is one of the primary factors of wildfire potential and is a major hazard for that reason alone.

Occurrence Probability and County Vulnerability
Countywide risk of other drought effects is minimal, with low probability of a recordable (moderately severe) drought but much higher incidence of less severe conditions. If a drought were to occur, all communities are vulnerable to drought effects, such as low water supplies in groundwater and drinking wells. Severe droughts can negatively affect drinking water supplies and impact critical facilities. Possible losses to infrastructure include the loss of potable water and reduction of flow for hydroelectric power.

Ecological Hazards

The following outline summarizes the significant ecological hazards covered in this section:

1. Wildfires
2. Invasive Species

These types of hazards deal with biological ecosystems and their effects on human economy and the built environment. The most well-known ecological hazard is wildfire, which occur naturally, but become dangerous when they threaten people that live in areas where the disaster event will periodically take place. Wildfires can cause damage and threats to human health and life. Ecological hazards must also be dealt with to maintain Michigan's environmental and recreational quality of life, as well as the important economic sectors that relate to them (such as tourism, recreation, agriculture, and natural resource extraction).

Wildfires

Hazard Description
Forests cover approximately 55% (20.4 million acres) of the total land area in Michigan and provide the state with the largest state-owned forest system in the U.S. Additionally, Michigan has the fifth largest quantity of timberland acreage, which includes 19.3 million acres of softwood and hardwoods. While vast forest cover is a boom for industry and recreation, it also makes many areas of Michigan highly vulnerable to wildfires.

The landscape in Michigan has significantly changed over the last several decades due to wildland development and thus potential danger from wildfires have become more severe. Increased development in and around rural areas has increased the possibility for loss of life and property from wildfires. Although most wildfires are small (a few acres), any one wildfire can burn out of control under the right conditions and multiply annual burned acreage. There are not enough fire suppression forces available in rural areas to protect every structure from a disastrous wildfire.

Most Michigan wildfires occur close to where people live and recreate. The most immediate dangers from wildfires are the potential injury or deaths of persons who live or recreate in the affected area and the destruction or homes, timber, and wildlife. Long-term effects included scorched and barren land, loss of wildlife habitat, soil erosion, landslides, water sedimentation, and loss of recreational opportunities.

According to the Michigan Department of Natural Resources (MDNR), the main cause of wildfires in Michigan is burning yard debris (47%), such as grass clippings, leaves, and trash. Most wildfires occur in the spring when days are dry and windy with abundant dead vegetation left after the snow melts. These conditions can spread a wildfire quickly because there is less moisture in the air and the wind carries burning debris to other areas. The dead vegetation makes for good wildfire fuel.[15]

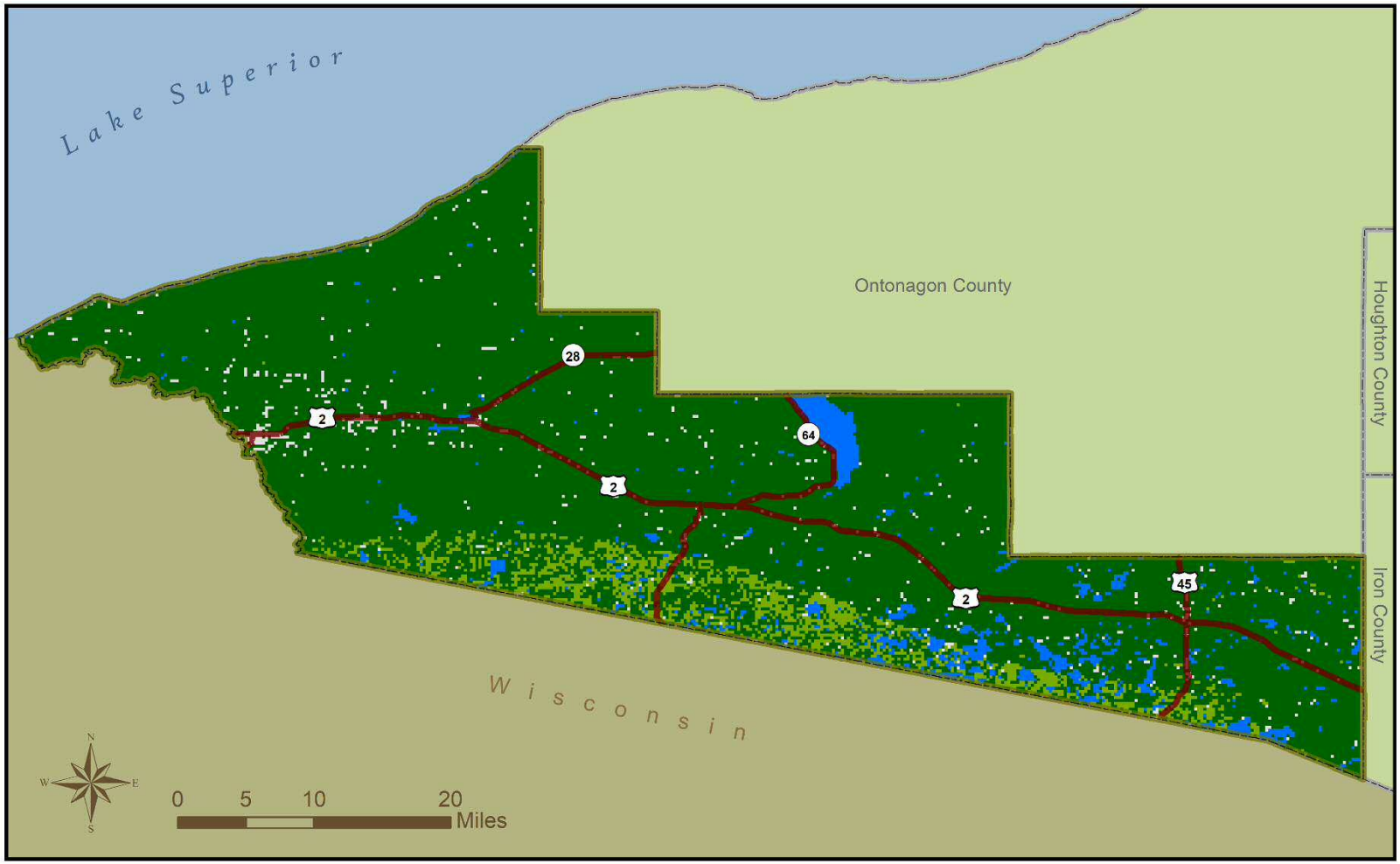
Climate Change Considerations

The average wildfire seasons has extended 78 days longer across the U.S., and large wildfires burn more than twice the area they did in 1970.[16] Changes in climate have led to hot, dry conditions that may increase fire activity. While there has been an overall increase in precipitation in Michigan, there will still be drought events and drier seasonal phases. Shorter duration seasonal droughts are expected to worsen in the warmer half of the year, which may affect wildfire occurrence. Development trends in Michigan seem to involve increases in wildfire risk over time, and annual cycles of summer drought have been projected by many climate analysts in the coming decades.

Historical Occurrence

Approximately 85% of Gogebic County is forest cover and is an asset for both industry and recreation, but also leaves the county highly vulnerable to wildfires (**Map 5.5**). From 1981 to 2018, the MDNR reported 120 wildfires (254.9 acres burned) in the areas under MDNR jurisdiction.[17] There have been no reports of a significant wildfire event in Gogebic County.

[15] MDNR, https://www.michigan.gov/michiganprepares/0,4621,7-232-65025_65201---,00.html
[16] Center for Climate and Energy Solutions. https://www.c2es.org/content/wildfires-and-climate-change/
[17] MDNR Wildland Fire Application. http://www.mcgi.state.mi.us/wildfire/index.html



Wildfire Hazard Potential
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal; Hazard data was developed by the USDA and USFS in 2014; Created by WUPPDR June 2019
https://www.firelab.org/project/wildfire-hazard-potential

Wildfire Potential

Very Low | Low | Moderate | High | Very High | Non-burnable | Water

WUPPDR of Michigan

Map 5.5: Wildfire Hazard Potential in Gogebic County

Occurrence Probability and County Vulnerability
Gogebic County has an ongoing risk of wildfires due to the tremendous amount of forest cover and increasing hazard due to urban infringement in rural areas. However, the probability of a future event is low. Development in rural areas can intensify overall damage from wildfires. All areas of the county have some vulnerability to wildfire, but extent varies greatly by location. Homes and other built infrastructure, such as roads and power lines, in rural townships are more vulnerable to wildfires due to their proximity to undeveloped areas.

Invasive Species

Hazard Description
An invasive species is defined as a species that is 1) non-native to the local ecosystem and 2) whose introduction causes or is likely to cause economic or environmental harm, or harm to human health. Invasive species can be plant, animals, and other organisms (e.g., microbes). Human actions are typically the cause of invasive species' invasion; it is not a natural shift in a species distribution. Nationally, the current environmental, economic, and health costs associated with invasive species were estimated as exceeding the costs of all other natural disasters combined.

Invasive species can be transported into an ecosystem in many ways, such as on animals, vehicles, ships, commercial goods, produce, and clothing. Although some non-native species are used to prevent erosion, provide fishing and hunting opportunities, and as ornamental plants and pets, occasionally a non-native organism flourishes too well and causes unwanted economic, ecological, or human health impacts. "Invasive" or "nuisance" are used to describe such species.

A plant or animal that causes little damage to agriculture or natural ecosystems in one area may cause significant problems in another. Certain non-native species are highly successful in their new habitats because they out-compete native plants or animals and have no natural controls (predators, diseases, etc.) in their new area. Hundreds of new species from other countries are introduced intentionally or accidentally to the U.S. each year. Transportation efficiencies make it possible for invasive species to travel around the globe in hours and make it possible for organisms to survive transportation from one continent to another. At least 200 well-known, high-impact, non-native species presently occur in the U.S.

As more adaptable and generalized species are introduced to environments already impacted by human activities, native species are often at a disadvantage to survive in what was previously a balanced ecosystem. While invasive species primarily cause environmental damage and degradation, there are situations in which serious threats to public health and well-being can occur due to animal disease or plant/animal infestation. Invasive species can also create serious public safety threats; some invasive insects can cause significant damage to trees (disease or death) and may lead to partial/total tree collapse.

Terrestrial species are likely to have more public awareness than aquatic ones. Although there have been well-publicized aquatic species of concern (e.g., zebra mussels, Asian carp), people

tend to be more aware of the impacts of terrestrial species, unless their recreational or business activities are impacted by aquatic species.

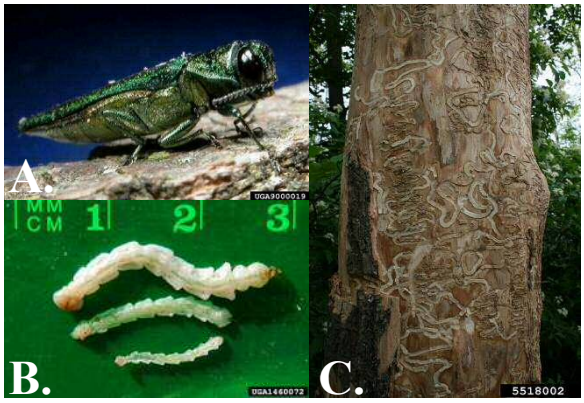
Climate Change Considerations

Due to the lengthening of the growing season in Michigan, species that had been previously found only in warmer areas to the south have started to appear. As seasonal temperatures fluctuate, invasive species can establish themselves in previously inhospitable climates. While the definition of invasive species specifically refers to species introduced by humans, to distinguish these patterns from naturally occurring ones, species transported by human action can be more likely to survive as climatic changes occur.

Historical Occurrence[18]

Due to Gogebic County's large amount of forest coverage, lakes, and rivers, both terrestrial and aquatic species have been found throughout the County. There have been over 3,800 reported locations of invasive species, most of which are terrestrial invasive plants,[19] and 219 invasive species reported.[20] The Western Peninsula Invasives Coalition (WePIC), a partnership between many organizations throughout Gogebic, Iron, and Ontonagon Counties, seeks to prevent, contain, and manage non-native invasive pests throughout the three counties. The following are some examples of reported invasive species that have been found or threaten the local ecosystem in Gogebic County:

Invasive Insects



Emerald ash borer adult (a), larvae (b), and damage (c) to ash trees. (Photo: David Cappaert (a, b) and Troy Kimoto (c))

Emerald Ash Borer (*Agrilus planipennis*): First discovered in southeastern Michigan near Detroit in 2002, this exotic beetle has killed hundreds of millions of ash trees throughout the U.S. Adult emerald ash borers (EAB) feed on ash foliage but cause little damage. However, the larvae feed on the inner bark of the ash trees, disrupting the tree's ability to transport water and nutrients. Many trees lose approximately 30 to 50 percent of their canopy in one year and the tree is often killed after 2-3 years of infestation. Most devastation has occurred in southeast Michigan, where about 20 million trees have been killed. EAB has not been reported within Gogebic County, but due to its proliferation in nearby counties, it may have an unreported presence.

Asian longhorned beetle (*Anoplophora glabripennis*): The Asian longhorned beetle (ALB) is a potential threating invasive insect that feeds on a variety of hardwood trees, such as maples, birch, and ash. The larvae feed on the inner bark of trees and form tunnels or galleries in tree

[18] All images in this section, except Sea lamprey photo B, are from www.bugwood.org
[19] Midwest Invasive Species Information Network. Data Map by State and County. www.misin.msu.edu
[20] Early Detection & Distribution Mapping System. www.eddmaps.org

trunks and branches, which weaken the tree's health and structure. ALB has not been found in Michigan but can be transported into new areas in logs and firewood.

Invasive Plants

Wild parsnip (*Pastinaca sativa):* Wild parsnip has been found in Michigan since 1838 and was originally introduced to the U.S. as a food source. It is commonly found growing in open areas, fields, roadsides, and disturbed areas and can grow in a variety of soil types and moisture levels. Wild parsnip can spread through seeds carried by wind, water, and equipment. This kind of parsnip is also a human health hazard. The sap found in the stem, leaves, and flowers contain a chemical that increases skin sensitivity to sunlight and cause severe rashes or blisters. Wildlife and domesticated animals are also vulnerable.

Invasive Aquatic Plants

Eurasian watermilfoil (*Myriophyllum spicatum*): Eurasian watermilfoil (EWM) is an aquatic plant that was found in Michigan freshwater lakes during the 1960s. EWM has spread quickly throughout all U.P. counties. Stem fragments, which can be attached to fishing lines or boats, can take root and form a new colony after being transported from one water body to another. It forms thick underwater vegetation mats that shade out native plants and impedes recreational activities, such as swimming, fishing, and boating. Prime EWM habitat include lakes that have been disturbed by watershed runoff, shoreline construction, or stressed by pollution. If a lake has a healthy population of native aquatic plants, EWM has a hard time establishing itself in the lake.

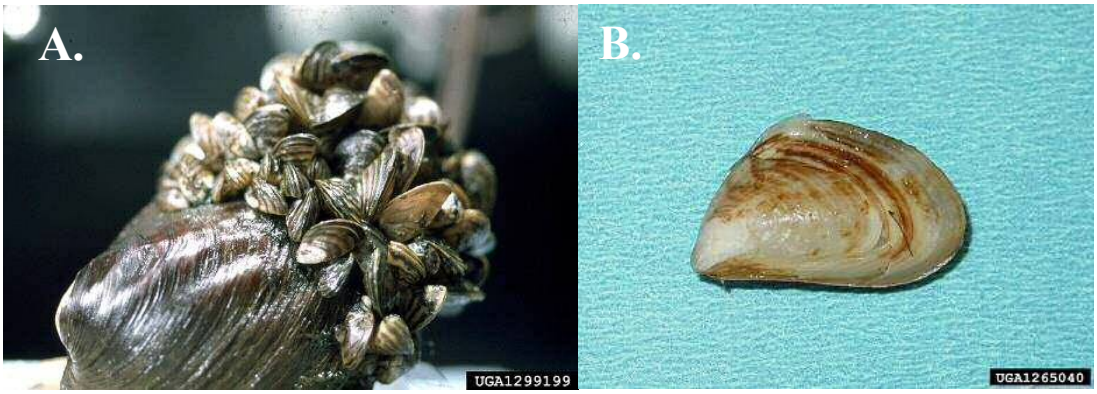
Eurasian watermilfoil (Photo: Chris Evans, University of Illinois)

Purple loosestrife (*Lythrum salicaria*): Purple loosestrife thrives in shorelines, roadsides, and wetlands. It is a perennial invasive plant, with spikes of magenta flowers that are present for most of the year. Loosestrife can spread quickly and form dense stands, replacing native vegetation which reduces food, shelter, and nesting sites for turtles, birds, frogs, and other wildlife. Its seeds can germinate in water, but it prefers shorelines that are not always flooded. The loosestrife has a large root mass and will survive even if the top is completely removed. Purple loosestrife was first introduced to the U.S. in the 1800s from Eurasia as an ornamental plant and for bee keeping. It has since spread to every U.S. state.

Invasive Aquatic Species

Dreissenid Mussels (including Zebra Mussels and Quagga Mussels); family *Dreissenidae*: Dreissenid mussels have been present in the Great Lakes since the late 1980s and were transported to the area via ballast waters from shipping barges. Both mussels can attach to hard surfaces, clogging water intake pipes and fouling other hard-shelled animals such as clams. Zebra mussels have significantly reduced plankton populations, as mussels can filter large

volumes of water for food, which can deplete food resources of larval and planktivorous fishes like smelt and alewife. This also results in an increase in water clarity and an increase in aquatic plants. Clear water is aesthetically pleasing, but the clarity indicates that there have been drastic changes at the base of the food web. While more attention has been given to the zebra mussels, quagga mussels have a large spatial extent in the Great Lakes as it can tolerate colder and deeper waters than zebra mussels.



Zebra mussel (Photo: A; Randy Westbrooks, Invasive Plant Control, Inc.) and quagga mussel (Photo: B; Amy Benson, USGS)

Sea lamprey (*Petromyzon marinus*): Sea lamprey were first discovered in the Great Lakes in the 1800s and its introduction into Lake Superior has caused serious decline in fish populations and an alteration of the ecosystem. The lamprey uses its suction cup like mouth to latch onto the skin of a fish and scrapes away tissue with its sharp probing tongue and hooked teeth. Secretions in the lamprey's mouth prevent the victim's blood from clotting and the lamprey sucks the blood from the fish. Victims typically die due to excessive blood loss or infection. The sea lamprey has played a significant role in the decline of Lake Superior lake trout, a key predator fish, which has allowed other invasive fish species, such as the alewife, to explode in population. Control efforts to mitigate the impacts of lamprey have been used, but it is still present in the Great Lakes.

Sea lamprey attached to a fish (Photo: A; U.S. Fish and Wildlife Service) and mouth (Photo: B; Angela Yu)

Occurrence Probability and County Vulnerability
The probability of occurrence for invasive species for Gogebic County is highly likely and will rise due to the continual transport of goods and expanding global trade. This has created opportunities for many organisms to be transported to and establish themselves in new countries and regions. There are several invasive species that have yet to be found in Gogebic County or surrounding area, but once established, they are hard to eradicate because most people will not notice their presence until the damage is already done.

The entire population is vulnerable to invasive species because the hazard primarily impacts the environment. The destruction that invasive species have on woodlands and water features ultimately impacts humans by diminishing the positive features that nature offers and diminishing our food supply. A widespread insect infestation, such as from the Emerald ash borer, can create serious public safety threats due to dead and dying trees being fire prone (due to their dry, brittle nature) or to partial/total collapse due to high winds or ice/snow accumulation. The falling trees or limbs can bring down power lines, cause damage to public and private structures, and cause injuries or death. Transportation infrastructure is also vulnerable to damage as tree debris can fall onto roadways and trails, blocking commuters, trail users, and emergency response vehicles.

Geological Hazards

The following outline summarizes the significant geological hazards covered in this section:

1. Earthquakes
2. Subsidence (Ground Collapse)

Although some states recognize "landslides" as an additional hazard, Michigan's geology and history tends to make it more prone to land subsidence instead. Michigan's two main vulnerabilities to ground movement are therefore identified in the sections on earthquakes and subsidence hazards.

Earthquakes

Hazard Description
Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes or come as a series of tremors over a period of several days. Earthquakes usually occur without warning; however, scientists cannot yet predict exactly when or where an event will occur. Earthquakes tend to strike repeatedly along faults, which are formed where tectonic forces in the Earth's crust cause the movement of rock bodies against each other. Risk maps have been produced which show areas where an earthquake is more likely to occur.

Most areas of the country are subject to earthquakes, including parts of Michigan, and they occur thousands of times a year. Most earthquakes are minor tremors and result in little or no loss of

life, property, or essential services. However, earthquakes are dangerous because they can cause severe and sudden loss and devastation without warning. Deaths and injuries are caused indirectly through the collapse of structures. Earthquakes are measured by their magnitude (amount of energy released at the epicenter) and intensity (measure of damage done at one location; essentially the same as "severity" as classified throughout this plan). The Richter Magnitude Scale is commonly used to determine earthquake magnitude, and the Modified Mercalli Intensity Scale is used for intensity. A 5.0 on the Richter Scale is a moderate event, while an 8.0 is a catastrophic event. The Mercalli Intensity Scale describes 12 increasing levels from imperceptible to catastrophic.

Michigan is not located in an area subject to major earthquake activities. Although there are faults in the bedrock of Michigan, they are now considered relatively stable. Earthquakes risks in Michigan are generally low, which means structures or utilities are not necessarily built to withstand even small seismic events. Due to low risk, Michigan may be more vulnerable to an earthquake because of poor preparation.

Historical Occurrence

No severely destructive earthquake has ever been documented in Michigan. However, several mildly damaging earthquakes have been felt since the late 1700s. Earthquake tremors have been felt in the Michigan Territory, with the earliest recorded in 1811. Up to nine tremors from the New Madrid Seismic Zone, which runs from Cairo, Illinois through New Madrid, Missouri to Marked Tree, Arkansas, were reportedly felt in Detroit. Since then, there has been only questionable activity in the Upper Peninsula, occurring in the Keweenaw Peninsula in 1905, 1906, and 1908. While there were explosions and ground shaking felt as far away as Marquette, it is believed to have been from pillars collapsing in local mines.

Occurrence Probability and County Vulnerability

The probability of an earthquake occurring anywhere in Gogebic County is very low – nearly zero. Due to the low probability of an earthquake, no critical facilities nor municipalities were considered vulnerable from earthquake impacts.

Subsidence (Ground Collapse)

Hazard Description

Subsidence is depressions, cracks, and sinkholes in the ground surface that can threaten people and property. When there is a collapse or lowering of a land surface, it can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities due to the dissolution of limestone or other soluble materials, such as salt and gypsum, by groundwater. Overtime, the dissolution of rock into groundwater can create a void that may be subject to sudden and catastrophic collapse, causing a sinkhole. Human-induced subsidence is caused mainly by groundwater withdrawal, drainage of organic soils, and underground mining. In the U.S., these activities have caused more than 17,000 square miles of surface subsidence, with groundwater withdrawal as the primary culprit.

In Gogebic County, the greatest risk of subsidence is associated with underground mining. Mine subsidence is a geologic hazard that can occur with little or no warning. It occurs when the ground surface collapses into underground mine areas. Strain from geological movements, additional surface loading, and vibrations from truck traffic and other industrial machinery can cause the ground above and around old mines to sink and collapse. Industrial or residential developments that are near or above active or abandoned mines are threatened by subsidence due to their proximity to underground cavities. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life.

The legacy of underground mining can be felt throughout the state, especially in the Upper Peninsula. Many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. Unfortunately, records of abandoned mines are often unreliable and sometimes non-existent; it is often difficult to determine exactly where the mines were located. In some cases, mine locations are not publicly available to prevent people from visiting these locations to reduce potential injuries. Many areas throughout the state may have been developed over abandoned mines and may not be aware of it. While underground mining has fueled economic growth in many parts of the state, it has left a legacy or threat of subsidence. Old abandoned mines will eventually begin to collapse under their own weight or human neglect and oftentimes can swallow up whatever is built upon them.

Historical Occurrence

Michigan has a rich mining heritage and a wide variety of mineral resources, most notable of which are copper ore, iron ore, sand, gravel, coal, salt, oil, and gas. Underground mining has occurred on a significant scale throughout the history of the Upper Peninsula. Michigan's Lake Superior region has been home to significant iron ore mining operations since the mid-1800s. In the late-1800s, Gogebic County was a focus of iron ore mining. During that time, the Gogebic Range was one of the last Upper Peninsula iron range to be opened and mined for iron ore.[21] The first ore was found in 1883 at a location that became the Colby Mine. At the peak of the mining era in 1920, this mine shipped nearly 8 million tons of iron. Mining activity ended in 1967, when the last shipment of iron ore was sent out. The Gogebic Range and associated mining activity run approximately concurrent with Highway US 2 from Ironwood to Wakefield (**Map 5.6**).

There are over 800 underground mines in Michigan, with more than 2,300 or other openings. Many mines were opened in the 1840s and even though a county mine inspector has inspected many mine sites, some are still unknown and/or unmarked. There are limited records of the locations of shafts, and the extent of underground minds and proximity to surface to the surface may be unknown. This is also the case in Gogebic County. However, the county does not currently have a mine inspector. Mine locations do become identifiable when ground collapse or sinkholes appear. In Gogebic County, this has occurred near recreational trails in Ramsay and Ironwood.

[21] Johnson, David. "Michigan Iron Mines." Mining Artifacts. http://www.miningartifacts.org/Michigan-Iron-Mines.html

Based upon Michigan Department of Natural Resources (MDNR) maps of underground mine locations, the following jurisdictions in the County have been identified as having a noteworthy overlap between the location of known iron mines and properties and infrastructure that are currently in use within or near such areas include the City of Bessemer, Bessemer Township, Ironwood Township, the City of Wakefield (including areas near M-28), and Wakefield Township (some areas near US 2).

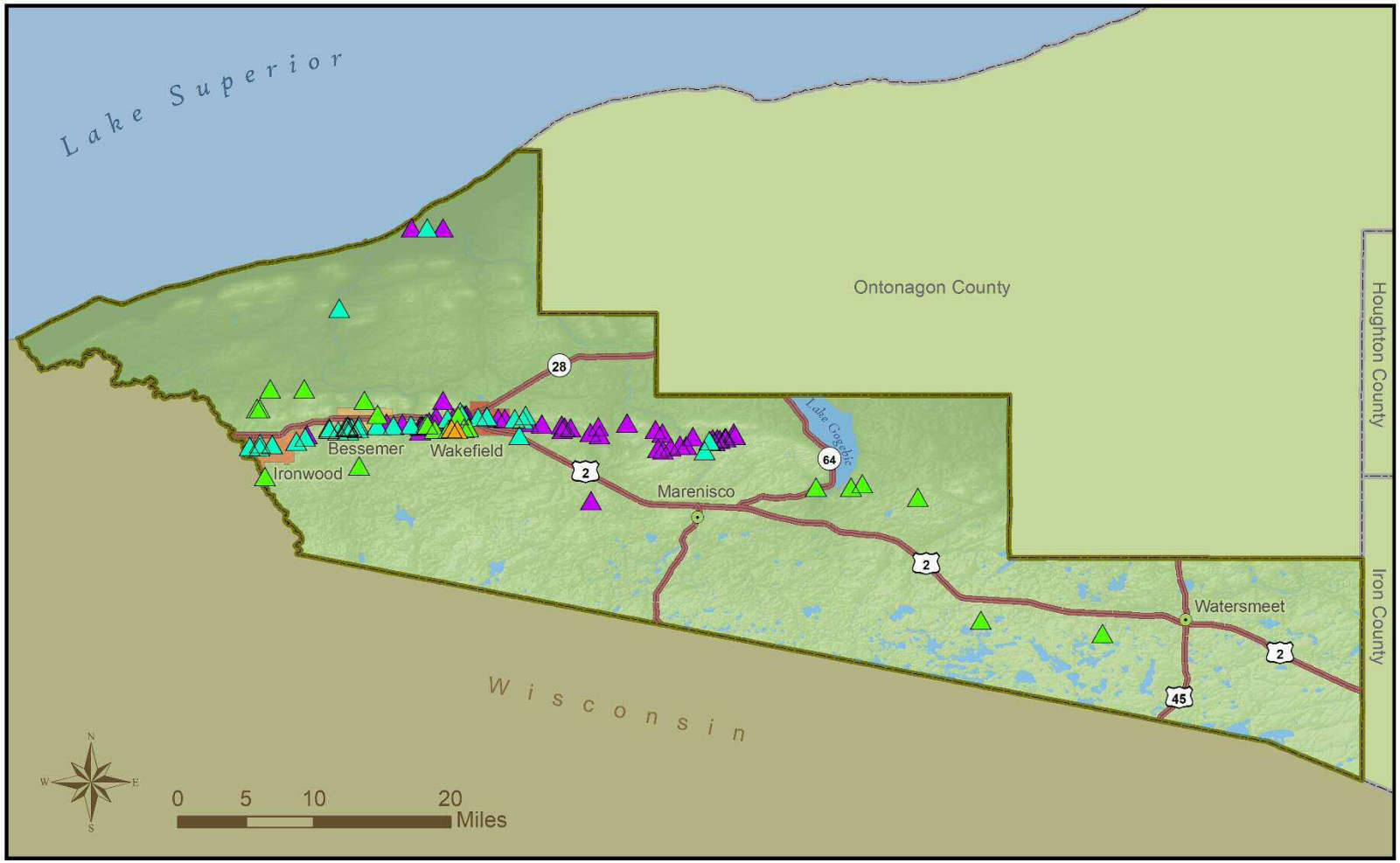
Sinkhole near Ironwood, June 3, 2014 (Photo: Daily Globe)

On June 2, 2014, frequent rains caused a sinkhole to expand along a trail in Ironwood.[22] Fencing had been installed prior to the event as mining subsidence was occurring.

Occurrence Probability and County Vulnerability

Michigan has not had a catastrophic subsidence incident that involved death, injury, or widespread property damage. However, smaller subsidence incidents have occurred that involved a single site or structure. Subsidence will continue to pose some risk in the future because of both known and unknown potential hazards. Most mine shafts are on private land and pose a serious risk to landowners or those that use the property. Municipalities with mines, such as the Cities of Bessemer and Wakefield and the Bessemer, Ironwood, and Wakefield Townships, are more vulnerable to subsidence compared to other locations in the county. At present there is no mine inspector on Gogebic County staff to direct county response to potential problem areas or to complete an inventory of historic mines and mine shafts. In Gogebic County, the probability of subsidence is high.

[22] "Photos from: Sinkhole in Ironwood continues to grow." (2014, June 2). Daily Globe. https://www.yourdailyglobe.com/photos/big/2975/12



Mine Locations
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal;
DEM was derived from elevation data available through the USGS;
Mine location data was downloaded from the National Mine
Repository https://mmr.osmre.gov/ Created by WUPPDR April 2019

Mine Type

Surface | Surface-Underground | Underground | Unknown

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Map 5.6: Mine Locations by Type in Gogebic County

Technological Hazards: Industrial Hazards

The following outlines the significant industrial hazards that are covered in this section:

1. Scrap Tire Fires
2. Structural Fires
3. Hazardous Materials: Fixed Site Incidents
4. Hazardous Materials: Transportation Incidents
5. Petroleum and Natural Gas Incidents

This section covers many related types of events that stem from breakdowns or weaknesses in industry and the built environment. Unlike ordinary fires and wildfire events, scrap tire fires are a special case of industrial hazard as these types of fires involve toxic smoke and chemical residues that have more in common with hazardous material incidents. This is also the case for structural fires, as it considers various types of large fires that occur among important buildings or structures. This hazard analysis focuses on larger-scale fires that have greater potential to affect an entire community, either through a fire's magnitude or through the vital nature of the facilities or resources that it affects.

The other hazards listed, specifically dealing with hazardous materials, cover a wide array of extremely hazardous substances across diverse situations that typically involve industrial or warehousing operations. Fixed site incidents include a consideration of fire-related industrial accidents and explosions, even if these did not involve a hazardous substance. The emphasis is on events of a relatively large magnitude, particularly those that resulted in states of emergency, evacuations, impairment or loss of economically significant or critical facilities, or multiple causalities.

Overlap with Other Sections of Hazard Analysis

Various types of structural, scrap tire, and industrial fires may be caused by other large-scale disaster events, such as lightning strikes which cause direct ignition of structure fires and the destruction caused by tornadoes could also lead to a fire. Additionally, wildfires have a clear potential to ignite structures and scrap tire piles. A structural fire involving a critical facility has the potential to cause infrastructure failures, energy emergencies, flooding, wildfires, dam failures, and transportation accidents.

Scrap Tire Fire

Hazard Description

A scrap tire fire is a large uncontrollable fire that burns scrap tires being stored for recycling or reuse. Scrap tire fires are dangerous because they can require significant resources to control and extinguish, often beyond the capability of local fire departments. Furthermore, the extreme heat from the fire can convert a standard automobile tire into about two gallons of oily residue. This residue can leach into soil or runoff into surrounding waterways, creating an environmental hazard. Scrap tire fires may also require temporary evacuation of some residences and businesses and even close roadways.

Michigan generates approximately 10 million scrap tires each year. Whole tires are banned from disposal in Michigan landfills due to their associated problems. Stockpiled tires can be breeding grounds for mosquitoes and can be homes to snakes and other small mammals. Although responsible means of tire storage and disposal have become more common, tire dumps of the last 40 years still present environmental and safety hazards.

Historical Occurrence
The Gogebic Range Solid Waste Management Authority in Ironwood is a registered scrap tire collection site. Residents can bring up to 9 automobile tires to the waste transfer station for a small disposal fee. Registered sites are required to meet strict storage and transportation requirements including isolation from potentially hazardous materials from tires due to possibility of a fire. Other scrap tire sites may be in Gogebic County, but they are not officially registered, so their locations are unknown.

Occurrence Probability and County Vulnerability
There have been no known scrap fire tire incidents in Gogebic County. Risk is low due to heavy regulation of scrap tire collection sites. An additional but unknown risk exists due to the possibility of unknown and unlicensed storage areas. Although the probability of a scrap fire tire is very low, severity is high as a small mistake on either a registered or unregistered site can spark a severe fire – particularly where regulation is lax. Because of the low occurrence probability, the associated vulnerability is also low.

Structural Fires

Hazard Description
In terms of average annual loss of life and property, structure fires are by far the most common and significant hazard facing communities in Michigan and across the country. Structural fires cause more property damage and loss of life than all types of natural disasters combined. These fires include any fire in or on a building or other structure, even if the structure itself was not damaged. Direct property losses due to fire exceed $9 billion per year nationwide and much of that figure is the result of structural fires. In 2017, there were 13,523 structure fires statewide resulting in over $415 million in losses and 104 deaths. Most deaths are due to structural fires in homes. In Michigan, residential fires account for 72.4% of all structural fires and cause nearly 82% of fire fatalities.[23]

Structural fires can cause displacement and homelessness, in addition to serious injuries, death, and economic losses. Beyond the small-scale structural fires that only impact a single home or two, emergency management authorities are primarily focused on disaster level events involving multiple or major structures such as hotels, college residence halls, and major employers and community facilities (e.g., schools and hospitals). Structural fires occur more frequently than other Michigan hazards and often cause more deaths, injuries, and property damage.

[23] U.S. Fire Administration, Fire Statistics by State. www.usfa.fema.gov/data/statistics/states/michigan.html

Historical Occurrence

Structural fires are of special concern in Gogebic County because almost half of the buildings were built before 1940. Many of these older homes, as well as numerous camps and cabins in the woods, are also heated by wood burning stoves. Michigan has a relatively high fire death rate at 12.3 deaths per million people, whereas the national rate is 10.9 per million (both as of 2016).

Firefighters work to control a fire on Aurora Street in downtown Ironwood on February 20, 2018 (Photo: Jason Juno/Daily Globe)

In the early morning hours of February 20, 2018, a fatal fire destroyed two buildings in downtown Ironwood. Three Ironwood residents died from smoke inhalation, while three others were rescued via windows and taken to the hospital. Due to the fire, one of the buildings collapsed and asbestos mitigation had to take place during the clean-up of the site. Direct cause of the fire is still unknown.[24]

Occurrence Probability and County Vulnerability

The probability of a structural fire in Gogebic County is highly likely with potentially extreme severity throughout the county. Severity is highest in cities and villages with densely populated neighborhoods. The county has multiple fire departments with mutual aid agreements in place to respond to structural fires. Education and operational fire detectors can often mitigate the loss from this type of hazard.

Due to an older housing stock, compact development in downtown areas, and remote development, Gogebic County is vulnerable to fire. Certain zoning ordinances can help reduce vulnerability to fires by improving safety and reducing potential losses from fires. Examples include property setbacks and road widths to allow easy access for emergency vehicles.

[24] "Downtown Ironwood fire among top local stories of 2018." Daily Globe. https://www.yourdailyglobe.com/story/2018/12/29/news/downtown-ironwood-fire-among-top-local-stories-of-2018/11471.html

Vulnerability to structural fires is high for low-density rural areas due to long travel or response times by responders. Additionally, rural fire departments find it difficult to recruit and sustain volunteer firefighters as the population ages. Also required training has greatly increased which has made recruitment and retention of firefighters more difficult.

Hazardous Materials: Fixed Site Incidents

Hazard Description

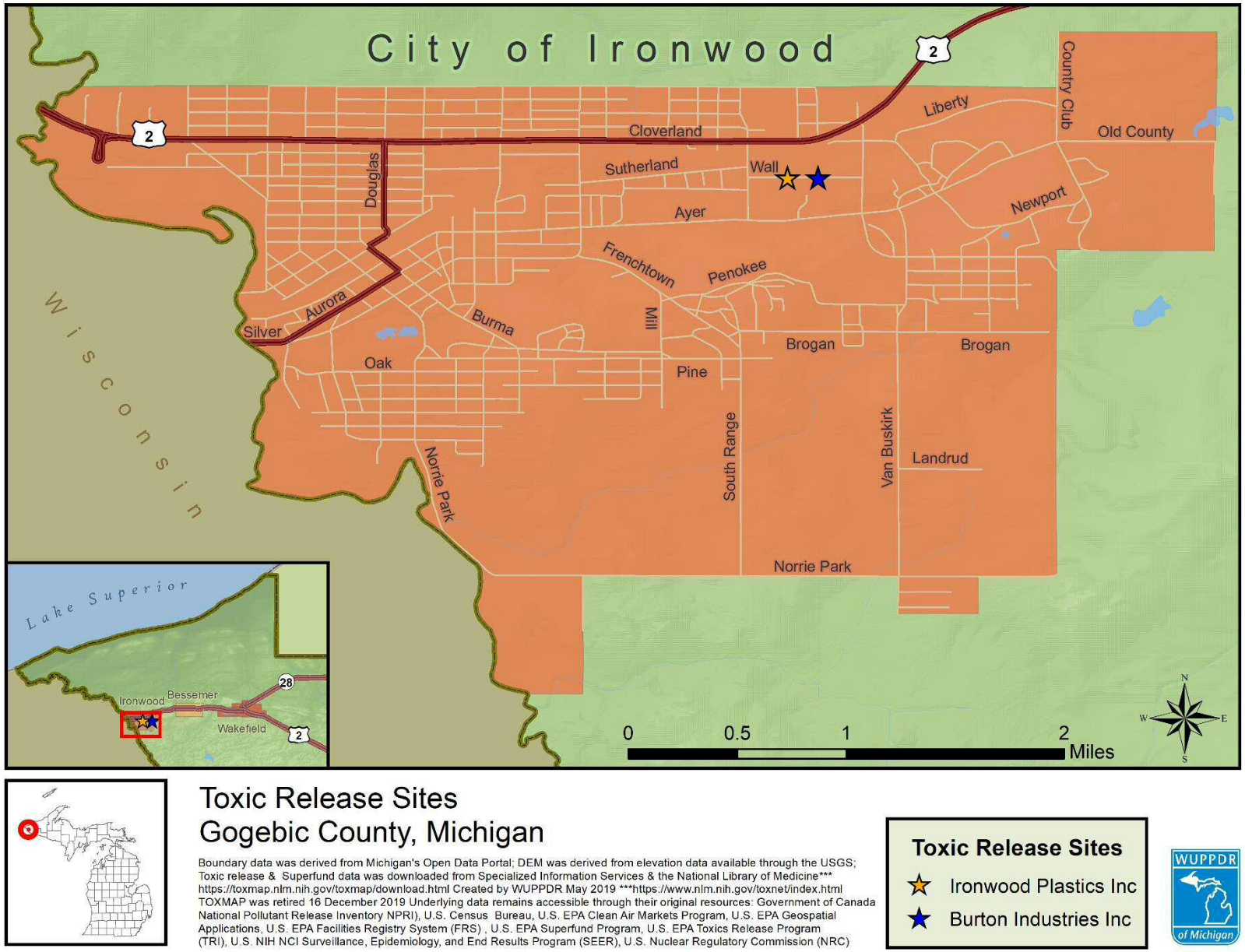
As new technologies have developed, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities. Hazardous materials, if released, pose a potential risk to life, health, property, or the environment due to their chemical, physical, or biological nature. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

Hazardous materials are highly regulated by federal and state agencies to reduce the risk to the public and environment. Despite precautions to ensure careful handling during the manufacture, transport, storage, use, and disposal of these materials, accidental releases do occur. Although most fixed site incidents occur at industrial facilities, this is not always the case. Incidents can occur at gas stations, auto shops, and other locations that store hazardous materials. Areas at highest risk after an incident are within a one to five-mile radius of identified hazardous material sites. Many communities have detailed response plans in place to mitigate the harm to people, property, and the environment from hazardous materials.

Historical Occurrence

The Superfund Amendments and Reauthorization Act (SARA) Title III establishes emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. Facilities with supplies of extremely hazardous substances are required to report this information. Title III also identifies what steps facilities, the state, and local communities must take to protect the public from hazardous materials. There are five facilities in Gogebic County with supplies of extremely hazardous substances that are reported under SARA Title III. Charter Communications (Ironwood), the City of Ironwood Water Treatment Plant, and three AT&T facilities (Wakefield, Bessemer, and Ironwood) have reported as SARA sites. There are also two facilities in Gogebic County included on the Toxics Release Inventory (TRI): Ironwood Plastics Inc. and Burton Industries, Inc (**Map 5.7**).

While there are facilities that have supplies of Extremely Hazardous Substances, they are isolated and in relatively small quantities. Risk to the public is minimal since few, if any applicable, sites exist. No catastrophic hazardous material spills have occurred in Gogebic County.



Map 5.7: Toxic Release Inventory Sites in Gogebic County

Occurrence Probability and County Vulnerability
Gogebic County is home to various industrial businesses that have the potential to create an industrial accident. Probability of a new fixed-sited incident is very low, but severity, if an event were to occur, can range from moderate to high. Many of these facilities are private and it is not public knowledge what chemicals are used and stored at each site. The City of Ironwood is vulnerable to a fixed site incident due to the presence of facilities with toxic chemicals. These facilities are not closely located to critical facilities in the area.

Hazardous Materials: Transportation Incidents

Hazard Description
Because of the extensive use of chemicals in society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments daily through local communities. A transportation incident or accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. Areas at greatest risk are those within one to five miles from major transportation routes.

Michigan has had numerous hazardous material transportation accidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Since 2010, the U.S. Department of Transportation recorded 3,515 hazardous material incidents in Michigan.[25] They are effectively dealt with by local and state emergency responders and hazardous material response teams. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material can adversely impact the life safety and/or health and well-being of those in the area surrounding the accident site. Statistics show that most hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure.

Michigan has had relatively few large-scale, serious hazardous material transportation incidents, but has had numerous small-scale material transportation incidents that required a response by local fire department and hazardous material teams, and many events also required evacuations and other protective actions.

Historical Occurrence
In Gogebic County, Highways US 2 and M-28 are major transportation routes for trucks traveling to and from Canada. The Illinois Central Railroad crosses part of the west end of the county from Wakefield to White Pine in Ontonagon County. The county also has many miles of shoreline susceptible to shipping accidents on Lake Superior. The types and amounts of hazardous materials being transported are often unknown. While there are state and federal restrictions for the transport of hazardous materials, this information is not required to be passed on to the local units of government potentially affected by a transportation accident. However,

[25] Incident Statistics. Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation. https://www.phmsa.dot.gov/hazmat-program-management-data-and-statistics/data-operations/incident-statistics

the county Emergency Manager occasionally receives notices for passage of hazardous materials trucks passing through the county.

On December 24, 2014, a semi-tractor trailer skidded on black ice, went out of control, and struck a guardrail on US- 2 near Watersmeet. The tractor detached from the trailer and rolled over, which was then punctured and leaked about 1,000 gallons of fuel. The tractor was loaded with around 8,000 gallons of regular unleaded fuel and diesel fuel. A Krist Oil emergency response team was called out to pump the remaining 7,000 gallons of fuel into another tanker and help with the clean-up effort. The Ironwood Public Safety Department's (IPSD) hazardous materials team also responded, marking the first time the team had used its equipment.

Fuel tanker on its side following an accident on December 24, 2014. Workers try to pump fuel out of the tanker into another tanker (Photo: Fire Officer Brandon Snyder/IPSD; Daily Globe)

On August 15, 2019, a tractor leaked diesel fuel onto the eastbound lane and shoulder of highway US 2. The amount of fuel that was on the road was not reported, but the tractor had a full 81-gallon tank. Crews responded to the scene and were able to contain the fuel and clean up the roadway.[26]

Occurrence Probability and County Vulnerability

In Gogebic County, the probability of a hazardous materials transportation accident is moderate based on history, but there is a considerable risk. This is due to the high level of trucking traffic, proximity to shipping lanes, and gasoline transmission lines within the county. Damage estimates for previous events are unavailable, but potential severity of an event could range from low to severe. Areas most vulnerable and have a higher probability of experiencing an accident are corridors near major transportation routes, including US 2 and M-28. The Cities of Bessemer, Ironwood, and Wakefield are vulnerable to a hazardous waste transportation accident event. Critical facilities in those locations, including two schools and a hospital, may become

[26] "Fuel spills on US 2 in Bates Township." WNMU-FM. https://www.wnmufm.org/post/fuel-spills-us-2-bates-township#stream/0

vulnerable if an accident were to occur on the nearby highway (US 2). Facilities typically have a plan in place if an event were to occur.

Petroleum and Natural Gas Incidents

Hazard Description

Often overlooked as a threat because most petroleum and natural gas infrastructure in the state is underground, these pipelines can pose a real threat to many Michigan communities. Petroleum and natural gas pipelines can leak or fracture, causing property damage, environmental contamination, injuries, and even loss of life. Most pipeline accidents that occur in Michigan are caused by third party damage to pipelines, often due to construction or some other activity that involves trenching or digging operations. Many structures are located right next to pipelines and thus may be at risk. Pipelines can also cross through rivers, streams, and wetlands, thus posing the possibility of extensive environmental damage in the event of a major failure.

Michigan is both a major consumer and producer of natural gas and petroleum products. Michigan is the largest residential liquefied petroleum gas market in the nation due mostly to high residential and commercial propane consumption. The state has a single petroleum refinery but a large network of product pipelines. More than 78% of the overall home heating market uses natural gas as its primary fuel. Michigan also has the greatest underground natural gas storage capacity in the nation and supplies natural gas to neighboring states during high-demand winter months. The state has a highly developed and extensive gas and petroleum network, representing every sector of the two industries – from wells and production facilities, to cross-county transmission pipelines that bring the products to market, storage facilities, and finally to local distribution systems.

While petroleum and natural gas industries have historically had a satisfactory safety record, and pipelines are the safest form of transportation for these products, the threat of fires, explosions, ruptures, and spills still exists. In addition to these hazards, there is a danger of hydrogen sulfide (H_2S) release. Hydrogen sulfide is not only an extremely poisonous gas but is also explosive when mixed with air at temperatures of 500 degrees Fahrenheit or above.

Historical Occurrence

Gogebic County is fully bisected by two Enbridge pipelines (crude oil and hydrocarbon gas liquids) and a Great Lakes Gas Transmission line (natural gas) (**Map 5.8**). All local jurisdictions, except Erwin Township, are traversed by one or two pipelines. These high-pressure gas pipelines transport and deliver gas to local and regional markets.

Enbridge Line 5, which began operation in 1953, has had five incidents since reporting started in 1968. A brief description of spills that occurred in Gogebic County from this pipeline are listed below.[27]

[27] Ellison, G. (2017, April 26). "Enbridge Line 5 has spilled at least 1.21M gallons in past 50 years." *MLive*. https://www.mlive.com/news/2017/04/enbridge_line_5_spill_history.html

- 1968, near Marenisco Township: About 285,000 gallons of oil spilled due to a weld failure.
- 1976, near Marenisco Township: About 210,000 gallons spilled due to a pipe failure. A fire started, which injured two people.
- 1992, north of Bessemer: About 4,200 gallons spilled due to equipment failure.
- March 15, 2002: Eight gallons spilled near Marenisco after a steam seal failed. It was discovered by Enbridge staff while conducting a station review.
- January 20, 2015, in Marenisco Township south of Lake Gogebic: 8 gallons of oil leaked from a weathered seal.

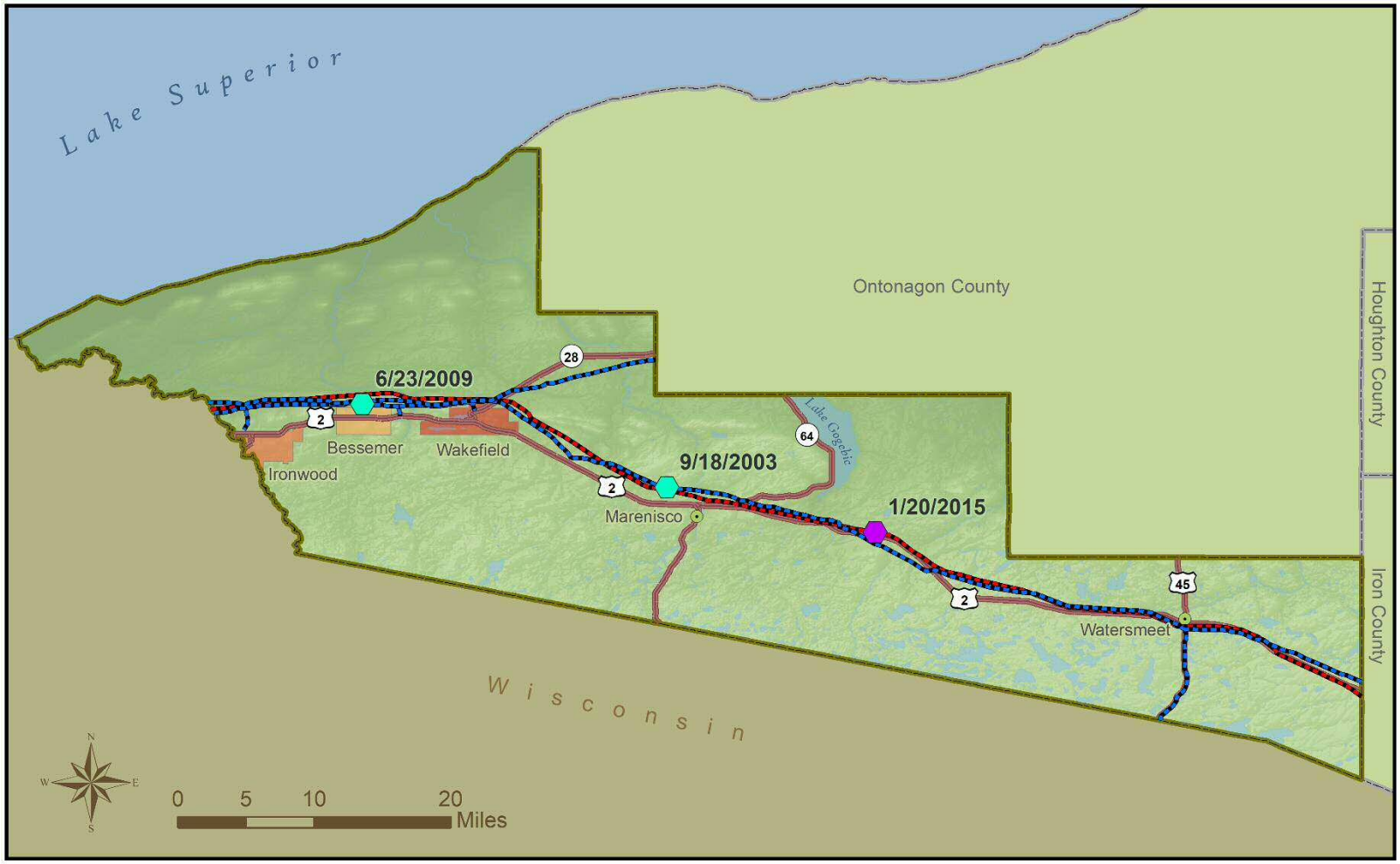
On June 23, 2009, a natural gas pipeline ruptured about a mile north of Bessemer. Homes within a half mile of the rupture were evacuated. No injuries were reported.[28] There was another incident on September 18, 2003, but details were not reported.

Occurrence Probability and County Vulnerability

There is a risk of a natural gas pipeline or fixed-site propane or petroleum incident in Gogebic County due to aging transmission lines, accident, or sabotage. The transmission lines may be at greatest risk due to the remoteness of the area, allowing a leak to go undetected for an extended period. The probability of a minor leak is low. Minor leaks do occur routinely and are quickly detected and addressed, occasionally with the need to evacuate small numbers of people nearby (e.g., three-mile radius) as a precaution. Probability of a more severe incident is also low, but vulnerability is higher than optimal due to the condition of aging lines.

Because the pipeline traverses through Gogebic County from west to east, all municipalities are vulnerable to an incident. This impacts a wide variety of critical facilities including, but not limited to schools, hospitals, emergency response, and long-term care facilities. For the public, it is most important to be aware of the signs that may indicate a gas leak in or near their home and to use the MISS DIG phone service whenever any sort of excavation, construction, or digging activities are being considered that may disturb the ground. The MISS DIG service can advise about whether a location requires special treatment due to the presence of any underground infrastructure, including pipelines. By doing so, this can prevent and lower the vulnerable of municipalities and facilities to pipeline incidents.

[28] "Gas pipeline forces evacuation near Bessemer." (2009, June 24). *Duluth News Tribune*. https://www.duluthnewstribune.com/news/gas-pipe-break-forces-evacuation-near-bessemer



Pipelines
Gogebic County, Michigan

Boundary data was derived from Michigan's Open Data Portal; DEM was derived from elevation data available through the USGS; Pipeline and incident locations were estimated using the National Pipeline Mapping System (NPMS) Public Viewer; Created by WUPPDR April 2019

Pipelines and Incidents

- Accident (Liquid)
- Incident (Gas)
- Gas Transmission Pipeline
- Hazardous Liquid Pipeline

WUPPDR of Michigan

Map 5.8: Pipeline Location and Incidents in Gogebic County

Infrastructure Hazards

The following list summarizes the broad types of infrastructure problems covered in this section:

1. Infrastructure Failure and Secondary Technological Hazards
2. Transportation Accidents

Although various industrial hazards involve certain types of infrastructure (e.g., pipelines) and their breakdown, the section titled infrastructure failures and secondary technological hazards focuses on the interruptions in critical life-sustaining infrastructure, such as electricity and water supplies. For example, an electrical black out affects all sectors of society including communications, commerce, government, education, health care, public safety, emergency services, food and water supply, and sanitation.

While technical systems become more efficient, they sometimes become more vulnerable to failures. Many industrial systems operate close to their full capacity for maximum efficiency during times when everything is functioning smoothly and predictably. When something in the operating environment breaks down, as in the case of a disaster or system failure, the system has issues operating outside relatively narrow parameters. The system then becomes more vulnerable to failure. System management can help, but it still has issues of its own, including lack of ways to overcome coordination problems, interdependencies, and lack of knowledge of system management flexibility.

The section on transportation accidents involves any of the major modes of transportation systems within the county.

Infrastructure Failures and Secondary Technological Hazards

Hazard Description

Michigan's citizens are dependent on public and private utility infrastructure to provide essential life-supporting services, such as electric power, fuel for heating, water, sewage disposal and treatment, storm water drainage, communications, and transportation. When one or more of these utility systems fail due to disaster or other causes, it can have devastating consequences, even if it is over a short period of time. When infrastructure failures occur due to a natural hazard event, this is considered a secondary or cascading technological hazard. For example, during power outages, people can die in their homes during periods of extreme heat or cold if immediate mitigation actions are not taken. When water or wastewater treatment systems in a community are inoperable, serious public health issues can arise and actions must be taken immediately to prevent outbreaks of diseases. If storm water drainage systems fail from damage or capacity overload, serious flooding can occur, impacting homes, businesses, and roads.

All these situations can lead to disastrous public health and safety consequences if immediate actions are not taken. It is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) who are most heavily impacted by an infrastructure failure. If the failure involves one or more systems, whole communities and possibly entire regions can be severely impacted.

The risk of infrastructure failure grows each year, as physical and technological infrastructure becomes more complex and the interdependency between various facets of infrastructure (e.g., pipelines, telecommunications lines, and roads) become more intertwined. Additionally, more vulnerable and aging infrastructure (e.g., electrical components, bridges, roads, sewers, etc.) needs repair. Because of this, large-scale disruptions in various components of infrastructure are likely. Major disruptions could lead to widespread economic losses, limit security, and a lower quality of life.

Many of the hazards considered in this plan may cause infrastructure failures and any resulting infrastructure failures are dangerous in Gogebic County due to its harsh climate and remoteness. Gogebic County is served by several systems, including power, natural gas, water treatment, and phone, and loss of these systems can have a detrimental impact on the functioning of the county. Failure of infrastructure or utilities includes anything from water treatment failure to power outages, which is the most common type of failure and produces a minor interruption of everyday life but has the potential to cause severe problems over a long period of time.

Historical Occurrences

In Gogebic County, Xcel Energy and Upper Michigan Energy Resources provide electric service. Any loss of power to the area grid can affect the entire region. Due to the rural nature of the county, trees can fall on power lines in remote locations causing a delay in restoration of service. Trimming trees adjacent to power lines is one way to decrease this risk and is regularly undertaken by electric providers.

Water systems and wastewater systems can also be affected by failure or secondary failure and may be compromised by aging facilities. On January 8, 2009, a 16-inch water pipe in Ironwood cracked due to pipe degradation. All local schools were closed. In response to the water main failure, local health officials issued an advisory to conserve and boil drinking water. Potable and non-potable water were available to affected residents for delivery and pickup. All water returned to normal on the afternoon of January 12.

Occurrence Probability and County Vulnerability

Probability of infrastructure failure is likely, based mainly on two or more power outages per year. Numerous factors contribute to the impact from infrastructure failure, including types of services affected, weather conditions, response capabilities, and time of day. Probability of occurrence is similar countywide, but the severity from failures may be more pronounced in urban areas that are more reliant on modern conveniences and systems served by utilities.

All municipalities and critical facilities are vulnerable to infrastructure failures. Loss of electrical power, natural gas, or water treatment can cause an immediate significant threat to life, safety, and public health. Some facilities in Gogebic County have partial or complete backup power sources (e.g. standby generators), such as hospitals and some fire/police stations.

Transportation Accidents

Hazard Description

Transportation accidents can occur on land, air, or water. The one commonality all transportation accidents share is that they can result in mass casualties. Although automobile crashes tragically kill many hundreds of Michigan residents each year, this analysis focuses on the types of accidents that are large enough in scale to potentially cause a disaster-level emergency. A major land transportation accident in Michigan has the potential to create a local emergency or to seriously strain or overwhelm local response and medical services. It can involve a commercial intercity passenger or tour bus, a local public transit bus, school bus, or multiple passenger cars. Air transportation accidents can result in significant numbers of deaths and injuries, and major victim identification and crash scene management problems. Water transportation accidents that can involve marine passenger ferries, may require significant underwater rescue and recovery efforts that few local jurisdictions are equipped or trained to handle. If any of these accidents were to occur in a rural community, an event can easily overwhelm the available resources in these areas.

Michigan has 19 airports with commercial passenger service,[29] 82 local bus transit systems serving 85 million passengers, 19 marine passenger ferry services and 3 intercity rail passenger corridors composed of 568 miles of track and serving 22 communities.[30] Gogebic County is serviced by an Indian Trails regional passenger bus service along US 2, which provides inter- and intrastate transportation. Other transportation services provided in Gogebic County include school buses, casino buses, public transit services along US 2, and commercial air passenger services at the Gogebic-Iron County Airport.

Historical Occurrence

While there have been minor transportation accidents within the county, there is no history of a large passenger transportation accident in Gogebic County.

Occurrence Probability and County Vulnerability

Though Gogebic County based transportation conveyances are susceptible to few major passenger accidents, the risk presented by through traffic on the two east-west highway routes is considerable. The probability of a large-scale transportation accident event is low, but if this type of accident were to occur, the severity would be high, particularly in communities that are located along major transportation routes. However, there is a relatively low volume of commercial traffic, compared to the state average, meaning that any incident would likely be isolated and of a small scale. Smaller scale transportation accidents have a highly likely probability of occurring. Still, vulnerability to even a small, isolated event can be considered high as mitigating potential accidents is difficult due to the unpredictability of an accident. With commercial bus transportation, the Gogebic-Iron County Airport, and an influx of tourists throughout the year, the entire county is vulnerable to transportation accidents as it can affect

[29] Michigan Department of Transportation Aeronautics – Commercial Service Airports. www.michigan.gov/aero/0,4533,7-352-79155_79156_79388---,00.html
[30] MDOT Public Transportation. https://www.michigan.gov/mdot/0,4616,7-151-11056---,00.html

many people. Emergency response plans and awareness of hazardous intersections and roadways are ways to prepare for this type of hazard.

Human-Related Hazards

The following list summarizes the significant human-related hazards covered in this section:

1. Civil Disturbances
2. Public Health Emergencies
3. Sabotage and Terrorism

Although civil disturbances are usually handled at the state or local level, some types of unrest may be related to broader patterns of criminal activities. In the state plan, the hazard now shifts beyond the emphasis on prisons, which had been a part of its earlier planning documents and considers civil disturbance events that are rooted in other human circumstances. The most probable circumstances may involve reaction to other emergency or disaster events, which are poorly handled by responders or governmental agencies. There are few recent historical records of such incidences escalating to the point of a civil disturbance emergency in Michigan.

Public health emergencies have taken on new importance recently, with the rise in concern about global pandemic illnesses. Travel is so rapid and widespread that quickly detecting and containing outbreaks of serious, even lethal, contagious diseases has been considered necessary and given higher priority by numerous levels of government and their partnering agencies. Various natural and technological hazards have the potential to cause significant public health concerns. For example, weather hazards, such as extreme temperatures, flooding, and drought, can affect the quality of drinking water in an area and increase the risk of contagious illness and food contamination.

Terrorism is one of the potential causes of widespread threats to public health and safety, as well as certain types of civil disturbance. In many cases, it may not be immediately clear if an incident was motivated by political causes, some other form of protest, criminal enterprises, or personal neurosis. It is recommended that human-related hazards be studied together since terrorism and civil disturbances can lead to public health and safety emergencies and other hazards covered in this plan, such as infrastructure failures, transportation accidents, and hazardous materials incidents.

Civil Disturbances

Hazard Description

Civil disturbances, though rare, typically involve protests, hooliganism, riots, and insurrection. Places that may be subject to or impacted by these types of disturbances include government buildings, military bases, universities, businesses, nuclear power plants, and critical service facilities, such as police and fire stations.

Protests, including political protests and labor disputes, usually contain some level of formal organization or shared discontent. They are usually orderly, lawful, and peaceful. However, some may become threatening, disruptive, and even deliberately malicious. When protests become malicious and there is destruction of property, interruption of services, interference with lawful behaviors, use of intimidation or civil rights violations, and threats/actual acts of violence, then it is considered a civil disturbance.

Another kind of civil disturbance is hooliganism, which is relatively unorganized and involves individual or collective acts of deviance inspired by the presence of crowds. Individuals take advantage of situations where there is anonymity and confusion, allowing them to behave in an unlawful or unusually expressive way that is normally considered publicly unacceptable. These individuals may be under the influence of illegal drugs and alcohol and may include criminals and persons with mental illnesses who may either be reacting with extreme hostility to the crowding, noise, and disorder. Common problems include destruction of property, assault and disorderly conduct, and criminal victimization.

Hooliganism and protests that become disorderly may result in riots. Riots may stem from motivations of protest, but it lacks organization. These events tend to involve violent gatherings of persons whose level of shared values and goals are not alike to allow their collective concerns or efforts to unite in a relatively organized manner.

Lastly, insurrection involves the deliberative collective effort to disrupt or replace the established authority of a government or its representatives by persons within a society or under its authority. Prison uprisings may fall into this category, but it can also be classified as a riot or protest.

Historical Occurrence

There have been no recorded civil disturbance events in Gogebic County in recent history. Gogebic County is home to Gogebic Community College and several federal, state, and local offices. In the past decade there have only been minor concerns affecting the general population, including a Rainbow Family gathering, a counter-culture hippie group, and a KKK rally by members from Mercer, Wisconsin, which is near the Michigan-Wisconsin border.

Occurrence Probability and County Vulnerability

The risk for a civil disturbance exists in Gogebic County because of governmental, educational, and other activities in the area. The probability of an incident is low throughout the county but perhaps slightly higher in urban areas along the US 2 corridor. The Gogebic County Courthouse in the City of Bessemer and other municipal centers have a greater vulnerability for these kinds of events compared to other critical facilities.

Public Health Emergencies

Hazard Description

A public health emergency is the result of widespread and/or severe epidemic, contamination incident, or other situation that presents a danger to or otherwise negatively impacts the general health and well-being of the public. These kinds of emergencies can be a primary event or a

secondary one caused by another disaster or emergency such as a flood or hazardous materials incident. Public health emergencies include disease epidemics, food or water contamination, extended periods without adequate water and sewer services, and harmful exposure to chemical, radiological, or biological agents. The greatest emerging public health threat is the intentional release of a radiological, chemical, or biological agent with the potential to adversely impact many people. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, many people. Its potential scope and magnitude can be localized, regional, or statewide. However, with modern travel a highly contagious disease could spawn a national health emergency.

Michigan has had several large-scale public health emergencies in recent history. There have been instances of infrastructure failure (widespread loss of water and sewer service in northern Michigan in 1994) and disease threats (hand-foot-and-mouth disease and West Nile encephalitis virus). Most recently, the novel Coronavirus disease (COVID-19) global pandemic has infected over 110 million people worldwide, with over 27 million cases in the U.S. In Michigan, over 499,906 residents have tested positive for COVID-19 and the virus has caused 12,610 deaths (both confirmed reports; as of December 31, 2020).[31] This number continues to increase due to the highly contagious character of COVID-19 and the continuing global pandemic. Cumulatively in Gogebic County, 727 cases have been confirmed and 14 confirmed deaths were reported at the end of 2020. No area in Michigan is immune to public health emergencies and areas with high population concentrations are more vulnerable to the threat. Additionally, more vulnerable members of society – elderly, children, impoverished individuals, and persons in poor health – are at higher risk than the general population.

The Western Upper Peninsula Health Department (WUPHD) works towards promoting community health through control of environmental health hazards and addressing the health needs of vulnerable population groups. The department is responsible for addressing and trying to prevent public health emergencies within Gogebic, Baraga, Houghton, Keweenaw, and Ontonagon counties. The WUPHD does this by providing state mandated public health services, such as restaurant inspections, foodborne illness investigation, sewage and well inspections, beach monitoring, and mercury clean-ups.

Exposure to Hazardous Materials

Exposure to hazardous materials can occur through accident, deliberate action, misuse of a product, or through natural means. Most common risks of exposure to materials are chemical in nature but can also be biological or radiological. Many hazardous materials are used in industry or in households. Household hazardous wastes come from everyday products that are used in the home, garden, or yard. Oil-based paints, antifreeze, household cleaners, and pesticides are a few examples. Household hazardous wastes are corrosive, toxic, flammable, or reactive. When hazardous waste is improperly disposed of, such as in the trash, down the sink, or into a storm drain, it poses a threat to water quality, human health, and wildlife. Electronic waste that is

[31] State of Michigan. Coronavirus – Michigan Data. https://www.michigan.gov/coronavirus/0,9753,7-406-98163_98173---,00.html

improperly handled can pose human and environmental risk of exposure to lead and mercury. In addition to electronic waste, lead and mercury exposure may be due to legacy use of these heavy metals in household items such as paint, thermometers, dental fillings, and electric switches. Exposure to lead and mercury have long lasting negative health effects, such as memory loss, tremors, neuromuscular changes (e.g., weakness, atrophy), and lack of coordination of movements amongst other symptoms.

A natural exposure to a hazardous material is in the form of radon. Radon is a cancer-causing radioactive gas that moves up through soil and is trapped inside buildings. It cannot be smelled or seen and is the second leading cause of lung cancer in the U.S. Exposure to radon is possible in Gogebic County. Testing kits are offered at no cost by the WUPHD. If radon is detected above 4 picocuries per liter (pCi/L), follow-up testing and resistance techniques should be installed. Mitigation includes sealing cracks and venting gasses from the home.

Individual Wells

Many Gogebic County residents live in rural areas that are not serviced by public sewer and/or water. The contamination of individual wells and the failure of individual septic systems presents the potential for public health emergencies. Coliform bacteria, high nitrates, and arsenic in water wells are common public health risks. Coliform bacteria are associated with animal wastes, sewages, and surface water. Nitrates are a naturally occurring form of nitrogen found in soil and groundwater. High concentrations of nitrates in drinking water can be toxic to infants and young animals. Elevated nitrate concentrations in groundwater and wells are typically associated with excessive fertilizers, sewage disposal systems, farm runoff, municipal wastewater and sludge, and industrial wastes. Arsenic is also naturally occurring; exposure to high levels of arsenic poses serious health effects because it is a known human carcinogen.

Public water and sewer facilities

Public water and sewer facilities are prone to disruptions such as broken or frozen lines that cause a loss in service, or system pressure loss that requires boil-water advisories due to potential water contamination. Any disruption in service is typically a secondary hazard due to an external triggering event. Extreme cold, subsidence, flooding, lack of maintenance, and sabotage are a few examples of what can cause a disruption in water or sewer service. Disruptions in service can also have a significant impact on health care facilities and impair patient care.

Drug and Substance Abuse Epidemic

As defined by the CDC, an epidemic is "the occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time."[32] While it is not an infectious disease outbreak, deaths due to drug overdoses are now greater than deaths due to car crashes in Michigan.[33] The state has the 14th highest overdose death rate in the country. In

[32] Epidemic Disease Occurrence. Center for Disease Control and Prevention. https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html

[33] "Opioid addiction: Michigan counties struggle to meet the need for treatment." Michigan News – University of Michigan. https://news.umich.edu/opioid-addiction-michigan-counties-struggle-to-meet-the-need-for-treatment/

2017, there were 2,686 drug overdose deaths in Michigan and was 12.1% higher than drug overdose deaths in 2016[34]. Deaths due to synthetic opioids, such as fentanyl and tramadol, increased by 48.5% from 2016 to 2017. Most Michigan counties are underequipped to address the needs for people who have an opioid addiction and effects from this drug epidemic. This includes a lack of nearby drug treatment programs, medication-based treatment services, and transportation capability to get people who want help the necessary services they need.

Climate Change Considerations

Climate change has the potential to affect human health by increasing the occurrence of vector-borne diseases such as malaria, Lyme disease, and West Nile virus. Warmer temperatures, shorter/milder winters, and earlier spring seasons can result in an increasingly hospitable environment for carriers of these diseases. Ticks and the bacterium that causes Lyme disease have higher survival rates in warmer, milder winters.

Historical Occurrence

The most likely public health threat in Gogebic County is influenza-type illnesses, which is the most common communicable disease and includes pneumonia. These illnesses had an average mortality rate of 16 per 100,000 Western U.P. residents from 2015-2017.[35] The average mortality rate in Michigan is 14.3. However, influenza, which can be widespread, rarely becomes a public health emergency. Small incidences of flu outbreaks and similar sicknesses have occurred in Gogebic County, but the extent of the emergencies have been limited.

There is a potential in Gogebic County for a larger disease outbreak as an isolated event or secondary hazard following another type of incident, such as flooding. With modern travel, highly contagious diseases can result in a national health emergency, even if the presence of a disease takes time to detect. For example, if reported number of infected cases within a county is low, this does not mean that the illness or virus is not present in the community or that there is no risk of infection. If a virus, such as COVID-19, infects a large portion of the population in the county and become an epidemic, it could overwhelm local facilities that are equipped to deal with this type of emergency. Aspirus Ironwood has an infection isolation room and a 24-hour emergency department. Despite awareness and planning, shortages of supplies, hospital rooms, and medical professionals to respond to the novel coronavirus pandemic and other future disease outbreaks can cause significant harm to the public.

The potential in the county for infectious disease outbreaks, such as chlamydia, hepatitis C, and Lyme Disease (highest number of cases in Dickinson County to the south)[36] is also high. Gogebic County has vaccination rates below the state average, which increases the risk of

[34] Drug Overdose Deaths in Michigan, 2016-2017. Michigan Department of Health and Human Services. https://www.michigan.gov/documents/mdhhs/Drug_Overdose_Deaths_MI_2016-2017_649230_7.pdf
[35] Michigan Department of Health and Human Services, Community Health Information. www.mdch.state.mi.us/pha/osr/chi/IndexVer2.asp
[36] Upper Peninsula Community Health Needs Assessment 2018. http://www.wupdhd.org/wp-content/uploads/2018/08/Upper-Peninsula-Community-Health-Needs-Assessment-2018-Second-Edition-1.pdf

diseases to the population (both vaccinated and not).[37] The potential for disease outbreaks and contamination may be isolated events or as events secondary to flooding or other incidents.

Gogebic County is one of several rural Michigan counties with high rates of suicide. From 1999 to 2017, there were 65 reported suicides (rate of 20.8 per 100,000 residents).[38] Research suggests that the high suicide rate may be linked to an upsurge in fatal opioid overdoses. Throughout the county and state, there are high rates of mortality due to drug overdoses and a lack of access to treatment facilities. Gogebic County, and most of the U.P., have no opioid treatment programs. The closest medication-based substance abuse treatment program is in Otsego County in the northern Lower Peninsula.[39]

The Upper Peninsula Substance Enforcement Team (UPSET) is a multi-jurisdictional narcotics task force that serves all 15 counties in the Upper Peninsula and assists any local or state police in fugitive apprehension. UPSET is the only federally trained and certified Clandestine Lab Team in the Upper Peninsula dealing with methamphetamine response. In 2016, UPSET West was formed to support an increased UPSET team, targeting the Western Upper Peninsula in increased narcotics enforcement. Since 2016, UPSET West detectives have made 48 felony arrests, but are fighting a growing methamphetamine supply as heroin supply decreases.[40]

There have been incidents of exposure to hazardous materials, including mercury spills. A mercury release occurred on April 16, 2008 in the Life Skills classroom at Wakefield-Marenisco school in Wakefield. A thermometer containing mercury was broken. The event was properly reported to the WUPHD, who oversaw the response and cleanup.[41] On March 2, 2016, the Upper Peninsula Regional Hazardous Material Team responded to a mercury spill at a home in Erwin Township.[42] A homeowner knocked over a glass bottle filled with mercury in their basement. Three ounces of mercury were recovered, along with other contaminated items. No injuries were reported. Clean-up took approximately a week.

In the City of Ironwood, citizens have had ongoing concerns regarding the water quality in their homes. The water going into their homes was highly discolored and various shades of brown. This was due to high levels of iron and manganese in the water. On July 8, 2019, the City of Ironwood held a public workshop to address these issues and to discuss the steps they were

[37] Michigan Department of Health and Human Services, County Quarterly Immunization Report Card. (2019, December 1). https://www.michigan.gov/documents/mdch/Gogebic_447442_7.pdf
[38] Roelofs, T. (2019, March 7). "Suicides, often linked to opioids, spike in rural Michigan and among young." *Bridge Magazine*. https://www.bridgemi.com/children-families/suicides-often-linked-opioids-spike-rural-michigan-and-among-young
[39] Bohnert, A et al. (2019 April). "Opioid Addiction: Meeting the need for treatment in Michigan." Poverty Solutions-University of Michigan. https://poverty.umich.edu/files/2019/05/PovertySolutions-OpioidTreatment-PolicyBrief-r4.pdf
[40] UPSET West reducing heroin supply, meth use growing. (2019, February 14). *Keweenaw Report*. http://www.keweenawreport.com/featured/upset-west-reducing-heroin-supply-meth-use-growing/
[41] Health Consultation: Wakefield-Marenisco School Mercury Spill. https://www.atsdr.cdc.gov/HAC/pha/Wakefield-MareniscoSchoolMercurySpill/Wakefield-Marenisco%20HC%208-4-2008.pdf
[42] "HazMat Team Responds to Mercury Spill in Gogebic County." Fox 21 – KQDS. https://www.fox21online.com/2016/03/03/hazmat-team-responds-to-mercury-spill-in-gogebic-county/

taking to ensure that the water was safe for consumption.[43] The WUPHD collected water samples throughout the summer at various homes and locations. While manganese levels in the water were within the health advisory limits, the city still recommended that families with infants 12 months and under use bottled water as a precaution.[44] After three rounds of manganese testing, on September 6, 2019, the WUPHD announced that manganese levels were under the EPA health advisory levels for all individuals.[45] The water was deemed safe for use and consumption.

Occurrence Probability and County Vulnerability

Public health emergencies can arise from a wide range of causes and exhibit varying levels of severity. In Gogebic County, the probability of a public health emergency is likely, as some health emergencies are currently occurring in the county (i.e., COVID-19 and opioid and meth-related health emergencies). The severity of a public health emergency, such as a disease epidemic, is unpredictable and could potentially be extreme, particularly as the population ages. A large magnitude epidemic could overload facilities that are inadequately equipped to deal with this type of emergency, such as long-term care facilities and rural medical centers. The drug and substance abuse epidemic are an ongoing problem within the region. There are currently no regional facilities that can assist individuals with an addiction, leaving them vulnerable to drug related health emergencies.

All individuals are vulnerable to the hazards associated with a disease outbreak or an epidemic, but vulnerable populations (e.g., elderly, children, impoverished individuals, and persons in poor health) are at higher risk of succumbing to an epidemic. The remoteness of the county could also be problematic during a large-scale emergency. In Gogebic County, the greatest susceptibility to most types of public health emergencies is along the corridor of US 2, where the cities of Ironwood, Bessemer, and Wakefield are located. However, events dealing with natural resource contamination could affect these populated areas but originate in rural outlying areas. Public health emergencies tend to be widespread rather than confined to a specific location.

Vulnerable locations include any public gathering areas, such as schools, long-term care facilities, hospitals, public water, sewer, and electric facilities, individual wells and septic systems, restaurants, etc. Almost all local communities in Gogebic County have at least one of these vulnerable critical facilities.

Public health emergencies have secondary impacts that may create further vulnerable situations that were otherwise not expected. For example, a pandemic or smaller disease outbreak, such as influenza, could result in large percentages of employees taking sick leave or mandated

[43] Bowden. E. (2019, July 8). "City of Ironwood holds 'Water Quality Workshop' in response to resident concerns." WLUC–TV6. https://www.uppermichiganssource.com/content/news/City-of-Ironwood-holds-Water-Quality-Workshop-in-response-to-resident-concerns-512450401.html

[44] "Second Round of Manganese Testing – Test Result Update." City of Ironwood. http://www.wupdhd.org/wp-content/uploads/2019/08/City-of-Ironwood-Manganese-Press-Release-3.pdf

[45] "Third Round of Manganese Testing – Western Upper Peninsula Health Department (WUPHD) Removes the Health Advisory for the City of Ironwood Water System." City of Ironwood. http://www.wupdhd.org/wp-content/uploads/2019/09/Press-Release-Removal-of-Health-Advisor-for-City-of-Ironwood-Water-System_LAF-1-1.pdf

quarantine action (i.e. shelter-in-place mandates), removing workers from their place of employment and thus impacting productivity in the economy or in emergency response capacity. Any hazardous event that would have secondary public health implications would significantly disrupt or halt the normal business activities of an impacted community. However, these measures should be taken if it lessens or slows the impact of a public health emergency.

Sabotage and Terrorism

Hazard Description

Terrorism is the use of violence by individuals or groups to achieve political goals by creating fear, while sabotage is any kind of deliberate action, such as obstruction, disruption, or destruction, for political or military gain. Both can take many forms, including the following: bombings; assassinations; organized extortion; use of nuclear, chemical, and biological weapons; information warfare, such as cyberattacks, hacking or release of classified information; ethnic, religious, and gender intimidation (hate crimes); advocacy for overthrowing local, state, or federal government, and; the disruption of legitimate scientific research or resource-related activities (eco-terrorism). The goal of terrorists is to frighten as many people as possible, not necessarily to cause the greatest damage possible. Media coverage allows terrorists to affect a much larger population than those who are directly attacked.

Since the previous update of this plan, the likelihood of a cyberterrorism attack has increased dramatically. A cyberterrorism attack is the use of the internet to conduct attacks on others to achieve political or ideological gains through threat or intimidation. This includes large-scale disruption to critical computer systems, allowing them to not only come under attack, but also be used to conduct attacks. Inadequate security can facilitate access to computers causing service disruption and resulting in economic losses and potential public disorder.

Sabotage and terrorism are long-established strategies that are practiced by many groups in many nations. The U.S. is not only threatened by international terrorists or saboteurs, but also by home-grown domestic terrorist groups including, but not limited to, racist, ecological, anti-abortion, and anti-government terrorists. Non-terrorist criminal activity may resemble terrorism or sabotage, but it lacks a political objective. These crimes are typically routine, individual crimes, but they may impact large portions of the population. Some of these attacks may require resources that are not available to local law enforcement agencies. Non-terrorist criminal activities may include mass shootings, random sniper attacks, infrastructure sabotage, and cyberattacks.

Terrorists fall into five major categories based upon the political cause that motivates their actions, but they can fit into more than one of these categories. They are the following:

1. **Nationalist terrorists** act in support of a culture or ethnic group. Typically, they are fighting on behalf of national populations that wish to have an independent government but are currently ruled by another country. They tend to direct their attacks against the "occupying power" but may also attack other nations that support their enemies. These

terrorists claim to speak for their entire national group, but usually only represent a small minority of extremists.

2. **Religious extremist terrorists** are violent adherents of a specific religion. They tend to be especially committed because they believe their violent actions are supported by their deity. Religious terrorists see themselves fighting a battle of ultimate good against pure evil, in which any action is justified.
3. **Left wing terrorists** attempt to force society to change to match their goals and values. They tend to target the government, power institutions, and symbols of authority. Socialist and Communist terrorists of this type were a threat in the late 1960s and 1970s but have weakened in recent decades.
4. **Right wing terrorists** see themselves as fighting for traditional values against an invading group and/or against a tyrannical government. In the U.S., these terrorists are associated with anti-immigration, white supremacy, anti-government, and Christian Identity movements. Only the most extreme elements of these movements have become terrorist, but they have carried out a substantial portion of the recent attacks. Right wing groups tend to target members of hated ethnic or religious minorities, or government employees.
5. **Single-issue terrorists** are not committed to an all-encompassing belief system, but rather are intensely concerned with one cause. Common causes for these terrorists include animal-rights, environmentalism, and opposition to abortion. They tend to target property or individuals rather than attempting to cause massive casualties.

Because sabotage and terrorism objectives are so widely varied, the potential targets are also widely varied. Virtually any public facility, place of public assembly, or business engaged in controversial activities can be considered a potential target. Large computer systems operated by government agencies, financial institutions, large businesses, health care facilities, and universities are at risk.

Since the previous update of the plan, the likelihood of a cyberterrorism event has increased dramatically. Cyberterrorism is an electronic attack using one computer system against another. Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks and cause major disruption. There are generally no direct effects on the built environment, but it may cause service disruption which could result in significant economic losses and cause public disorder. Documenting and understanding the services that are reliant on computer systems can work to mitigate the consequences of cyberterrorism.

Historical Occurrence

While there have been acts of terrorism and sabotage within Michigan, there is no recorded history of these events occurring in Gogebic County. However, a bombing did occur in nearby Kimball Township, which is near the Michigan-Wisconsin border, at the Northwoods Paving site on US 2. The site had ongoing public demonstrations against the site's "alleged adverse effects on the environment." On July 4, 2015, two separate explosive devices were detonated at the

asphalt plant, causing a vehicle fire and significant blast damage to an asphalt tank.[46,47] Two men were eventually charged with the bombing on June 17, 2019.

There appeared to be an event in summer 2018 where the locks at the water treatment facility were broken and tampered with. No other damage was reported. It was suspected that this was an isolated incident.

Occurrence Probability and County Vulnerability

The probability of sabotage and terrorism in Gogebic County is low but should not be ignored as these incidents can occur at any level. Most potential target facilities are in the populated areas along the US 2 corridor. Earlier mentioned pipelines running through the county are another possible target. Other threatened locations are impossible to identify, especially since widely dispersed rural areas are increasingly perceived by both authorities and terrorists as vulnerable to the element of surprise. Severity of an incident is impossible to predict.

[46] Ansami, R. (2015, July 6). "Fire, explosions at asphalt plant in Kimball probed." *Daily Globe*. https://www.yourdailyglobe.com/story/2015/07/06/news/fire-explosions-at-asphalt-plant-in-kimball-probed/5078.html

[47] Jenkins, R. (2019, June 21). "Two charged in Kimball asphalt plant bombing." *Daily Globe.* https://www.yourdailyglobe.com/story/2019/06/21/news/two-charged-in-kimball-asphalt-plant-bombing/12339.html

SECTION 6: Risk Assessment

The hazard profiles presented in this section were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its "How-to" guidance document titled Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA Publication 386-2). It relies heavily on historical and anecdotal data, stakeholder input, and professional and experienced judgment regarding observed and/or anticipated hazard impacts. It also carefully considers the findings in other relevant plans, studies and technical reports.

This section will include the following components:

- Differential Vulnerability
- Hazard Extent
- Hazard Profiling Concept of Planning
- Hazard Priority Risk Index and Ranking
- PRI Results
- Hazard Summary

Differential Vulnerability

Currently, there is no reliable way to accurately estimate costs associated with the hazards that affect Gogebic County. There is an overall lack of publicly available data, including flood hazard maps, estimated critical facility costs, and dam inundation maps. Numerous variables can affect the vulnerability of the county to hazards, including climate, location, scale, and time of day. Vulnerability is also affected by time of year the hazard occurs. Additionally, populations in many jurisdictions throughout the county varies by season, and response capabilities are sometimes compromised in winter.

Although Gogebic County is susceptible to many types of hazards, each jurisdiction varies in its level of vulnerability to certain hazards. Vulnerability to most fire hazards, weather hazards, flooding due to spring runoff, and all technological and societal hazards have been determined to be similar for all of Gogebic County. Subsidence is of note because it can occur in most jurisdictions, but the most at-risk areas are in scattered locations. **Table 6.1** provides a summary of hazards within the county and notes especially high vulnerabilities for each jurisdiction. Countywide hazards and others that affect most but not all jurisdictions equally, such as subsidence and petroleum/natural gas incidents, are generally not noted for specific jurisdictions.

Technical expertise is necessary to estimate the costs of each potential hazard. The value of property in Gogebic County and its communities can, at a minimum, provide an overview of property that can be affected by hazards. **Table 6.2** shows the State Equalized Value (SEV) of properties in Gogebic County by location and class. Vulnerability estimates that are provided in this plan were based on a most likely scenario.

Table 6.1: Differential Vulnerabilities by Jurisdiction, Gogebic County

Jurisdictions (Population)	Extreme Temperatures	Fog	Hail	Ice & Sleet Storms	Lightning	Severe Winds	Snowstorms & Blizzards	Tornadoes	Dam Failures	Riverine & Urban Flooding	Shoreline Flooding & Erosion	Drought	Wildfires	Invasive Species	Earthquakes	Subsidence	Scrap Tire Fires	Structural Fires	Hazardous Materials: Fixed Site Incidences	Hazardous Materials: Transportation Incidents	Petroleum & Natural Gas Incidents	Infrastructure Failures & Secondary Tech. Hazards	Transportation Accidents	Civil Disturbances	Public Health Emergencies	Sabotage & Terrorism
Gogebic County (15,577)	X	X	X	X		X	X	X				X	X	X						X	X	X	X	X	X	X
Bessemer Township (1,149)																X										
Erwin Township (340)																										
Ironwood Township (2,213)											X					X	X		X							
Marenisco Township (1,623)																										
Wakefield Township (304)											X					X										
Watersmeet Township (1,322)																										
City of Bessemer (1,908)									X							X		X	X							
City of Ironwood (5,051)										X						X		X	X							
City of Wakefield (1,667)									X	X						X		X								
Lac Vieux Desert Reservation (227)																										

Table 6.2: State-equalized Value for Gogebic County, 2019

**** REAL ****						Total Real	Personal	Total Real & Personal
Township/ City	Agricultural	Commercial	Industrial	Residential	Timber Cutover			
Bessemer Township	$24,750	$3,910,770	$65,021	$34,371,022	$4,182,303	$42,553,866	$4,658,412	$47,212,278
Erwin Township	$0	$0	$1,900	$11,796,297	$1,590,717	$13,388,914	$323,634	$13,712,548
Ironwood Township	$978,086	$6,965,214	$3,820,115	$86,483,791	$7,921,552	$106,168,758	$9,268,534	$115,437,292
Marenisco Township	$105,789	$2,300,506	$1,472,691	$59,762,092	$4,445,260	$68,086,338	$11,132,854	$79,219,192
Wakefield Township	$0	$1,556,628	$1,785,165	$15,182,892	$5,156,912	$23,681,597	$15,289,277	$38,970,874
Watersmeet Township	$0	$5,810,457	$701,556	$191,249,834	$2,231,998	$199,993,845	$12,339,672	$212,333,517
City of Bessemer	$0	$3,792,700	$941,384	$24,902,968	$0	$29,637,052	$2,437,490	$32,074,542
City of Ironwood	$0	$28,692,197	$4,746,407	$56,810,180	$0	$90,248,784	$16,692,850	$106,941,634
City of Wakefield	$0	$3,202,266	$468,791	$23,577,171	$0	$27,248,228	$1,680,260	$28,928,488
						County Total Real and Personal		$674,830,365

Source: Michigan Department of Treasury Assessed & Equalized Valuation

Hazard Extent

Table 6.3 describes the extent of each hazard identified in Gogebic County. The extent of a hazard is its severity or magnitude, as it relates to the county.

Table 6.3: Hazard Extent in Gogebic County

Weather Hazards	
Extreme Temperatures	Extreme heat event extent is measured through the heat index, which is temperature in relation to the percentage of humidity. The highest heat index was recorded on July 31, 2006, where heat indices ranged from 100 to 105 degrees Fahrenheit. Extreme cold extent is generally measured through the wind chill temperature index. It should be noted that future events may be much hotter or colder than these incidences.
Fog	The extent of fog is measured by area and number of roads and vehicles affected by a fog event, as fog itself is not hazardous.
Hail	Hail extent is defined by the size of the hail stone. The largest hailstone reported in Gogebic County was 4 inches on July 28, 2006. It should be noted that future events may exceed this.
Ice and Sleet Storms	The extent of ice and sleet storms can be classified by meteorological measurements and by evaluating its societal impacts.
Lightning	The frequency of cloud-to-ground lightning flashes per square mile can be used as a method to measure extent. Gogebic County receives approximately 1.5 to 3 strikes per square mile per year. Greater strikes per square mile per year are possible in the future.
Severe Winds	The extent of a severe wind event is measured by speed of wind recorded. The highest wind speed recorded from the NCEI data was 90 mph (78 knots) on June 11, 2016 near Wakefield. Note that future events may result in stronger winds.
Snowstorms and Blizzards	The extent of winter storms can be measured by the amount of snowfall received (in inches).
Tornadoes	Tornado hazard extent is measured by historic tornadoes per county in Michigan provided by the NCEI and MSP, as well as the Fujita/Enhanced Fujita Scale (Tables 5.9 and 5.10). 3 tornadoes have historically occurred in Gogebic County based on the MSP EMHSD map. The greatest magnitude reported was an EF1 on July 11, 2016 near Bessemer.
Hydrological Hazards	
Dam Failures	Dam Failure extent is defined using the Michigan Department of Environment, Great Lakes, and Energy under Dam Safety criteria. Of the 16 dams in the county, 88% are state regulated, and only one of them is classified as significant risk hazard potential. A significant hazard potential indicates that if the dam were to fail there would be no loss of life, but could cause

	economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.
Riverine and Urban Flooding	Flood extent in Gogebic County is measured by the duration and magnitude of an event.
Shoreline Flooding and Erosion	The extent of erosion can be defined by the rate (in feet) of erosion that occurs according to the Michigan Department of Environment, Great Lakes, and Energy – Coastal Management.
Drought	Drought extent is defined by the U.S. Drought Monitor classifications, which included abnormally dry, moderate drought, severe drought, extreme drought, and exceptional drought (in ascending order).
Ecological Hazards	
Wildfires	Extent of a wildfire is determined by the annual average of total acres burned.
Invasive Species	The extent of invasive species is largely dependent on the preferred habitat of the species as well as the species' ease of movement and establishment. Invasive species magnitude ranges from nuisance to widespread killer.
Geological Hazards	
Earthquakes	Earthquake extent can be measured by the Modified Mercalli Intensity (MMI) scale and the distance of the epicenter.
Subsidence (Ground Collapse)	Subsidence is measured by total displacement of material volume from the event, as well as monetary damages.
Technological (Industrial) Hazards	
Scrap Tire Fires	Extent is measured by the area affected, monetary damages incurred, as well as type of tire products involved.
Structural Fires	Structural fire hazard extent is measured in area affected, time required to extinguish the fire, and incurred monetary damages.
Hazardous Materials: Fixed Site Incidents	Measured by the spatial extent of the event and volume of material lost. Additionally, material type, wind speed and direction and terrain factors impact extent.
Hazardous Materials: Transportation Accident	Extent is measured by volume of material lost, as well as proximity to major transportation routes. Hazard extent is also influenced by material type, terrain and wind speed and direction.
Petroleum and Natural Gas Incidents	Extent is measured by the spatial extent of an incident, and volume of material lost.
Infrastructure Hazards	
Infrastructure Failures and Secondary Technological Hazards	Hazard extent is measured by the type of failure and duration and what cascading effects are because of the hazard.
Transportation Accidents	Extent of a transportation accident can be measured by type of transportation involved and location of accident.

Human Related Hazards	
Civil Disturbances	Extent is measured by potential economic losses through damage to or disruption of operations of governmental facilities or other commercial businesses.
Public Health Emergencies	Public health emergency extent is measured by percentage of the population affected by the hazard. If the health emergency is a pandemic, the extent depends on how easily the illness is spread, mode of transmission, and amount of contact between infected and uninfected individuals.
Sabotage and Terrorism	Extent is measured by the area affected by the hazard, type of facility threatened, and the potential number of injuries or fatalities resulting from an event.

Hazard Profiling Concept of Planning
The method used to rank the hazards, vulnerabilities and risks includes the following:

- A public survey that was released for 30 days online with paper copies being made available at the county clerk's office, public library, and the post office.
- A public comment period after the final draft was released and before plan adoption.
- Government and institution survey released for added input into the plan.
- Gogebic County Emergency Management Coordinator reviewed the profile and ranked the overall risk for the county.
- Members of the Local Planning Team reviewed and ranked the risks for their communities.
- The risk profile was circulated among the staff at the Western U.P. Planning & Development Region for comment.

A risk assessment identifies the characteristics and potential consequences of a disaster, how much the community could be affected by the disaster, and the impact on community assets.

Hazard Priority Risk Index and Ranking

In order to draw some meaningful planning conclusions on hazard risk for Gogebic County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a "Priority Risk Index" (PRI). The purpose of the PRI, described further below, is to categorize and prioritize all potential hazards for Gogebic County as high, moderate or low risk. Combined with the asset inventory and quantitative vulnerability assessment provided in the next section, the summary hazard classifications generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes, and more specifically, the identification of hazard mitigation opportunities for Gogebic County jurisdictions to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for Gogebic County is based principally on the PRI, a tool used to measure the degree of risk for identified hazards in a

planning area. The PRI is used to assist the Gogebic County Local Planning Team (LPT) in gaining consensus on the determination of those hazards that pose the most significant threat to Gogebic County based on a variety of factors. The PRI is not scientifically based but is rather meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks in Gogebic County based on standardized criteria. The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time and duration). Each degree of risk has been assigned a value (1 to 4) and an agreed upon weighting factor, as summarized in **Table 6.4**.

To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the example equation below:

PRI VALUE = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

According to the weighting scheme, the highest possible PRI value is 4.0. Applying the weighting scheme to Gogebic County, the highest score of 3.3 was given to riverine and urban flooding as well as public health emergencies. Prior to being finalized, PRI values for each identified hazard were reviewed and accepted by the members of the LPT.

It should be noted that due to data gaps in the region, FEMA's Hazus was unable to be utilized in estimating potential losses from hazards. To improve model accuracy and future hazard mitigation planning, Gogebic County will seek to update hazard data with flood boundaries, flood depth grids, and asset inventories.

Key Definitions for Prioritized Risk Index Categories

Probability – a guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.

Magnitude/Severity – indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability assessment gives information that is helpful in making this determination for each community.

Warning Time – plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.

Duration – relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

Table 6.4: Priority Risk Index for Gogebic County

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

PRI Results

Table 6.5 summarizes the degree of risk assigned to each category for all initially identified hazards based on the application of the PRI. Assigned risk levels were based on the detailed hazard profiles developed for this section, as well as input from the LPT. The results were then used in calculating PRI values and making final determinations for the risk assessment.

Table 6.5: Summary of PRI Results for Gogebic County

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Weather Hazards						
Extreme Temperatures	Highly Likely	Limited	Large	More than 24 hours	Less than one week	3.0
Fog	Highly Likely	Minor	Small	6 to 12 hours	Less than 6 hours	2.3
Hail	Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Ice and Sleet Storms	Likely	Limited	Moderate	6 to 12 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.6
Severe Winds	Likely	Limited	Large	Less than 6 hours	Less than 24 hours	2.9
Snowstorms and Blizzards	Highly Likely	Limited	Large	12 to 24 hours	Less than one week	3.1
Tornadoes	Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	2.1
Hydrological Hazards						
Dam Failures	Possible	Limited	Small	Less than 6 hours	More than one week	2.4
Riverine and Urban Flooding	Highly Likely	Critical	Moderate	6 to 12 hours	Less than one week	3.3
Shoreline Flooding and Erosion	Highly Likely	Limited	Small	6 to 12 hours	More than one week	2.9
Drought	Possible	Minor	Large	Less than 6 hours	More than one week	2.5

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Ecological Hazards						
Wildfires	Possible	Limited	Small	Less than 6 hours	Less than 24 hours	2.2
Invasive Species	Highly Likely	Limited	Large	More than 24 hours	More than one week	3.1
Geological Hazards						
Earthquakes	Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	2.1
Subsidence (Ground Collapse)	Likely	Limited	Small	Less than 6 hours	Less than 6 hours	2.4
Technological (Industrial) Hazards						
Scrap Tire Fires	Unlikely	Minor	Small	Less than 6 hours	Less than 6 hours	1.5
Structural Fires	Highly Likely	Critical	Negligible	Less than 6 hours	Less than 24 hours	2.9
Hazardous Materials: Fixed Site Incidents	Possible	Limited	Small	Less than 6 hours	Less than one week	2.3
Hazardous Materials: Transportation Accident	Possible	Minor	Small	Less than 6 hours	Less than one week	2.0
Petroleum and Natural Gas Incidents	Possible	Minor	Small	Less than 6 hours	Less than one week	2.0
Infrastructure Hazards						
Infrastructure Failures & Secondary Technological Hazards	Likely	Limited	Small	Less than 6 hours	Less than one week	2.6
Transportation Accidents	Highly Likely	Critical	Negligible	Less than 6 hours	Less than 6 hours	2.8
Human Related Hazards						
Civil Disturbances	Unlikely	Minor	Negligible	Less than 6 hours	Less than 24 hours	1.4
Public Health Emergencies	Likely	Critical	Moderate	More than 24 hours	More than one week	2.9
Sabotage and Terrorism	Unlikely	Catastrophic	Negligible	Less than 6 hours	Less than one week	2.4

The conclusions drawn from the hazard profiling process for Gogebic County, including the PRI results and input from the LPT, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk and Low Risk (**Table 6.6**). For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout all of Gogebic County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately and is described in the Vulnerability Assessment section. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or unprecedented magnitudes is still possible in some cases and their assigned classification will continue to be evaluated during future updates.

Table 6.6: Conclusion on Hazard Risk Index for Gogebic County

High Risk	Riverine and Urban Flooding Snowstorms and Blizzards Invasive Species Extreme Temperatures Public Health Emergencies Severe Winds Shoreline Flooding and Erosion Structural Fires
Moderate Risk	Transportation Accidents Ice and Sleet Storms Lightning Infrastructure Failures and Secondary Technological Hazards Drought Sabotage and Terrorism Dam Failures Subsidence (Ground Collapse)
Low Risk	Fog Hail Tornadoes Wildfires Hazardous Materials: Transportation Accidents Petroleum and Natural Gas Incidents Earthquakes Hazardous Materials: Fixed Site Incidents Scrap Tire Fires Civil Disturbances

Hazard Summary

Although many of the hazards identified can and do occur throughout Gogebic County, the highest priority hazards include:

- Riverine and Urban Flooding
- Snowstorms and Blizzards
- Invasive Species
- Extreme Temperatures
- Public Health Emergencies
- Severe Winds
- Shoreline Flooding and Erosion
- Structural Fires

Hazard mitigation activities will focus on mitigating loss due to these priority hazards in Gogebic County while also considering activities that may mitigate loss due to lower ranking hazards.

SECTION 7: Hazard Mitigation

This section of the Plan provides the blueprint for Gogebic County and its municipal jurisdictions to follow in becoming less vulnerable to natural hazards. It is based on the consensus of the Local Planning Team (LPT) along with the findings and conclusions of the Capability Assessment and Risk Assessment. Few changes have been made to this section since the LPT reviewed and confirmed the existing goals for the plan update. The Mitigation Strategy consists of the following subsections:

- Overview of Mitigation Strategy Development
- Review and Update of Mitigation Goals and Objectives
- Capability Assessment
- Mitigating Hazards in Gogebic County
- Mitigation Resources
- Updating the 2020 Gogebic County Hazard Mitigation Plan

Overview of Mitigation Strategy Development

In formulating Gogebic County's mitigation strategy, a wide range of activities were considered in order to help achieve the general countywide goals in addition to the specific hazard concerns of each participating jurisdiction (again, for more details on the specific activities discussed and considered by the LPT, please see the summary of the second Mitigation Advisory Committee meeting in Section 3: *Planning Process*). In general, hazard mitigation actions are commonly broken into four different categories and were thoroughly explained and discussed at the Mitigation Strategy LPT Meeting:

Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.

Structure and Infrastructure Projects (SIP) - 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 human made structures to reduce the impact of hazards.

Natural Systems Protection (NRP) – These are actions that minimize damage and losses and preserve or restore the functions of natural systems.

Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.

The intent of the Mitigation Strategy is to provide Gogebic County and its municipal jurisdictions with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a listing of proposed actions deemed necessary to meet those goals and reduce the impact of natural hazards. It is designed to be comprehensive and strategic in nature.

In being comprehensive, the development of the strategy included a thorough review of all hazards and identifies far-reaching policies and projects intended to not only reduce the future impacts of hazards, but also to assist the county and municipalities achieve compatible economic, environmental, and social goals. In being strategic, the development of the strategy ensures that all policies and projects are linked to established priorities and assigned to specific departments or individuals responsible for their implementation with target completion deadlines. When necessary, funding sources are identified that can be used to assist in project implementation.

The first step in designing the Mitigation Strategy includes the identification of countywide Mitigation Goals. Mitigation Goals represent broad statements that are achieved through the implementation of more specific, action-oriented objectives listed in each jurisdiction's Mitigation Action Plan. These actions include both hazard mitigation policies (such as the regulation of land in known hazard areas through a local ordinance), and hazard mitigation projects that seek to address specifically targeted hazard risks (such as the acquisition and relocation of a repetitive loss structure).

The second step involves the identification, consideration, and analysis of available mitigation measures to help achieve the identified mitigation goals. This is a long-term, continuous process sustained through the development and maintenance of this Plan, beginning with the LPT during the first meeting. Alternative mitigation measures will continue to be considered as future mitigation opportunities become identified, as data and technology improve, as mitigation funding becomes available, and as this Plan is maintained over time.

The third and last step in designing the mitigation strategy is the creation of the local Mitigation Action Plans (MAPs), which are provided separately in Section 8: *Action Plan*. The MAPs represent unambiguous plans for action and are the most essential outcome of the mitigation planning process. They include a prioritized listing of proposed hazard mitigation actions (policies and projects) for each of Gogebic County's local jurisdictions along with accompanying information such as those agencies or individuals assigned responsibility for their implementation, potential funding sources and an estimated target date for completion. The MAPs provide those individuals or agencies responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring progress over time. The cohesive collection of actions listed in each jurisdiction's MAP also can serve as an easily understood menu of mitigation policies and projects for those local decision makers who want to quickly review their jurisdiction's respective element of the countywide Plan.

In preparing their own individual Mitigation Actions Plans, each jurisdiction considered their overall hazard risk and capability to mitigate natural hazards as recorded through the risk and capability assessment process, in addition to meeting the adopted countywide mitigation goals and the unique needs of their community. Prioritizing mitigation actions for each jurisdiction was based on the following five (5) factors: (1) effect on overall risk to life and property; (2) ease of implementation; (3) political and community support; (4) a general economic cost/benefit review, and; (5) funding availability.

Review and Update of Mitigation Goals and Objectives

The goals of the Gogebic County Hazard Mitigation Plan were crafted early in the planning process through a facilitated discussion and brainstorming session with the LPT (for more details, please see the summary of the second LPT meeting in Section 3: *Planning Process*). Each of the following goal statements represent a broad target for Gogebic County and its jurisdictions to achieve through the implementation of their own specific Mitigation Action Plans. These goals were reviewed at the LPT Meeting (August 2019) and confirmed to still be valid for the 2020 Gogebic County Hazard Mitigation Plan.

Goal 1	Work to improve existing local government policies and codes to reduce the impacts of natural hazards.
Goal 2	Design and implement specific mitigation measures to protect vulnerable public and private properties.
Goal 3	Increase the protection of critical facilities and infrastructure from hazard threats through retrofit projects for existing facilities and innovative design standards for new facilities.
Goal 4	Enhance public education programs to promote community awareness of natural hazards and the hazard mitigation techniques available to reduce their impact.
Goal 5	Improve stormwater management through enhanced local government programs, policies and practices.
Goal 6	Enhance the county's storm evacuation procedures through increased intergovernmental coordination between Gogebic County, its municipalities, and the State of Michigan.
Goal 7	Increase the County's emergency management capabilities through sustained system and technology improvements.
Goal 8	Promote volunteer involvement in emergency preparedness and response through increased citizen awareness and training activities.

Note: A stated objective of the Disaster Mitigation Act of 2000 is to improve the coordination of risk reduction measures between state and local government authorities. Linking local and state mitigation planning goals is an important first step. The Gogebic County LPT determined that the mitigation goal statements are consistent with the State of Michigan's current mitigation planning goals as identified in the State Hazard Mitigation Plan promulgated by the Michigan Emergency Management and Homeland Security Division of the Michigan State Police.

Capability Assessment

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. As in any planning process, it is important to try to establish which goals, objectives and/or actions

are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given a local government's planning and regulatory framework, level of administrative and technical support, amount of fiscal resources and current political climate.

A capability assessment has two primary components: an inventory of a local jurisdiction's relevant plans, ordinances or programs already in place; and an analysis of its capacity to carry them out. Careful examination of local capabilities will detect any existing gaps, shortfalls or weaknesses with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. A capability assessment also highlights the positive mitigation measures already in place or being implemented at the local government level, which should continue to be supported and enhanced, if possible, through future mitigation efforts.

The capability assessment completed for Gogebic County and its participating municipalities serves as a critical planning step and an integral part of the foundation for designing an effective multi-jurisdictional hazard mitigation strategy. Coupled with the Risk Assessment, the Capability Assessment helps identify and target meaningful mitigation actions for incorporation in the Mitigation Strategy portion of the Hazard Mitigation Plan. It not only helps establish the goals for Gogebic County to pursue under this Plan, but also ensures that those goals are realistically achievable under given local conditions.

Planning and Regulatory Capability

Planning and regulatory capability is based on the implementation of plans, ordinances and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment in a responsible way while maintaining the general character of the community. It includes emergency response and mitigation planning, land use and transportation planning, zoning and building code enforcement, as well as protecting environmental, historical, and cultural resources. Some conflicts may arise, but these planning initiatives generally present significant opportunities to integrate mitigation principles into the local decision-making process.

Table 7.1 below provides a summary of relevant local plans, ordinances and programs already in place or under development for Gogebic County's participating local governments. A checkmark (✓) indicates that the given item is currently in place, or it is currently being developed for future implementation. Local governments will integrate, as appropriate, the data, information and hazard mitigation goals and actions from this mitigation plan into other planning mechanism, such as those listed in Table 7.1.

Table 7.1: Relevant Plans, Ordinances, and Programs in Gogebic County

Jurisdictions	Land Use Plan	Stormwater Management Plan	Master Plan	Asset Management Plan	Watershed Management Plan	Recreation Plan	Recreation and Natural Resource Conservation Plan	Emergency Operations Plan	Disaster Recovery Plan	Capital Improvements Plan	Historic Preservation Plan	Zoning Ordinances	Building Code	National Flood Insurance Program
Gogebic County			✓			✓		✓	✓					
City of Bessemer	✓ MP		✓	✓ CIP		✓		✓*	✓*	✓	✓ MP	✓	✓	✓
City of Ironwood	✓ MP	✓ MP	✓	✓		✓ MP		✓		✓	✓ MP	✓	✓	✓
City of Wakefield	✓	✓	✓*	✓		✓*		✓				✓	✓	✓
Bessemer Township			✓	✓		✓		✓				✓	✓	✓
Erwin Township			✓					✓				✓	✓	✓
Ironwood Township	✓		✓	✓*		✓		✓		✓*		✓	✓	✓
Marenisco Township	✓ MP		✓			✓		✓				✓	✓	✓
Wakefield Township			✓*					✓		✓		✓	✓	
Watersmeet Township	✓		✓	✓*		✓		✓				✓	✓	

MP - Embedded in Master Plan *CIP – Embedded in Capital Improvements Plan* ** - Plan Under Development*

Mitigating Hazards in Gogebic County

The following is an overview of potential activities by category for Gogebic County. A more detailed list of activities, responsible parties, and estimated costs are mapped out in Section 8: *Action Plan*.

Local Plans and Regulations

The purpose of these actions is to include government authorities, policies or codes that influence the way land and buildings are being developed and built. Several activities can be implemented at the local level, including:

- Building Codes
- Planning and Zoning
- Open Space Preservation
- National Flood Insurance Program

Building Codes: Building codes are an effective way to address many hazards identified in this plan. Through building code enforcement all new and improved buildings can be built or rehabilitated to withstand the impacts of certain hazards such as snow load, high winds, extreme temperatures and flooding.

In 1999 the State of Michigan amended the process of code adoption under the State Construction Code Act (Act 230). This Act now requires municipalities to administer and enforce the statewide codes, including the Michigan Building Code 2003, Michigan Plumbing Code 2003, Michigan Mechanical Code 2003, and Michigan Residential Building Code 2003, all developed by the International Code Council (ICC); and the National Electrical Code 2002, published by the National Fire Protection Association. The language does not permit local communities to modify the State codes. In Gogebic County, the County is responsible for all electrical, mechanical, and plumbing code enforcement. All jurisdictions maintain local control of building codes. Thorough inspection of property during and after construction ensures that builders are incorporating all the current standards and requirements in effect.

Planning and Zoning: Planning and zoning guides indicate where development should occur based on suitability and compatibility, keeping development away from sensitive areas such as floodplains and wetlands and thereby protecting property from certain types of natural hazards. Master plans are a primary way for a local unit of government to guide future development within their community. Through a planning process that reviews a community's background, current land use, and projected needs, guidance can be given to future development. Master plans serve only as a guide and do not regulate land use.

Zoning regulations are the primary tool to implement comprehensive plans and control land use. By identifying different zones or districts, a community can guide development within its boundaries. Zoning puts restrictions on use, lot size, setbacks, etc., but can be combined with more creative regulations such as a planned unit development option that allows more flexibility in the development process. Zoning is enforced by the local unit of government and should be based on a comprehensive plan for the community.

Land conservation is another good tool for communities to use for reducing the risks of stormwater runoff and sewer overflows.

Open Space Preservation: Open space preservation is a way to keep hazardous areas free from development and is especially effective in floodplain areas. Prohibiting new development in hazard-prone areas is the best way to mitigate future problems. An additional benefit to open space preservation is the maintenance of agricultural areas, green space/parks, and the installation of green infrastructure to mitigate stormwater runoff. While single-purpose gray stormwater infrastructure—conventional piped drainage and water treatment systems—is designed to move urban stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits. Comprehensive plans can help identify suitable areas to preserve through any number of means including acquisition, donation by developers, easement or regulated setbacks/buffers where development is restricted.

National Flood Insurance Program: The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures.

Natural Systems Resource Protection

Natural Systems Resource Protection mitigation activities are a way to enable land to function in a natural way. There are many benefits to naturally functioning watersheds, floodplains and wetlands, which can include:

- Reduction in runoff from rainwater and snowmelt
- Infiltration and velocity control during overland flow
- Filtering of excess nutrients, pollutants and sediments
- Floodwater storage
- Water quality improvement
- Groundwater recharge
- Habitat availability and regeneration
- Recreation and aesthetic qualities

Many natural areas have historically been affected by development and will be affected by development in the future, there are several ways to protect and restore the environment through hazard mitigation. Resource protection activities can include:

- Wetland protection

- Erosion and sedimentation control
- River restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Wetland Protection: Wetlands are a valuable resource that provides mitigation functions including storage of floodwaters and pollutant filtration, regulate overland flow, as well as habitat for fish, wildlife, and plants. As a result, wetlands are regulated in Michigan by Part 303, Wetland Protection, of the Natural Resources and Environmental Protection Act (Act 451 of 1995). EGLE administers the permit program. In Michigan a permit is required to: deposit fill material in a wetland; dredge or remove soil or minerals from a wetland; construct, operate, or maintain any use or development in a wetland; or drain surface water from a wetland. Wetlands are specifically defined under the Act, and certain activities are exempted under the Act.

Bioswales are vegetated, mulched, or xeriscaped channels that provide treatment and retention as they move stormwater from one place to another. Vegetated swales slow, infiltrate, and filter stormwater flows. As linear features, they are particularly well suited to being placed along streets and parking lots.

Local units of government can play a role in wetland protection and should serve as stewards over their water resources. Wetland protection measures can be implemented on a local level, and public education is a key to protecting this valuable resource.

Erosion and Sedimentation Control: Surface water can easily erode soil in large exposed areas including farmlands, construction sites, and forested areas. In addition to exposed areas, erosion often occurs along stream banks and shorelines with high velocity currents and wave action. The erosion carries sediments and deposits them downstream where they can cause problems to storm sewers, culverts and ditches by reducing the capacity of the systems. Erosion also results in sediment in the water which reduces light and oxygen in the water. Heavy metals and other contaminants are the reason that sediment is identified as the number one nonpoint source pollutant for aquatic life.

Erosion and sedimentation can be controlled through phased construction, minimization of clearing, and stabilization of bare ground with vegetation, and other means. Sediment can be captured onsite with traps and filters, and water velocity can be slowed by terraces, temporary cover, constructed wetlands, and impoundment.

Part 91, Soil Erosion and Sedimentation Control of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, regulates only earth change activity

(primarily construction projects disturbing one or more acres of land or that which is within 500 feet of the water's edge of a lake or stream). Part 31, Water Resources Protection Act, of NREPA addresses most other sources of sediment. Locally, municipalities may adopt additional protection measures dependent on state laws via the NREPA or Planning and Zoning Enabling Acts.

River Restoration: History has proven that returning streams and adjacent land to a natural condition reduces erosion. The restoration of vegetation along stream banks protects the water by:

- Reducing the amount of sediment (and pollutants) entering the water.
- Provides habitat for wildlife.
- Slows the velocity of water, thus reducing flood damage and erosion.
- Provides recreational opportunities and aesthetic value.
- Reduces long-term maintenance costs.

Best Management Practices: Non-point source pollutants including fertilizers, pesticides, animal wastes, chemicals, and sediment are washed away by storm water and distributed in storm sewers, ditches, and streams. The term best management practices (BMPs) refers to the design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff.

Dumping Regulations: Dumping regulations attempt to regulate the disposal of solid matter that can end up in streams and wetlands. Solid waste can pollute water, obstruct water flow, and reduce the ability of the stream or wetland to clean storm water. The dumping of waste materials such as garbage is illegal, but the dumping of yard waste, such as leaves and branches, can also affect a watercourse. Waste can block culverts, creating earthen dams that can fail during heavy rain events. Public information should be a central focus of a dumping enforcement program.

Urban Forestry: Damage caused by wind, ice, and snowstorms is often due to their impact on trees. Downed trees and branches can upset power lines, damage buildings, and harm property under them. An urban forestry program can reduce the damage potential of trees through maintenance and monitoring. Through better tree selection, proper pruning and evaluation, communities can also mitigate damage caused by downed trees.

Farmland Protection: Farmland protection's purpose is to provide ways to keep prime, unique or important agricultural land intact. Farmland is being converted to nonagricultural uses at an alarming rate which results in residential development that needs more infrastructure, increased storm water runoff, and emergency services capacity difficulties. Farmland protection parallels open space protection in that it keeps the land open for future generations but also helps with storm water runoff, ecosystem maintenance, and scenic enhancement.

The Michigan Farmland and Open Space Preservation Act (PA 116) is a law that works to preserve farmland by offering incentives to farmers who are willing to participate. According to the Michigan Department of Agriculture and Rural Development (MDARD), the law, which was passed in 1974, enables a farm landowner to enter into a development rights agreement with the

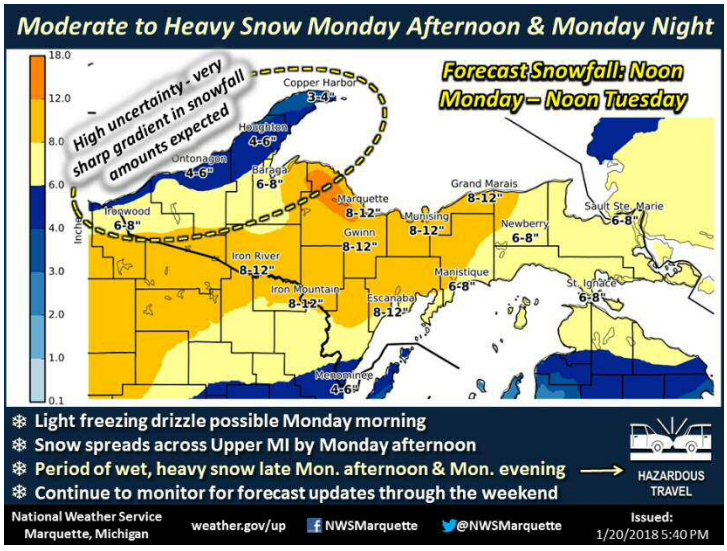
state. The agreement is designed to ensure that the land remain in agricultural use for a minimum of 10 years. In return, the farm owner may be entitled to income tax benefits and exemption from special assessments on the land. Today, 3.3 million acres of land, or 9% of Michigan's total land area, is protected under this program[48]. In June 2019, MDARD issued a ruling opening farmland in the state preservation program to large-scale solar development, with several important caveats, including landowners not being able to claim tax credits under PA 116 until the panels are uninstalled[49].

Emergency Services

Local emergency services authorities, resources, and facilities throughout Gogebic County are documented in Section 3 of this plan. Although all authorities are effective in conducting their internal and incident response activities, there is an opportunity to further educate the public about their operations – for example, through dissemination of hazard-related materials. Furthermore, several agencies lack necessary equipment to meet their responsibilities in areas of local government operations such as public works and planning. Inadequate funding sources will make this a continuing problem.

Emergency services provide protection for people both during and after a disaster. A thorough emergency services program addresses all hazards and involves all response departments and facilities. In Michigan, emergency services are supervised by the Michigan State Police Emergency Management and Homeland Security Division and coordinated through county emergency management offices. Several components pertain to emergency services, including:

- Threat Recognition
- Warning
- Response
- Critical Facilities Protection
- Post-Disaster Recovery and Mitigation



National Weather Service in Marquette issuing a heavy snowfall warning on January 20, 2018

Threat Recognition: The first step in responding to a hazard is being aware that there is potential for an event to occur. With a threat recognition system, adequate warnings can be disseminated, and other response actions can be undertaken. Flood threats can be evaluated by measuring rainfall, soil moisture, and stream flows upstream and then calculating flood levels for downstream locations. Discerning the time

[48] Farmland and Open Space Preservation Frequently Asked Questions. MDARD. https://www.michigan.gov/mdard/0,4610,7-125-1599_2558-10312--,00.html

[49] Policy for Allowing Commercial Solar Panel Development on PA 116 Lands. MDARD. https://www.michigan.gov/documents/mdard/MDARD_Policy_on_Solar_Panel_and_PA116_Land_656927_7.pdf

and height of a potential flood crest will allow more efficient evacuations. Some rivers have gauges that establish threat levels. Under threat conditions, the National Weather Service (NWS) may issue flash flood watches for affected areas. The NWS is the agency that predicts meteorological threats and can issue public warnings.

Warning: After a threat is identified, the Office of Emergency Measures (OEM) notifies municipalities and other agencies that an event is possible or occurring. Early notification is key to distribute information to all affected parties. The NWS notifies the public using two levels: *Watch* and *Warning*. *Watch* refers to conditions that are right for flooding, thunderstorms, tornadoes or winter storms. *Warning* refers to a flood, tornado, etc. has started or has been observed. A more specific warning may be disseminated in a few ways, including:

- Warning sirens (outdoor and on public safety vehicles)
- Via commercial radio or TV (news and weather channels)
- NOAA Weather Radio (where available)
- Mass telephone notification
- Tone activated receivers in key facilities
- Door to door contact
- Mobile public address systems via text
- Internet/e-mail notification

All the systems have their limitations because they reach only certain audiences. TV and radio can provide information, but this method of notification is only effective if people have them on. NOAA radio will only reach those with access to a weather radio. Outdoor warnings can indicate to tune into another information source such as TV or radio, but this type of warning has limited reach and may not be heard by people indoors or in noisy environments. Door-to-door contact is time consuming but preferred when there is enough lead time for an incident. The best warning system is a redundant system that provides notification via numerous methods to reach as much of the population as necessary.

The warning system should also include information as to the response action to take, such as staying indoors during a tornado warning or staying off roads in the event of a severe winter storm.

Response: Effective response, in combination with threat recognition and warnings, is another way for a community to mitigate hazard impact. A community typically coordinates an incident response through an emergency operations center (EOC) that assists the Incident Commander in the field with resources, expertise, etc. as per the Emergency Action Plan (EAP). An EAP ensures that the community responds efficiently and appropriately to a threat. EAPs need to be regularly updated to keep names and contact information current.

Response activities may include a variety of agencies, offices, and measures such as closing streets and bridges, shutting off power to threatened areas, ordering an evacuation and opening evacuation centers, monitoring water levels, and implementing security measures.

Critical Facilities Protection: Critical facilities are the vital facilities that keep a community functioning as identified in Section 3. Critical facilities must be prepared to respond during an emergency. Most critical facilities will have their own response plan in place, and the facilities are also included in municipal emergency action plans. The best protections are early warning, response planning, and coordination in the event of an emergency.

Post-Disaster Recovery and Mitigation: Communities must be prepared for recovery and mitigation of future problems after an incident. While the focus is on recovery, it is also important to recognize mitigation methods to prevent the incident from reoccurring at the same magnitude. During recovery several actions take place including patrolling, cleanup, providing services, monitoring impact, and regulating reconstruction. During this recovery time, mitigation activities can include undertaking public information efforts aimed at educating residents on how to protect themselves in the future, evaluating reconstruction methods including the addition of mitigation measures, and seeking funding for recovery efforts.

Structure and Infrastructure Projects

Structure and infrastructure projects are intended to protect people and infrastructure from damage due to natural hazards. Such projects are typically used to manage and control flood waters. The complexity and cost of structural projects can vary greatly and are dependent on individual circumstances. Structural projects are undertaken where non-structural measures would not be effective. Structural projects may include:

- Reservoirs and Detention Areas
- Roadway and Road Crossing Improvements
- Levees, Floodwalls, and Seawalls
- Drainage and Storm Water Improvements/Maintenance
- Channel improvements

Because of the construction costs, maintenance and impacts of structural projects, they are often undertaken and funded by larger agencies with coordination at the local level. Agencies including the Michigan Department of Natural Resources, U.S. Army Corps of Engineers, and the USDA Natural Resources Conservation Service are often involved in structural projects.

Reservoirs and Detention Areas: Reservoirs are intended to protect development downstream by temporarily storing flood waters. The reservoirs hold water behind dams or in storage/detention basins until flood waters subside. The detained water is then released downstream at a rate the river or stream can accommodate. Reservoirs are built to address existing problems or may be built to handle increased runoff from new development.

Roadway and Road Crossings Improvements: Flooding can often affect accessibility by inundating roadways, culverts, bridges, driveways, and other transportation infrastructure. There are several things that can be done to maintain access when alternative access is not available, including elevating the roadbed, enlarging culverts to increase channel capacity, or replacing culverts with bridges. A concern when undertaking these types of improvements is the impact to downstream locations from increased capacity of the water system when it is no longer constricted up stream.

Upgraded culverts can mitigate flooding problems by increasing the flow capacity of streams as they pass under roadways.

Levees, Floodwalls, and Seawalls: One of the most popular flood control measures is the construction of an earth levee or concrete floodwall to protect property. The purpose of these structures is to keep a stream within its channel by providing higher "banks." Levees require extensive design to address large floods, erosion, river access and views, and cost of construction and maintenance. Seawalls are often used to protect from erosion due to storm surges along Lake Superior's edge. Seawalls are built along a property edge and are designed to protect a property from the storm surges. Along the Great Lakes they can be significantly impacted by ice movement during the winter months and often have difficulty resisting lake forces.

Drainage and Storm Water Improvements/Maintenance: Human-made ditches and storm sewers assist in guiding runoff where surface drainage is inadequate. These systems allow water to be conveyed quickly to other locations; thus, they are most appropriate where the receiving location has adequate capacity. Storm sewer improvements may include installing new sewers, enlarging pipes, and preventing back flows. Other improvements in combination with drainage enhancements may include wetland detention, vegetated trenches, and practices that reduce the quantity and velocity of runoff. It is also important to maintain storm water and drainage systems. This involves keeping channels, ditches, and culverts cleared of debris; maintaining overgrowth; and remediating stream bank erosion sites. Debris can be any number of things, from tree limbs and branches to illegally dumped trash. Maintenance of public drainage systems is the responsibility of government agencies. The city or township must perform routine maintenance on these drainage systems or they, or residents in the watershed, may petition the County Drain Commission to establish a county drain. If approved by the County Board of Commissioners, the drain then becomes the county's responsibility to maintain.

Channel Improvements: Channel improvements are another method of increasing the capacity of streams, thereby allowing more water to travel at a faster rate. Improvements can be made through dredging, "channelization," or diversion. Dredging increases the capacity of a stream by removing material at the bottom. Channelization refers to the straightening, widening, and/or

deepening of a stream. Diversion is the practice of creating a new channel to send floodwaters to an alternative location.

Education and Awareness Programs

Education and awareness programs are a mitigation strategy that has broad reaching impact across both the public and private sectors. Activities that provide local officials, property owners, renters, businesses, and other parties with information about how to protect themselves and others from potential hazards may have the greatest impact of all mitigation strategies. Information empowers people to protect their own property and lives.

There are many ways to get information out to the public affected by hazards through community outreach. Community outreach is informing the public through news media, community newsletters, direct mailings, presentations, displays, signs, the internet, brochures, technical assistance, and other outlets. Because methods are diverse, it is best to analyze each community to find out how people obtain information and use that knowledge to build an outreach plan. While in some communities a local newsletter is distributed, other communities may rely on a newspaper to get information.

While public information on hazards is important, it is also vital to provide people with methods to address the hazard. Outreach projects should include information on hazards, safety, health, and property protection measures at the local level. Community offices and libraries are good places to distribute printed information (e.g., books and pamphlets) and increasing internet use indicates web distribution is also an effective way to disseminate information. Information on a website can easily be linked to an infinite number of available resources.

Technical assistance can further assist people in protecting their property. Assistance can be in the form of hazard identification assistance or property protection assistance. Resources for technical assistance may include direction from building department staff or FEMA Flood Map clarification with assistance from community staff.

In Gogebic County and its jurisdictions, education is the key to hazard mitigation. By providing individual citizens with the information and tools necessary, much can be done to further mitigation efforts in Gogebic County. An ongoing education program and availability of limited technical assistance could provide the public with the ability to protect themselves and their property.

Mitigation Resources

There are two types of resources: existing institutional establishments, such as government agencies and continuing programs, and funding sources to undertake specific projects. The following list is intended to provide examples of funding sources for both current and future mitigation projects and should not be considered comprehensive. Potential new sources for mitigation funding should be added as identified. Project specific funding options are included in the respective Action Items identified in Section 8. The following mitigation funding and resources can be found with further detail in Appendix C.

Federal		
Economic Development Administration	U.S. Department of Agriculture	U.S. Department of Transportation
Federal Emergency Management Agency	U.S. Department of Energy	U.S. Small Business Administration
U.S. Army Corps of Engineers	U.S. Department of Health & Human Services	U.S. Department of Housing and Urban Development
U.S. Department of the Labor		

State		
Environment, Great Lakes, and Energy	Michigan Department of Natural Resources	Michigan Economic Development Corporation
Michigan Department of Transportation		

Other - Local		
Duck Lake Riparians' Association	Keweenaw Land Trust	Superior Health Foundation
Gogebic-Ontonagon Community Action Agency	Superior Watershed Partnership and Land Conservancy	Western Upper Peninsula Planning and Development Region (WUPPDR)

Other - National		
Community Restoration and Resiliency	National Low-Income Housing Coalition	Rebuilding Together
Grants for Indigenous Peoples	Planning for Post Disaster Recovery	Volunteer Organizations Active in Disasters (VOAD)

Updating the 2020 Gogebic County Hazard Mitigation Plan

This section is intended to provide discussion on how communities will continue public participation in the plan maintenance process. It will also contain a description of plan monitoring, evaluating, and updating for keeping the plan current and updated within five years.

Throughout of the development of the 2020 Gogebic County Hazard Mitigation Plan, the County has made a concerted effort to collect feedback from the public, local government, and agencies. Moving forward residents will continue to be notified of any plan updates and be invited to provide feedback through the incorporation of hazard mitigation into other planning documents.

The Hazard Mitigation Plan will be updated every five years in order to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene an LPT representing local agencies and concerned parties to evaluate progress and update the plan in accordance with FEMA regulations. The Committee will review the plan to determine the sections that need to be updated or modified based on changing conditions or alterations in State or Federal requirements. It is recommended that public participation will include surveys, charettes, and other community presentations at regularly scheduled meetings. Goals, objectives, and strategies will also be reviewed to determine whether they thoroughly address new or changing conditions.

The Emergency Manager with monitor and evaluate the plan implementation overtime to assess the effectiveness of the plan at achieving its stated goals. They will work with Gogebic County to update the plan within five years based on public feedback, the LPT and State Hazard Mitigation Officer recommendations. The public will also be notified of any plan updates (interim or within five years), and copies will be made available at all local government offices and online.

SECTION 8: Action Plan

This section highlights the five-year action plan set out by the Local Planning Team (LPT)f for Gogebic County to reduce the community's vulnerability and risk to local hazards based on their capability. The final step in the mitigation process is to build upon the general recommendations for mitigation activities suggested in Section 7 and identify specific action items for Gogebic County and its communities. All the activities identified in this section are consistent with the following mitigation goals identified in Section 7:

Goal 1 Protect lives and property within Gogebic County from all known hazards while focusing on priority hazards.

Goal 2 Identify feasible projects throughout the County that will help mitigate future problems.

Goal 3 Be proactive in protecting public facilities and critical facilities through proper maintenance and upgrades.

Goal 4 Educate citizens to encourage self-help and mitigation of hazards on private property.

Projects vary from structural measures to education and are prioritized based on impact to persistent, known hazards and potential resources available to complete the project. Although projects are prioritized on a countywide basis, this does not limit the county's or a local community's ability to pursue identified projects as funding becomes available. Several of the projects are ongoing action activities that will be accomplished as time and resources permit. Identified action items include a short description of the activity, the responsible agency or agencies, timeline, projected costs if available, and ways that Gogebic County and its citizens will benefit.

Cost-benefit consideration, both financial and otherwise, is a major factor in the prioritization of action items. As a result, action priorities are not entirely consistent with the rankings in the Hazard Analysis section. In addition, a potential event that is anomalous within its hazard category may warrant action regardless of the rank of that general hazard type.

Past Mitigation Accomplishments

Tables 8.1 and **8.2** summarizes the status of mitigation action items from the 2005 and 2013 Hazard Mitigation Plans.

Table 8.1: 2005 Mitigation Action Items

2005 Item	Status
City of Wakefield Flood Mitigation Plan and Feasibility Study for Sunday Lake Floodgate	Completed
NOAA Weather Radio	Completed
Update Stormwater Management Plans and Flood Maps	Partially completed
Review Plans and Development Regulations	Ongoing
Improved Emergency Response	Ongoing
Drainage Improvements and Maintenance	Ongoing
Mine Shaft Safety	Ongoing
Public Information/Education Program	Ongoing
Update Shoreline Erosion Map and Identify Future Mitigation Activities	Ongoing
Insurance	Ongoing
Retrofit Underground Pipes	Ongoing

Table 8.2: 2013 Mitigation Action Items

2013 Item	Status
Repair Sunday Lake Floodgate	Completed
Repair of Presque Isle Wildlife Dam	Completed
Pipeline Safety Program	Ongoing
Mobile 911 Boosters	Not completed [A]
Mine Inspector	Ongoing
Mine Shaft Safety	Ongoing
Drainage Improvements and Maintenance	Ongoing
Implement State Line Community Wildfire Protection Plan (CWWP) Action Items	Ongoing
Public Information/Education Program	Ongoing
Update Shoreline Erosion Map and Identify Future Mitigation Activities	Ongoing
Insurance	Ongoing
Retrofit Underground Pipes	Not completed [A]
Scrap Tire Removal	Ongoing
Create and Review Plans and Development Regulations	Ongoing
Improve Emergency Response Capability	Ongoing
Early Warning System	Ongoing

A: These action items were not completed due to a change in county priorities.

Action Items

Some action items are carried over from the 2013 Hazard Mitigation Plan. Several of these are ongoing activities that will continue indefinitely. Two projects have been completed: repair of the Sunday Lake Floodgate and the Presque Isle Wildlife Dam. The other action items either were or are still dependent on funding that has not been available. For 2020, a debris management plan was implemented to mitigate flooding of the Montreal River. Since 2005, no large-scale changes in land development have occurred in Gogebic County. Most construction has been incremental within or adjacent to existing developed areas. While several jurisdictions are in the progress of completing (City of Wakefield/Wakefield Township) or have updated their master plans, none are expected to have a major impact on land use in the county.

The 2020-2025 Gogebic County action items seeks to implement priority mitigation actions that reduce risk from hazards within the county. Each action item summary provides a description of the project, lists the responsible agency, an estimated deadline, project cost, potential funding sources, and an outline of how the action would benefit the county.

Action Item 1: **Upgrades of Roads, Culverts, and Dams**

As an ongoing project in the county, the Gogebic County Road Commission and local public works officials has had an active role in upgrading roads and replace inadequate culverts in response to previous problems and mitigate future problems. The county should upgrade culverts along county roads that are susceptible to flooding every three- to four- years during spring runoff. The County and local public works should continue to maintain and upgrade current dam systems as needed, while also monitoring beaver dam problems. A list of priority systems and locations to be repaired or upgraded should be developed.

Responsible Agency:	Gogebic County Road Commission and local municipal public works
Deadline:	Ongoing
Cost:	Varies by project; staff time
Potential Funding Sources:	FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program, Michigan Department of Transportation, and organization/agency operating budgets
Benefits:	Addressing infrastructure needs before an emergency arises will reduce costs. Inspection and maintenance of the existing infrastructure will prevent and mitigate future problems in areas with known issues, such as flooding. Work will largely fix/replace or other improve roads, culverts, and dams and prevent future damages.

Action Item 2: **Debris Management Plan for the Montreal River**

During spring snowmelt, the Montreal River typically reaches flood stage and trees are washed downstream, causing large log jams in the river. This can create flooding issues the following spring. Gogebic County, in partnership with Iron County, Wisconsin, have worked together to clear debris from the river to prevent flooding issues.

Responsible Agency:	Gogebic County Emergency Manager, in partnership with Iron County, Wisconsin Emergency Manager
Deadline:	Ongoing (annual summer project)
Cost:	$30,000
Potential Funding Sources:	FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program
Benefits:	Increasing shoreline stability will help prevent or reduce the impact from floods resulting from tree debris and log jams.

Action Item 3: Reduce possibility of damages and losses resulting from disease/pandemic hazards

The COVID-19 pandemic has significantly impacted the local economy and public health sector, along with the health of the community itself. Steps have been taken to mitigate and reduce the spread of the highly infectious disease, but the long-term effects on public health and small businesses is still unknown. To better prepare for the potential long-term impacts, the county will work with local and regional organizations to create strategies that will minimize harm to residents and local small businesses.

Responsible Agency:	Gogebic County, local organizations, and EDOs
Deadline:	Ongoing
Cost:	Staff time
Potential Funding Sources:	Organization/agency operating budgets and federal and state sources
Benefits:	Planning and mitigating the impacts from COVID-19 will help the county be more resilient from the long-term effects that the pandemic has caused on the local economy and community health.

Action Item 4: **Develop and distribute outreach materials related to hazard mitigation and emergency preparedness**

Public information is key to mitigating many of the potential hazards in Gogebic County. Several projects can help to educate the public on potential hazards and how to protect themselves from hazards. Recommended projects include preparing and gathering educational materials on hazards affecting Gogebic County and how people can help with mitigation and emergency preparedness. These materials should be created and made available at government offices,

schools, and other easily accessible public facilities as well as on the internet. Topics should focus on, but are not limited to, community hazard awareness, preparedness, and resiliency, invasive species, safe driving in hazardous weather conditions, and implications of long-term infrastructure outages.

Responsible Agency:	Gogebic County Emergency Manager, DNR, MSU Extension, Red Cross, and other applicable organizations
Deadline:	Ongoing
Cost:	Staff time, cost of materials, and printing
Potential Funding Sources:	Organization/agency operating budgets, FEMA, DHS Homeland Security Grant Program, Michigan Invasive Species Grant Program, and other federal and state sources
Benefits:	Organizing locally applicable materials and making them publicly available ensures that the message is shared with throughout the county. Using newspapers and the internet, the public is easily informed, and the message can be made consistent. This action item helps inform the public and assists people who want to learn more about property protection and how to reduce their risk from hazards.

Action Item 5: **Increase Hazard Education and Risk Awareness**

Education programs can provide more in-depth education beyond developed outreach materials. Outreach efforts should be targeted to specific groups, such as students, homeowners, or business owners. Workshops, forums, seminars, and other hands-on programs can help educate the public on potential impacts from hazards, hazard risk, and emergency preparedness. Existing school education programs should also be utilized to promote hazard education, safety, and mitigation. Cooperative relationships with local media should be established to produce public service announcements about hazards.

Responsible Agency:	Gogebic County Emergency Manager, DNR, MSU Extension, and other local organizations
Deadline:	Ongoing
Cost:	Staff time, cost of programming and materials
Potential Funding Sources:	Organization/agency operating budgets, FEMA, DHS Homeland Security Grant Program, Michigan Invasive Species Grant Program, and other federal and state sources
Benefits:	Efforts aimed to inform and educate residents, businesses, and other stakeholders can promote community resiliency after a hazard. If individuals and local governments are better informed and prepared for a hazard, this can reduce negative outcomes following a hazard.

Action Item 6: **Hazard insurance to property owners**

Not all hazards can be mitigated prior to occurrence but by maintaining and promoting insurance, property owners can protect themselves from losses due to hazards.

Responsible Agency:	Municipalities, residents, business owners, and others
Deadline:	Ongoing
Cost:	Varies by insurance coverage
Potential Funding Sources:	FEMA – National Flood Insurance Plan, organization/agency operating budgets, and individual property owners
Benefits:	All residents benefit by protecting themselves and their community facilities from loss. Conventional insurance policies will protect people from most hazards while in municipalities participating in the NFIP, residents also have access to flood insurance. The County and municipalities can also educate its citizens on the importance of maintaining adequate property insurance.

Action Item 7: **NOAA weather radios in schools and government buildings**

Because weather is one of the most persistent hazards in Gogebic County, access to an efficient emergency broadcast system is vital. NOAA Weather Radio All Hazards (NWR) early warning system is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service office. An NWR would provide schools and local governments up to date weather and emergency information for all types of hazards without having to rely on electricity or internet connectivity. This includes natural, environmental, and public safety hazards.

Responsible Agency:	Gogebic County
Deadline:	2021
Cost:	$50,000
Potential Funding Sources:	FEMA Hazard Mitigation Grant Program and other state/federal sources
Benefits:	Providing an NWR in all schools and government buildings can assist schools and local governments to better prepare for a potential or present hazard in the area.

Action Item 8: **Mine Shaft Safety**

An ongoing program of mine shaft safety that includes capping and other measures should be implemented. As funding is available, the County will prioritize and address hazardous shafts.

Responsible Agency:	Gogebic County/Mine Inspector

Deadline:	Ongoing
Cost:	$15,000 per shaft or opening
Potential Funding Sources:	FEMA Hazard Mitigation Grant Program and DOI Abandoned Mines Reclamation Program
Benefits:	Action to address numerous abandoned mine shafts throughout the area is necessary to protect people and property. The long history of mining has led to a persistent problem with mine shaft openings and shafts that are reopening due to improper capping (with materials such as rotting logs and rusting cars).

Action Item 9: **Mine Inspector**

A county mine inspector should be brought on County staff to identify and close off subsidence-prone areas on an ongoing basis.

Responsible Agency:	Gogebic County Administrator
Deadline:	2020
Cost:	$45,000 annually
Potential Funding Sources:	County operating funds, countywide millage, FEMA Hazard Mitigation Grant Program, and DOI Abandoned Mines Reclamation Program
Benefits:	Reduces the risk of property damage and injury from subsidence. Allows property owners and local governments to restrict access to hazardous areas. Although subsidence is a relatively low-priority risk in the County, it must be addressed due to its site-specific nature, sudden unforeseeable impacts, and lack of records that should be made available, and this action is more cost-beneficial than many others.

Action Item 10: **Drainage improvements and maintenance**

As an ongoing project in the County, the Gogebic County Road Commission has had an active role in upgrading roads and replacing inadequate culverts in response to previous problems and to mitigate future problems. In addition, ditches must be constructed where needed and kept clear to prevent backups and improper drainage directly into private lots. Regular maintenance and monitoring of critical drainage ways will prevent increased problems due to debris.

Responsible Agency:	Gogebic County Road Commission and municipal public works
Deadline:	Ongoing
Cost:	Varies by project; staff time
Potential Funding Sources:	FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Program, and U.S. Army Corp of Engineers

Benefits:	Inspection and maintenance of the existing drainage system will prevent flooding caused by plugged culverts, whereas upgrading identified culverts and roads will ensure mitigation of future problems.

Action Item 11: **Community Wildfire Protection Plan (CWPP)**

Completed in 2009, the State Line CWPP covers Watersmeet Township, MI and Phelps Town, WI. The plan aims to protect human life and reduce property loss. Identified action items include distribution of educational materials (Firewise), brush cleanup, home ignition assessments, installation of dry hydrants, acquisition of new equipment, and regular review and evaluation of the CWPP.

Responsible Agency:	Watersmeet Township, Gogebic County, and U.S. Forest Service
Deadline:	Ongoing
Cost:	Varies by component
Potential Funding Sources:	FEMA, DNR, USDA Forest Service, and organization/agency operating budgets
Benefits:	The entire county will benefit by reducing risk of wildfire in one of the highest-risk areas of the state.

Action Item 12: **Disaster Recovery Plan**

The Federal Emergency Management Agency (FEMA) works to ensure that communities have the tools needed to make informed decisions to reduce risks and vulnerabilities and to effectively respond and recover. Effective pre-disaster planning is an important process that allows a comprehensive and integrated understanding of community objectives. Pre-disaster planning also connects community plans to guide post-disaster decisions and investments.

Responsible Agency:	Gogebic County Emergency Manager, the local emergency planning team, and local units of government
Deadline:	2021
Cost:	$5,000
Potential Funding Sources:	Pre-Disaster Mitigation Grant Program (FEMA)
Benefits:	The ability of a community to successfully manage the recovery process begins with its efforts in pre-disaster preparedness, mitigation, and recovery capacity building. These efforts result in resilient communities with an improved ability to withstand, respond to, and recover from disasters. Pre-disaster recovery planning promotes a process in which the whole community fully engages with and considers the needs and resources of all its members. The community will provide leadership in

developing recovery priorities and activities that are realistic, well planned, and clearly communicated.

Action Item 13: **Adopt Hazard Mitigation Plan and Update Regularly**

By adopting the Gogebic County Hazard Mitigation Plan, the County and its municipalities recognize the need to incorporate hazard mitigation activities into everyday decisions at the County and local level. The Emergency Manager will annually review the plan in coordination with the Emergency Operations Plan update to determine whether revisions are needed.

The Hazard Mitigation Plan will be updated every five years to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene a Hazard Mitigation Committee representing local agencies and concerned parties to evaluate progress and update the plan in accordance with FEMA regulations. The Committee will review the plan to determine the sections that need to be updated or modified based on changing conditions or alterations in State or Federal requirements. Goals, objectives, and strategies will also be reviewed to determine whether they thoroughly address new or changing conditions.

The Emergency Manager will work with Gogebic County to update the plan based on Hazard Mitigation Committee and State Hazard Mitigation Officer recommendations. The public will be notified of any plan updates, and copies will be made available at all local government offices and online if feasible. The public will be provided with and notified of comment opportunities during all interim and five-year plan updates.

Responsible Agency:	Gogebic County Emergency Manager
Deadline:	Ongoing
Cost:	Staff time
Potential Funding Sources:	Office of Emergency Management operating budget
Benefits:	The adoption of the Hazard Mitigation Plan commits Gogebic County and its communities to working on mitigation efforts within its boundaries. Through implementation of mitigation strategies in the Plan, the County and municipalities will be actively working to prevent future problems within Gogebic County.

Appendix

Appendix A: County Capability Snapshot

Appendix B: Shoreline Erosion Maps for Gogebic County

Appendix C: Mitigation Funding and Resources

Appendix D: County Letter to Commit Match

Appendix E: Public Participation

Appendix F: Meeting Materials

Appendix G: State Document Review

Appendix H: Plan Adoption

Appendix A: County Capability Snapshot

Gogebic County

2020-2025

Hazard Mitigation Plan

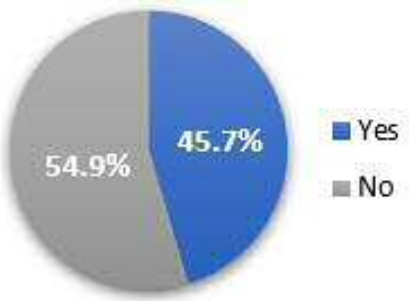
FAST FACTS

Area: 1,107 sq. miles	**Climate:** humid continental	**Growing Season:** 100 days	**Population:** 15,577
Housing: 10,797 units	**Average Household Income:** $21,375	**Poverty Rate:** 20.4%	**Disability:** 9.7%

PUBLIC SURVEY SUMMARY

Respondents are very concerned about flooding due to precipitation, snowstorms and blizzards and severe winds and snowstorms. In the last five years, most households have experienced severe winds or windstorms at 60.0%, the second most common hazard experienced was flooding at 50.0%. Respondents were asked whether they had taken actions to make their home or community more resistant to hazards. Nearly half (42.6%) said yes. Information on property located in the floodplain, flood frequency, and flood insurance was also collected. According to the responses, the most effective ways to receive hazard emergency information are by the internet - social media, radio, and phone.

Percentage of Households That Experienced a Hazard in the Past 5 years



DISASTER DECLARATIONS

Gogebic County has experienced nine presidential declarations since 1965. Four have occurred since the 2013 plan. Other emergencies and disasters not declared by the president have impacted the county. Listed below are declarations from 1965-2020.

Presidential Disaster Declarations

Event	Declaration Date
Drought	March 2, 1977
Blizzards and Snowstorms	January 27, 1978
Severe Freeze	May 10, 1994
Flooding	May 6, 2002
Hurricane Katrina Evacuation	September 7, 2005
Flooding	June 18, 2013
Severe Storms, Flash Flooding, Landslides, and Mudslides	August 2, 2018
COVID-19	March 13/27, 2020

Source: FEMA

HAZARD RANKING

Hazards are ranked using a "Priority Risk Index" (PRI) to categorize and prioritize county wide hazards. Risk is the estimated impact a hazard will have on human life and property. PRI helps to prioritize high risk hazards for mitigation planning purposes and to recognize mitigation opportunities in the planning area.

High Risk

- Riverine & Urban Flooding
- Snowstorms & Blizzards
- Invasive Species
- Extreme Temperatures
- Severe Winds
- Shoreline Flooding & Erosion
- Structural Fires
- Public Health Emergencies

Moderate Risk

- Transportation Accidents
- Ice & Sleet Storms
- Lightning
- Infrastructure Failures & Secondary Technological Hazards
- Drought
- Sabotage & Terrorism
- Dam Failures
- Subsidence (Ground Collapse)

Low Risk

- Fog
- Hail
- Tornadoes
- Wildfires
- Hazardous Materials: Transportation Accidents
- Petroleum & Natural Gas Incidents
- Earthquakes
- Hazardous Materials: Fixed Site Incidents
- Scrap Tire Fires
- Civil Disturbances

ACTION PLAN

A 5-year action plan set out by the Local Planning Team to reduce the community's vulnerability and risk to local hazards based on their capability. Identified specific action items for Gogebic County and its communities. All activities are consistent with the following mitigation goals:

Goal 1: Protect lives and property within Gogebic County from all known hazards while focusing on priority hazards;

Goal 2: Identify feasible projects throughout the County that will help mitigate future problems;

Goal 3: Be proactive in protecting public facilities and critical facilities through proper maintenance and upgrades;

Goal 4: Educate citizens in order to encourage self-help and mitigation of hazards on private property.

Action Item	Deadline	Cost
Upgrades of Roads, Culverts, and Dams	Ongoing	Varies
Debris Management Plan for the Montreal River	Ongoing	$30,000
Reduce possibility of damages and losses resulting from disease/ pandemic hazards	Ongoing	Staff time
Develop and Distribute outreach materials related to hazard mitigation	Ongoing	Staff time, materials, printing
Increase Hazard Education and Risk Awareness	Ongoing	Staff time, programming, materials
Hazard insurance to property owners	Ongoing	Varies
NOAA weather radios in schools and government buildings	2021	$50,000
Mine Shaft Safety	Ongoing	$15,000/shaft or opening
Mine Inspector	2020	$45,000
Drainage improvements and maintenance	Ongoing	Varies
Community wildlife protection plan	Ongoing	Varies
Disaster Recovery Plan	2021	$5,000
Adopt Hazard Mitigation Plan and update Regularly	Ongoing	Staff time

DATA SOURCES

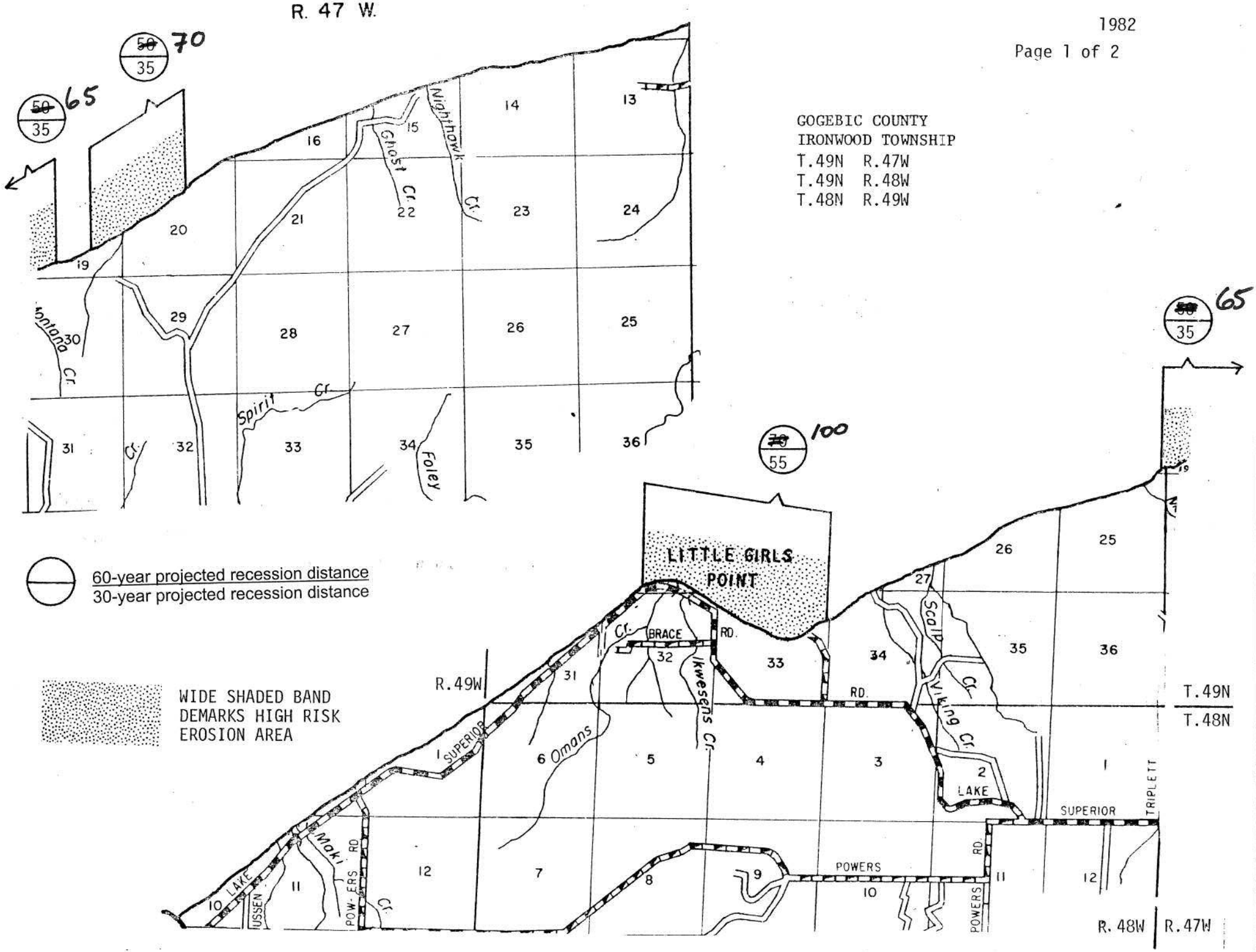
Michigan Hazard Mitigation Plan, Emergency Management and Homeland Security Division, Michigan Department of State Police: www.michigan.gov/documents/msp/MHMP_480451_7.pdf

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration: www.ncdc.noaa.gov

National Centers for Environmental Information Storm Events Database, U.S. Department of Commerce, National Oceanic and Atmospheric Administration: www.ncdc.noaa.gov/stormevents

Appendix B: Shoreline Erosion Maps for Gogebic County

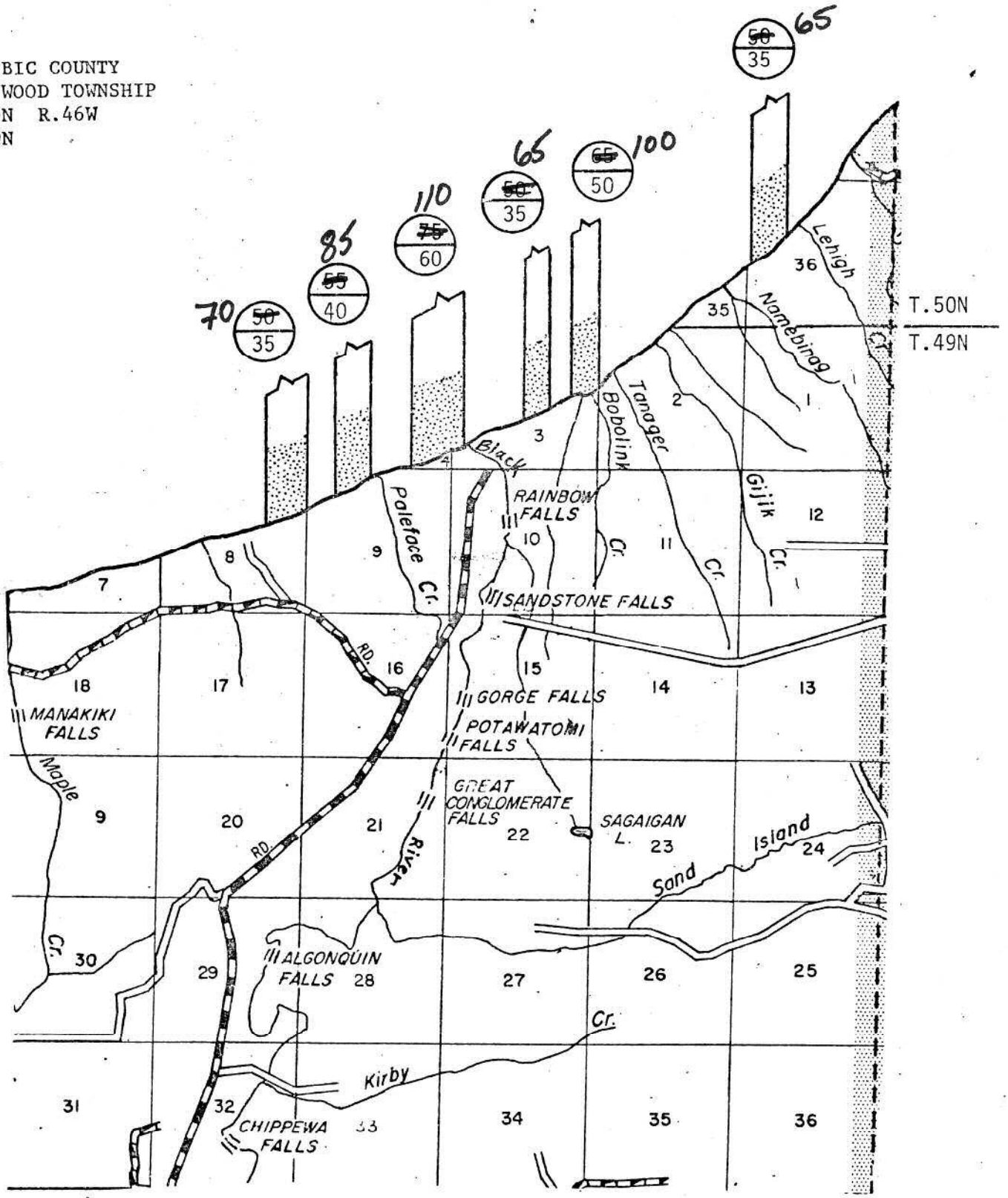
GOGEBIC COUNTY
IRONWOOD TOWNSHIP
T.49N R.47W
T.49N R.48W
T.48N R.49W



60-year projected recession distance
30-year projected recession distance

WIDE SHADED BAND DEMARKS HIGH RISK EROSION AREA

GOGEBIC COUNTY
IRONWOOD TOWNSHIP
T.50N R.46W
T.49N



60-year projected recession distance
30-year projected recession distance

WIDE SHADED BAND DEMARKS HIGH RISK EROSION AREA

Appendix C: Mitigation Funding and Resources

Mitigation Funding & Resources **Created: October 31th, 2019**

Federal Resources

Economic Development Administration (EDA): Provides grants and technical assistance to generate new employment, help retain existing jobs and stimulate industrial and commercial growth.

Economic Development Assistance: The U.S. Dept. of Commerce solicits applications from applicants in rural and urban areas to provide investments that support construction, non-construction, technical assistance, and revolving loan fund projects under EDA' Public Works and Economic Adjustment Assistance programs.

Additional Information: https://www.grants.gov/web/grants/view-opportunity.html?oppId=279842

Planning Program & Technical Assistance Programs: Develop Economic Development plans, studies, and analysis to build capacity, resiliency, and prosperity, particularly in an economically distressed area or region.

Additional Information: https://www.grants.gov/web/grants/view-opportunity.html?oppId=301960

Post-Disaster Economic Recovery: EDA and the International Economic Development Council (IEDC) provide several case studies and tools to assist in post-disaster recovery.

Additional Information: https://eda.gov/programs/disaster-recovery

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Regional Innovation Strategies: Funding is available for capacity-building programs that provide proof-of-concept and commercialization assistance to innovators and entrepreneurs and for operational support for organizations that provide essential early-stage funding to startups. Under the RIS Program, EDA is soliciting applications for two separate competitions: the 2019 i6 Challenge; and the 2019 Seed Fund Support (SFS) Grant Competition.

Additional Information: https://www.eda.gov/files/oie/ris/EDA-2019-RIS-Program-NOFO-FINAL.pdf

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Restore Your Economy: This website provides guidance on what to do after a disaster to plan for economic recovery and navigate the federal system post-disaster. Within the Disaster Planning for Economic Recovery Section, this resource provides step-by-step guidance on how to assess and create a plan for economic recovery.

Additional Information: https://restoreyoureconomy.org/

Environmental Protection Agency (EPA): Protect human and environmental health

Brownfields Program: Sub-programs include funding to conduct research and to provide training and technical assistance to communities, Targeted Brownfield Assessments, through funding to clean up and sustainably reuse contaminated properties.

Additional Information: https://www.epa.gov/brownfields

College/Underserved Community Partnership Program: Students in various courses work with communities to solve different issues by matching local needs to university resources. Students provide technical assistance through internships and capstone projects to help communities gain access to resources.

Additional Information: https://www.epa.gov/environmentaljustice/collegeunderserved-community-partnership-program

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Environmental Justice Small Grants: EJSG program awards grants that support community-driven projects designed to engage, educate, and empower communities to better understand local environmental and public health issues and develop strategies for addressing those issues, building consensus in the community, and setting community priorities.

Additional Information: https://www.epa.gov/environmentaljustice/environmental-justice-small-grants-program

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Small Growth in Small Towns & Rural Communities: Provides links to multiple resources targeted to increase sustainability in small towns and rural areas.

Additional Information: https://www.epa.gov/smartgrowth/smart-growth-small-towns-and-rural-communities

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Federal Emergency Management Agency (FEMA): coordinates the response efforts to disasters when local and state resources are overwhelmed.

Assistance to Firefighters Grants: Grants awarded to fire departments, state fire training academies, and emergency medical service organizations.

Additional Information: https://www.fema.gov/assistance-firefighters-grant

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Community Rating System: Voluntary incentive program for community floodplain management activities that exceed the minimum National Flood Insurance Program requirements. As a reward, flood insurance premiums are discounted for activities that reflect a reduce flood risk. Activities: (1) reduce flood damage to insurable property; (2) strengthen and support the insurance aspects of the NFIP; (3) encourage a comprehensive approach to floodplain management.

Additional Information: https://www.fema.gov/national-flood-insurance-program-community-rating-system

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Disaster Assistance: May be provided as financial or direct assistance to individuals and families whose property has been damaged or destroyed from a federally declared disaster.

Additional Information: https://www.fema.gov/disaster-assistance-available-fema

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Floodplain Management Assistance Program: Nationally competitive grants for the development of comprehensive flood mitigation plans and the implementation of flood mitigation projects to eliminate repetitive losses.

Additional Information: https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html

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Hazard Mitigation Grant Program: Implement long-term, cost-effective mitigation actions to eliminate/reduce risk to life and property after a Federal disaster declaration. The amount of funding made available is a percentage of total disaster costs and will vary with each disaster. A project does not have to be in a declared county to be eligible.

Additional Information: https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html#Hazard_Mitigation

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National Flood Insurance Program: Community participation in the National Flood Insurance Program is mandatory for homeowners, business owners, and renters to purchase flood insurance. Insurance claims can be paid if a federal disaster in not declared by the president. Cost of insurance is based where property is located in the floodplain (Special Flood Hazard Area).

Additional Information: https://www.fema.gov/news-release/2006/07/20/fact-sheet-national-flood-insurance-program-nfip

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Port Security Grant Program: Supports the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation.

Additional Information: https://www.fema.gov/port-security-grant-program

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Pre-Disaster Mitigation Program: Pre-disaster planning and direct hazard mitigation projects to cost-effectively reduce overall risk to the population and structures.

Additional Information: https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html

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U.S. Army Corps of Engineers (USACE): public engineering, design, and construction management

Continuing Authorities Program: Under the Continuing Authorities Program (CAP), the USACE is authorized to plan, design, and construct certain types of water resource and ecosystem restoration projects without additional and specific congressional authorization. The purpose is to implement projects of limited scope and complexity. Each authority has specific guidelines and total program and per-project funding limits.

Additional Information: https://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/

Floodplain Management Services: Educate individuals on flood hazards and the actions they can take to reduce property damage and prevent the loss of life. Foster public understanding of the options for dealing with flood hazards and promote prudent use and management of the nation's floodplains

Additional Information: Contact Detroit District Area Office: (313) 226-5013

Hazard Mitigation Team (Silver Jacket Team): The Michigan Silver Jackets Team is an interagency team dedicated to creating a collaborative environment to bring together Federal, State, local, and other stakeholders to develop and implement solutions to natural hazards and mitigation by combining available agency resources, which include funding, programs, and technical expertise. The Michigan Silver Jackets Team has been functioning for years, but a team charter was formalized in 2016.

Additional Information: https://silverjackets.nfrmp.us/State-Teams/Michigan.cfm

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Levee Safety Program: Assess the integrity and viability of levees to ensure that levee systems do not present unacceptable risks to the public, property, and environment. Risk communication activities will be initiated for the state in the fiscal year 2019.

Additional Information: https://www.lre.usace.army.mil/Missions/Civil-Works/Levee-Safety-Program/

State Planning Assistance: Provide assistance in preparing comprehensive plans for the development, utilization, and conservation of water and related land resources. Typical studies do not include a detailed design for project construction. The program can encompass many types of studies dealing with water resources issues.

Additional Information:
https://www.lre.usace.army.mil/Portals/69/docs/Navigation/STAKEHOLDERMTGS/9%20FEB%2012%20-%20Planning%20Assistance%20to%20States%20Fact%20Sheet.pdf

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U.S. Department of Agriculture (USDA): develops and executes federal laws related farming, forestry, rural economic development, and food.

Business & Industry Loan: This program bolsters the availability of credit by guaranteeing loans from local financial institutions (credit unions, banks, etc.) for rural businesses.

Additional Information: https://www.rd.usda.gov/programs-services/business-industry-loan-guarantees

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Community Connect Grants: This program helps fund broadband deployment into rural communities where it is not yet economically viable for private sector providers to deliver service.

Additional Information: https://www.rd.usda.gov/programs-services/community-connect-grants

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Community Facilities Direct Loan & Grant Program: This program provides affordable funding (low-interest loans, grants, or a combination) to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides a critical service to the local community for the orderly development of the community in a primarily rural area and does not include private, commercial or business undertakings.

Additional Information: https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program

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Disaster – Supplemental Nutrition Assistance Program (D-SNAP): Can be authorized by the Food and Nutrition Service during a presidentially declared disaster with individual assistance. The state must request approval to activate the program. The program allows people who don't normally qualify for the Supplemental Nutrition Assistance Program (SNAP) eligible.

Additional Information: https://www.fns.usda.gov/snap/dsnap/state-agencies-partners-resources

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Emergency Community Water Assistance Grants: Provides grants to rural communities who have a decline in quantity or quality of water. Funds can be used to help reduce or eliminate pollution of water resources and to improve planning for and management of solid waste sites.

Additional Information: https://www.rd.usda.gov/programs-services/emergency-community-water-assistance-grants

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Emergency Conservation Program: Funding for farmers and ranchers to repair damages to their land from wind erosion, floods, hurricanes, or other natural disasters. The disaster must create new conservation issues, and the land must be returned to a productive agricultural state.

Additional Information: https://www.fsa.usda.gov/programs-and-services/conservation-programs/emergency-conservation/index

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Emergency Forest Restoration Program: Provides payments to eligible nonindustrial private forest landowners to implement emergency measures to restore damages produced by a natural disaster.

Additional Information: https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/emergency-forest-restoration/

Emergency Watershed Protection Program: Provides technical and financial assistance to preserve life and property threatened by excessive erosion and flooding from natural disasters. Owners, managers, and users of public, private, or tribal lands are eligible.

Additional Information:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/

Emergency Watershed Protection Program – Floodplain Easements: Purchase floodplain easements as an emergency measure to restore, protect, maintain, and enhance floodplain functions.

Additional Information:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/landscape/ewpp/?cid=nrcs143_008216

Foods for Disaster Assistance: For mass feeding sites facilitated by disaster relief agencies. Possibility of delivering food directly to households in need. The program requires a governor's request and a presidential emergency or disaster declaration.

Additional Information: https://www.fns.usda.gov/disaster/usda-foods-disaster-assistance

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Mutual Self-Help Housing: Provides grants to qualified organizations to help them carry out local self-help housing construction projects. Grant recipients supervise groups of very-low- and low-income individuals and families as they construct their own homes in rural areas.

Additional Information: https://www.rd.usda.gov/programs-services/mutual-self-help-housing-technical-assistance-grants

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Re-connect Program: Provides grants and loans to buy infrastructure and install equipment needed to provide reliable broadband service.

Additional Information: https://www.rd.usda.gov/files/ReConnect_Program-Factsheet.pdf

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Rural Business Development Grants: Support targeted technical assistance, training, and other activities leading to the development or expansion of small and emerging private businesses in rural areas. Programmatic activities are separated into enterprise or opportunity type grant activities.

Additional Information: https://www.rd.usda.gov/programs-services/rural-business-development-grants

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Rural Economic Development Innovation: Rural communities and regions may apply for technical assistance to implement economic development planning projects. Through Rural Economic Development Innovation, the REDI initiative, USDA, and the cooperators will score, review, and select applications on a competitive basis.

Additional Information: https://www.rd.usda.gov/files/RD_REDI_FactSheet_6519.pdf

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Rural Economic Development Loan and Grant Program: The purpose of the program is to promote rural economic development and job creation projects.

Additional Information: https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program

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Rural Energy for America Program: Provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements.

Additional Information: https://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency

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Rural Microentrepreneur Assistance: Provides loans and grants to Microenterprise Development Organizations (MDOs) to help microenterprises startup and grow through a Rural Microloan Revolving Fund and provide training and technical assistance to microloan borrowers and micro-entrepreneurs.

Additional Information: https://www.rd.usda.gov/programs-services/rural-microentrepreneur-assistance-program

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U.S. Department of Energy: concerned with policies regarding energy and safe handling of nuclear materials

Tribal Energy Loan Guarantee Program: The Tribal Energy Loan Guarantee Program (TELGP) is a partial loan guarantee program that can guarantee up to $2 billion in loans to support economic opportunities to tribes through energy development projects and activities. Can guarantee up to 90 percent of the unpaid principal and interest due on any loan made to a federally recognized Indian tribe for energy development. The tribal borrower will be required to invest equity in the project and all project debt will be provided by non-federal lenders.

Additional Information: https://www.energy.gov/lpo/tribal-energy-loan-guarantee-program

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Weatherization Assistance Program: The U.S. Department of Energy (DOE) Weatherization Assistance Program reduces energy costs for low-income households by increasing the energy efficiency of their homes while ensuring their health and safety. The program supports 8,500 jobs and provides weatherization services to approximately 35,000 homes every year using DOE funds. Through weatherization improvements and upgrades, these households save, on average, $283 or more every year according to a national evaluation of the program. Since the program began in 1976, WAP has helped improve the lives of more than 7 million families through weatherization services.

Additional Information: https://www.energy.gov/eere/wipo/weatherization-assistance-program

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U.S. Department of Health and Human Services (HHS): protects the health of all Americans and provides essential human services

Small Health Care Provider Quality Improvement Program: The purpose of the Rural Quality Program is to support planning and implementation of quality improvement activities for rural primary care providers or providers of health care services serving rural residents. These activities include providing clinical health services to residents of rural areas by funding projects that coordinate, expanded access, contain costs, and improve the quality of essential health care services. The program goal is to promote the development of an evidence-based quality improvement culture and to promote the delivery of cost-effective, coordinated health care services in primary care settings.

Additional Information: https://www.grants.gov/web/grants/view-opportunity.html?oppId=307894

U.S. Department of Housing and Urban Development (HUD): provide housing with fair and equal access and community development assistance

Disaster Assistance Resources: HUD offers many disaster resources and partners with Federal and state agencies to implement disaster recovery assistance.

Additional Information: https://www.hud.gov/info/disasterresources

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Rural Capacity Building for Community Development and Affordable Housing: Enhances the capacity and ability of local governments, Indian tribes, housing development organizations, rural Community Development Corporations, and rural Community Housing Development Organizations (CHDOs), to carry out community development and affordable housing activities that benefit low- and moderate-income families and persons in rural areas.

Additional Information: https://www.hudexchange.info/programs/rural-capacity-building/

Rural Gateway: The Rural Gateway is an information clearinghouse providing technical assistance, training workshops, and peer learning and resource sharing to support rural housing and economic development.

Additional Information: https://www.hudexchange.info/programs/rural/

U.S. Department of the Interior (DOI): responsible for management and conservation of most federal land and natural resources

Invasive and Noxious Plant Management: Funds may be used on public, State county, and private lands for approved projects that prioritize and target undesirable plant species or group of species to be controlled or contained within a specific geographic area.

Additional Information:
https://beta.sam.gov/fal/cf4feb36160a4f11ab376036796925b4/view?keywords=Invasive%20and%20Noxious%20Plant%20Management&sort=-relevance&index=cfda&is_active=true&page=1

Plant Conservation and Restoration Management: Provides leadership in identifying, maintaining, and restoring Western native plant communities on public lands. Focus on more diverse forbs and grasses for the restoration of wildlife habitats and rehabilitation after wildfires. Improve habitat for western big-game winter range and migration corridors, and recovery of lands damaged by wildfire.

Additional Information:
https://beta.sam.gov/fal/c64ad5b621574cf38ea11ccd164e43ce/view?keywords=Plant%20Conservation%20and%20Restoration%20Management&sort=-relevance&index=cfda&is_active=true&page=1

U.S. Department of Labor (DOL): improve working conditions, advance opportunities for profitable employment and assure work-related benefits and rights

Disaster Unemployment Assistance: Financial assistance to individuals whose employment or self-employment has been lost or interrupted as a direct result of a major disaster and who are not eligible for regular employment insurance benefits.

Additional Information: https://oui.doleta.gov/unemploy/disaster.asp

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U.S. Department of Transportation (DOT): responsible for helping to maintain and develop transportation systems and infrastructure

Emergency Relief Program: Fund for the repair or reconstruction of Federal-aid highways and roads on Federal lands which have suffered serious damage as a result of natural disasters or catastrophic failures from an external cause. Supplements the commitment of resources by States, their political subdivisions, or other Federal agencies to help pay for unusually heavy expenses resulting from extraordinary conditions.

Additional Information: https://www.fhwa.dot.gov/programadmin/erelief.cfm

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U.S. Small Business Administration (SBA): advocates, aids, assists, and protects the interests of small business concerns

Disaster Loans: Provides low-interest disaster loans to businesses of all sizes, private non-profit organizations, renters, and homeowners. Eligible costs must not be covered by personal insurance or FEMA and include repair or replaced real estate, personal property, machinery & equipment, inventory and business assets that have been damaged or destroyed along with economic losses.

Additional Information: https://www.sba.gov/funding-programs/disaster-assistance

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Economic Injury Disaster Loans: Small businesses, small agricultural cooperatives, or private nonprofit organization in a declared disaster area who have suffered substantial economic injury, may be eligible for an Economic Injury Disaster Loan.

Additional Information: https://disasterloan.sba.gov/ela/Information/EIDLLoans

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Home and Personal Property Loans: Homeowners, renters and/or property owners in declared disaster areas may apply for a loan to help recover from disaster-related damages.

Additional Information:
https://disasterloan.sba.gov/ela/Information/HomePersonalPropertyLoans

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Lender Match: The Lender Match program does not provide loans directly to businesses. Instead, it reduces the risk for participating financial institutions by guaranteeing their loans to small businesses-making it easier for them to obtain loans at competitive rates.

Additional Information: https://www.sba.gov/funding-programs/loans

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Military Reservists Economic Injury Loans: Provides funds to help an eligible small business meet its ordinary and necessary operating expenses that it could have met, but is unable to, because an essential employee was called-up to active duty in his or her role as a military reservist.

Additional Information: https://disasterloan.sba.gov/ela/Information/MREIDLLoans

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State Resources

Environment, Great Lakes, and Energy (EGLE): Supports a sustainable environment, healthy communities, and vibrant economies

Brownfield Redevelopment Grants: Brownfield redevelopment grants provide funding to local units of government and other public bodies to investigate and remediate known sites of environmental contamination, which will be used for identified economic redevelopment projects.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-151085--,00.html

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Brownfield Redevelopment Loans: Brownfield redevelopment loans facilitate the redevelopment of brownfield properties by providing low-interest loans to local units of government and other public bodies to investigate and remediate sites of known or suspected environmental contamination.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-151086--,00.html

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Drinking Water Contaminant Remediation Grants: For drinking water infrastructure, grants shall be awarded to drinking water systems for contaminant remediation efforts or connection to an alternate system.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-492719--,00.html

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Michigan Aquatics Invasive Plant Control Grant Program: The grants will assist with the prevention, detection, eradication, and control by chemical, physical, or biological methods of aquatic invasive plant species within Michigan inland lakes.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-498017--,00.html

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Nonpoint Source Pollution Control Grants – Clean Michigan Initiative: To provide funding to implement the physical improvements in approved watershed management plans intended to restore impaired waters and protect high-quality waters. Practices must address specific sources of nonpoint source pollution identified by Michigan's Nonpoint Source Program Plan. Physical improvements are structural and vegetative best management practices.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314499--,00.html

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Nonpoint Source Pollution Control Grants – Federal Clean Water Action Section 319: To provide funding to implement nonpoint source activities identified in EGLE-approved watershed management plans. Implementation activities must address specific sources of nonpoint source pollution identified by Michigan's Nonpoint Source Program Plan.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314500--,00.html

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Planning and Construction Grants: Michigan Coastal Management (MCM) Program provides grant funds to promote vibrant and resilient coastal communities. Approximately $700,000 for planning and on-the-ground, site-specific projects are available annually in partnership with the National Oceanic and Atmospheric Administration.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314490--,00.html

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Scarp Tire Cleanup Grants: To assist property owners and local units of government with the proper removal of abandoned scrap tires and scrap tires at collection sites. Priority will be given to scrap tires accumulated prior to January 1, 1991, and to collection sites that pose an imminent threat to public health, safety, welfare, or the environment.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314505--,00.html

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Scarp Tire Law Enforcement Grants: To issue grants for projects that will result in restricting the illegal dumping or improper disposal of scrap tires.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-495979--,00.html

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Scarp Tire Market Development Grants: To issue grants for projects that will result in the development of increased markets for scrap tires.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314506--,00.html

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Source Water Protection Grants: To provide matching funds to public water supply systems for the development and implementation of a source water protection program to help prevent drinking water sources from becoming contaminated. These funds can be used to develop a Surface Water Intake Protection Program for systems utilizing surface water or to develop a Wellhead Protection Program for those systems that use groundwater sources.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314515--,00.html

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State Revolving Loan Fund: Provides low-interest loans for water pollution control projects.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314509--,00.html

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Strategic Water Quality Initiatives Fund: Provides low-interest loans for water pollution control projects involving the on-site upgrade or replacement of failing septic systems or for the removal of groundwater or stormwater from sanitary or combined sewer leads.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314512--,00.html

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Substantial Public Health Risk Project Grants: For projects to address a substantial public health risk from treatment system failure.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-492720--,00.html

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Volunteer River, Stream, and Creek Cleanup Grants: Provides funding to local units of government for volunteer cleanups of rivers, streams, and creeks to improve Michigan waterways of human-made trash.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314495--,00.html

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Michigan Department of Natural Resources (DNR): Maintains natural resources such as parks, state forests, and recreation areas.

Michigan Invasive Species Grant Program: To address strategic issues of prevention, detection, eradication and control for both terrestrial and aquatic invasive species in Michigan. Annually, $3.6 million in funding is available.

Additional Information: https://www.michigan.gov/invasives/0,5664,7-324-71276_92000---,00.html

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Michigan Department of Transportation (MDOT): Maintains all interstate, US and state highways in Michigan.

Emergency Relief: Assists with replacing or repairing roadways or roadway structure damage on ALL federal aid highways (major collectors and above) resulting from a catastrophic failure or natural disaster. Also includes debris removal and emergency protective measures such as traffic control and detour signing.

Additional Information:
https://www.michigan.gov/documents/mdot/FHWA_Emergency_Relief_program_outline_Michigan_022113_418318_7.pdf

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Rural Task Force Program: The money is provided within two funding sources: Surface Transportation Program (STP) Rural for improving the federal aid system; and Transportation Economic Development Fund (TEDF) Category D for building an all-season network.

Additional Information: https://www.michigan.gov/mdot/0,4616,7-151-9621_17216_54903-227096--,00.html

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State Infrastructure Bank Loan Program: Provide loans to public entities for eligible transportation improvements to meet urgent project financing demands.

Additional Information:
https://www.michigan.gov/documents/mdot/Guidelines_for_Applicants_623329_7.pdf

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Michigan Economic Development Corporation (MEDC): Collaborates with other economic partners to assist businesses grow and develop strategies.

Michigan Business Development Program: Provide grants, loans, and other economic assistance to businesses for highly competitive projects in Michigan that create jobs and/or provide investment.

Additional Information:
https://www.michiganbusiness.org/4a7f60/globalassets/documents/reports/fact-sheets/michiganbusinessdevelopmentprogram.pdf

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Michigan Community Revitalization Program: Promotes community revitalization.

Additional Information:
https://www.michiganbusiness.org/49a841/globalassets/documents/reports/fact-sheets/communityrevitalizationprogram.pdf

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Other

Local Resources & Programs

Baraga County Community Foundation: Funding and scholarships available to address community needs. Provide support for non-profits and volunteer organizations in Baraga County.

Additional Information: http://baragacountyfoundation.org/

Baraga, Houghton, and Keweenaw Community Action Agency: Has programs such as Western Upper Peninsula Food Bank, weatherization, emergency programs, Commodity Supplemental Food Program (CSFP), The Emergency Food Assistance Program (TEFAP), transportation, furnace and chimney cleaning/minor roof repairs and much more.

Additional Information: 926 Dodge St. Houghton, MI 49931 | (906) 482-5528
http://www.keweenaw.org/list/member/community-action-agency-houghton-71 ;
http://bhkcaa.org/index.html

Copper County Habitat for Humanity - Homeownership Program: For families and individuals in need of decent, affordable housing. Application selection based on level of need, willingness to partner with Habitat for Humanity and the ability to repay mortgage through an affordable payment plan.

Additional Information: https://www.habitat.org/us-mi/houghton/copper-country-hfh

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Dickinson Iron Community Action Agency: Focus and coordinate all available resources that empower individuals to obtain the opportunities to become self-sufficient. Provides 14 different human services including in-home senior services, transportation, weatherization, nutrition and food services. Reach out to the agency to see what other services they provide.

Additional Information: https://www.dicsami.org/

Duck Lake Riparians' Association: (Gogebic County) Improve, conserve, and safeguard overall welfare of the air, water, and shorelines of Duck Lake in Gogebic County. Assists local government in development and administration of regulations to protect the environment and promote social and recreational activities.

Additional Information: http://www.ducklakeriparians.org/index.cfm

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Gogebic Ontonagon Community Action Agency: Provides food, weatherization, housing, and community development programs. Visit their website or call the agency to find out more.

Additional: http://www.gocaa.org/index.cfm?fuseaction=dep_list

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Gogebic Salvation Army Service Extension: Disaster and emergency response services are provided by a committee of volunteers through the Salvation Army:

Additional Information: Tom Bremer (715) 554-0177

Habitat for Humanity Menominee River: Build and repair homes in Iron and Dickinson County. Make home improvements such as repairs and replacements of roofs, furnaces, water heaters, septic systems, and siding.

Additional Information: http://www.habitatmr.com/index.html

Hancock Salvation Army: Provides emergency financial assistance and disaster services for Houghton, Keweenaw, and Ontonagon counties.

Additional Information: https://centralusa.salvationarmy.org/hancock

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Ishpeming Salvation Army: Provides emergency financial assistance and disaster services to Baraga County

Additional Information: (906) 486-8121

Keweenaw Community Foundation: Strengthen all aspect of the Keweenaw and assist donors in achieving their philanthropic goals. Various grant applications are available.

Additional Information: http://keweenawcommunityfoundation.org/

Keweenaw Economic Development Alliance: Private-public partnership local economic development organization serving Baraga, Houghton, and Keweenaw Counties. Provides leadership and staffing to implement the Keweenaw Economic Dev. Strategic Plan with the goals of fostering business growth, improving infrastructure, revitalizing our communities, developing and attracting talent, and enhancing cultural and recreational opportunities.

Additional Information: https://kedabiz.com/about/

Keweenaw Land Trust: Focus on protection of land, water, and quality of life through conservation, stewardship, and education. Current projects include preservation of wetlands, watersheds, and natural habitat, conservation easements. and educational outreach.

Additional Information: http://www.keweenawlandtrust.org/about.php

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Lake Superior Community Development Corp: Non-profit Native Community Development Financial Institution. Loan programs available to assist with access to home mortgages and decent, safe, and sanitary housing for low- and very-low-income individuals.

Additional Information: https://www.lakesuperiorcdc.com/

Portage Health Foundation: Offers grants and sponsorships for projects implementing and promoting health education, health research, community health, healthcare leaders and access to care. Also raises funds to help those in need after disasters.

Additional Information: http://phfgive.org/grants.php

Superior Health Foundation: Assists in meeting unmet health needs through education, programs, and research on illness prevention and health promotion. Several grants are provided through the foundation for non-profit health-centered organizations.

Additional Information: http://superiorhealthfoundation.org/

Superior Watershed Partnership and Land Conservancy: Implements a variety of conservation and public education projects including pollution prevention, invasive species removal and prevention, water quality and stormwater management, habitat protection and restoration, native plant restoration, climate change adaptation planning and implementation, alternative energy and energy conservation, land protection, watershed restoration, and education programs.

Additional Information: https://superiorwatersheds.org/projects

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Western U.P. Planning & Development Region (WUPPDR): Offers planning support for the counties of Baraga, Gogebic, Houghton, Iron, Keweenaw, and Ontonagon. Services and technical assistance on Hazard Mitigation planning are available. Additionally, information on mitigation and community development funding and resources is also provided.

Additional Information: https://www.wuppdr.org/

Other

National Resources & Programs

Community Restoration & Resiliency: Keep America Beautiful Community Restoration and Resiliency Fund benefits Keep America Beautiful Affiliates that serve communities directly affected by natural and environmental disasters. The fund provides immediate and long-term support for initial and ongoing cleanup efforts and helps rebuild vital public spaces: parks, greenways, community gateways, Main Street/downtown areas, open spaces, and more. Funds will help improve resiliency physically — as green infrastructure — and socially — to build community.

Additional Information: https://www.kab.org/

Grants for Indigenous Peoples: Seventh Generation Fund is an Indigenous identity-based organization dedicated to the self-determination of Native Peoples and tribal sovereignty. It mobilizes financial, technical, and informational resources directly to Native communities to empower action. Grant awards in several categories ranging from $250 to $50,000. An organization may apply for a single large grant per year, with the possibility of additional Traveling Song Initiative or Mini-Grants.

Additional Information: http://www.7genfund.org/apply-grant

National Low-Income Housing Coalition: The National Low-Income Housing Coalition is dedicated solely to achieving socially just public policy that assures people with the lowest incomes in the United States have affordable and decent homes.

Additional Information: https://nlihc.org/issues/disaster

Planning for Post Disaster Recovery - Next Generation: American Planning Association provides tools and guidance with briefing papers, case studies, a comprehensive report, and model pre-event recovery ordinance.

Additional Information: https://www.planning.org/research/postdisaster/

Rebuilding Together: Rebuilding Together helps people and communities in need by bringing together its national network of local Rebuilding Together affiliates, corporate and individual donors, skilled trades individuals and associations, and almost 100,000 volunteers each year.

Additional Information: www.rebuildingtogether.org

Voluntary Organizations Active in Disasters: Association of organizations that mitigate and alleviate disaster impact. The website has a list of national partners that provide various services and programs for communities affected by disasters.

Additional Information: https://www.nvoad.org/voad-members/national-members/

Produced by: Western U.P. Planning & Development Region

Appendix D: County Letter to Commit Match

COUNTY OF GOGEBIC
Board of Commissioners
George Peterson III, Chairman

200 NORTH MOORE STREET
BESSEMER, MICHIGAN 49911
CLERK (906) 663-4518
FAX (906) 663-4660

GERRY R. PELISSERO
County Clerk-Register

CHIEF DEPUTY
Donna Frello

December 7, 2018

Jerald Wuorenmaa, Executive Director
WUPPDR
400 Quincy St. 8th Floor
Hancock, MI 49930

Dear Mr. Wuorenmaa,

The Gogebic County Board of Commissioners understands that WUPPDR intends to apply, or already has, for Federal Emergency Management Agency (FEMA) to update the Gogebic County Hazard Mitigation Plan beginning in late 2018 or early 2019. The funding source, the Hazard Mitigation Grant Program, requires a nonfederal local share of at least 25 percent of the total project budget.

As the County will benefit significantly from this project through a plan of action to mitigate future hazards and disasters, as well as through establishment of eligibility for future FEMA pre or post-disaster funding, the County Board commits to a local share not to exceed $3,000. This amount may be provided through in-kind services (facilitated and documented with assistance from the County Emergency Manager), a cash contribution, or a combination of both.

Gogebic County looks forward to working with you to complete its Hazard Mitigation Plan update.

Sincerely,

Gerry R. Pelissero
Gogebic County Clerk-Register of Deeds

Appendix E: Public Participation

2019 Gogebic County Hazard Mitigation Public Opinion Survey

We need your help!

Gogebic County is currently updating their five-year hazard mitigation plan as required by the Federal Emergency Management Agency (FEMA). A committee and staff in Gogebic County are working with the Western Upper Peninsula Planning & Development Region (WUPPDR) to update the County's Hazard Mitigation Plan. Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. This survey provides an opportunity for you to share your knowledge and participate in the hazard mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that help lessen the impact and risk of future hazard events to your community.

You can either fill out the attached paper survey or participate online at:
https://www.surveymonkey.com/r/GogebicHazMitPublicInput

Although participation in this survey is optional, we strongly encourage you to respond. All responses will be kept confidential. **Please respond by Friday, July 19, 2019.** If you have questions regarding this survey or would like to learn about more ways that you can participate in the planning process, please contact:

Angela Yu, Assistant Regional Planner
WUPPDR
(906) 482-7205 ext. 118
ayu@wuppdr.org

Paper surveys can be mailed back using the attached envelope or to:
Angela Yu
Western U.P. Planning and Development Region (WUPPDR)
400 Quincy St., 8th Floor
Hancock, MI 49930

Thank you for your time and participation!

1. Where do you live in Gogebic County?

☐ City of Bessemer ☐ Bessemer Township ☐ Marenisco Township
☐ City of Ironwood ☐ Erwin Township ☐ Wakefield Township
☐ City of Wakefield ☐ Ironwood Township ☐ Watersmeet Township

☐ Outside Gogebic County; please specify: _____

2. During the past five (5) years, have you or someone in your household directly experienced a hazard in Gogebic County, such as a severe windstorm, flood, or other type of hazard?

☐ Yes ☐ No

IF YES, which of hazards have you or someone in your household experienced in the past five (5) years?

3. How concerned are you about the following hazards affecting your home and community in the next five (5) years?

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
WEATHER HAZARDS					
Extreme Weather Temperatures (hot/cold)	☐	☐	☐	☐	☐
Fog	☐	☐	☐	☐	☐
Hail	☐	☐	☐	☐	☐
Ice and Sleet Storms	☐	☐	☐	☐	☐
Lightning	☐	☐	☐	☐	☐
Severe Winds (Windstorms)	☐	☐	☐	☐	☐
Snowstorms and Blizzards	☐	☐	☐	☐	☐
Tornados	☐	☐	☐	☐	☐
GEOLOGIC HAZARDS					
Earthquakes	☐	☐	☐	☐	☐
Landslide /Mudslide	☐	☐	☐	☐	☐
Subsidence (sink holes or ground collapse)	☐	☐	☐	☐	☐
HYDROLOGICAL HAZARDS					
Dam Failure	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐
Flooding due to precipitation event or snowmelt	☐	☐	☐	☐	☐

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
Shoreline Flooding and Erosion	☐	☐	☐	☐	☐
ECOLOGICAL HAZARDS					
Invasive Species (Emerald Ash Borer/Asian Carp)	☐	☐	☐	☐	☐
Wildfires	☐	☐	☐	☐	☐
INDUSTIRAL HAZARDS					
Scrap Tire Fires	☐	☐	☐	☐	☐
Structural Fires	☐	☐	☐	☐	☐
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	☐	☐	☐	☐	☐
Hazardous Materials, Transportation-Related (e.g. waste spill from traffic accident)	☐	☐	☐	☐	☐
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	☐	☐	☐	☐	☐
INFRASTRUCTURE HAZARDS					
Infrastructure failure & resulting hazards (e.g. power outage)	☐	☐	☐	☐	☐
Transportation Accidents (car crashes)	☐	☐	☐	☐	☐
HUMAN RELATED					
Civil Disturbances (rioting)	☐	☐	☐	☐	☐
Public Health Emergencies (disease epidemic)	☐	☐	☐	☐	☐
Sabotage/Terrorism	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐

4. Have you taken any actions to make your home or community more resistant to hazards?

   ☐ Yes ☐ No

   IF YES, please explain:

5. Is your home located in a floodplain? ☐ Yes ☐ No ☐ Don't know

6. Does your street or home flood regularly during significant rain events? ☐ Yes ☐ No

IF YES, what are the closest major cross street to this location?

7. If your street or home **does flood regularly** during significant rain events, how many times did it flood in the past 12 months?

☐ 1 time ☐ 2 times ☐ 3 times ☐ 4 times ☐ 5 or more times

8. Do you have flood insurance? ☐ Yes ☐ No; ***please indicate reason(s) below*** ☐ Don't know

☐ Not Located in a floodplain
☐ Too expensive
☐ Property never floods
☐ Property is elevated or otherwise protected
☐ Insurance company will not provide
☐ Never considered / didn't know about it
☐ Other (specify):

_____

9. What are the most effective ways for you to receive information during or immediately following a hazard emergency?

☐ Newspaper
☐ Phone
☐ Television
☐ Radio
☐ Internet – Social Media (Facebook or Twitter)
☐ Internet – Government Website Postings
☐ Mailings
☐ Public Forums / Meetings
☐ Other (specify): _____
_____
_____

10. In your opinion, what are some steps or projects your local government could take to reduce or eliminate the risk for future hazard damages to your community?

11. Several community-wide activities can reduce our risk from hazards. In general, these activities fall into one of six broad categories. Please tell us how important you think each one is for your community to consider doing:

Category	Very Important	Somewhat Important	Not Important
1. **Prevention** Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning & zoning, building codes, open space preservation, and floodplain regulations.	☐	☐	☐
2. **Property Protection** Modification or removal of existing buildings to protect them from a hazard. Examples include purchase, relocation, raised elevation, and structural retrofits (updates).	☐	☐	☐
3. **Natural Resource Protection** Preservation or restoration of the functions of natural systems while minimizing hazard losses. Examples include floodplain protection, forest management, and slope stabilization.	☐	☐	☐
4. **Structural Projects** Modification of the natural conditions for or progression of a hazard. Examples include dams, levees, seawalls, detention/retention basins, channel modification, retaining walls, and storm sewers.	☐	☐	☐
5. **Emergency Services** Protection of people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of emergency facilities.	☐	☐	☐
6. **Public Education and Awareness** Informing of citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach, school education, library materials, and demonstration events.	☐	☐	☐

Please feel free to provide any additional comments in the space provided:

THANK YOU FOR YOUR PARTICIPATION!

PRESS RELEASE

Western Upper Peninsula Planning and Development Region
400 Quincy St., 8th Floor
Hancock, MI 49930
906-482-7205
info@wuppdr.org

Release Date: June 14, 2019

Gogebic County Hazard Mitigation Plan – Public Input Survey

Hazard mitigation is any action taken before, during or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. Officials in Gogebic County along with the Gogebic County Emergency manager are contracting the Western Upper Peninsula Planning & Development Region to update the County-wide Hazard Mitigation Plan.

We are asking that any Gogebic County resident take a short online survey. The paper survey and flyers with the online-link are available at the city and township halls, county clerk's office, public libraries, as well as wuppdr.org/surveys and will be available until Friday, July 12, 2019.

The survey link is as follows:

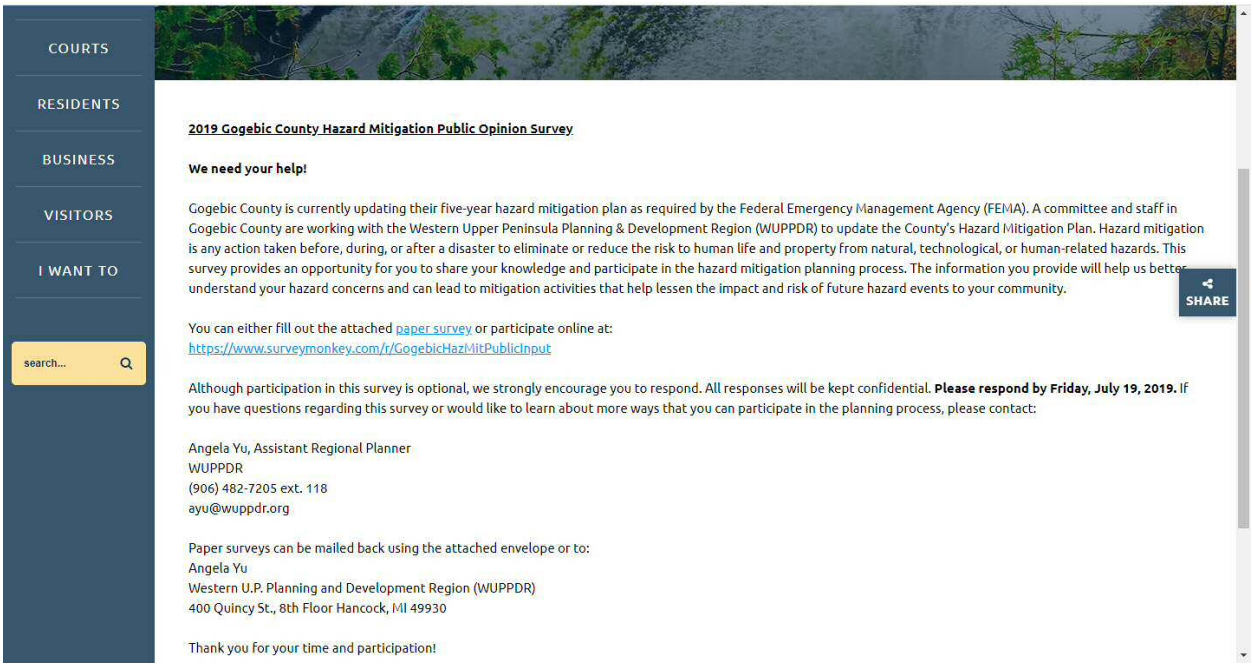
https://www.surveymonkey.com/r/GogebicHazMitPublicInput

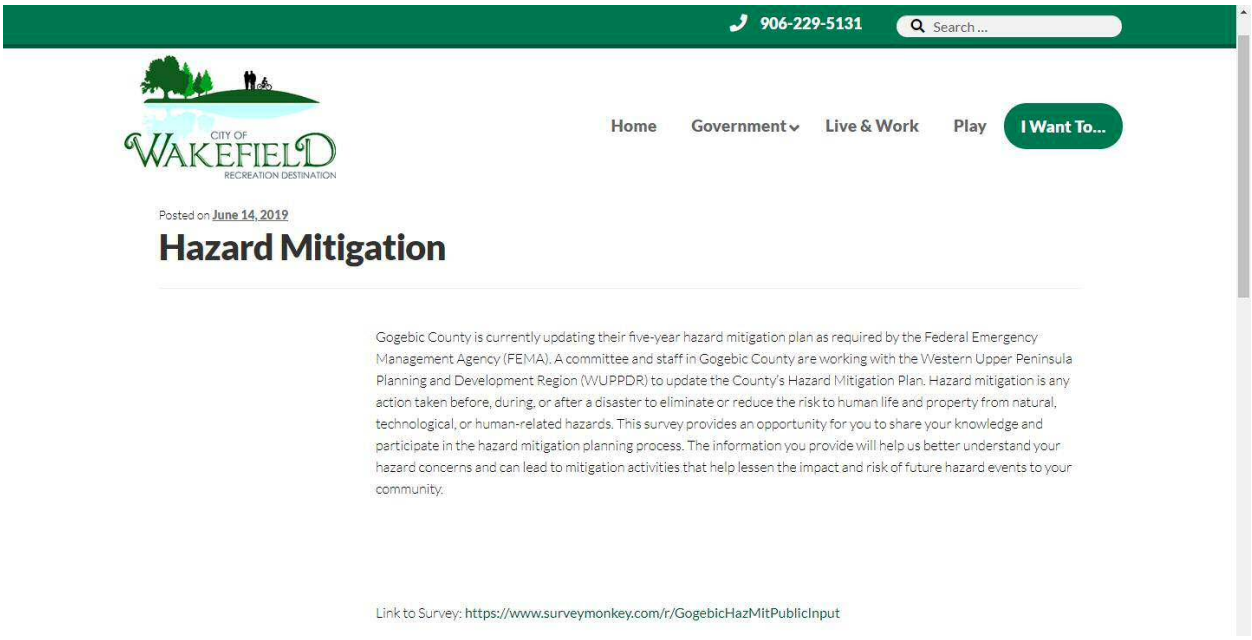
The information you provide will help us better understand local hazard concerns and can lead to mitigation activities that help lessen the impact of future hazard events in your community.

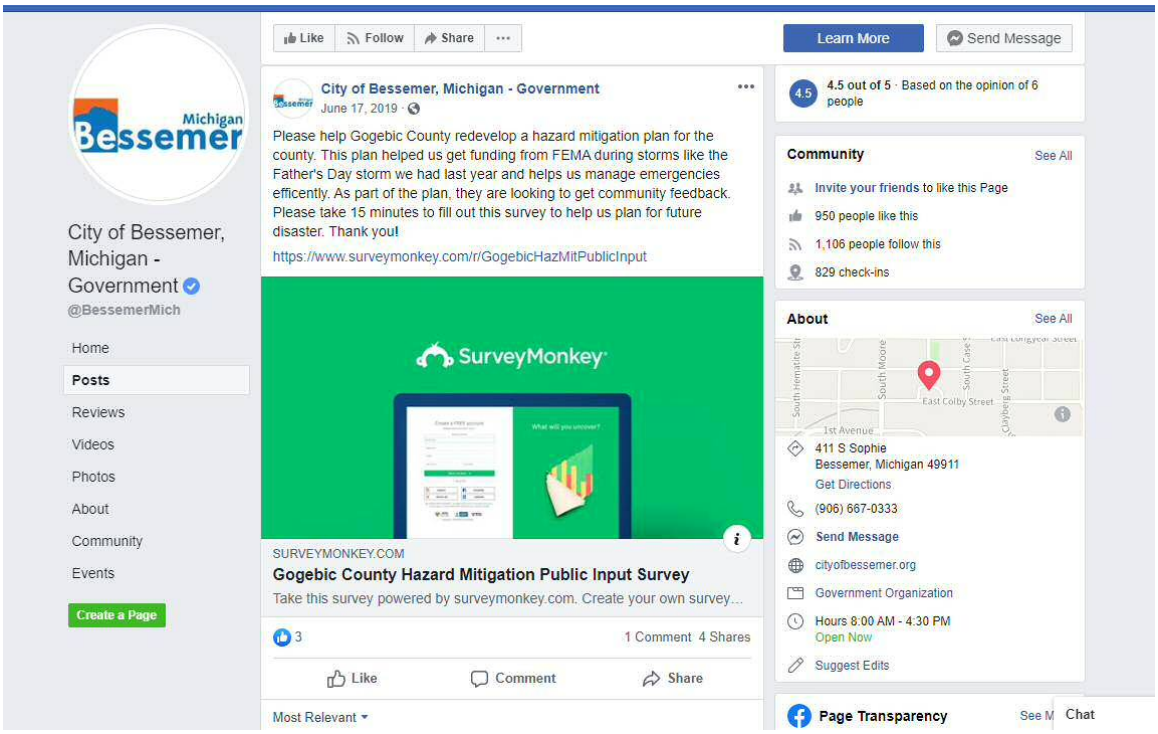
For more information or for a paper survey contact:

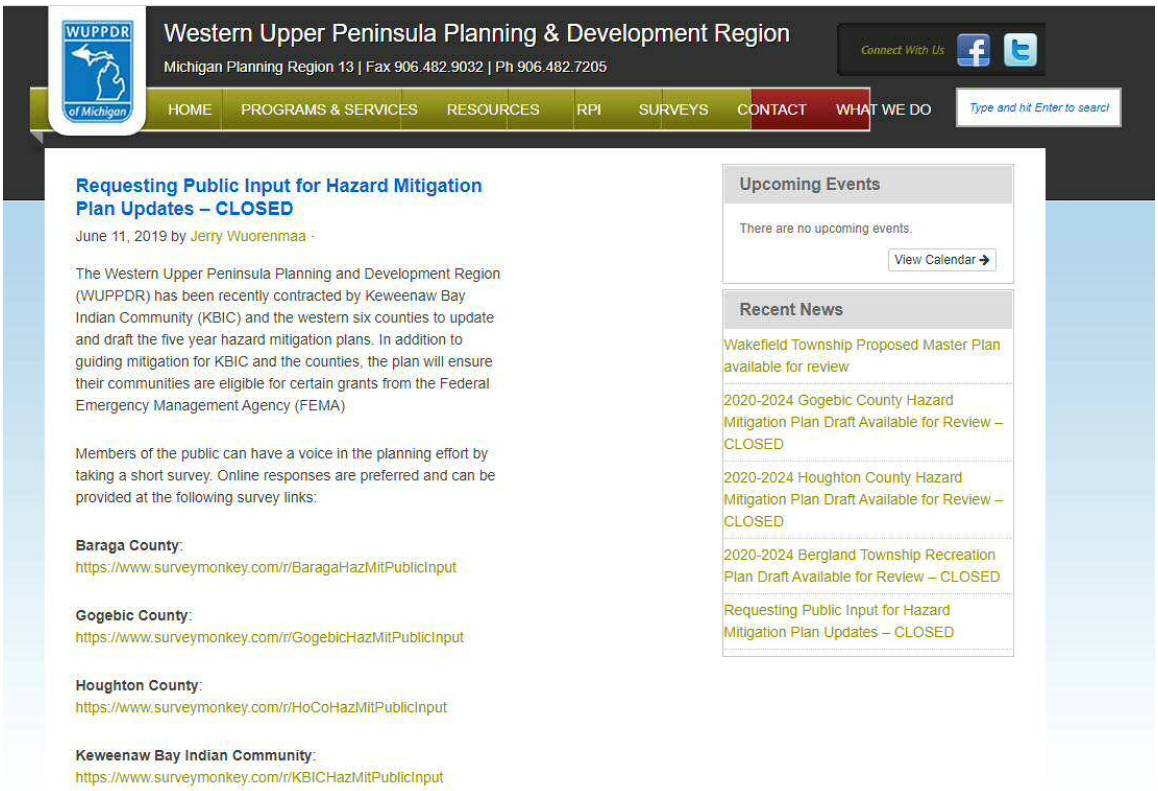
Angela Yu, ayu@wuppdr.org
WUPPDR Assistant Planner
1-906-482-7205, ext. 118

Screenshots of some locations where public survey was advertised:






Like
Follow
Share
Learn More
Send Message
City of Bessemer, Michigan - Government
@BessemerMich
Home
Posts
Reviews
Videos
Photos
About
Community
Events
Create a Page
City of Bessemer, Michigan - Government
June 17, 2019
Please help Gogebic County redevelop a hazard mitigation plan for the county. This plan helped us get funding from FEMA during storms like the Father's Day storm we had last year and helps us manage emergencies efficently. As part of the plan, they are looking to get community feedback. Please take 15 minutes to fill out this survey to help us plan for future disaster. Thank you!
https://www.surveymonkey.com/r/GogebicHazMitPublicInput
SurveyMonkey
SURVEYMONKEY.COM
Gogebic County Hazard Mitigation Public Input Survey
Take this survey powered by surveymonkey.com. Create your own survey...
3
1 Comment 4 Shares
Like
Comment
Share
Most Relevant
4.5 out of 5 · Based on the opinion of 6 people
Community
See All
Invite your friends to like this Page
950 people like this
1,106 people follow this
829 check-ins
About
See All
411 S Sophie
Bessemer, Michigan 49911
Get Directions
(906) 667-0333
Send Message
cityofbessemer.org
Government Organization
Hours 8:00 AM - 4:30 PM
Open Now
Suggest Edits
Page Transparency
See M
Chat


WUPPDR
of Michigan
Western Upper Peninsula Planning & Development Region
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Requesting Public Input for Hazard Mitigation Plan Updates – CLOSED
June 11, 2019 by Jerry Wuorenmaa
The Western Upper Peninsula Planning and Development Region (WUPPDR) has been recently contracted by Keweenaw Bay Indian Community (KBIC) and the western six counties to update and draft the five year hazard mitigation plans. In addition to guiding mitigation for KBIC and the counties, the plan will ensure their communities are eligible for certain grants from the Federal Emergency Management Agency (FEMA)
Members of the public can have a voice in the planning effort by taking a short survey. Online responses are preferred and can be provided at the following survey links:
Baraga County:
https://www.surveymonkey.com/r/BaragaHazMitPublicInput
Gogebic County:
https://www.surveymonkey.com/r/GogebicHazMitPublicInput
Houghton County:
https://www.surveymonkey.com/r/HoCoHazMitPublicInput
Keweenaw Bay Indian Community:
https://www.surveymonkey.com/r/KBICHazMitPublicInput
Upcoming Events
There are no upcoming events.
View Calendar
Recent News
Wakefield Township Proposed Master Plan available for review
2020-2024 Gogebic County Hazard Mitigation Plan Draft Available for Review – CLOSED
2020-2024 Houghton County Hazard Mitigation Plan Draft Available for Review – CLOSED
2020-2024 Bergland Township Recreation Plan Draft Available for Review – CLOSED
Requesting Public Input for Hazard Mitigation Plan Updates – CLOSED

Results of 2019 Gogebic County Hazard Mitigation Survey – Summary

The county survey received 47 responses to the 2019 Gogebic County Hazard Mitigation Public Survey. Printed copies of the survey were available to residents at a variety of locations through the county. The survey was also accessible online with notices published in the Daily Globe newspaper, the Gogebic County website, and some jurisdictional websites.

All respondents, except one who commented that they have vacation property in Wakefield, were residents of Gogebic County. The majority (41.2% or 5 people) live in the City of Bessemer. All nine jurisdictions in Gogebic County were represented in the survey results.

When asked if they or someone in their household directly experienced a hazard in Gogebic County over the last five years, 42.6% (20 people) said yes. Most comments listed more than one hazard. The most mentioned hazard that households experienced was severe winds or windstorms (60.0%; 12 people), with half of those responses also including downed trees as a result of those storms. The second most common hazard mentioned was flooding (50.0%; 10 people).

Respondents were asked how concerned they were about the following potential hazards that could affect their home and community in the next five years. 84.8% were very concerned or somewhat concerned about flooding due to a precipitation event or snow melt. The other top hazards that concerned citizens in Gogebic County were snowstorms and blizzards (84.4%), severe winds and windstorms (82.9%), ice and sleet storms (76.7%), infrastructure failures and secondary hazards (71.7%), and invasive species (69.6%). The respondents were either not very concerned or not concerned at all about earthquakes (82.2%), civil disturbances (63.0%), fog (57.8%), and sabotage or terrorism (47.78).

Respondents were also asked whether they had taken actions to make their home or community more resistant to hazards. Nearly half (42.6%; 20 people) said yes and 18 explained what they had completed. Responses included the following:

- Home improvement projects, including installing auxiliary lights, building a retaining wall between yard and salt on highway, removing or trimming trees that were too close to structures, storing extra water and food, purchasing generators, sealing and fixing foundations and roofs, ditching properties, creating a readiness kit, securing outdoor items, and keeping things off basement floor.
- One comment stated, “paying close attention to surroundings.”

38 respondents (80.9%) said that their home was not located on a floodplain, while 8 (17.0%) did not know if their property was on a floodplain. One individual responded that their home was located on a floodplain. However, 7 people (14.9%) responded that their street or home floods regularly with significant rain events. The survey went on to ask them specific cross streets and how many times it flooded in the past year. The locations listed were throughout the county. Out of 11 people who answered, their listed location flooded:

1 time	4 (36.4%)
2 times	2 (18.2%)
3 times	1 (9.1%)
4 times	4 (36.4%)
5 or more times	0

Most of the respondents reported not having flood insurance (95.6%; 43 people). One respondent was not sure, one said they had it, and two people did not answer the question. The top reasons listed for not having coverage was because they were not located in a floodplain (65.9%), their property is elevated or otherwise protected (31.7%), they never considered or did not know about it (12.2%), or the property never floods (19.5%). Four responded that it was too expensive and two stated that their insurance company will not provide flood insurance.

When asked what the most effective ways are to receive information during or immediately following a hazard emergency (they could check all that apply), 36 people (80.0%) said they utilize social media and 26 (57.8%) said the radio. Other responses say will use the television (44.4%), phone (40.0%), government websites (31.1%), and newspaper (15.6%). Texting and city sirens were also mentioned as effective methods.

The last question in the survey was an additional comment box for the LPT containing 1 response. These data are also attached to this survey summary.

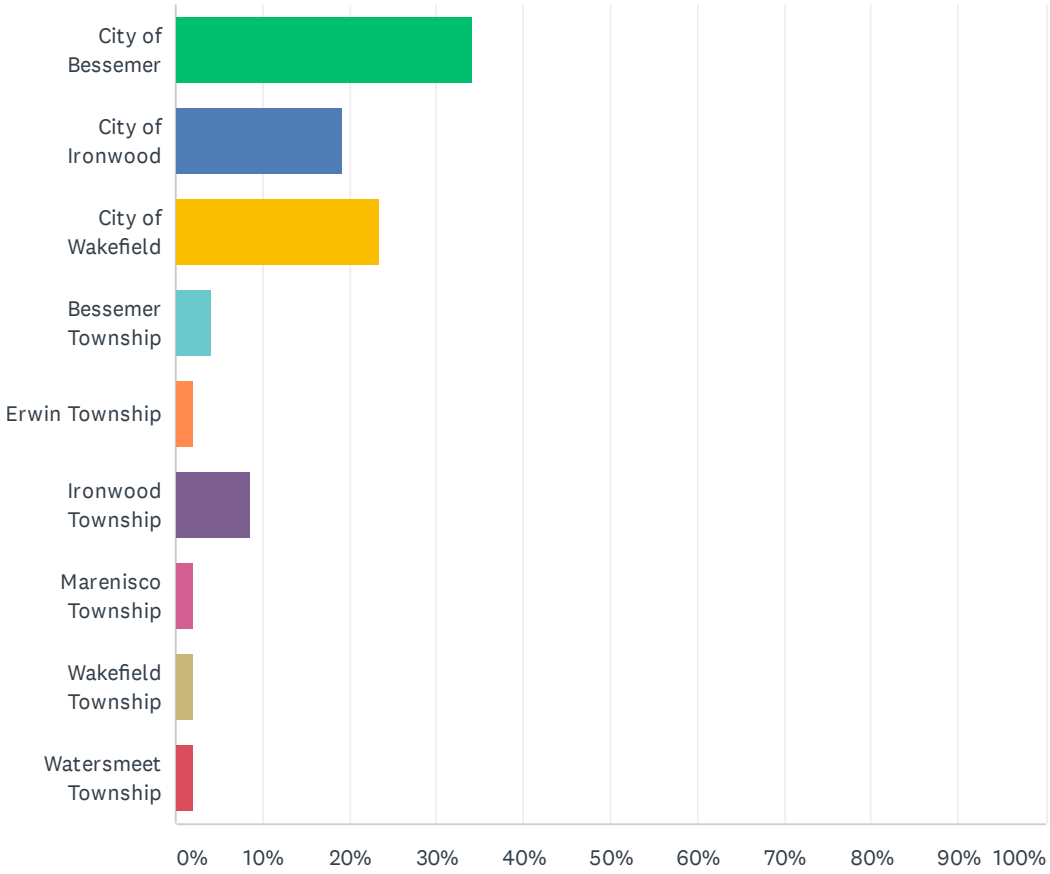
Attached:

Q14 In your opinion, what are some steps or projects your local government could take to reduce or eliminate the risk for future hazard damages to your community? 21 Comments

Q15 Additional Comments

Q1 Where do you live in Gogebic County?

Answered: 47 Skipped: 0

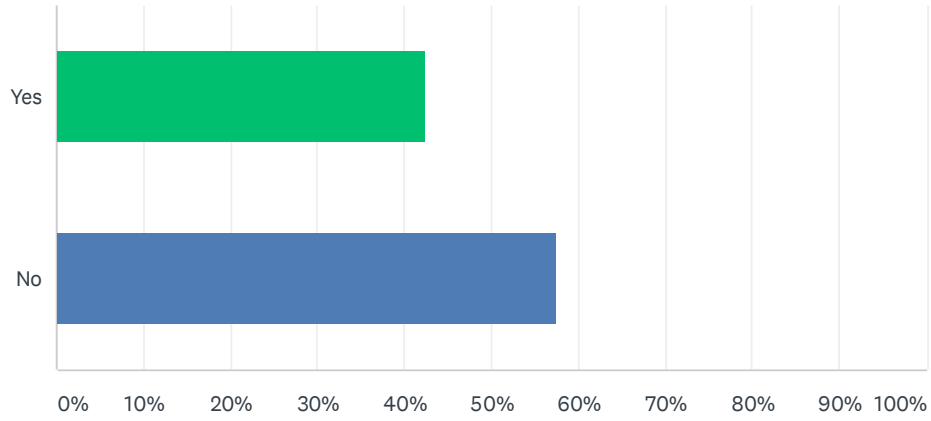


ANSWER CHOICES	RESPONSES	
City of Bessemer	34.04%	16
City of Ironwood	19.15%	9
City of Wakefield	23.40%	11
Bessemer Township	4.26%	2
Erwin Township	2.13%	1
Ironwood Township	8.51%	4
Marenisco Township	2.13%	1
Wakefield Township	2.13%	1
Watersmeet Township	2.13%	1
TOTAL		47

#	OUTSIDE OF GOGEBIC COUNTY; PLEASE SPECIFY	DATE
1	Outside of the area but we have a vacation property in Wakefield	6/14/2019 1:35 PM

Q2 During the past five (5) years, have you or someone in your household directly experienced a hazard in Gogebic County, such as a severe windstorm, flood, or other type of hazard?

Answered: 47 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	42.55%	20
No	57.45%	27
TOTAL		47

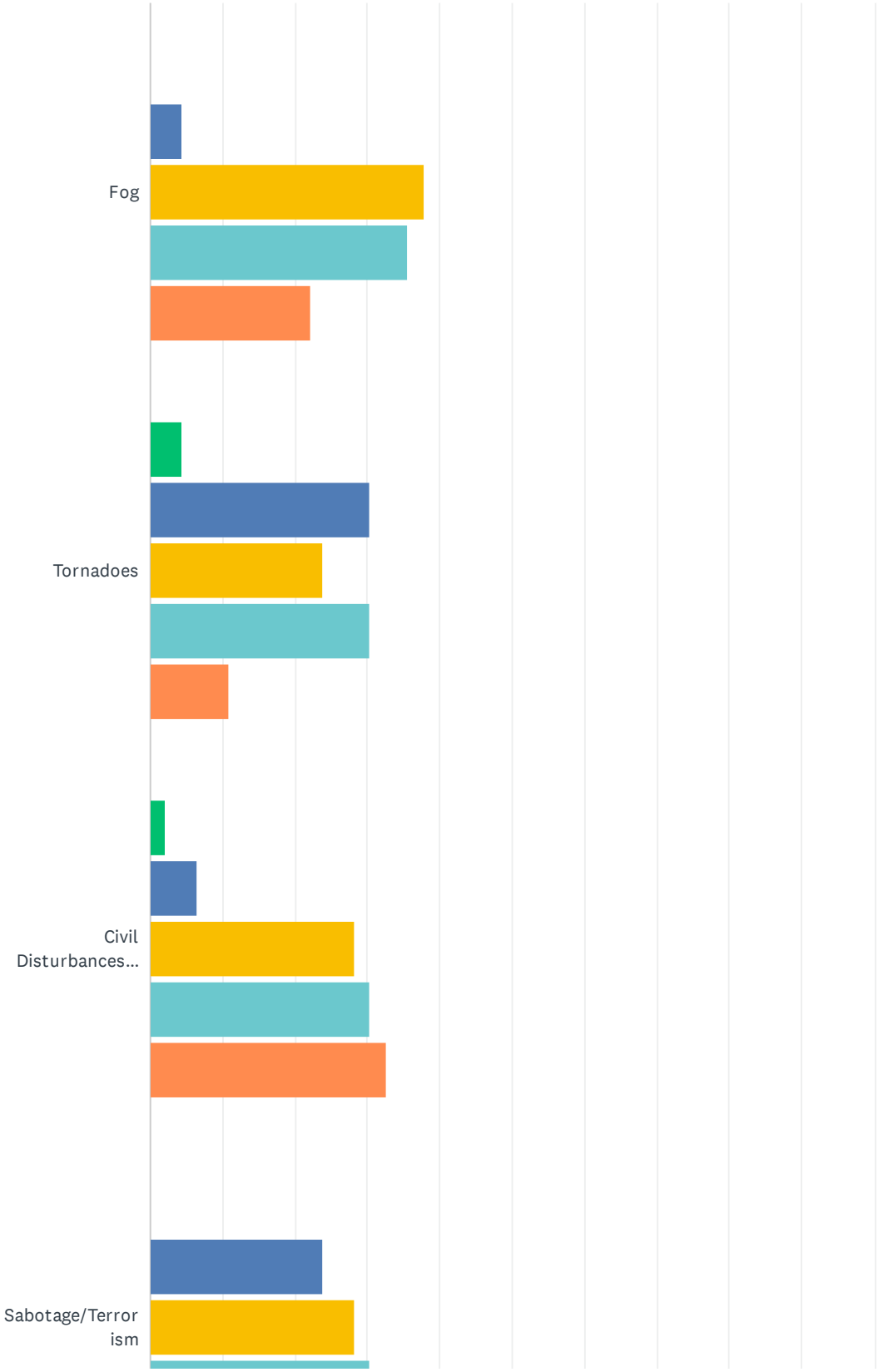
Q3 IF YES, which hazard(s) have you or someone in your household experienced in the past five (5) years?

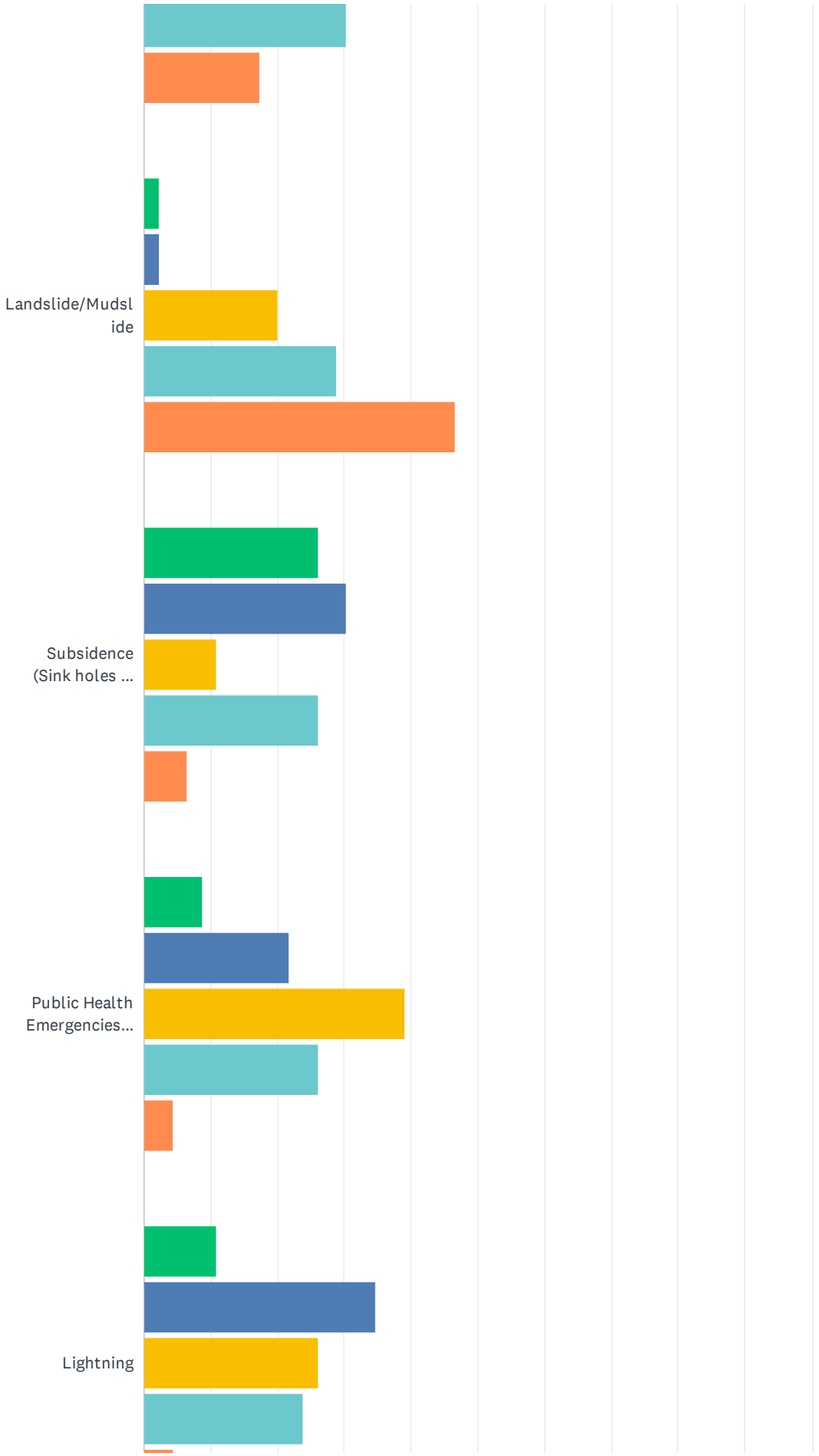
Answered: 20 Skipped: 27

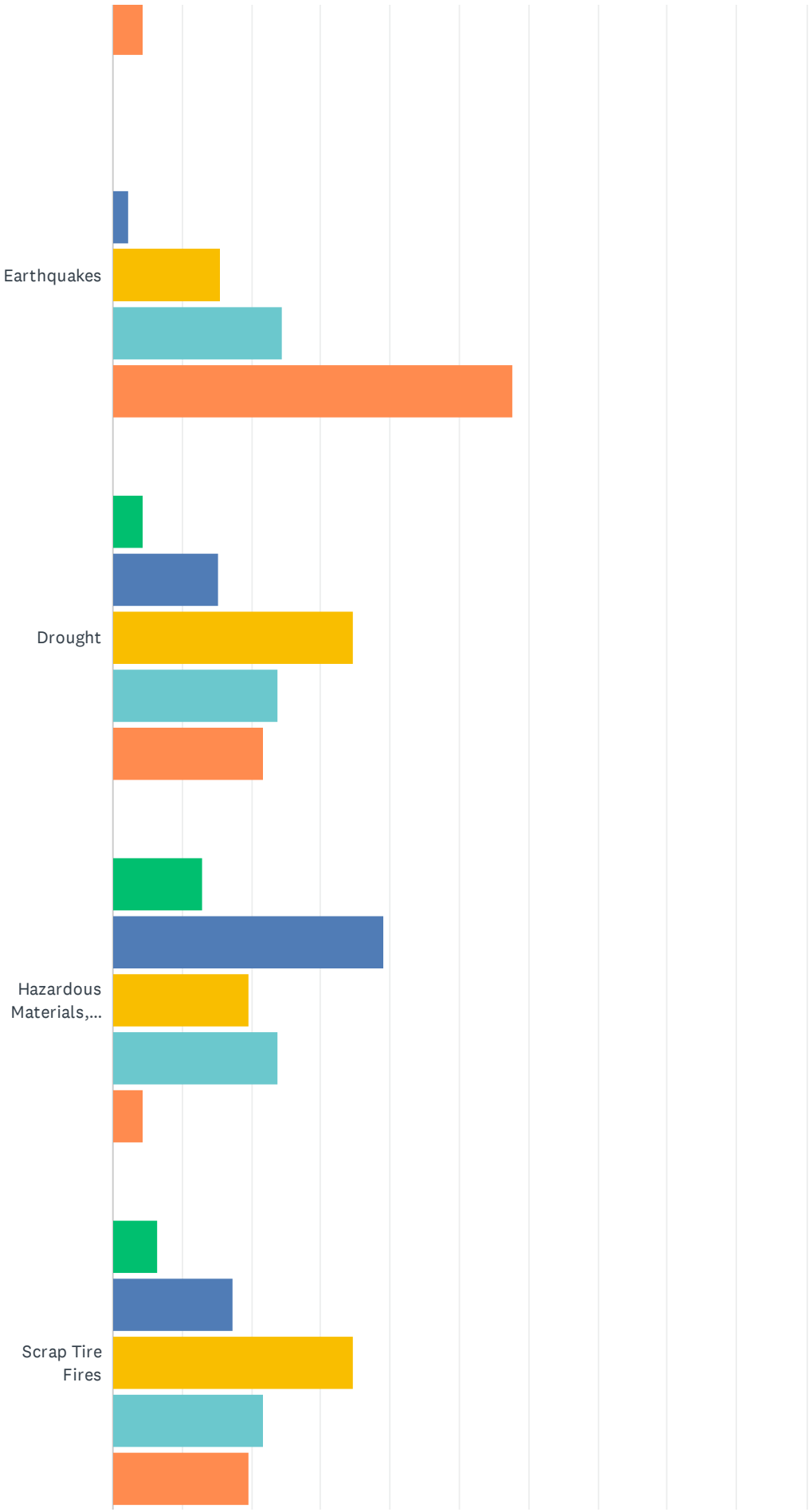
#	RESPONSES	DATE
1	severe wind storm	8/22/2019 11:14 AM
2	severe wind	8/22/2019 10:47 AM
3	Flooding wind storm	8/22/2019 10:44 AM
4	wind storm and flood	8/22/2019 10:39 AM
5	Flood	7/15/2019 10:38 PM
6	Flooding	6/18/2019 11:41 PM
7	Lightning hit power pole. Knocking out power for 3 days	6/17/2019 11:45 PM
8	Blizzard, flood and high winds, terrible shoreline erosion at Little Girls Point on Lakr Superior	6/17/2019 5:43 PM
9	loss of some trees due to high winds	6/17/2019 11:54 AM
10	Down tree from storm	6/17/2019 11:32 AM
11	Flooding/high winds	6/17/2019 11:30 AM
12	Downed trees from wind.	6/17/2019 11:09 AM
13	Severe windstorm with downed tree branches, some water infiltration in basement.	6/17/2019 10:59 AM
14	Flood	6/17/2019 10:23 AM
15	Flooding	6/17/2019 10:19 AM
16	flood, wind storm, ice storm	6/17/2019 10:17 AM
17	Severe storms either rain/wind/snow	6/15/2019 3:19 AM
18	Severe wind storm	6/14/2019 12:52 PM
19	Tornado, windstorm	6/14/2019 12:31 PM
20	Severe windstorm	6/14/2019 12:30 PM

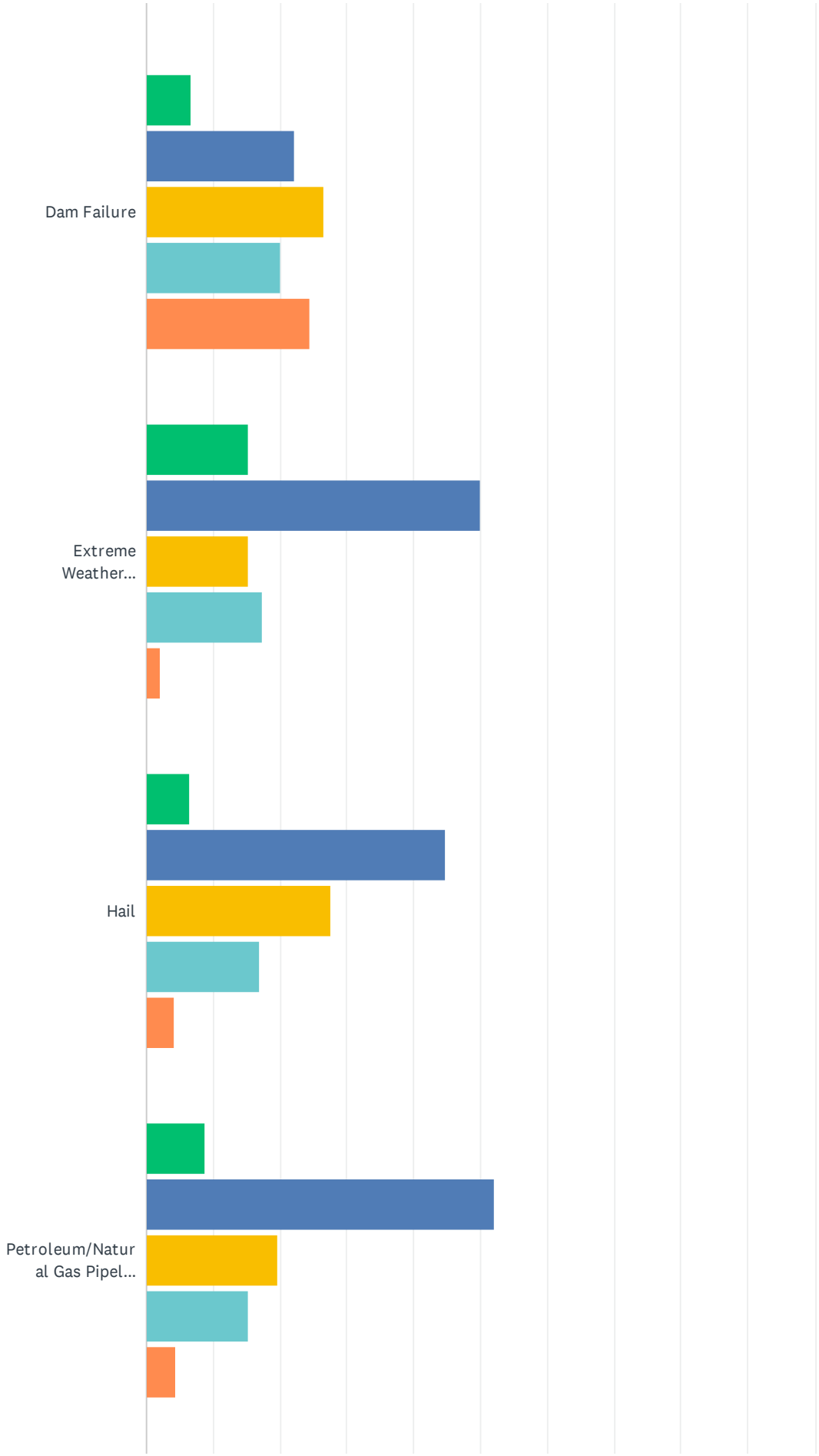
Q4 How concerned are you about the following hazards affecting your home and community in the next five (5) years?

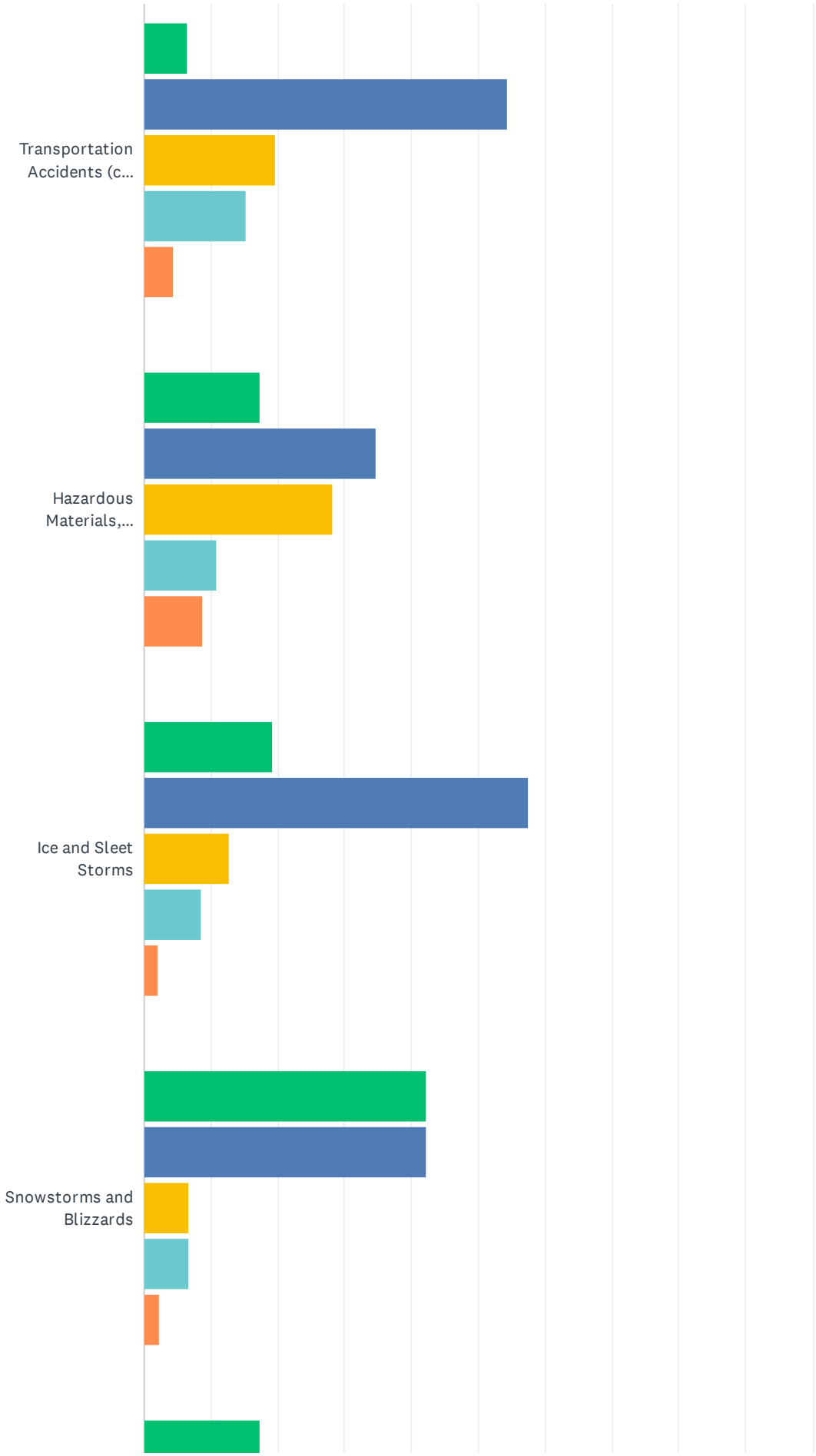
Answered: 47 Skipped: 0

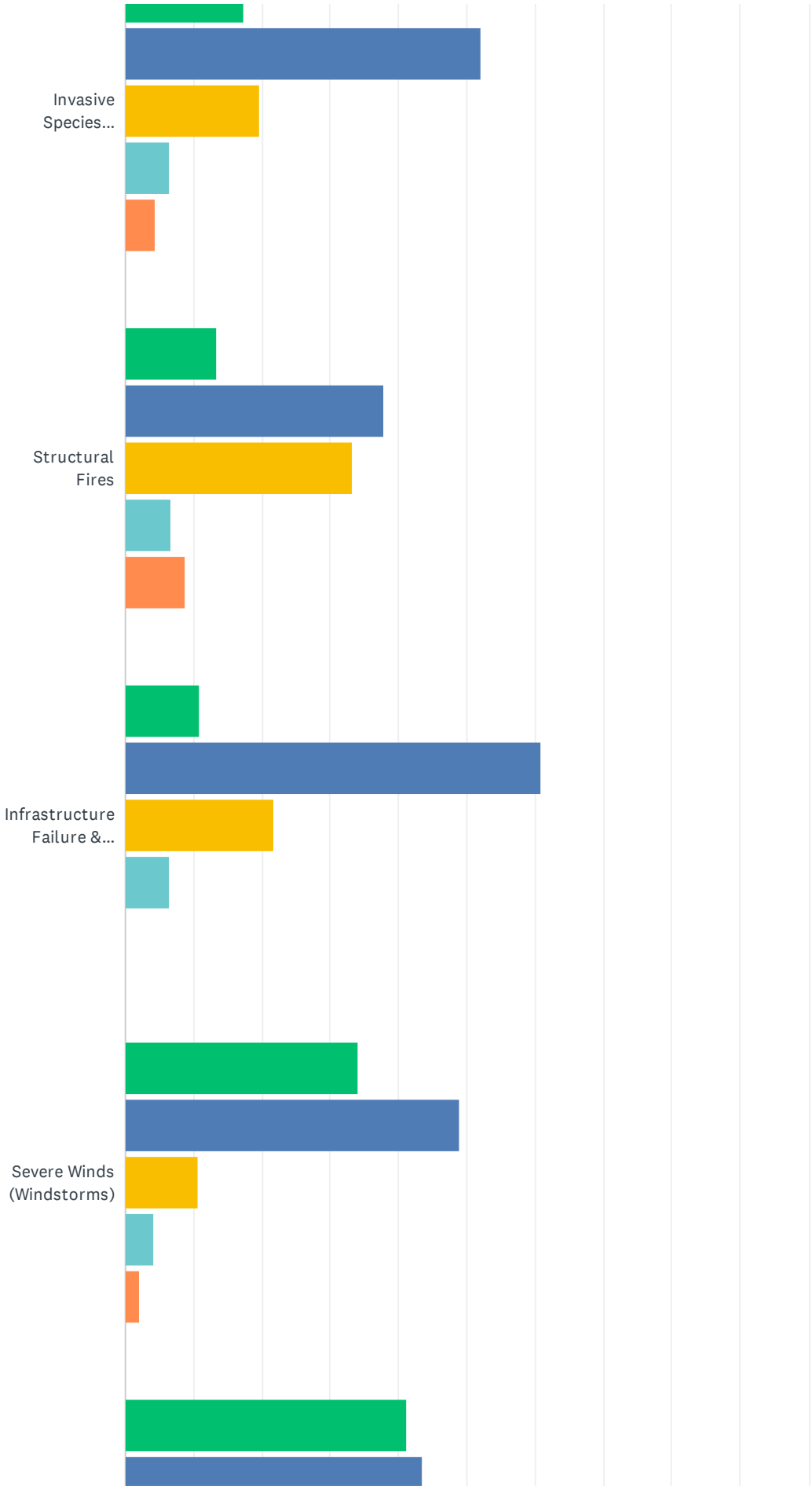


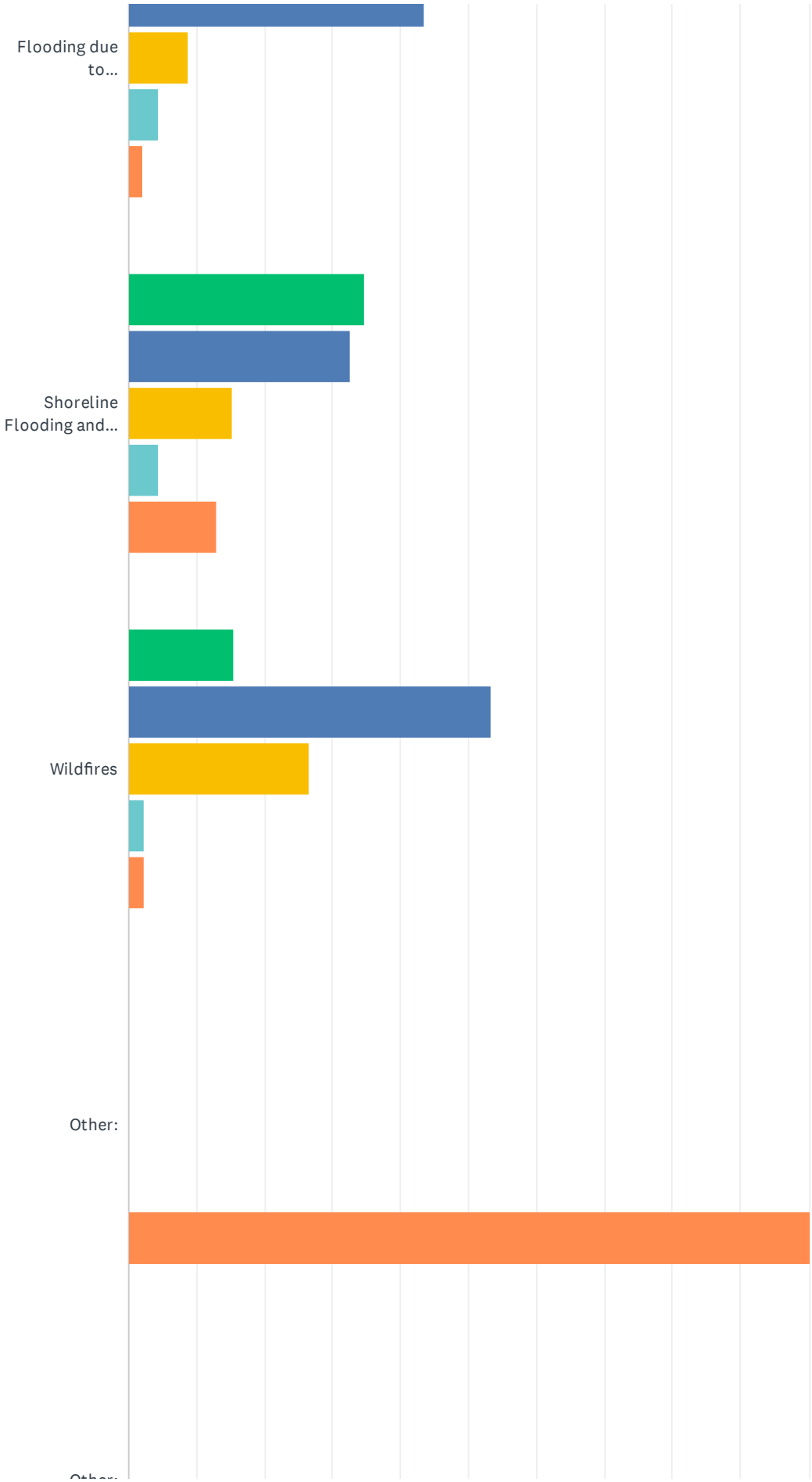

Landslide/Mudslide
Subsidence (Sink holes ...
Public Health Emergencies...
Lightning

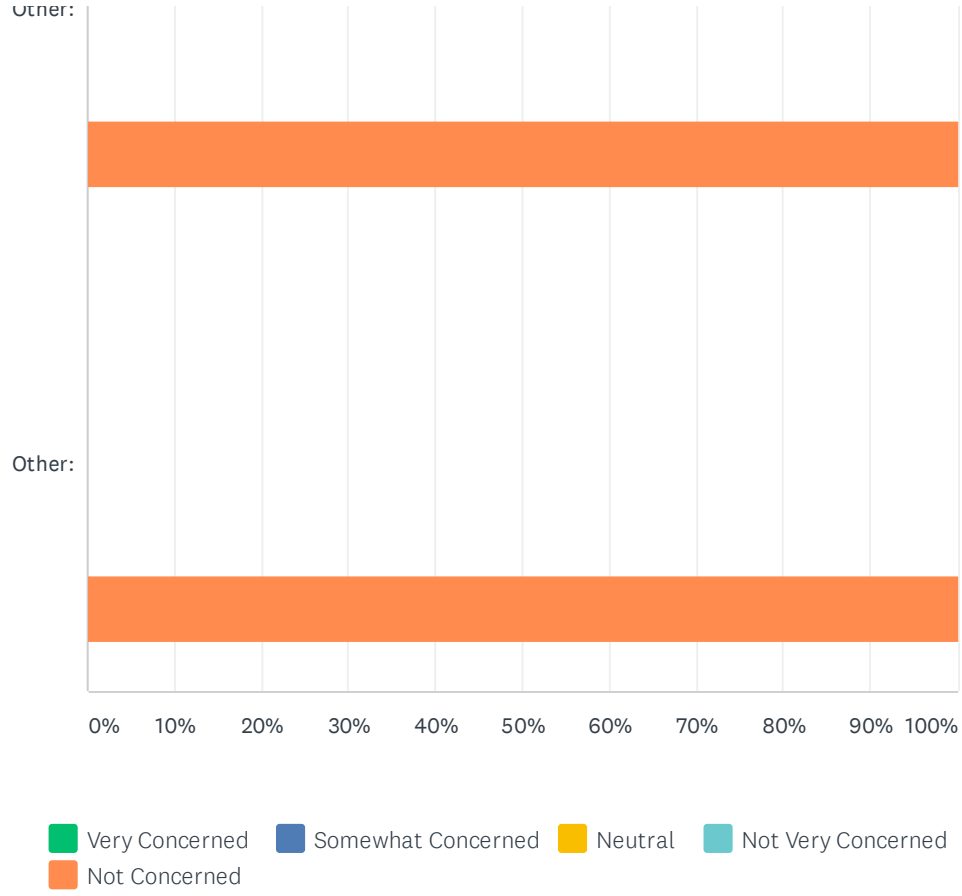

Earthquakes
Drought
Hazardous Materials,...
Scrap Tire Fires


Dam Failure
Extreme Weather...
Hail
Petroleum/Natural Gas Pipel...


Transportation Accidents (c...
Hazardous Materials,...
Ice and Sleet Storms
Snowstorms and Blizzards


Invasive Species...
Structural Fires
Infrastructure Failure &...
Severe Winds (Windstorms)


Flooding due to...
Shoreline Flooding and...
Wildfires
Other:


Other:
Other:
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Very Concerned
Somewhat Concerned
Neutral
Not Very Concerned
Not Concerned

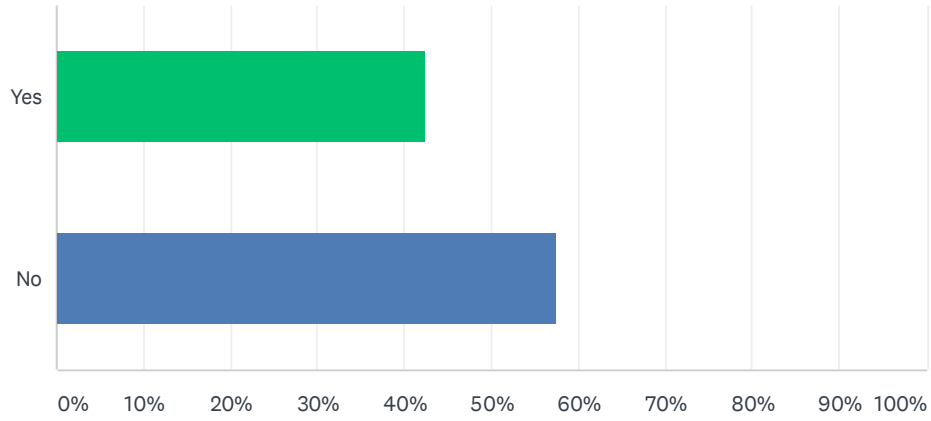
	VERY CONCERNED	SOMEWHAT CONCERNED	NEUTRAL	NOT VERY CONCERNED	NOT CONCERNED	TOTAL
Fog	0.00% 0	4.44% 2	37.78% 17	35.56% 16	22.22% 10	45
Tornadoes	4.35% 2	30.43% 14	23.91% 11	30.43% 14	10.87% 5	46
Civil Disturbances (rioting)	2.17% 1	6.52% 3	28.26% 13	30.43% 14	32.61% 15	46
Sabotage/Terrorism	0.00% 0	23.91% 11	28.26% 13	30.43% 14	17.39% 8	46
Landslide/Mudslide	2.22% 1	2.22% 1	20.00% 9	28.89% 13	46.67% 21	45
Subsidence (Sink holes or ground collapse, mine-related or not)	26.09% 12	30.43% 14	10.87% 5	26.09% 12	6.52% 3	46
Public Health Emergencies (disease epidemic)	8.70% 4	21.74% 10	39.13% 18	26.09% 12	4.35% 2	46
Lightning	10.87% 5	34.78% 16	26.09% 12	23.91% 11	4.35% 2	46
Earthquakes	0.00% 0	2.22% 1	15.56% 7	24.44% 11	57.78% 26	45
Drought	4.35% 2	15.22% 7	34.78% 16	23.91% 11	21.74% 10	46
Hazardous Materials, Transportation-related (e.g. waste spill from traffic accident)	13.04% 6	39.13% 18	19.57% 9	23.91% 11	4.35% 2	46
Scrap Tire Fires	6.52% 3	17.39% 8	34.78% 16	21.74% 10	19.57% 9	46
Dam Failure	6.67% 3	22.22% 10	26.67% 12	20.00% 9	24.44% 11	45
Extreme Weather Temperatures (hot/cold)	15.22% 7	50.00% 23	15.22% 7	17.39% 8	2.17% 1	46
Hail	6.38% 3	44.68% 21	27.66% 13	17.02% 8	4.26% 2	47
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	8.70% 4	52.17% 24	19.57% 9	15.22% 7	4.35% 2	46
Transportation Accidents (car crashes)	6.52% 3	54.35% 25	19.57% 9	15.22% 7	4.35% 2	46
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	17.39% 8	34.78% 16	28.26% 13	10.87% 5	8.70% 4	46
Ice and Sleet Storms	19.15% 9	57.45% 27	12.77% 6	8.51% 4	2.13% 1	47
Snowstorms and Blizzards	42.22% 19	42.22% 19	6.67% 3	6.67% 3	2.22% 1	45
Invasive Species (Emerald Ash Borer/Asian Carp)	17.39% 8	52.17% 24	19.57% 9	6.52% 3	4.35% 2	46
Structural Fires	13.33% 6	37.78% 17	33.33% 15	6.67% 3	8.89% 4	45

Infrastructure Failure & resulting hazards (e.g. power outage)	10.87% 5	60.87% 28	21.74% 10	6.52% 3	0.00% 0	46
Severe Winds (Windstorms)	34.04% 16	48.94% 23	10.64% 5	4.26% 2	2.13% 1	47
Flooding due to precipitation event or snowmelt	41.30% 19	43.48% 20	8.70% 4	4.35% 2	2.17% 1	46
Shoreline Flooding and Erosion	34.78% 16	32.61% 15	15.22% 7	4.35% 2	13.04% 6	46
Wildfires	15.56% 7	53.33% 24	26.67% 12	2.22% 1	2.22% 1	45
Other:	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1
Other:	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1
Other:	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1

#	OTHER (PLEASE SPECIFY & RATE YOUR CONCERN)	DATE
1	Drugs in the area/very concerned	6/15/2019 3:19 AM

Q5 Have you taken any actions to make your home or community more resistant to hazards?

Answered: 47 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	42.55%	20
No	57.45%	27
TOTAL		47

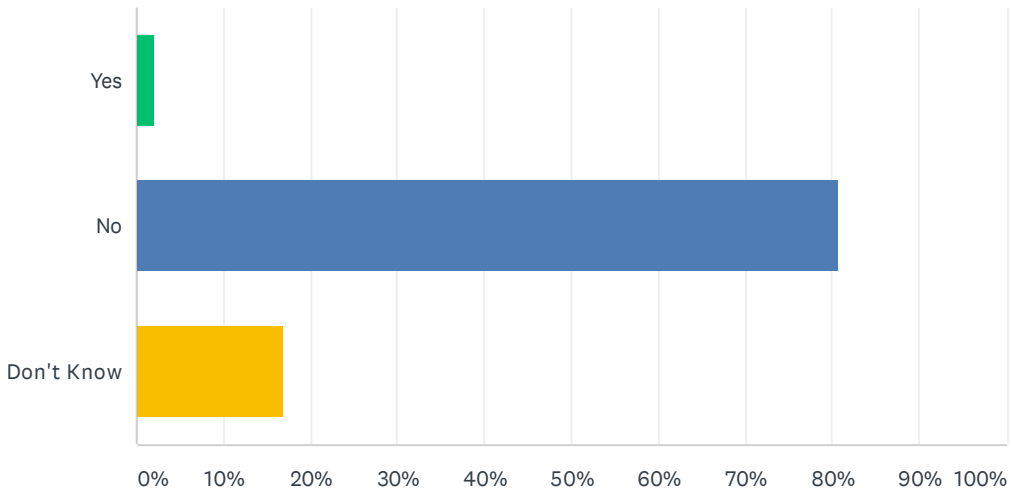
Q6 IF YES, please explain:

Answered: 18 Skipped: 29

#	RESPONSES	DATE
1	1. Generator installed at community center. 2. New lift station for w/w	8/22/2019 11:16 AM
2	Put on a better quality roof. Improved drainage.	8/22/2019 11:14 AM
3	Worked with the county to determine how to react quickly in an emergency. Tried to limit building in flood plains.	8/22/2019 11:07 AM
4	new culverts & ditching on my property	8/22/2019 11:00 AM
5	basic planning	8/22/2019 10:47 AM
6	Planning, readiness kits	8/22/2019 10:44 AM
7	Beaver dam system. Tree trimming.	8/22/2019 10:39 AM
8	Did work in house and around house	7/15/2019 10:38 PM
9	We have water, heat, food, auxillary light	6/18/2019 7:44 PM
10	My home. Fire safety.	6/17/2019 6:04 PM
11	We put in a retaining wall between our front yard and the salt used on the highway	6/17/2019 5:43 PM
12	removed trees that didn't look stable or were too close to structures	6/17/2019 11:54 AM
13	Generator, stored water	6/17/2019 11:09 AM
14	Trimmed trees.	6/17/2019 10:59 AM
15	Sealing and fixing foundations	6/17/2019 10:23 AM
16	Trimmed tree, secured outdoor items, keep things off the basement floor	6/17/2019 10:17 AM
17	Paying close attention to what is happening around me	6/15/2019 3:19 AM
18	Sec	6/14/2019 12:52 PM

Q7 Is your home located on a floodplain?

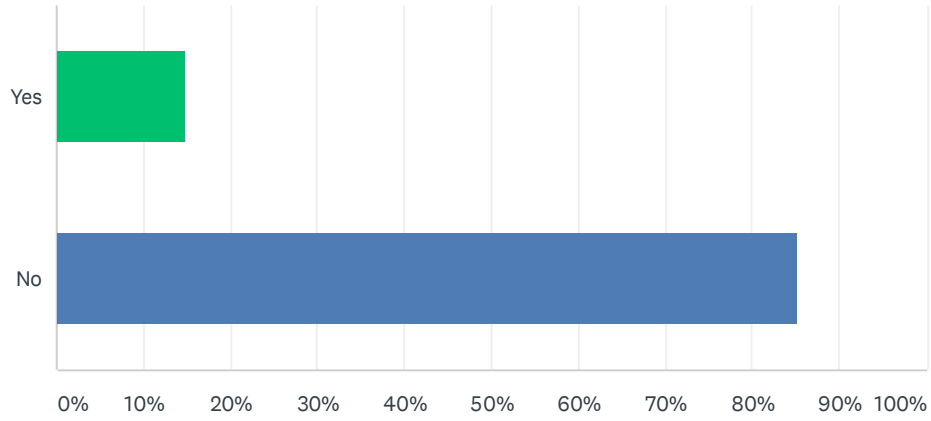
Answered: 47 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	2.13%	1
No	80.85%	38
Don't Know	17.02%	8
TOTAL		47

Q8 Does your street or home flood regularly during significant rain events?

Answered: 47 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	14.89%	7
No	85.11%	40
TOTAL		47

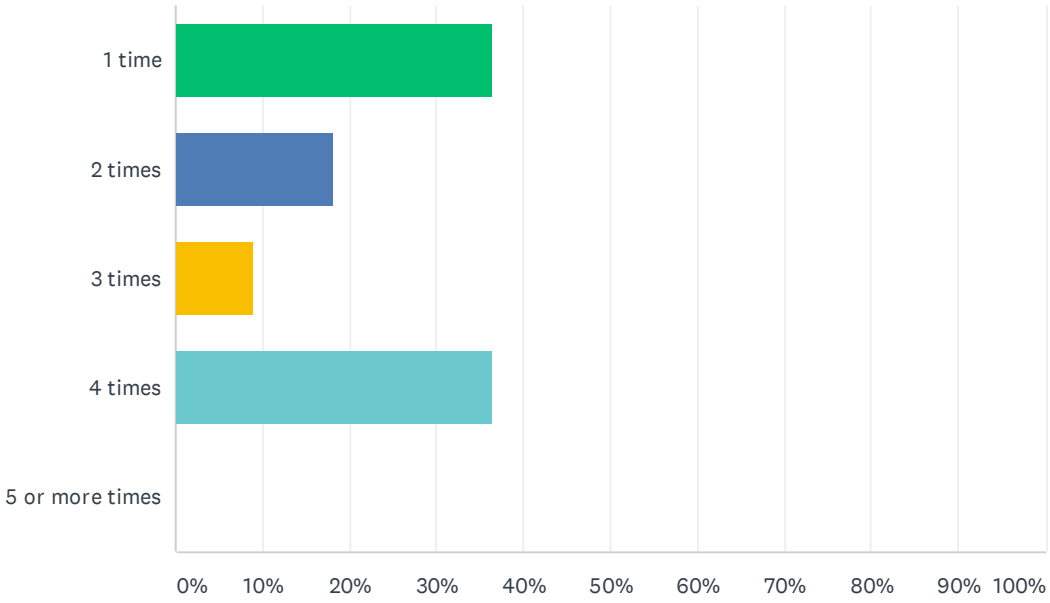
Q9 IF YES, what are the closest major cross streets to this location?

Answered: 7 Skipped: 40

#	RESPONSES	DATE
1	Lake/GCC Drive and/or Welch Creek	8/22/2019 10:39 AM
2	2	7/15/2019 10:38 PM
3	Road side washouts near Slade Rd, Little girls point and Vanderhagen	7/11/2019 5:03 PM
4	Woolsey and Eli	6/18/2019 11:41 PM
5	Eli/porter	6/17/2019 11:30 AM
6	Cloverland and Douglas	6/17/2019 10:23 AM
7	Sunday Lake Street Pierce Street	6/14/2019 12:30 PM

Q10 If your street or home does flood regularly during significant rain events, how many times did it flood in the past 12 months?

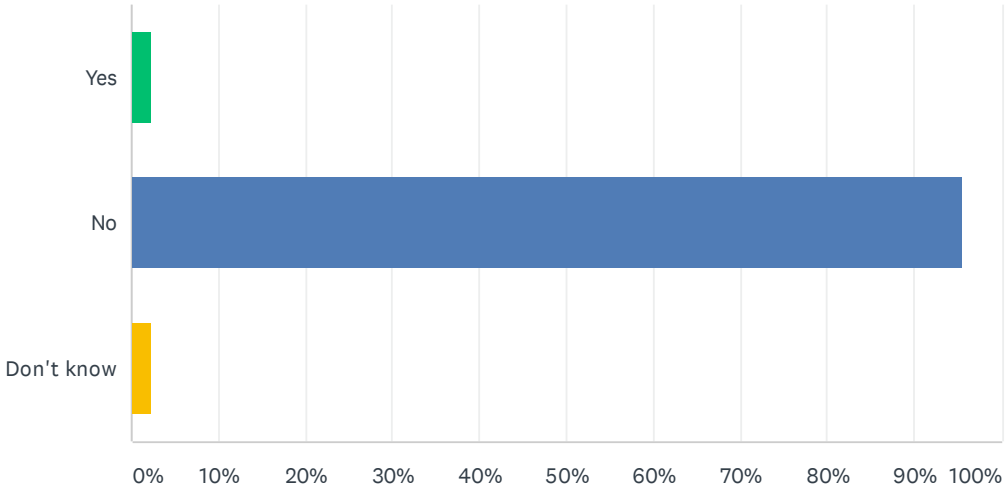
Answered: 11 Skipped: 36



ANSWER CHOICES	RESPONSES	
1 time	36.36%	4
2 times	18.18%	2
3 times	9.09%	1
4 times	36.36%	4
5 or more times	0.00%	0
TOTAL		11

Q11 Do you have flood insurance?

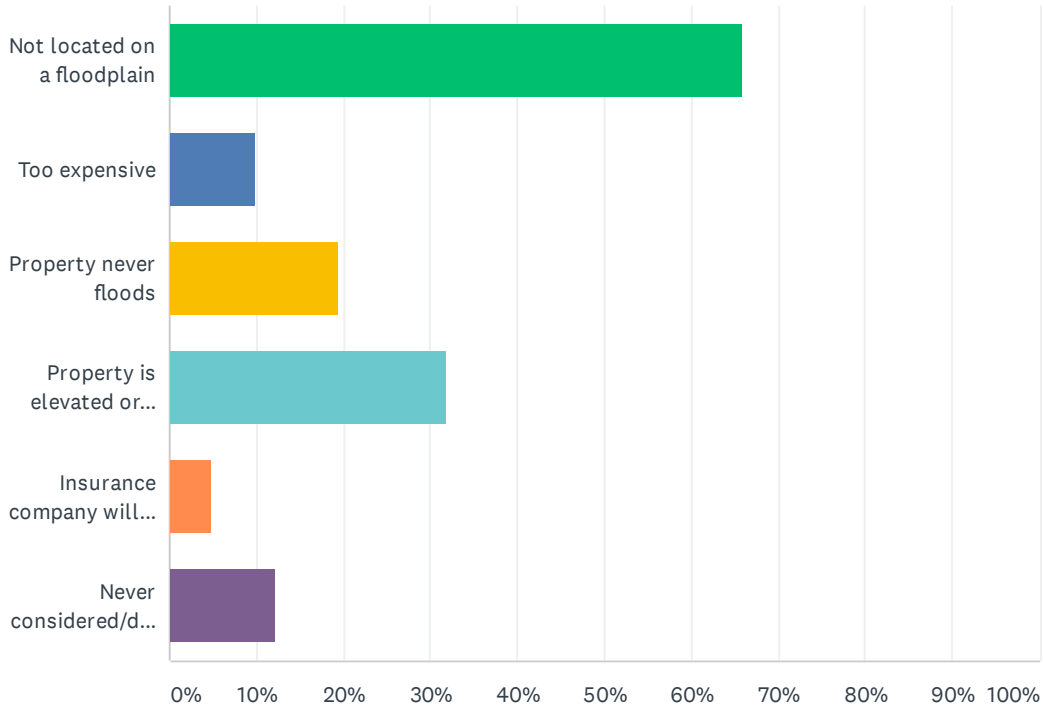
Answered: 45 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	2.22%	1
No	95.56%	43
Don't know	2.22%	1
TOTAL		45

Q12 If you do NOT have flood insurance, please indicate reason(s) below.

Answered: 41 Skipped: 6

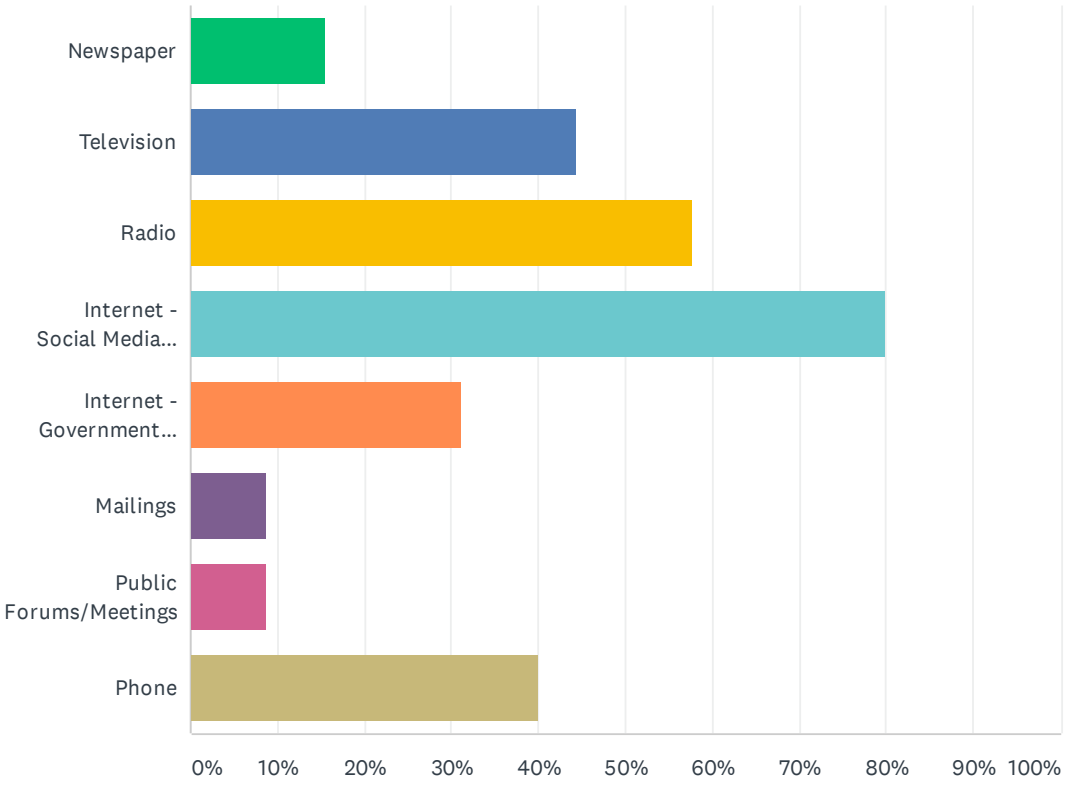


ANSWER CHOICES	RESPONSES	
Not located on a floodplain	65.85%	27
Too expensive	9.76%	4
Property never floods	19.51%	8
Property is elevated or otherwise protected	31.71%	13
Insurance company will not provide	4.88%	2
Never considered/didn't know about it	12.20%	5
Total Respondents: 41		

#	OTHER REASON (PLEASE SPECIFY)	DATE
	There are no responses.	

Q13 What are the most effective ways for you to receive information during or immediately following a hazard emergency? (Check all that apply)

Answered: 45 Skipped: 2



ANSWER CHOICES	RESPONSES	
Newspaper	15.56%	7
Television	44.44%	20
Radio	57.78%	26
Internet - Social Media (Facebook or Twitter)	80.00%	36
Internet - Government Website Postings	31.11%	14
Mailings	8.89%	4
Public Forums/Meetings	8.89%	4
Phone	40.00%	18
Total Respondents: 45		

#	OTHER (PLEASE SPECIFY)	DATE
1	We are in the process of having a website	8/22/2019 11:14 AM
2	Text messages	8/22/2019 11:07 AM
3	City siren	6/17/2019 10:59 AM
4	Pager	6/14/2019 11:23 PM
5	text message (SMS)	6/13/2019 8:26 AM

Q14 In your opinion, what are some steps or projects your local government could take to reduce or eliminate the risk for future hazard damages to your community?

Answered: 21 Skipped: 26

#	RESPONSES	DATE
1	Figure out what to do with old mine shafts, redo floodplain maps given current weather patterns	8/22/2019 11:07 AM
2	ditching	8/22/2019 11:03 AM
3	plan for it	8/22/2019 10:47 AM
4	Flood mitigation, power redunancy	8/22/2019 10:44 AM
5	Need far better drainage to avoid and help with flooding and water back ups	7/15/2019 10:38 PM
6	Underground electrical distribution wires.	7/12/2019 10:28 PM
7	up keep on general things, water dams, roads, follow up on power or gas issues, keep residents informed	7/10/2019 10:20 AM
8	Public safety and First Responder investments	6/20/2019 10:53 PM
9	Road and sewer repair	6/18/2019 11:41 PM
10	Have a solid plan in place, practice	6/18/2019 7:44 PM
11	Most have been nature related	6/17/2019 5:43 PM
12	Some type of barrier for the erosion at Lake Superior.	6/17/2019 1:34 PM
13	Lack of street curbing causes water to cascade from one street to the next washing through people's yards and driveways causing damage. Install curbs to control and direct water.	6/17/2019 11:30 AM
14	Get different elected officials.	6/17/2019 11:09 AM
15	Update sewer system and other infrastructure.	6/17/2019 10:59 AM
16	WORK ON STORM DRAINAGE SYSTEM	6/17/2019 10:54 AM
17	Fix the infrastructure	6/17/2019 10:23 AM
18	Educate public about what they can do to reduce impact & prepare their own property. Make sure sewer drains aren’t blocked.	6/17/2019 10:17 AM
19	Repair or replace known hazards	6/16/2019 6:21 AM
20	Mine inspections	6/14/2019 11:23 PM
21	Sandbag sooner as snow melts	6/14/2019 12:28 PM

Q15 Additional comments:

Answered: 1 Skipped: 46

#	RESPONSES	DATE
1	Something is wrong with the water in Ironwood, numerous times a year it comes out of the sink brown, it effects the whole town but nothing is being done about it.	6/17/2019 10:23 AM

2019 County Hazard Mitigation Local Government/Institutions Survey

The Western Upper Peninsula Planning and Development Region is updating Hazard Mitigation Plans for all six (6) counties in the Western Upper Peninsula. Update and adoption of the plan is **required** by the Federal Emergency Management Agency (FEMA) as a pre-condition for organization and/or local government to apply for federal mitigation grant funding.

The goal of the Hazard Mitigation Plan is to recommend strategies on a pre-disaster basis for the purpose of reducing adverse effects caused by natural, man-made, and technological disasters, including flooding, dam failures, wildfires, severe weather events, public health emergencies, terrorism, and hazardous materials and gas pipeline incidents.

We need your assistance in providing input into the County Hazard Mitigation Plan update through the enclosed survey. FEMA **requires** a certain level of participation of local units of government for the plan to be approved, and this survey will help to meet that requirement. Please fill out the survey as completely as possible and return it. Feel free to attach additional pages if necessary.

Contact rpressley@wuppdr.org with any questions.

Thank you for your time and participation!

Key Definitions:

Hazard - Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.
Mitigation - The action of reducing the severity, seriousness, or painfulness of something.
Risk - A situation involving exposure to danger; the possibility that something unpleasant or unwelcome will happen.
Vulnerability - The quality or state of being exposed to the possibility of being attacked or harmed, either physically, emotionally, financially, etc.

2019 County Hazard Mitigation Local Government/Institutions Survey

Local Government/Establishment: _____

Completed by: _____

1. Please specify the degree to which you think your jurisdiction is at risk of the following hazards occurring:

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
WEATHER HAZARDS					
Extreme Weather Temperatures (hot/cold)	☐	☐	☐	☐	☐
Fog	☐	☐	☐	☐	☐
Hail	☐	☐	☐	☐	☐
Ice and Sleet Storms	☐	☐	☐	☐	☐
Lightning	☐	☐	☐	☐	☐
Severe Winds (Windstorms)	☐	☐	☐	☐	☐
Snowstorms and Blizzards	☐	☐	☐	☐	☐
Tornados	☐	☐	☐	☐	☐
GEOLOGIC HAZARDS					
Earthquakes	☐	☐	☐	☐	☐
Landslide /Mudslide	☐	☐	☐	☐	☐
Subsidence (sink holes or ground collapse)	☐	☐	☐	☐	☐
HYDROLOGICAL HAZARDS					
Dam Failure	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐
Flooding due to precipitation event or snowmelt	☐	☐	☐	☐	☐
Shoreline Flooding and Erosion	☐	☐	☐	☐	☐
ECOLOGICAL HAZARDS					
Invasive Species (Emerald Ash Borer/Asian Carp)	☐	☐	☐	☐	☐
Wildfires	☐	☐	☐	☐	☐
INDUSTIRAL HAZARDS					
Scrap Tire Fires	☐	☐	☐	☐	☐
Structural Fires	☐	☐	☐	☐	☐
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	☐	☐	☐	☐	☐
Hazardous Materials, Transportation-Related (e.g. waste spill from traffic accident)	☐	☐	☐	☐	☐
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	☐	☐	☐	☐	☐

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
INFRASTRUCTURE HAZARDS					
Infrastructure failure & resulting hazards (e.g. power outage)	☐	☐	☐	☐	☐
Transportation Accidents (car crashes)	☐	☐	☐	☐	☐
HUMAN RELATED					
Civil Disturbances (rioting)	☐	☐	☐	☐	☐
Public Health Emergencies (disease epidemic)	☐	☐	☐	☐	☐
Sabotage/Terrorism	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐

For any of the hazards in the table for which you responded **"very"** or **"somewhat concerned,"** are there any that you feel would cause particularly severe property damage or loss of life if they occurred? Please explain.

2. Is your government agency/institution involved in any hazard mitigation projects? ☐ Yes ☐ No

   IF YES, please explain:

3. What hazard mitigation activities/projects has your government agency/institution implemented since 2013? **If any**, please describe:

4. Has your agency applied for any mitigation funding from federal, state, local, and/or private sources since 2013?

   ☐ Yes ☐ No

   IF YES, please explain:

   IF YES (on question 4), was the funding request successful? ☐ Yes ☐ No

5. What are the most important community assets to protect from damage during a hazard event?

6. How is growth and development in the community contributing to natural hazard events?

7. What activities will assist the community in reducing risk and preventing loss from future natural hazard events?

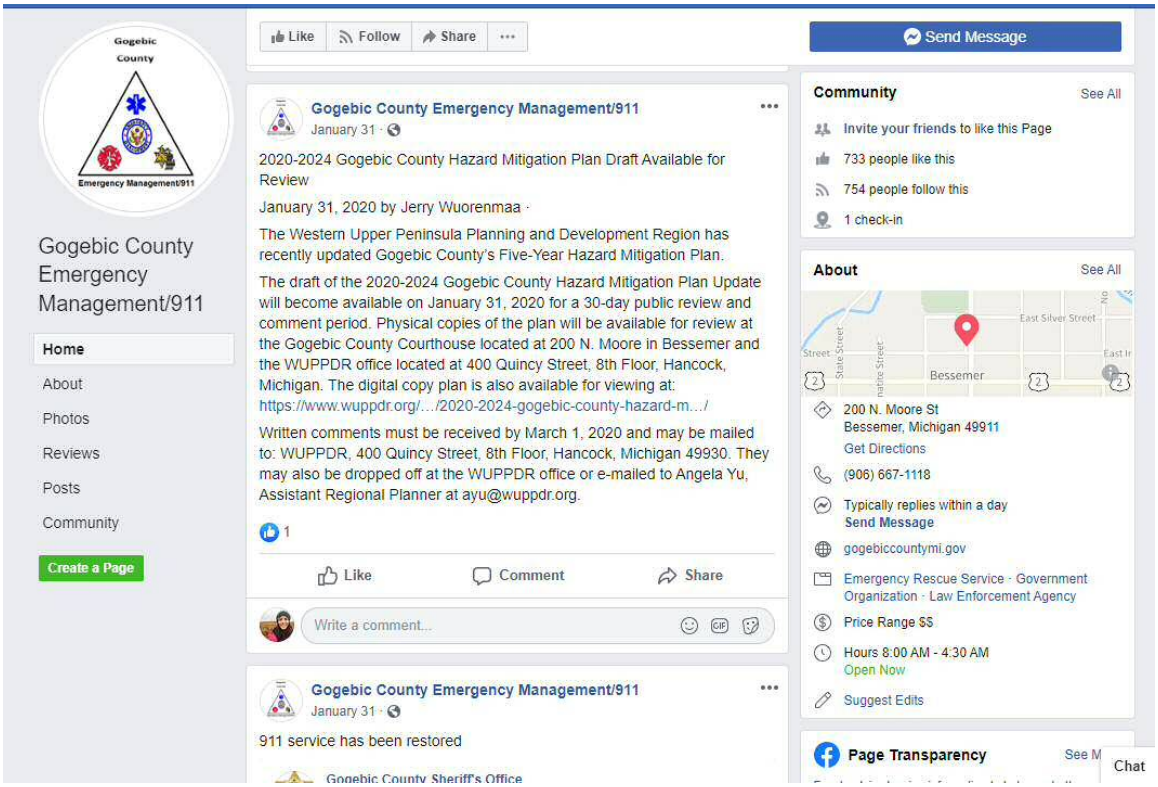
8. Do you see any gaps in the current system for reducing risk? ☐ Yes ☐ No
   Do you see new ways for agencies, organizations, or individuals to participate/coordinate to reduce risk from hazards?

9. How, if at all, does your institution educate the public concerning mitigation and preparedness projects, programs and activities?

- ☐ Newspaper
- ☐ Television
- ☐ Radio
- ☐ Internet – Social Media (Facebook or Twitter)
- ☐ Internet – Website Postings
- ☐ Mailings
- ☐ Public Workshops / Meetings
- ☐ Other (specify): _____
  _____
  _____

10. Please feel free to provide any additional comments in the space provided:

THANK YOU FOR YOUR PARTICIPATION!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Share
Send Message
Gogebic County Emergency Management/911
Gogebic County Emergency Management/911
Home
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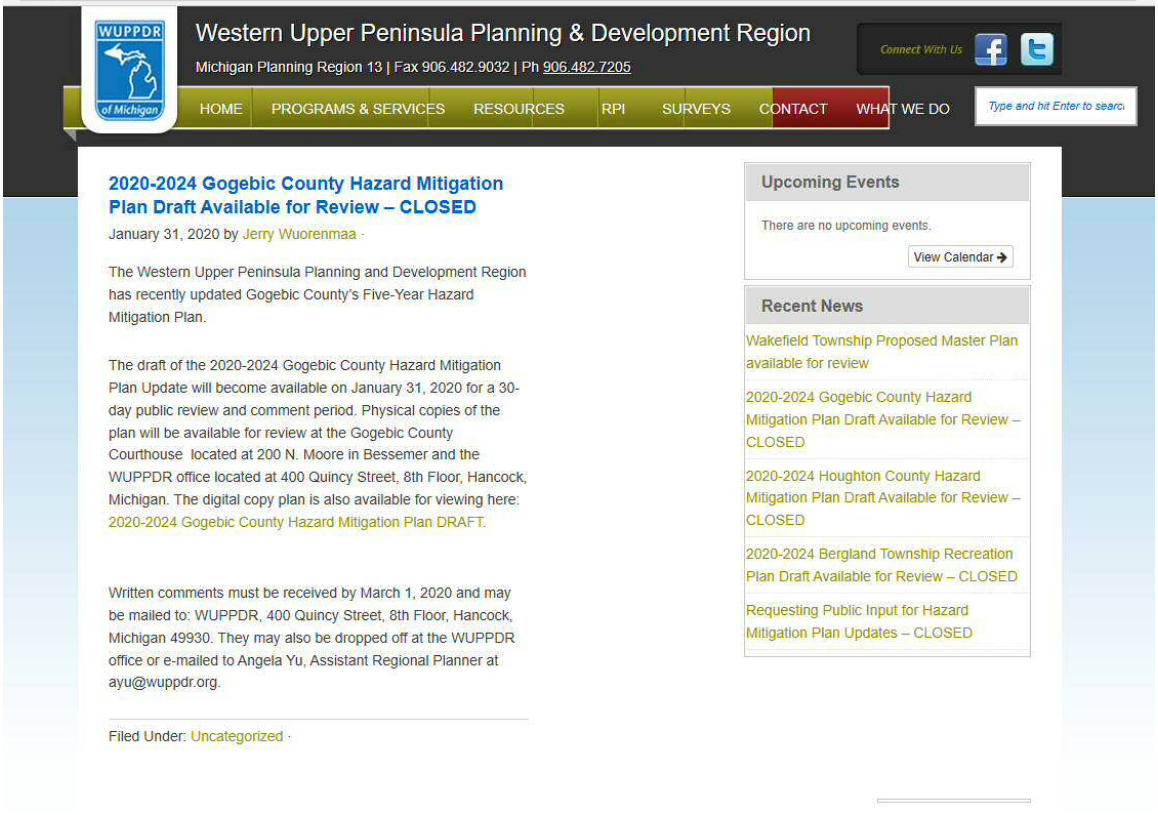
Photos
Reviews
Posts
Community
Create a Page
Gogebic County Emergency Management/911
January 31 ·
2020-2024 Gogebic County Hazard Mitigation Plan Draft Available for Review
January 31, 2020 by Jerry Wuorenmaa ·
The Western Upper Peninsula Planning and Development Region has recently updated Gogebic County's Five-Year Hazard Mitigation Plan.
The draft of the 2020-2024 Gogebic County Hazard Mitigation Plan Update will become available on January 31, 2020 for a 30-day public review and comment period. Physical copies of the plan will be available for review at the Gogebic County Courthouse located at 200 N. Moore in Bessemer and the WUPPDR office located at 400 Quincy Street, 8th Floor, Hancock, Michigan. The digital copy plan is also available for viewing at: https://www.wuppdr.org/.../2020-2024-gogebic-county-hazard-m.../
Written comments must be received by March 1, 2020 and may be mailed to: WUPPDR, 400 Quincy Street, 8th Floor, Hancock, Michigan 49930. They may also be dropped off at the WUPPDR office or e-mailed to Angela Yu, Assistant Regional Planner at ayu@wuppdr.org.
1
Like
Comment
Share
Write a comment...
Gogebic County Emergency Management/911
January 31 ·
911 service has been restored
Gogebic County Sheriff's Office
Community
See All
Invite your friends to like this Page
733 people like this
754 people follow this
1 check-in
About
See All
East Silver Street
Bessemer
200 N. Moore St
Bessemer, Michigan 49911
Get Directions
(906) 667-1118
Typically replies within a day
Send Message
gogebiccountymi.gov
Emergency Rescue Service · Government Organization · Law Enforcement Agency
Price Range $$
Hours 8:00 AM - 4:30 AM
Open Now
Suggest Edits
Page Transparency
See M
Chat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Western Upper Peninsula Planning & Development Region
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2020-2024 Gogebic County Hazard Mitigation Plan Draft Available for Review – CLOSED
January 31, 2020 by Jerry Wuorenmaa ·
The Western Upper Peninsula Planning and Development Region has recently updated Gogebic County's Five-Year Hazard Mitigation Plan.
The draft of the 2020-2024 Gogebic County Hazard Mitigation Plan Update will become available on January 31, 2020 for a 30-day public review and comment period. Physical copies of the plan will be available for review at the Gogebic County Courthouse located at 200 N. Moore in Bessemer and the WUPPDR office located at 400 Quincy Street, 8th Floor, Hancock, Michigan. The digital copy plan is also available for viewing here: 2020-2024 Gogebic County Hazard Mitigation Plan DRAFT.
Written comments must be received by March 1, 2020 and may be mailed to: WUPPDR, 400 Quincy Street, 8th Floor, Hancock, Michigan 49930. They may also be dropped off at the WUPPDR office or e-mailed to Angela Yu, Assistant Regional Planner at ayu@wuppdr.org.
Filed Under: Uncategorized ·
Upcoming Events
There are no upcoming events.
View Calendar
Recent News
Wakefield Township Proposed Master Plan available for review
2020-2024 Gogebic County Hazard Mitigation Plan Draft Available for Review – CLOSED
2020-2024 Houghton County Hazard Mitigation Plan Draft Available for Review – CLOSED
2020-2024 Bergland Township Recreation Plan Draft Available for Review – CLOSED
Requesting Public Input for Hazard Mitigation Plan Updates – CLOSED

Appendix F: Meeting Materials

County Hazard Mitigation Plan Update – Local Planning Team
May 2019

AGENDA

Introductions
Community Survey
Overview of the process
Timeline
Community Profile
Hazard Worksheet and Discussion
Map Review Exercise
Government/Institution Survey

Action: Submit past/present/future mitigation activities to Project Coordinator (rpressley@wuppdr.org)

Next meeting (August 2019): Survey results, review mitigation strategies, and update recommendations/implementation goals

WUPPDR Hazard Mitigation Team:
Executive Director – Jerald Wuorenmaa, jwuorenmaa@wuppdr.org
Project Coordinator – Rachael Pressley, rpressley@wuppdr.org
Planning Support – Angela Yu, ayu@wuppdr.org
GIS Support – Alanna Mingay, amingay@wuppdr.org
Hazard Mitigation Intern – Celine Carus, ccarus@wuppdr.org

2020 Gogebic County Hazard Mitigation Plan
Local Planning Team Meeting #1 – May 14, 2019 (9:30am)
Gogebic County Courthouse (200 N. Moore St, Bessemer)

Last Name	First Name	Representing	Email Address
DeRosso	Heidi	Gogebic County Emergency Mgmt	hderosso @ gogebicCounty mi.gov
Rogers	Mike	WATERSMEET Township	SUPERVISOR@WATERSMEET.
Grimsby	Larry	Erwin Twp	Supervisor
Ryskey	Greg	Gogebic County F&P	gryskey@gogebiccounty.mi.gov
Bolich	Danny	GCRC	dbolich@gogebic County MI.gov
Graser	Maria	Ironwood Twsp	treasurer@ironwoodtownship.com
Brown	Robert	City of Wakefield	city manager @ cityofwakefield.org
Cox	John	Wakefield Twp	WAKEFIELD Supervisor@Township
DiGiorgio	Andrew	City of Ironwood IPSD	digiorgio@city of
Loper	Charly	City of Bessemer	Charly.Loper@bessemer mi.org
Snyder	Brandon	IPSD, LEPC, 911	Snyder @cityofiron wood

County Hazard Analysis Priority Checklist

Name & Email:	Representing Organization:

Worksheet Instructions:
Please circle the following hazards in concern from 1-10. If any relevant historic occurrences are known, please note in th
end of the checklist any information or hazards are missing please take note of it and contact: rpressley@wuppdr.org

Helpful Definitions:
Hazard - Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.
Mitigation - The action of reducing the severity, seriousness, or painfulness of something.
Risk - A situation involving exposure to danger; the possibility that something unpleasant or unwelcome will happen.
Vulnerability - The quality or state of being exposed to the possibility of being attacked or harmed, either physically, emot
Location – The geographic areas in the county planning area that are affected by the hazard. Note whether the hazard is pr
the hazard is localized, please write the hazard's specific location
Maximum Extent – The strength or magnitude of the hazard. How is the hazard measured in your organization and list the
Impact – the consequence or effect of the hazard on the county government and its assets. List specific vulnerable agencie
that might be more susceptible to the hazard
Probability: a numerical index of risk; it is a measure of the likelihood that the undesirable event will occur.

Hazard	Overall Concern	Comments
Extreme Temperature	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Fog	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Hail	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Ice/Sleet Storms	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Lightning	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Severe Winds	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Snowstorms & Blizzards	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Tornadoes	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Dam Failures	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Riverine & Urban Flooding	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Shoreline Flooding & Erosion	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Drought	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Wildfires	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Invasive Species	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	

Earthquakes	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Subsidence/Ground Collapse/Sinkhole	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Scrap Tire Fires	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Structural Fires	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Hazardous Materials: Fixed Site Incidents	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Hazardous Materials: Transportation Incidents	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Petroleum & Gas Pipeline Accidents:	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Infrastructure Failure & Secondary Technological Hazards	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Transportation Accidents	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Civil Disturbances	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Public Health Emergencies	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	
Sabotage & Terrorism	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10	

Write additional comments on back of page.

Introductions
Survey Results
Risk Assessment
Mitigation Action Plan

- Goals
- Past Mitigation Activities
- Current Projects
- Future Recommendations

Final Plan Adoption Process

Action: Review Draft when released and submit comments to Rachael Pressley (rpressley@wuppdr.org)

WUPPDR Hazard Mitigation Team:
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Project Coordinator – Rachael Pressley, rpressley@wuppdr.org
Planning Support – Angela Yu, ayu@wuppdr.org
GIS Support – Alanna Mingay, amingay@wuppdr.org
Hazard Mitigation Intern – Celine Carus

2020 Gogebic County Hazard Mitigation Plan
Local Planning Team Meeting #2 – August 20, 2019 (9:00am Central)
Gogebic County Courthouse (200 N. Moore St., Bessemer)

Last Name	First Name	Representing	Email Address
Bolich	Bavvy	G.C.R.C.	bbolich@gogebic county mi. gov
Ryskey	Greg	G.C. F. P.	gryskey@gogebic county mi. gov
Brown	Robert	Wakefield	city manager@ city of wakefield.org
Loper	Charly	Bessemer	Charly.Loper@bessemer mi.org
DeRosso	Heidi	Emergency Mgmt	hderosso@gogebic county mi. gov
Western	Andrew	Emergency Mgmt	awestern@gogebic county mi. gov
Solbers	Ross	GCSD	rsolbers@ gogebiccounty mi. gov
Graser	Maria	Ironwood Twsp	treasurer@ironwood
DiGiorgio	cari	WUPHD	cdigiorgio@ wuphd
Snyder	Brandon	IPSD/LEPC	snyder@cityofironwood
Clemens	Adam	IPSD	clemens@cityofironwood

NOAA Weather Radio	Completed
Update Stormwater Management Plans and Flood Maps	Partially completed
Review Plans and Development Regulations	
Improved Emergency Response	
Drainage Improvements and Maintenance	
Mine Shaft Safety	
Public Information/Education Program	
Update Shoreline Erosion Map and Identify Future Mitigation Activities	
Insurance	
Retrofit Underground Pipes	

2013 Mitigation Program Action Items

2013 Item	Status
Repair Sunday Lake Floodgate	
Repair of Presque Isle Wildlife Dam	
Pipeline Safety Program	
Mobile 911 Boosters	
Mine Inspector	
Mine Shaft Safety	
Drainage Improvements and Maintenance	
Implement State Line Community Wildfire Protection Plan (CWWP) Action Items	
Public Information/Education Program	
Update Shoreline Erosion Map and Identify Future Mitigation Activities	
Insurance	
Retrofit Underground Pipes	
Scrap Tire Removal	
Create and Review Plans and Development Regulations	
Improve Emergency Response Capability	
Early Warning System	

Appendix G: State Document Review

Appendix H: Plan Adoption