



ONTONAGON COUNTY

2020 - 2025

**Hazard
Mitigation
Plan**



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Table of Contents

SECTION 1: Introduction	1
Background	1
Purpose	2
Scope.....	3
Authority	3
SECTION 2: Planning Process	4
Overview of Hazard Mitigation Planning.....	4
History of Hazard Mitigation Planning in Ontonagon County.....	5
Preparing the 2020 Plan.....	5
Local Planning Team.....	7
Local Planning Team Meetings	8
Involving the Public.....	10
Involving Stakeholders	10
SECTION 3: Community Profile	11
Geography and the Environment.....	11
Population and Demographics.....	13
Housing, Infrastructure, and Land Use.....	16
Employment and Industry.....	20
Police, Fire, and Emergency Services	21
Critical Facilities and Cultural Assets	23
Cultural Assets.....	25
Disaster Declaration.....	28
SECTION 4: Hazard Identification	29
SECTION 5: Hazard Analysis	34
Study Area	34
Natural Hazards: Weather Hazards	34
Extreme Temperatures.....	35
Fog.....	38
Hail	39
Ice and Sleet Storms	41
Lightning.....	43
Severe Winds.....	44
Snowstorms and Blizzards.....	48
Tornadoes	50
Hydrological Hazards	54
Dam Failures.....	55
Riverine and Urban Flooding	59
Shoreline Flooding and Erosion	63
Drought.....	65
Ecological Hazards	67
Wildfires	67

Invasive Species.....	71
Geological Hazards.....	75
Earthquakes.....	75
Subsidence (Ground Collapse)	77
Technological Hazards: Industrial Hazards.....	80
Scrap Tire Fires.....	80
Structural Fires.....	81
Hazardous Materials: Fixed Site Incidents	84
Hazardous Materials: Transportation Accident	88
Petroleum and Natural Gas Incidents	89
Infrastructure Hazards	92
Infrastructure Failures and Secondary Technological Hazards	92
Transportation Accidents.....	94
Human-Related Hazards	96
Civil Disturbances	97
Public Health Emergencies.....	98
Sabotage and Terrorism.....	103
SECTION 6: Risk Assessment.....	105
Differential Vulnerability	105
Hazard Priority Risk Index and Ranking.....	111
PRI Results	114
SECTION 7: Hazard Mitigation	118
Overview of Mitigation Strategy Development	118
Review and Update of Mitigation Goals	120
Capability Assessment.....	120
Updating the 2020 Ontonagon County Hazard Mitigation Plan	133
SECTION 8: Action Plan.....	134
Past Mitigation Accomplishments	135
Action Items.....	136
Appendix.....	144
Appendix A: County Capability Snapshot	
Appendix B: Mitigation Funding and Resources	
Appendix C: County Letter to Commit Match	
Appendix D: Public Participation	
Appendix E: Meeting Materials	
Appendix F: State Document Review	
Appendix G: Plan Adoption	

Table of Figures

Figure 2.1: Hazard Mitigation Planning Process6
Figure 5.1: NOAA’s National Weather Service Heat Index Chart36

Table of Maps

Map 3.1: Ontonagon County Jurisdictions12
Map 3.2: Ontonagon County Watersheds.....14
Map 3.3: Ontonagon County Transportation.....17
Map 3.4: Ontonagon County Land Use/Cover19
Map 5.1: Hail events in Ontonagon County, 1955-2018.....40
Map 5.2: Severe Wind Events in Ontonagon County, 1955-201847
Map 5.3: Reported Tornadoes in Ontonagon County, 1955-201953
Map 5.4: Dams in Ontonagon County (NID)57
Map 5.5: Wildfire Hazard Potential in Ontonagon County70
Map 5.6: Mine Locations by Type, Ontonagon County79
Map 5.7: Toxic Release Sites and Landfills in Ontonagon County85
Map 5.8: Pipelines in Ontonagon County.....91

Table of Tables

Table 2.1: Participating Local Units of Government and Representatives8
Table 2.2: Ontonagon County Local Planning Team8
Table 3.1: Municipal Populations for Ontonagon County, 1960-201715
Table 3.2: Race and Ethnicity Percentages in Ontonagon County, 201715
Table 3.3: Public Schools in Ontonagon County, 2019-202016
Table 3.4: Employment by Sector for Ontonagon County, 201821
Table 3.5: Fire Departments in Ontonagon County.....22
Table 3.6: Siren Locations in Ontonagon County23
Table 3.7: Critical Facilities in Ontonagon County24
Table 3.8: Presidential Disaster Declarations for Ontonagon County, 1965-202028
Table 4.1: Description of Identified Hazards30
Table 5.1: Heat Index and Related Heat Disorders36
Table 5.2: Cold Disorders Associated with Extreme Cold Temperatures.....37
Table 5.3: Hail Size Reference39
Table 5.4: Reported Hail Events by Size in Ontonagon County, 1955-201941
Table 5.5: Reported Ice and Sleet Storms in Ontonagon County, 1996-201942

Table 5.6: Severe Wind Events in Ontonagon County, 1955-2019	45
Table 5.7: Reported Snowstorms by Type in Ontonagon County, 1996-2019	49
Table 5.8: Fujita Scale with Associated Damages.....	51
Table 5.9: Enhanced Fujita Scale with Associated Damages.....	51
Table 5.10: Tornado Events in Ontonagon County, 1950-2019.....	52
Table 5.11: Dams in Ontonagon County	56
Table 6.1: Differential Vulnerabilities by Jurisdiction in Ontonagon County	106
Table 6.2: State-equalized value for Ontonagon County, 2020.....	107
Table 6.3: Hazard Extent in Ontonagon County	108
Table 6.4: Priority Risk Index Summary Table.....	113
Table 6.5: Summary of PRI Results for Ontonagon County	114
Table 6.6: Conclusions on Hazard Risk for Ontonagon County	116
Table 7.1: Relevant Plans, Ordinances, and Programs in Ontonagon County	122
Table 8.1: 2005 Hazard Mitigation Action Items	135
Table 8.2: 2013 Hazard Mitigation Action Items	135

SECTION 1: Introduction

This section provides a general introduction to the Ontonagon 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, natural hazards threaten lives and livelihoods and result in billions of dollars in damage.

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.

Ontonagon 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



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

may never be fully eliminated, there is much that can be done to lessen their potential impact upon the community. The Ontonagon 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 Ontonagon County and its municipalities. At its most inner core, the Plan recommends specific actions to combat forces of nature and protect its residents from losses to those hazards that pose the greatest risk. These mitigation actions go beyond simply recommending structural solutions to reduce existing vulnerabilities but also suggest local policies on community growth and development, incentives for natural resource protection, and public education activities are examples of other actions considered to reduce Ontonagon 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 the National Flood Insurance Reform Act of 2004

To reduce national 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 Ontonagon County Emergency Coordinator to ensure that it meets all applicable Disaster Mitigation Act planning requirements. The Local Mitigation Plan Review, found in Appendix F, 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, in post the pre-disaster and post-disaster environment.
- 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 Hazard Mitigation 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 Ontonagon County (Section 6: *Risk Assessment*). Other hazards that post low or negligible risk will continue to be evaluation during future updates to the Plan, but they may not be fully addressed until they are determined to be of high or moderate risk to Ontonagon County. The geographic scope (i.e., planning area) for the Plan includes the entire area of Ontonagon County.

Authority

This Hazard Mitigation Plan has been adopted by Ontonagon County in accordance with the authority and adoption powers granted to counties as defined by the State of Michigan (MI Const., Article VII § 2). This Hazard Mitigation Plan has also been adopted by Ontonagon County's participating municipal jurisdictions under the authority granted to cities, and villages as defined by the State of Michigan (MI Const. Article VII § 22 & 34). Copies of all local resolutions to adopt the Plan are compiled in Appendix G.

- 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; and
- 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 Ontonagon County in preparation of the Hazard Mitigation Plan. It consists of the following seven subsections:

- Overview of Hazard Mitigation Planning
- History of Hazard Mitigation Planning in Ontonagon County
- Preparing the 2020 Plan
- Local Planning Team
- Local Planning Team 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 Ontonagon 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 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, 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 Ontonagon County

Ontonagon 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 initial plan was led by the mitigation planning team, formerly named the *Ontonagon County Ad-hoc Committee* and organized by the *Ontonagon County Emergency Management Office*. The committee included planning professionals from the Western U.P. Planning & Development Region (WUPPDR) and Ontonagon County Emergency Manager, Road Engineer, Board Chairperson, Fire Chief, Sheriff, and Ontonagon Village Manager. The final plan was adopted in Fall 2005. FEMA approved the plan in Fall 2005, validating it until 2010.

In 2012, Ontonagon County contacted WUPPDR again to update the 2005 plan. This plan update began with a review of the 2005 plan and gathering data from local sources, including statewide data, to update the hazard risks to municipalities within the County. WUPPDR planning professionals then met with the County Emergency Coordinator and ad-hoc committee to identify new projects to address existing and newly identified hazards. One public meeting was held during the planning process on August 20, 2013. The final plan was adopted by the Ontonagon County Board of Commissioners on September 17, 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 and public assistance funding. In preparation of the 2020 Hazard Mitigation Plan update, Ontonagon County contracted with WUPPDR to provide professional mitigation planning services. Per the contract, WUPPDR followed the mitigation planning process as recommended by FEMA (Local Mitigation Planning Handbook, March 2013) and recommendations by 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 this plan were developed, it will be necessary to review the previous versions of this plan.

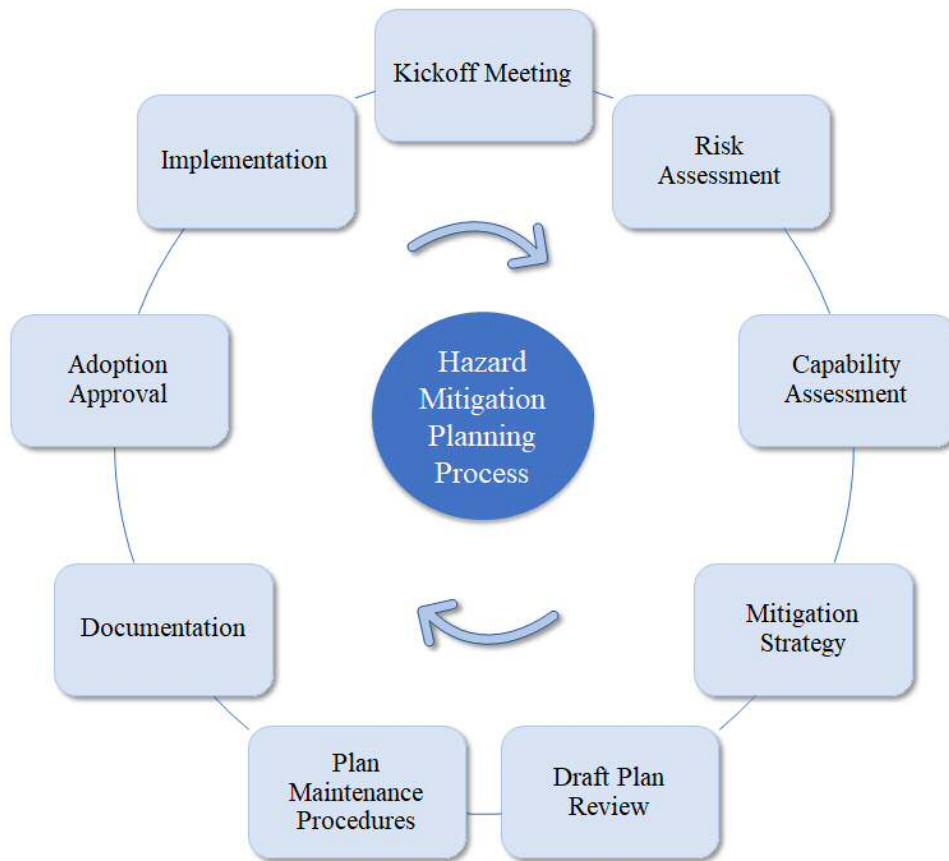
Plan updating and review procedures were established in the previous versions of this plan and were used, in addition to the requirements discussed above, to prepare the 2020 update. These procedures provide the general guidelines for the updating and reviewing the plan on a five-year basis. These procedures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

- A. Do 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 Plan implementation?
- D. Are there any implementation problems that impede the action plan?
- E. What implementation outcomes have been completed?
- F. Have other agencies, organization, 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 on the plan that was reviewed and updated with the identified results. The State of Michigan Hazard Mitigation Plan was reviewed extensively to incorporate relevant material into the Ontonagon County Hazard Mitigation Plan update.

The planning process included several steps (**Figure 2.1**) that were completed over the course of several months. Each step resulted in outcomes that make up the Plan. These elements have been integrated into this document and are further explained here for introductory purposes.

Figure 2.1: Hazard Mitigation Planning Process



The *Community Profile*, in Section 3, provides a general overview of Ontonagon 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 Ontonagon 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* (Section 7) 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 Ontonagon County to keep up to date with the hazard mitigation plan.

Local Planning Team

The Ontonagon County Emergency Coordinator convened a Local Planning Team (LPT) to guide the development of this plan update. While remaining consistent with the initial plan developed, 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 units of government in Ontonagon County (**Table 2.1**) have participated in the development of the 2020 Ontonagon 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
Ontonagon County	Michael Kocher	Emergency Services Director
Village of Ontonagon	Joe Erickson	Village Manager
Bergland Township	Wendy Savola	Township Treasurer
Bohemia Township	LuAnn Hayrynen	Township Supervisor
Carp Lake Township	Homer Colclasure	Township Supervisor
Greenland Township	Fred Barron	Township Supervisor
Haight Township	Joseph Pietila	Township Supervisor
Interior Township	Robert Garrison	Fire Department
Matchwood Township	Lorraine Warsop	Township Supervisor
McMillan Township	DJ Staff	Fire Department
Ontonagon Township	Steve Store	Township Supervisor
Rockland Township	Charles Pantti	Township Supervisor
Stannard Township	Bill Andrus	Public Safety

Ontonagon County Local Planning Team

The participants listed in **Table 2.2** represent the members of the Ontonagon County Local Planning Team who participated in the development of the Plan. The planning process was led at the county level by the Ontonagon County Emergency Coordinator. The regional planning agency (WUPPDR) provided a team of professional planners and a GIS coordinator to facilitate all LPT meetings. Committee members are listed alphabetically by agency/jurisdiction.

Table 2.2: Ontonagon County Local Planning Team

Name	Agency/Jurisdiction
Michael Kocher	Ontonagon County Emergency Services Director
Dale Rantala	Ontonagon County Sheriff
Stacy Preiss	Ontonagon County Clerk
Ted Baird	Baird Legal Offices

Local Planning Team 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 Local Planning Team. Copies of the agendas, sign-in sheets, and handout materials for all meetings can be found in Appendix E.

First Local Planning Team Meeting

The first meeting of the Local Planning Team was held on May 23, 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 Local Planning Team meeting was held on October 31, 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 top five hazards in Ontonagon County based on the quantitative prioritized risk assessment are the following: 1). Snowstorms and Blizzards, 2). Invasive Species, 3). Severe Winds, 4). Shoreline Flooding and Erosion, and 5). Structural Fires

Capability Assessment Discussion

- In Ontonagon County, Carp Lake Township, Ontonagon Township, and the Village of Ontonagon participate in the National Flood Insurance Program (NFIP).
- Bergland Township, Carp Lake Township, Interior Township, Ontonagon Township, and the Village of Ontonagon have adopted and implement/enforce a comprehensive plan, building codes, and zoning ordinances.
- The Village of Ontonagon has administrative and technical capabilities, with adequate staff resources to implement local government programs.

Review of Existing Mitigation Plan Goals, Objectives, and Actions

The existing goals from the 2013 Ontonagon County Hazard Mitigation Plan were presented to the Local Planning Team during the second meeting focusing on mitigation strategies. The committee agreed that these goals were chosen for good reason and still captured what Ontonagon County means to accomplish. The goals are listed in Section 7 and 8.

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

One of the fundamental components of Ontonagon County's community-based mitigation planning process involves public participation. Individual citizen involvement provides the Local Planning Team 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 potentials risks that hazard effects.

For the 2020 plan update, public input was sought using multiple methods: (1) public survey development and implementation; (2) posting the draft of the Ontonagon County Hazard Mitigation Plan for public review on the WUPPDR website, and at government offices and the public library; and (3) open public meetings with opportunities for hearing public comments prior to adoption.

Summary of Public Participation Survey

A summary of public survey results is available for review in Appendix D.

Summary of Draft Locations

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

Summary of Public Meeting and Comments Received

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

Involving Stakeholders

A range of stakeholders were invited and encouraged to participate in the Ontonagon County Hazard Mitigation Plan by joining the Local Planning Team meetings. The invitations were sent to the following individuals:

- Michael Kocher, Ontonagon County Emergency Coordinator
- Dale Rantala, Ontonagon County Sheriff
- Stacy Preiss, Ontonagon County Clerk
- Ted Baird, Baird Legal Offices

In addition to the Local Planning Team meetings, Ontonagon County encouraged more open and widespread stakeholder participation through the design and publication of newspaper advertisements for the public survey, the draft open 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 Ontonagon 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 Ontonagon County. This information has been updated to reflect the community profile for the 2020 plan. 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
- Disaster Declarations

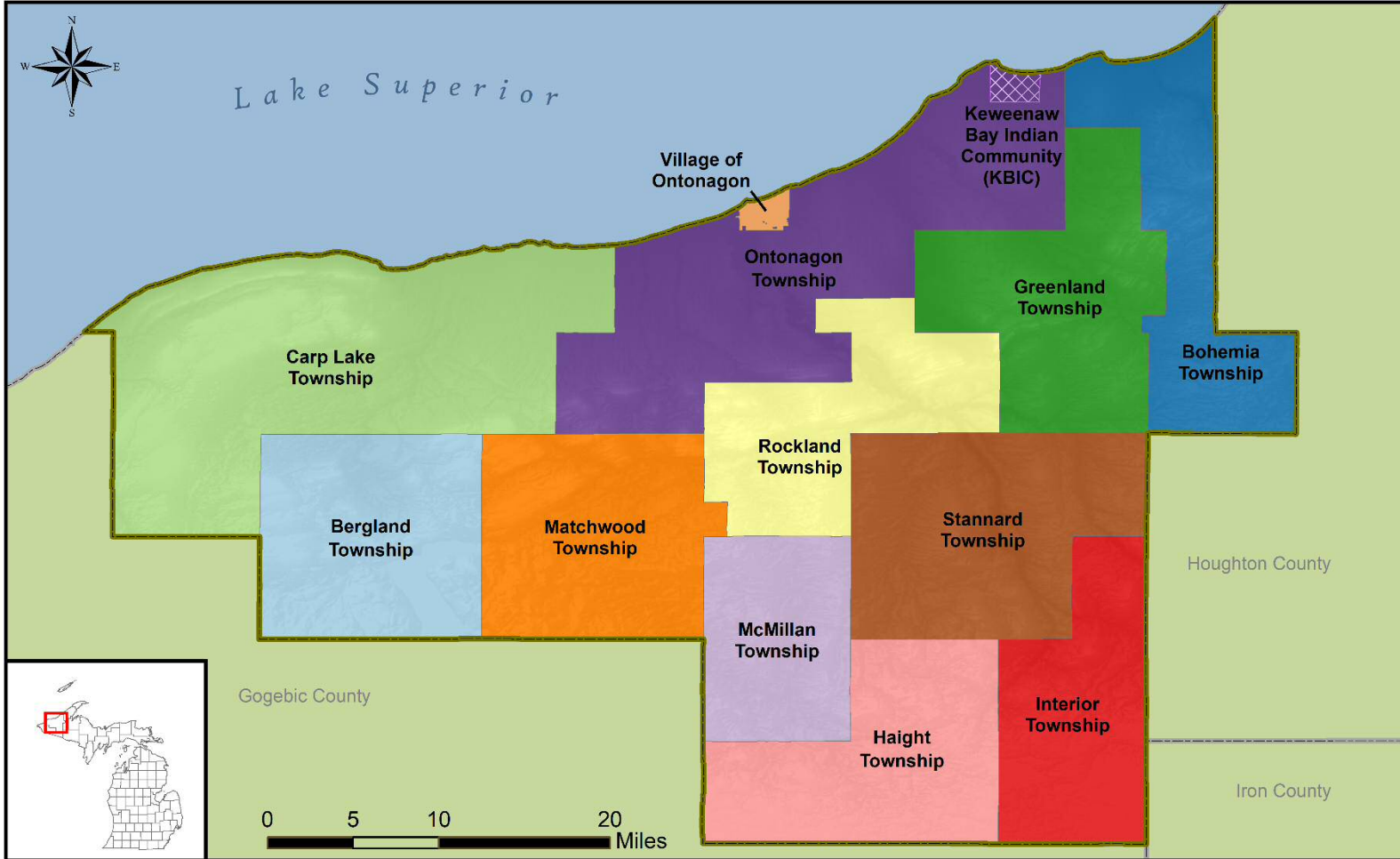
Geography and the Environment

Ontonagon County is in the northwest corner of Michigan’s Upper Peninsula on the south shore of Lake Superior, nestled between the Porcupine Mountains and the Keweenaw Peninsula. It is bordered to the west and south by Gogebic County and by Houghton and Iron Counties to the east. Ontonagon County was one of the four counties created in 1843 by the division of the Upper Peninsula; it was further split to create Gogebic County. The Village of Ontonagon serves as the county seat and is the only incorporated municipality in the county. The Keweenaw Bay Indian Community stewards land in reservation trust in the northeastern section of Ontonagon Township, on the Lake Superior shore. **Map 3.1** shows a map of Ontonagon County with the locations of its municipal jurisdictions and KBIC trust.

The total area of Ontonagon County is about 3,741 square miles: land accounts for 1,311 square miles (35%). It is the third largest county in Michigan by area. The county is mainly comprised of lake-border plains and hilly uplands. Elevations vary between 600 and 1,800 feet. About 90% of the county, or 750,000 acres, is covered by forests, the majority of which are upland hardwood with some aspen. The county has approximately 645 inland water bodies that occupy about 11,000 acres. These include 592 natural lakes and ponds, accounting for 8,424 acres, 26 major trout streams, and nine waterfalls. Other water bodies include hydroelectric reservoirs, tailing ponds and pits, and other artificial ponds. The county also contains about 52 miles of Lake Superior shoreline.

The climate in Ontonagon County is characterized as temperate, with short, moderate summers and relatively long, cold winters. This is due to the impact of Lake Superior on the air temperatures. The moderating effect of the lake is evident in the spring and fall when the water temperatures tend to level out temperature extremes and reduces the likelihood of frost. The area usually experiences its first freezing temperatures in late September and last freezing temperatures in late May. 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.

Map 3.1: Ontonagon County Jurisdictions



**Local Units of Government
Ontonagon 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

Township				Village	
	Bergland		Haight		Ontonagon
	Bohemia		Interior		Ontonagon
	Carp Lake		Matchwood		Rockland
	Greenland		McMillan		Stannard
					Keweenaw Bay Indian Community (KBIC)



The growing season in Ontonagon County is around 110 days. Average temperature in the winter is approximately 18 degrees Fahrenheit. In the summer, the mean temperature is 65.5 degrees Fahrenheit. Annual rainfall is about 33 inches, while snowfall averages 90 to 160 inches depending on distance from Lake Superior.

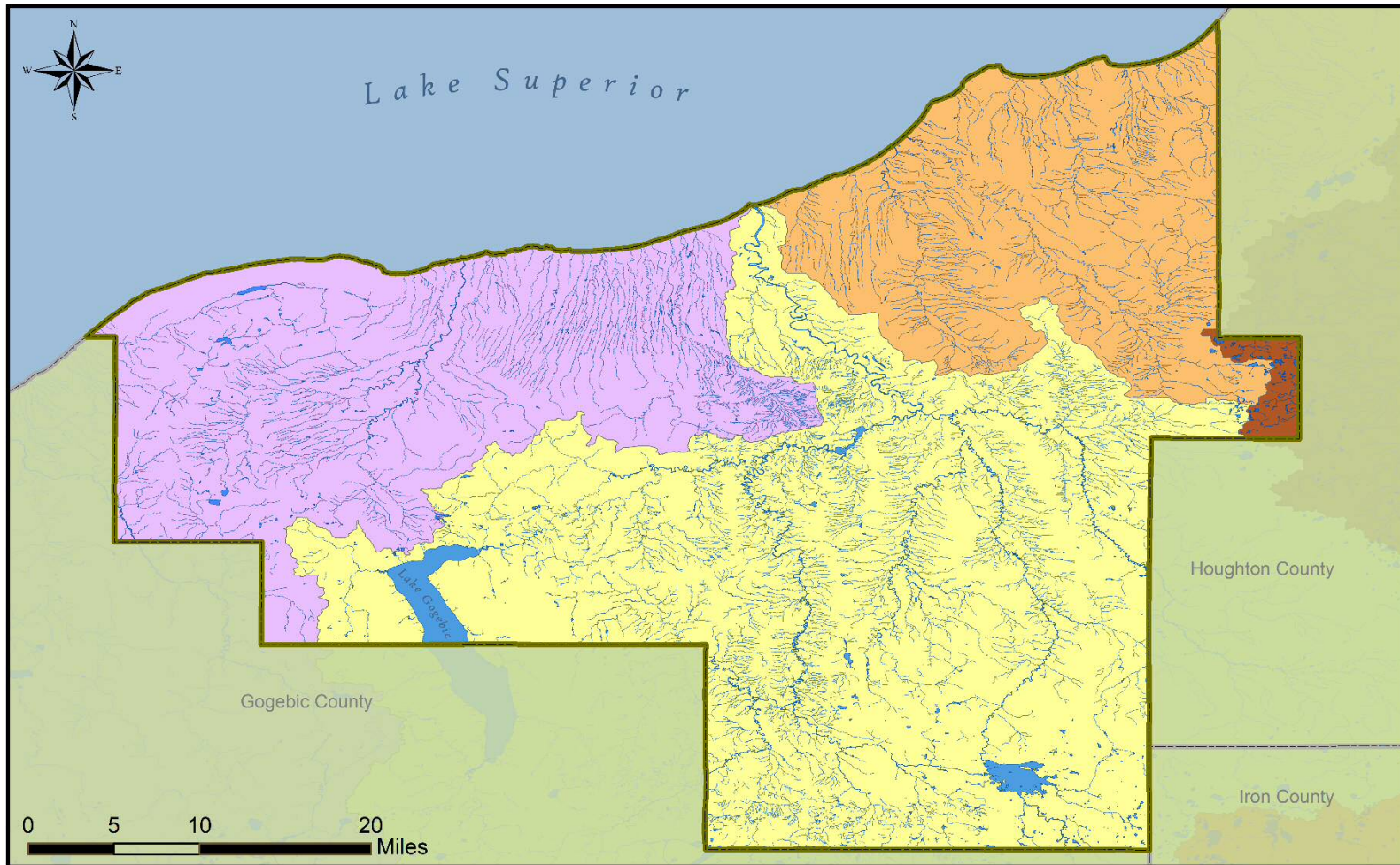
The Ontonagon River has wide coverage, with all branches and other small tributaries located throughout the county. The Ontonagon River has a drainage area near 1,453 square miles, which extends well beyond Ontonagon County. The river discharges into Lake Superior at the Village of Ontonagon. There are also minor watersheds located along Lake Superior in the coastal plain (**Map 3.2**). These rivers and streams are estimated to account for about 1.3% of the total area. The northern half of Michigan's largest inland lake, Lake Gogebic, is in the southern part of the county.

The county is bisected throughout its center in a northeast-southwest line of rocky, rugged hills. These hills are characterized by the Porcupine Mountains which are found in the northwest portion of the county, close to Lake Superior. North of the mountains, the hills taper into a coastal plain, bisected with river valleys. The southern and particularly the southeast portion of Ontonagon County is composed of rolling plateau-like highlands.

Population and Demographics

Ontonagon County is comprised of 11 townships and the Village of Ontonagon. There are also several small towns and villages. In addition, it has numerous small former mining, logging, and rail communities where populations remain concentrated. These communities are remnants of much larger settlements. The county's total 2017 population was 6,072 with most of the population in the Village and Township of Ontonagon; about 60.4% of the population lived in these communities (**Table 3.1**). Since the last hazard mitigation plan update, the county has seen a 9.4% decline in population.

Map 3.2: Ontonagon County Watersheds



**Watersheds
Ontonagon County, Michigan**

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



All drain to Lake Superior



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

Municipality	U.S. Census (Decennial)					ACS (5-Year Estimates)		
	1960	1990	2000	2010	1960-2010 Change	2012	2017	2012-2017 Change
Bergland Township	762	618	550	467	-38.7%	527	485	-8.0%
Bohemia Township	133	90	77	82	-38.3%	61	48	-21.3%
Carp Lake Township	1,248	1,193	891	722	-42.1%	698	702	0.6%
Greenland Township	1,370	1,001	870	792	-42.2%	837	585	-30.1%
Haight Township	242	218	228	212	-12.4%	185	181	-2.2%
Interior Township	818	480	375	336	-58.9%	379	408	7.7%
Matchwood Township	156	122	115	94	-39.7%	100	76	-24%
McMillan Township	823	650	601	478	-41.9%	445	432	-2.9%
Ontonagon Township	3,506	3,238	2,954	2,579	-26.4%	2,583	2,217	-14.2%
Rockland Township	460	371	324	228	-50.4%	165	221	34.0%
Stannard Township	1,030	873	833	790	-23.3%	723	717	-0.8%
Village of Ontonagon	2,358	2,040	1,769	1,494	-36.6%	1,514	1,448	-4.4%
Ontonagon County	10,584	8,854	7,818	6,780	-35.9%	6,703	6,072	-9.4%

Source: U.S. Census and ACS

According to the American Community Survey for 2017, the median age for persons in Ontonagon County was 57.1 years. 33.3% of the population was comprised of persons 65 years old and over. Poverty rates for persons within Ontonagon County was estimated at 15.5%. People who identified as white constituted 95.8% of the population; next was American Indian/Alaska Native which comprised of 1.2% of the population. **Table 3.2** displays the most recent estimates for demographic data on race and ethnicity distribution for Ontonagon County.

Table 3.2: Race and Ethnicity Percentages in Ontonagon County, 2017¹

Race	People	Percent
White	5,818	95.8%
Black	19	0.3%
American Indian/Alaska Native	71	1.2%
Asian	9	0.1%
Native Hawaiian/Pacific Islander	4	0.1%
Other	10	0.2%
Two or More Races	142	2.3%
Total Latinx Population (<i>ethnicity</i>)	82	1.4%

Housing, Infrastructure, and Land Use

In 2017, there were 5,679 housing units in Ontonagon County, an increase of nine houses from 2012. Of these, 2,945 were inhabited, 2,598 were owned occupied (88.2%), and 347 were renter occupied (11.8%). The average household size was two persons. The median home value in Ontonagon County in 2017 was \$69,500, a 4.9% decrease from 2012.

¹ Data from the 2013-2017 American Community Survey 5-year Estimates.

Schools

Schools are some of the largest institutions in the county and could potentially see great impacts from the hazards discussed in this plan. There are two school districts in Ontonagon County, both 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 Ontonagon County.²

Table 3.3: Public Schools in Ontonagon County, 2019-2020

School District/School Name	Location	Grades	Students	Instructors
Ewen-Trout Creek School District				
Ewen-Trout Creek School	Ewen	K-12	183	22
Ontonagon Area School District				
Ontonagon Area School	Ontonagon	K-12	270	17

Public Works

Ontonagon County has a Road Commission responsible for County, State, and Federal roadways as well as public works agencies for maintenance and development of transportation and other infrastructure. The Ontonagon County Road Commission operates an office and garage within Village of Ontonagon. There are additional garages in Bergland, Greenland, and Stannard Townships. Most townships have staff for maintenance of facilities. All agencies and individuals are resources for implementation of related mitigation actions.

Roads

There are 157 miles of State trunk line highway in Ontonagon County, which includes US-45, M-28, M-64, M-26, and M-38 (**Map 3.3**). The county also contains over 570 miles of County roads, including many miles of seasonal roads with a number built and maintained by the U.S. Forest Service.

Rail

There are two disused railways in Ontonagon County. The Canadian National (CN) Railroad accesses the White Pine Industrial Park from the south. The Escanaba and Lake Superior (ELS) Railroad accessed the Village of Ontonagon from the southeast and was discontinued in 2010.

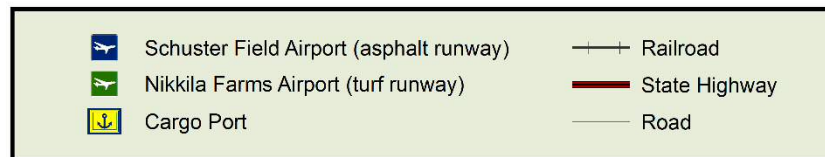
² MI School Data. Student Enrollment Counts and Staffing Information. <https://www.mischooldata.org/>

Map 3.3: Ontonagon County Transportation



Transportation Ontonagon 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 May 2019



ELS filed a petition on April 9, 2010 to abandon most of the rail line.³ While these two railways are still in working order and could be reused, there is currently no regularly scheduled rail service to the county.

Ports

A 38-ship full-service marina is in the Village of Ontonagon near the mouth of the Ontonagon River and Lake Superior. The U.S. Army Corps of Engineers maintains the Ontonagon Harbor as a deep-water port up stream to the old M-64 bridge site and serves as a harbor of refuge. Keeping the harbor dredged and usable to deep-water vessels is important to the local economy and future industrial development in the Village. This harbor is the only deep-water port in the Western Upper Peninsula.

Airports

The Ontonagon County Airport (OGM), also known as Schuster Field, is located three miles west of the Village of Ontonagon at an elevation of 665 feet. The airport has a single 3,500-foot asphalt runway that is open to the public. Self-service fuel is available. The airport has no control tower and is unattended. Four aircraft are based at the field; all are single engine airplanes. The airport sees an average of 100 flights per year.

Nikkila Farms Airport (1MI1) is a small private airport near Mass City with a 2,000-foot turf runway. The airport has no control tower and is unattended. The airport is predominately for private, personal use.

Transit

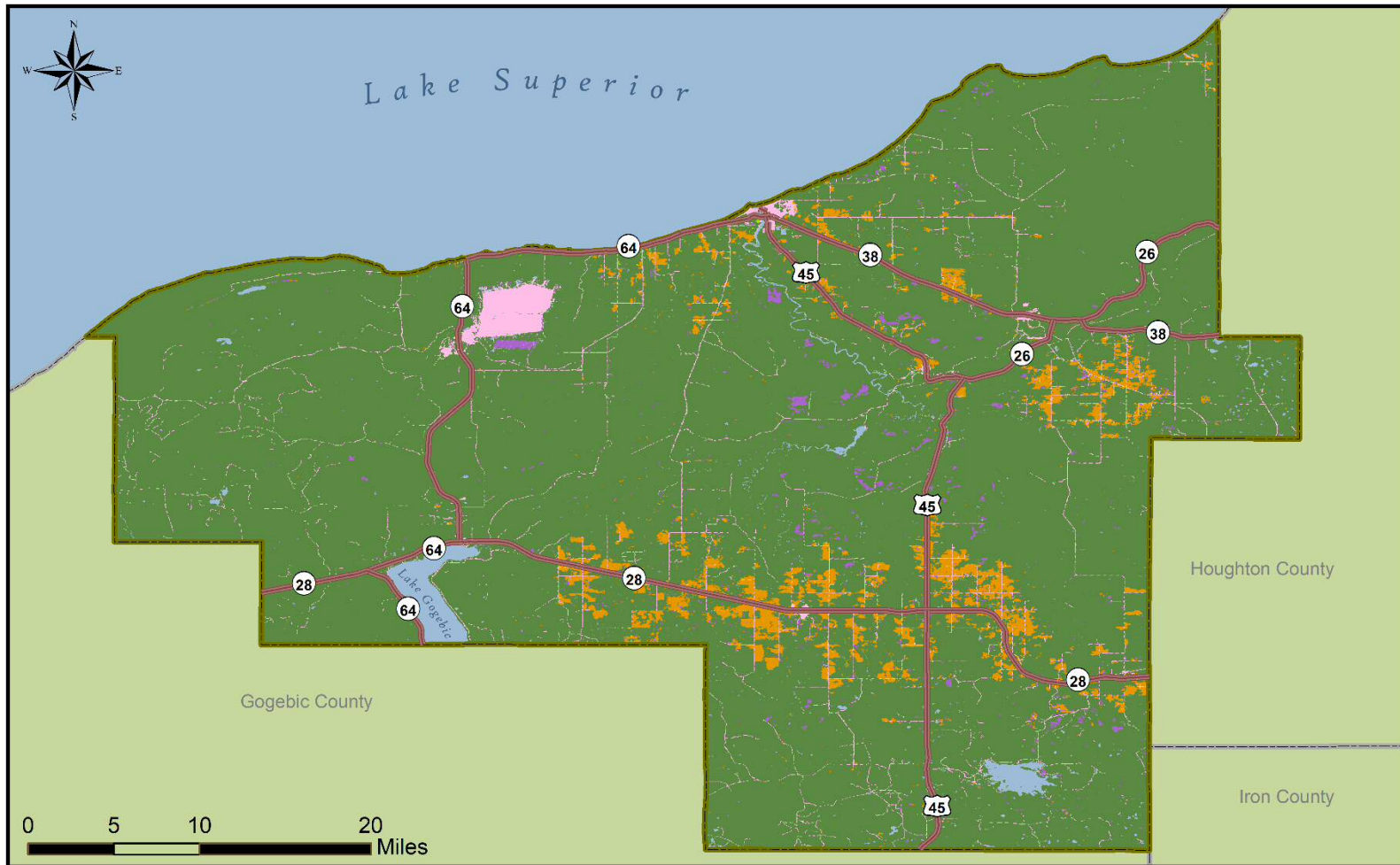
Ontonagon County Public Transit offers a countywide bus system called On-Tran. It provides local service from 6:00 am to 6:00 pm, Monday through Friday, and a monthly round trip to the major shopping area in the City of Houghton. There is a feeder bus to the southern end of the county. Buses are equipped with wheelchair lifts, and normally operate 4 buses at a time. Seniors and persons with disabilities comprise 57% of the annual ridership.

Land Use

Nearly 40% of the forest land in Ontonagon County is owned by state and federal governments. About 20% is owned by the forest industry. The rest is in private lands. Residential, commercial, and other urban development is centered in the Village of Ontonagon and other small communities, whereas agricultural land is scattered throughout the county (**Map 3.4**). Land use and development is directed by zoning regulations in the Village of Ontonagon and all but two of the townships – Bohemia and Matchwood. The lack of land use planning and zoning leaves these areas more vulnerable to land use-related hazards.

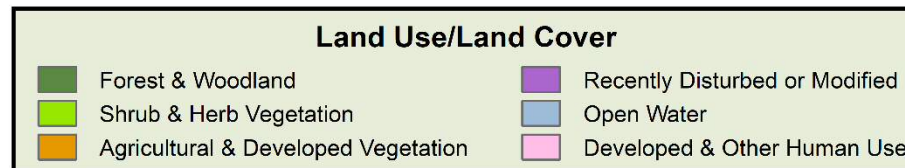
³ Surface Transportation Board: Escanaba & Lake Superior Railroad Company – Abandonment Exemption – in Ontonagon and Houghton Counties, MI. 77 Fed. Reg. § 22,174 (notice April 10, 2010). <https://www.govinfo.gov/content/pkg/FR-2010-04-27/pdf/2010-9676.pdf>

Map 3.4: Ontonagon County Land Use/Cover



**Land Use/Land Cover
Ontonagon 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



Most of southern Ontonagon County is part of the Ottawa National Forest. The entire forest encompasses over 954,000 acres and spans five counties, stretching from Lake Superior down to Wisconsin. Almost a third of the land in Ontonagon is part of this forest. The forest contains over 30 developed recreation areas, trails, and three wilderness areas.

The Porcupine Mountains Wilderness State Park is in Ontonagon County, 15 miles west of the Village of Ontonagon on the Lake Superior shoreline. At approximately 60,000 acres, the park is Michigan's largest state park. The park was established in 1945. It contains the largest old-growth hardwood-hemlock forest in the Great Lakes region, waterfalls, Lake Superior shoreline, remote rustic cabins, miles of rivers and streams, more than 90 miles of hiking trails, the Porcupine Mountain Ski Area, and virtually no roads.

Employment and Industry

In 2018, the median household income for Ontonagon County was \$38,906. The state unemployment rate for 2018 was 4.1% and for Ontonagon County the rate was 7.8%. About 58.1% of residents 16 and over were not in the labor force, mainly due to the large proportion of retirees in the county. 10.2% of people in Ontonagon County were reportedly below the federal poverty level.

Historically, the economy of Ontonagon County was focused on copper mining, forestry, and productive industry. In the later years of the last century, the economy shifted towards tourism. Major industrial employers, such as the Smurfit-Stone Container Paper Mill which closed in 2010, contributed to the out-migration of residents. The county experienced the largest percent-based population loss of any Michigan county from 2000 to 2010.

The current economy in Ontonagon County focuses on two dominate sectors: service industries and tourism (**Table 3.4**). The largest private employer is Aspirus Ontonagon Hospital and Clinic in the Village of Ontonagon. The medical facility employs about 150 persons. Other significant employers are Settler's Co-Operative, Inc., Ewen-Trout Creek Consolidated Schools, and Ontonagon Area schools.⁴ Many county residents also commute outside of the county to major education and health care institutions, construction firms, and service and retail establishments.

The tourism industry focuses primarily on the natural resources located in the county. An increase in small businesses has occurred to support the growing tourism industry, which is built around snowmobiling, fishing, Porcupine Mountains Wilderness State Park, Ottawa National Forest, and various other recreation sites.

⁴ Ontonagon County - Operation Action U.P. www.operationactionup.com/county-profiles/ontonagon-county/

Table 3.4: Employment by Sector for Ontonagon County, 2018

Employment Sector	Percentage
Educational Services; Healthcare & Social Assistance	24.1
Arts, Entertainment, Recreation; Accommodation & Food Service	14.6
Retail Trade	10.9
Construction	8.4
Public Administration	7.5
Manufacturing	6.1
Professional, Scientific, Management, and Administrative and Waste management services	5.8
Agriculture, Forestry, Fishing, Hunting, and Mining	5.8
Other services, except public administration	5.5
Finance & Insurance; Real Estate, Rental & Leasing	4.5
Transportation & Warehousing; Utilities	4.2
Information	2.4

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 Ontonagon County Sheriff’s Department, with offices located in the Village of Ontonagon, provides local police service to the area. The County jail is also located in the Village. The Eighth District of the Michigan State Police, headquartered in Marquette, provides road patrol to Ontonagon County and maintains a satellite office at the Ontonagon Sheriff’s Department.

Fire

There are eight fire departments that serve Ontonagon County (**Table 3.5**). Most fire departments in Ontonagon County are volunteer. Bohemia Township does not have a fire department and is served by Greenland Township and contracts with Laird Township and Toivola in Houghton County. Mutual aid agreements are in place to supplement coverage. The Michigan Department of Natural Resources and U.S. Forest Service also have wildfire-dedicated resources.

Table 3.5: Fire Departments in Ontonagon County⁵

Fire Department	Location	Service Area		Staff*
		Sq. mi.	Population	
Bergland VFD	Bergland	140	610	25
Bruce Crossing VFD	Bruce Crossing	125	800	18
Carp Lake Twp. FD	White Pine	212	932	17
Greenland Twp. VFD	Mass City	150	1000	25
McMillan Twp. VFD	Ewen	180	1175	18
Ontonagon VFD	Ontonagon	350	3500	28
Rockland VFD	Rockland	97	450	20
Trout Creek VFD	Trout Creek	500	900	17

* Staff includes paid, part-time, and volunteers

Medical

Aspirus Ontonagon Hospital is an 18-bed critical access hospital which offers 24-hour emergencies treatment services to the residents of Ontonagon County and surrounding areas. The hospital also has an operating room, pharmacy, physical and respiratory therapy, radiology, cardiac rehabilitation, 46-bed long term care units, and a fitness center. Near the hospital, there is a walk-in clinic, family practice clinic, and a long-term care facility. There is also an Upper Great Lakes Ontonagon Family Health Center clinic near the hospital and provides primary care services.

Mental health assessment and treatment services, as well as crisis intervention, are offered by Copper Country Mental Health in the Village of Ontonagon. Emergency victim services and crisis intervention are offered through Dial Help, Inc. Ontonagon County is also serviced by the Western Upper Peninsula Health Department from its office in the Village of Ontonagon.

Office of Emergency Services

The Ontonagon County Office of Emergency Services is located at the Ontonagon County Airport. It promotes emergency and disaster education and awareness. The Ontonagon Sheriff’s Department office is the designated Emergency Operations Center (EOC) during an emergency incident. The Greenland Firehall is the alternate EOC. These centers perform dispatching and ensures interagency coordination before, during, and after disasters or emergencies.

Siren Coverage

Ontonagon County is serviced by eight sirens, all located at local fire departments. The sirens are currently used for fire emergencies, not as public warning systems. **Table 3.6** shows the siren locations, range, and estimated population coverage for Ontonagon County.

⁵ Department of Licensing and Regulatory Affairs Fire Service Directory. w2.lara.state.mi.us/FireServiceDirectory

Table 3.6: Siren Locations in Ontonagon County

Siren Site	Remote Activation	Range (radius) (miles)	Estimated Population Covered	Location
Ontonagon Village VFD	No	1.50	500	River Street
White Pine VFD	No	0.50	200	White Pine
Mass City VFD	No	3.00	300	1502 Mass Ave.
Rockland VFD	No	0.50	100	Main St./US-45
Bruce Crossing VFD	No	1.50	200	610 Larson Road
Ewen VFD	No	0.50	200	Ewen
Trout Creek VFD	No	0.50	100	3845 Golden Glow Road
Bergland VFD	Yes	0.25	40	101 Pine Street

Critical Facilities and Cultural Assets

Even a slight chance of exposure to hazards, such as flooding, is too great a threat to the delivery of services offered by the maintenance and operation of critical facilities in a community. A critical facility provides services and functions essential to a community, especially during and after a disaster. Examples of critical facilities requiring special consideration include:

- Police stations, fire stations, critical vehicle and equipment storage facilities, and emergency operations centers needed for flood response activities before, during, and after a flood
- Medical facilities, including hospitals, nursing homes, 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 a flood
- 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 flooded areas before, during, and after a flood
- 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 Ontonagon County, grouped by type of facility. Facility location and estimated cost of potential facility loss is included, if available. 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 and 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.

In addition, this section has been modified to include cultural assets of importance to Ontonagon County. Understanding and inventorying the important and visited locales of Ontonagon 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 Ontonagon County

Facility Name	Location
Emergency Services	
Sonco North Ambulance	Village of Ontonagon
Sonco South Ambulance	Ewen
Bergland Fire Hall	Bergland Township
Bruce Crossing Fire Department	Bruce Crossing
Carp Lake Fire Department	Carp Lake Township
Ewen Fire Hall	Ewen
Greenland Fire Department	Mass City
Ontonagon Fire Department	Village of Ontonagon
Ontonagon Volunteer Fire Department	Ontonagon Township
Rockland Fire Department	Rockland
U.S. Forest Service Ranger Stations	Ontonagon Township
Trout Creek Fire Department	Trout Creek
Equipment Storage Facilities	
Ontonagon County Road Commission Garage No. 1	Ontonagon Township
Ontonagon County Road Commission Garage No. 2	Stannard Township
Ontonagon County Road Commission Garage No. 3	Bergland Township
Ontonagon County Road Commission Garage No. 4	Greenland Township
Medical Facilities	
Aspirus Ontonagon Hospital/Clinic	Village of Ontonagon
New Beginnings AFC	Village of Ontonagon
Northern Stars AFC Home	Bruce Crossing
Maple Ridge AFC Home	McMillan
Harbor House Assisted Living	Ontonagon Township
Upper Great Lakes Family Health Center	Ontonagon Township
Schools	
Ewen-Trout Creek School	Ewen
Ontonagon Area Schools	Village of Ontonagon
Waste/Utility/Drinking Water/Wastewater Services	
Electrical Substation	Village of Ontonagon
Electrical Substation	Mass City
Ever-Green Landfill and Recycling Center	Ontonagon Township
K&W Landfill – Waste Management	Ontonagon Township
Ontonagon Regional Water Storage Tank	Village of Ontonagon
Ontonagon Regional Water Storage Tower	Village of Ontonagon
Ontonagon Wastewater Ponds	Village of Ontonagon
Water Pump Station	Carp Lake (Silver City)

Other Notable/Vulnerable Structures	
Ontonagon County District Court	Village of Ontonagon
Village of Ontonagon Council Chambers	Village of Ontonagon
Ontonagon Housing Commission	Village of Ontonagon
Western Upper Peninsula Health Department	Village of Ontonagon
Bergland Cultural & Heritage Center & Museum	Bergland Township

Cultural Assets

Ontonagon County has a distinguished history of logging and mining; it is also the site of the first telephone system in Michigan. The oldest standing log home village in the United States is located at Old Victoria, near the village of Rockland. In addition, there are several State and National Register historic sites including:

- Bergland Administrative Site (Bergland Ranger Station)*: Built by the Civilian Conservation Corps in 1936, the Bergland Administrative Site is a government administrative complex that consists of six buildings. It was one of the first administrative offices in the Ottawa National Forest. It now houses the Bergland Cultural and Heritage Center and Bergland/Matchwood Historical Society Museum. National-registered site.
- Marsi Homestead* – The Marsi Homestead is significant as the oldest in the surrounding Finnish settlement. According to local tradition it was built in 1889 by the Marsi family whose patriarch was a lay minister. It was abandoned c.1950 and purchased c.1982 for a private residence and farm. The Marsi Homestead is located on a 93-acre plot of open and wooded land in Bohemia Township on South Road, south of Misery Bay Road. The homestead contains a log house, assorted sheds, and two log barns. State-registered site.
- Methodist Episcopal Church (Minnesota Mine Church)* – The Methodist Episcopal Church of the Minnesota Mine was paid for by the predominately Cornish miners at a cost of \$2,000. The church is the community of Rockland’s oldest Methodist congregation and is also significant as the company town’s oldest house of worship. The church is a one-story, clapboard-sheathed, Gothic structure with a deeply pitched gable



Marsi Homestead (Source: [rossograph](#) is licensed under [CC BY-SA 4.0](#))

roof and pointed arch windows. It is located at the south end of Rockland on US-45 at Minnesota Mine Location. State-registered site.

- Minnesota Mine – Copper mining has taken place here since about 3,000 BC, intensifying during the Late Archaic Period by the people of the old Copper Culture. This hill was again mined from 1848 to 1870 when it was owned by the Minnesota Mining Company. The mine is southeast of Rockland off US-45. State-registered site.
- Ontonagon County Courthouse (Not in use) – Completed in 1886 and renovated in 1897 after a fire that destroyed much of the Ontonagon Village, this Romanesque, two-story brick building with sandstone foundation served as a symbol of stability and governmental organization during the frontier days of Michigan’s Upper Peninsula. In 1980 a new courthouse was constructed, and the old courthouse is not in use. The historical courthouse is at 601 Trap Street in Ontonagon. National-registered site.

- Ontonagon Lighthouse – The second light station constructed on the southern shore of Lake Superior is one of the oldest on the Great Lakes. The station was built in 1866 by Detroit contractor W.F. Chittenden to replace an older structure built in 1852. The light aided navigation during the height of the shipping boom and was operational until 1964. The site is currently being restored by the Ontonagon Historical Society and is located off M-64 at the mouth of the Ontonagon River. National-and State-registered site.



Ontonagon Lighthouse (Source: [rossograph](#), is licenced under CC By-SA 4.0)

- Ontonagon School (not in use) – The Ontonagon School was originally built in 1912 as a high school and rebuilt following a fire in 1929. It was expanded in 1938, with the addition for elementary schooling. An additional section was constructed in 1967 to expand the school to meet increasing population. The building features stained-glass art, elaborate floor and wall tiling, and a large children’s theater with a stage. The building was last used in 2010 and is not in use. The school is at 301 Greenland Road in the Village of Ontonagon. National-registered site.
- Soo Line Railroad Depot – The depot is one of the oldest buildings standing in the Township of Interior. It was built for the railroad which served two large sawmills. The depot is in Trout Creek. State-registered site.

- Porcupine Mountains – From Lake Superior the main range of mountains looks like a crouching porcupine, thus their name. Machinery, rock dumps, and old adits are reminders of forty mining ventures in the years from 1846 to 1928, none of which succeeded. In 1945, the area was made a state park to preserve its virgin splendor. The park is in Carp Lake Township on M-107, 10 miles west of Silver City. State-registered site.



Lake of the Clouds in the Porcupine Mountain Wilderness State Park

- Victoria Mining Company Town (Old Victoria) – The town is at the site of one of the earliest copper mines in Michigan and was the subject of an experiment using waterpower to provide compressed air to run the steam engine that helped run the mine. The town consists of ten log houses, four of which have been restored and three of which have been refurbished. It is located at the intersection of Victoria Dam Road and Victoria Road near Rockland. State-registered site.
- Walker, Elton B., House (Mass Mine Superintendent's House) – Constructed between 1905 and 1910 along with two other houses, the houses were built for the foreman, assistant superintendent, and the superintendent of the Ridge Mine. Walker occupied the house until 1920 when the mine failed. The Walker House is the only remaining example of the row form of housing for the mine captains and is also significant as a stately Colonial Revival house. The house is at 508 Ridge Road, between Greenland and Mass City. State-registered site.

Disaster Declaration

Since 1965, Ontonagon County has experienced a total of eight presidential disaster declarations, shown in **Table 3.8**. Three new disaster declarations have 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 Ontonagon 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
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 United States 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, Ontonagon County has identified twenty-five (25) 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 plan has also been reorganized so that the most closely related hazards are located near each other in the same section of the plan. The hazard analysis component of this plan now 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
 - **Hydrologic Hazards**
 - Dam Failure
 - Riverine and Urban Flooding
 - Shoreline Flooding and Erosion
 - Drought
 - **Ecological Hazards**
 - Invasive Species
 - Wildfires
 - **Geologic 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 storms) 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: Description of Identified Hazards

Hazard	Description
NATURAL HAZARDS	
WEATHER	
Extreme Temperatures	Prolonged periods of very low or very 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 very 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.
GEOLOGIC	
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.
HYDROLOGIC	
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	
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 threatening 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).
Wildfires	An uncontrolled fire in grass, brush, or forested areas.
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:

Dillion, G.K. (2018). Wildfire Hazard Potential (WHP) for the conterminous United State (270-m GRID). USDA Forest Service, Fire Modeling Institute: <https://www.firelab.org/project/wildfire-hazard-potential>

Michigan GIS Open Data (map boundary data): <http://gis-michigan.opendata.arcgis.com/>

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

Mineral Resources Data System, USGS: <https://mrdata.usgs.gov/mrds/>

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

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

National Geospatial Program, U.S. Geological Survey (DEM and Land Use/Land Cover data): <https://viewer.nationalmap.gov/basic>

National Mine Repository, Office of Surface Mining Reclamation and Enforcement, U.S. Department of Interior: <https://mmr.osmre.gov/>

National Pipeline Mapping System (NPMS) Public Viewer, Pipeline and Hazardous Materials Safety Administration: <https://pvnpm.phmsa.dot.gov/PublicViewer/>

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

NWS GIS Portal, NWS, NOAA, U.S. Department of Commerce: www.weather.gov/gis

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

SECTION 5: Hazard Analysis

This section of the Plan describes the hazards identified by Ontonagon County that pose a threat to people and property located within the county and its participating jurisdictions. An assessment of risk has also been developed which includes hazard descriptions and background, 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. When applicable, the impacts of climate change are included in the risk assessment and hazard descriptions. Climate change itself may not be a hazard, but it can change the characteristics or impact from a hazard. 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 Ontonagon 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 Ontonagon County and its participating jurisdictions that have a recognizable geographic boundary (i.e., hazards that are known to occur in certain areas of Ontonagon 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 tornadoes, 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

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

Weather hazards are perhaps the single greatest natural hazard anywhere in the world 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 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, and, as a result, more severe precipitation events.

In Ontonagon County, weather hazards already vary greatly by season and from year to year. In winter, Ontonagon 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 and are dependent on the age of buildings and building codes..

For the weather hazards in Ontonagon 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 devised the Heat Index as a mechanism to better inform the public of heat dangers, The Heat Index Chart (**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 Chart⁷

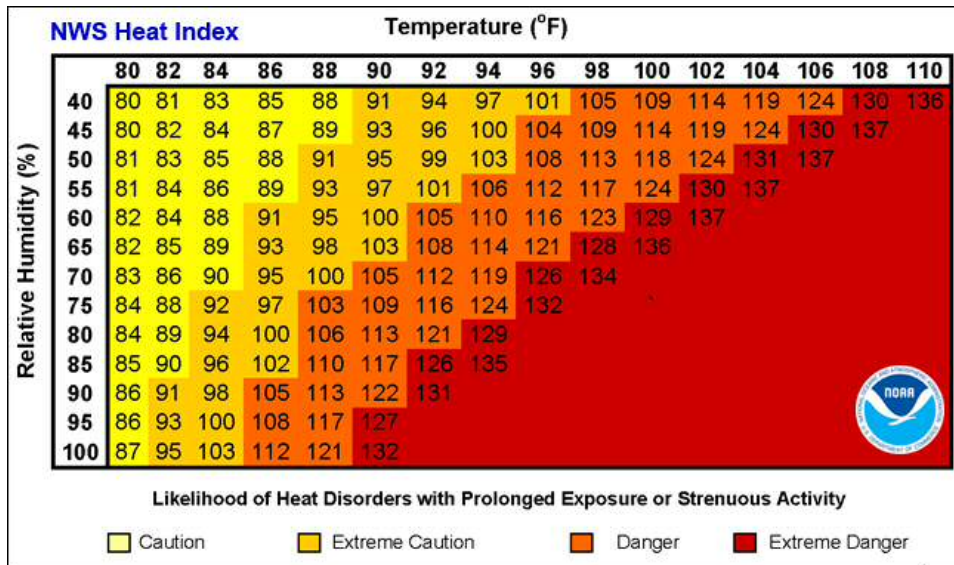


Table 5.1: Heat Index and Related Heat Disorders

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 strong 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. 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 Disorders 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.
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.

Climate Change Considerations

Certain indicators of climate change in Michigan and Ontonagon 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. Extreme heat problems are expected to increase in the future. Although Michigan’s winter season has been shortening, there have been lessened differences in temperature between polar and temperate regions (due to warming of the arctic and polar regions) can make it easier for a polar weather front to swing southward across the United States. Instances of persistently cold temperatures, ice storms, freezing rain, and heavy snowstorms are affecting the state with increasing rapidity.

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. From 1996-2019, there have been 28 extreme temperature events in Ontonagon County. Of these, only one was for extreme heat. A heat event occurred on July 31, 2006 where temperatures reached well into the 90s, with heat indices in the 100 to 105-degree Fahrenheit range.

Occurrence Probability and County Vulnerability

The probability of an extreme temperature event is moderate as it can occur anytime during the year. In the last 10 years, there have been 16 extreme temperature events, all cold/wind chill events – a frequency of 1.6 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. However, the county is somewhat more vulnerable to extreme heat than cold, as residents are less accustomed to extreme heat.

All Ontonagon 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 Ontonagon Regional Water System in the Village of Ontonagon. If water mains were to break, this facility 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 can form quickly, in a matter of minutes or hours. Fog itself is not a hazard because it does not directly apply destructive forces, but the interactions between humans and fog can be dangerous, sometimes resulting in disastrous consequences. However, freezing fog (a hazard that the National Weather Service does issue special statements) can cause direct harm by causing slickness on roadways and thus leading to serious transportation accidents.

Fog is considered a hazard because it causes reduced visibility and, consequently, dangerous transportation conditions for air and ground travel. At airports, fog can be particularly hazardous for aircrafts that are attempting to land and take-off. Fog and its resulting reduction in visibility has played a contributing role in several multi-vehicle accidents over the past several years. 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 events occurred in Ontonagon County from 1996 to 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.

Occurrence Probability and County Vulnerability

While there were only four fog events reported since 1996 (one in the past 10 years – a frequency of 0.1 events per year), fog is a common occurrence in Ontonagon County despite not being regularly reported. It does typically dissipate by mid-morning. It is assumed that the county is uniformly exposed to fog hazards. Populations and critical facilities become vulnerable to fog only when fog and people interact on transportation corridors.

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. They are typically accompanied by heavy rains. Falling hailstones batter crops, damage home roofs, dent autos, and injure wildlife and people. Approximately \$1 billion in damages occur annually across the United States. 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.

Hail reported in Michigan ranges in size from a pea (¼” diameter) to a golf ball (1 ¾” diameter), but hailstones larger than a 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

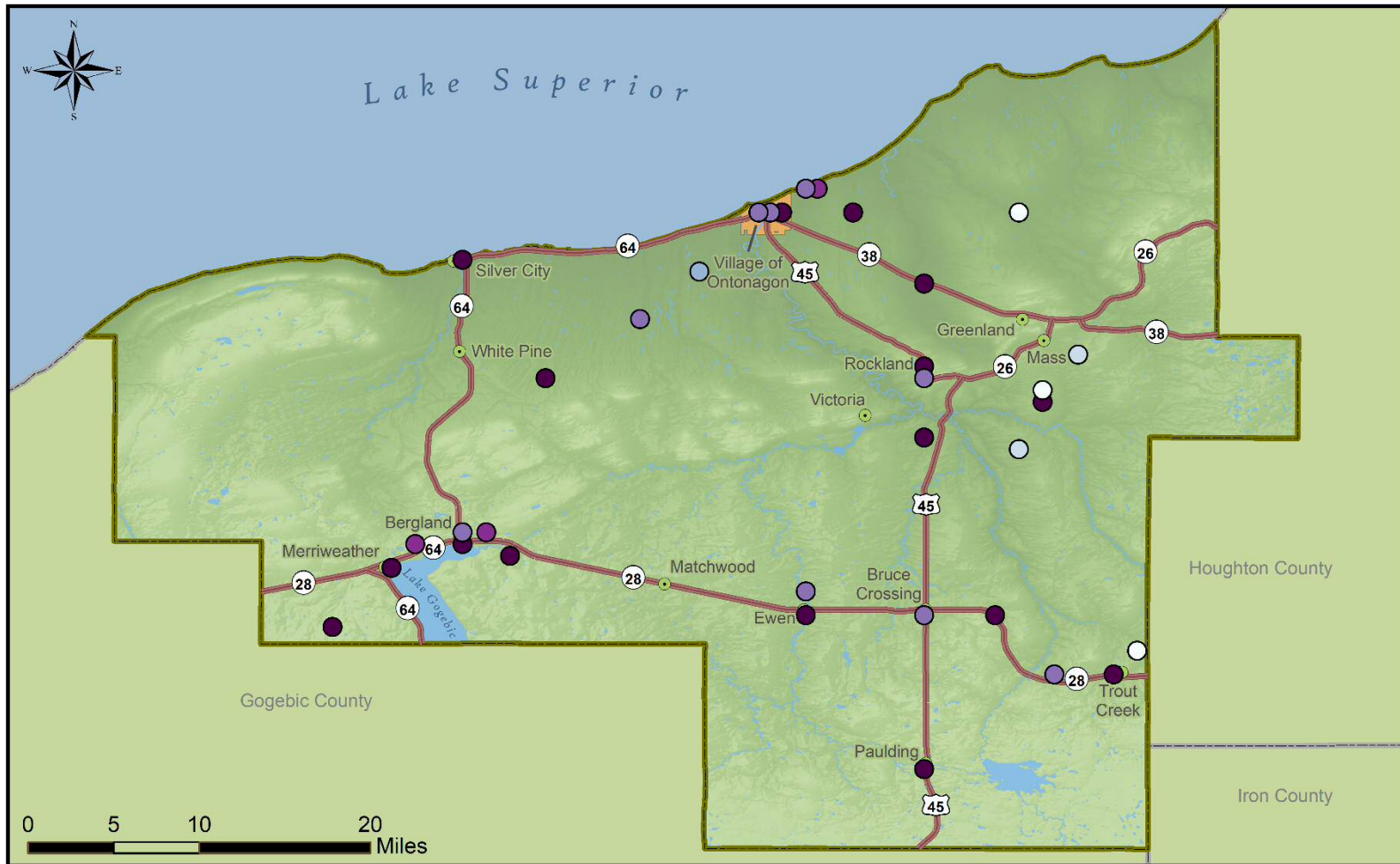
Descriptive Size of Hail	Diameter (inches)	Descriptive Size of Hail	Diameter (inches)
Pea	¼”	Golf ball	1 ¾”
Marble or mothball	½”	Hen’s egg	2”
Penny or Dime	¾”	Tennis ball	2 ½”
Nickel	0.9”	Baseball	2 ¾”
Quarter	1”	Teacup	3”
Half-dollar	1 ¼”	Softball	4”
Walnut/Ping-pong ball	1 ½”		

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, these events are typically widespread. From 1955-2019, 49 hail events were reported throughout the county (**Map 5.1**). **Table 5.4** provides an overview of all reported hail events in Ontonagon County through 2018.

Map 5.1: Hail events in Ontonagon County, 1955-2018



**Recorded Hail Events 1955-2018
Ontonagon 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

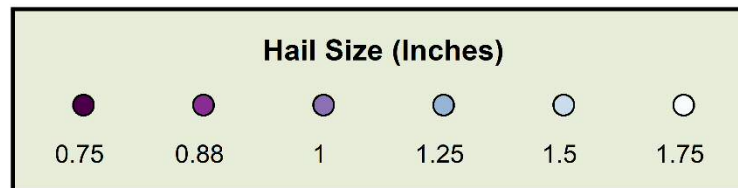


Table 5.4: Reported Hail Events by Size in Ontonagon County, 1955-2019

Hail Size Reported	Number of Events
¾"	26
0.9"	5
1"	12
1 ¼"	1
1 ½"	2
1 ¾"	3
TOTAL	49

Occurrence Probability and County Vulnerability

From 2010-2019, nine hail events were reported. Based on this, the frequency of a hail event within a year is approximately one event per year. Thus, the probability of a hail event is likely, but the severity of damages due to a hailstorm is minor and typically incurred by individual property owners. There are no known locations in the county that have a higher susceptibility to hail; because of this, it is presumed that this hazard uniformly impacts the county. However, 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 Ontonagon County communities 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 sleet of sufficient depth.

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 in and around the winter months are closer to the freezing point and at the temperature at which ice and sleet events typically occur. Instead of winter arriving and precipitation turning into snow, Michigan winters have involved many thawing episodes followed by refreezing which causes treacherous ice cover on frozen surfaces, weighs down cables and tree branches, and causes infrastructure failures. Even though Michigan winters have been shortening a bit over time, winters remain hazardous because the increasing level of precipitation more often takes the form of major snow event and provides more moisture for refreezing after the warmer thawing periods occur.



Tree damage after an April 26, 2017 ice storm in the Porcupine Mountains Wilderness State Park (Source: [MLive](#))

Historical Occurrence

Ice storms usually have a regional effect and groups of counties are usually affected instead of just one county when they occur. From 1996-2019, three ice storms and one sleet storm were reported in Ontonagon County. **Table 5.5** lists all these events, along with descriptions about the storm and any reported damages.

Table 5.5: Reported Ice and Sleet Storms in Ontonagon County, 1996-2019

Date	Type of Storm	Description and Location	Property Damages
12/18/2002	Ice Storm	Quarter inch of ice reported in Paulding.	No reported damages
12/30/2004	Ice Storm	Ice accumulation of a quarter inch or more on roads countywide causing hazardous travel.	No reported damages
01/01/2005	Sleet	Sleet accumulation of a half inch to an inch throughout the county.	No reported damages
04/26/2017	Ice Storm	High elevation in Porcupine Mountains State Park received over an inch of ice accumulation from freezing rain, which was then covered by 2-4 inches of wet snow. This caused extensive damage to trees within the park, damaging 35-50 miles of trails, broke bridges and boardwalks.	\$100,000

Occurrence Probability and County Vulnerability

While ice and sleet storms do not appear to occur at a frequent rate, the probability of an event in Ontonagon County is likely to occur. One ice storm was reported in the past 10 years – a frequency of 0.1 events per year. Severity is also variable, but generally low to moderate. However, the vulnerability of Ontonagon County communities to such a storm is high, as little

can be done to prevent 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 hospitals, 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. While residents are accustomed to snowstorms, ice and sleet storms have unique aspects that residents may be not prepared for, increasing their vulnerability to these events.

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 United States, 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 United States each year, on average, than tornadoes and hurricanes. From 2005-2014, Michigan ranked seventh in the nation in lightning fatalities.⁸ 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 2008-2017,⁹ Ontonagon County experiences approximately 0.75 to 3 strikes per square mile per year. However, there were no reported lightning incidents in the county from 1996-2019. The communications tower behind the county jail did have a history of being struck by lightning. However, the tower has been grounded which has prevented future strikes. Lightning of a lower level may have occurred, but these events usually do not have any recordable damage and thus are not reported.

Occurrence Probability and County Vulnerability

⁸ "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>.

⁹ Vaisala National Lightning Detection Network. <https://www.vaisala.com/en/products/data-subscriptions-and-reports/data-sets/nldn>

While there were no reported incidents, the future probability of lightning remains high since some degree of lightning is inherent to thunderstorms. No significant events were reported, but that does not mean that lightning strikes do not occur. Ontonagon 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.

All communities in Ontonagon County are equally vulnerable to lightning strikes as there is really no way to pinpoint exactly where, when, and to what extent lightning will cause damage. Parks, forests, and outdoor recreation areas throughout the county contain hazard-prone features, like trees, and may contribute to or intensify the effects from lightning. 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.

Severe Winds

Hazard Description

Severe winds, or straight-line winds, sometimes occur 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. Power outages can result in a need to shelter persons left without power for extended times.

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. Along the Great Lakes shoreline, high winds of lower magnitude occur regularly, as do hurricane-velocity gusts (over 74 miles per hour).

Historical Occurrence

From 1955-2019, 80 severe wind events were reported in Ontonagon County (**Map 5.2**). Of these, 34 had reported property or crop damage. Windstorms are rarely a singular event; they usually accompany other severe weather – particularly thunderstorms and occasional blizzards. Most damage due to severe winds are primarily to trees and powerlines. The largest recorded wind gust in Ontonagon County since 1955 was 65 knots (75 miles per hour) measured most recently on July 21, 2016 in the Village of Ontonagon. This event was due to severe thunderstorm winds. Details of the event are listed below in **Table 5.6**, including other severe wind events with reported property damage. From 1955-2019, total reported estimated property damages due to severe winds is \$195,000 and estimated crop damages at \$1.06 million.

Table 5.6: Severe Wind Events in Ontonagon County, 1955-2019

Number of Events	Total Property Damage	Total Crop Damage	Injuries	Deaths
80	\$195,000	\$1.060M	0	0

Other severe wind events that caused significant property and crop damage include:

- August 31, 1998: Thunderstorm winds knocked an 18-inch diameter tree onto a van and another across Creek Road. Estimated property damage of \$3,000.
- November 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. A gust of 94 mph wind was recorded by the Ontonagon County Road Commission. Estimated crop damage was \$1 million.
- July 30, 1999: Thunderstorm wind knocked down apple trees in Bruce Crossing. Estimated crop damage of \$60,000.
- July 28, 2006: Widespread severe thunderstorms with strong winds (69 mph) destroyed the outbuildings of a farm and blew down highway construction signs near Ewen Township. Estimated damages of \$4,000.
- February 18, 2011: Strong west wind (58 mph) due to a cold front caused extensive damage to power lines in the Village of Ontonagon. UPPCO reported that nearly 150 customers were without power for a day in winter conditions. Relief crews from Wisconsin were called in to help restore full power. Estimated damages of \$10,000.
- August 19, 2011: Strong thunderstorms produced severe downdrafts (69 mph), trees falling, dime sized hail, significant lightning, heavy rain, and runoff for about 20 minutes. Four large trees fell across roads blocking traffic lanes in Porcupine Mountains State Park. Estimated property damages of \$4,000.
- July 2, 2012: The Ontonagon sheriff received reports of downed trees and powerlines on the southern end of Ontonagon County, mainly near Bergland Township. Thunderstorm winds of 63 mph were measured. Estimated property damages of \$4,000.
- July 21, 2016: The Western U.P. experienced a strong line of thunderstorms during the early morning hours of July 21. The thunderstorms were accompanied by very strong winds and impacted areas from Ontonagon to Twin Lakes in Houghton County. Thunderstorm wind of 75 mph were reported near the Village of Ontonagon. Ontonagon Emergency Manager reported dozens of trees down in



Storm damage from thunderstorm wind on July 21, 2016 in the Village of Ontonagon (Source: NWS Marquette).

and around the village, including on homes. Power was out for 8-10 hours. Numerous trees were down in Mass City and Merriweather. Estimated damages of \$106,000.

- June 29, 2018: Thunderstorm winds of 69 mph destroyed a barn and downed power poles near Mass City. Trees were down on roads throughout the county. Estimated property damages of \$10,000.
- June 30, 2018: In Trout Creek, strong winds caused by severe thunderstorms blew down aspen trees near the roots at Trout Creek. The trees were 8 inches in diameter. Estimated damages of \$2,000.
- September 24, 2019: Severe thunderstorms with winds of 63 mph were reported near Paulding. A poplar and spruce tree were reported down across the street from Running Bear Resort and nearby trails. Other trees were also reported down, but quickly cleared from the road. Estimated damages of \$1,000.



Wilbur Farm, northeast of Ontonagon, was destroyed following straight-line winds of over 50 mph on June 29, 2018 (Source: Skip Schulz for the Mining Gazette)

Occurrence Probability and County Vulnerability

Most severe wind events are classified as thunderstorm winds. In the past 10 years, there were 33 extreme wind events, with 25 associated with thunderstorms – a frequency of 3.3 severe wind events per year and 2.5 thunderstorm wind events a year. The probability of a future severe wind event is likely. Severe winds are the most common and prevalent hazard encountered in Ontonagon County that results in recordable damage. Near the Lake Superior shoreline in communities such as Carp Lake, Ontonagon, and Bohemia Townships, the probability of a severe wind event is higher than in locations not at the shoreline. However, wind events are far from being localized to a certain area and can affect inland areas of Ontonagon County as well.

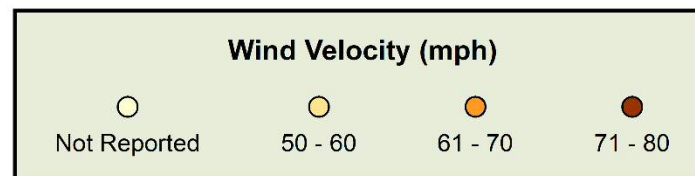
Critical infrastructure, such as power and communication lines, are also vulnerable to damage from severe wind events. Fallen trees can damage these lines, causing electrical and communication outages. Additionally, trees on roadways can delay emergency response capabilities.

Map 5.2: Severe Wind Events in Ontonagon County, 1955-2018



**Recorded Wind Events 1955-2018
Ontonagon 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



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 very 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 they are 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 liquid waters 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 precipitation. Even though the length of Michigan winters has been decreasing, the season remains intense. 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., 8 or more inches, higher snowdrifts, canceled school sessions, etc.).

Historical Occurrence

Ontonagon County has experienced 311 reported 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 5.7** summarizes the total number of

winter storms events and associated deaths or injuries. Of these storms, six events had reported property damages and are described below:

- March 24-25, 1996: A **winter storm** produced high winds with frequent gusts over 40 mph causing whiteout conditions throughout the western U.P. The whiteout caused a fatal traffic accident between two semi-trucks on Highway M-28 in Matchwood Township, 2 miles east of Bergland Township. One person died, while two were injured. By the 25th, 20 inches of snow was reported in Ontonagon and 28 inches in Rockland.
- May 11-12, 2006: Wet, **heavy snow** and strong winds caused tree limbs to break off at numerous locations throughout Gogebic and Ontonagon Counties. 3 to 5 inches of snow reported throughout high terrain locations in Ontonagon County. Frequent power outages were reported. Reported property damage of \$1,000.
- December 14, 2011: A slush mix of rain and snow from **winter weather** caused slick roads on the morning of the 14th. This contributed to a fatal accident on US Highway 45 near Bruce Crossing. A 36-year-old man was killed when the vehicle he was driving spun head-on into the path of a semi-tractor and trailer rig. The tractor driver received minor injuries. Total estimated property damage was \$15,000 due to this weather.
- December 5, 2017: A strong low-pressure system and a push of Arctic air generated **winter weather** and lake-effect snow over Ontonagon County. Strong and gusty winds caused blowing and drifting snow. There was an estimated eight inches of lake effect snow in 18 hours at Ontonagon. Wind gusts were also measured at 59 mph. Several power outages were reported. Estimated property damage was \$5,000.
- November 27, 2019: Dense heavy snow due to a large **winter storm** affected most of west and north central Upper Michigan. Accompanying the snow was wind gusts of 35 to more than 50 miles per hour. In Ontonagon County, observers in Bergland and Paulding reported nearly 10 inches of dense lake effect snow in 12 hours. The wet, heavy snow combined with high winds caused damage to trees and power lines, which caused road and snowmobile trail closures. Several businesses and services were closed due to the storm. Estimated property damage was \$20,000.

Table 5.7: Reported Snowstorms by Type in Ontonagon County, 1996-2019

Snowstorm Type	Number of Events	Total Property Damage	Injuries	Deaths
Blizzard	7	0	0	0
Heavy Snow	52	\$1,000	0	0
Lake Effect Snow	33	0	0	0
Winter Storm	94	\$20,000	1	2
Winter Weather	125	\$20,000	1 ^A	1 ^A
TOTAL	311	\$41,000	1	3

A: Injury/death listed as indirect

Occurrence Probability and County Vulnerability

The probability of a snowstorm event in Ontonagon County is very high. From 2010-2019, there were 174 snowstorm and winter related events in the county – a frequency of 17.4 events per year. However, the vulnerability of all communities in Ontonagon County is low due to the preparedness of the residents. The county also provides driveway plowing services for all residents. Like most of the U.P., the county is aware of and accustomed to dealing with large amounts of snow as this event is assumed to impact all communities in Ontonagon 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 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. 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.

The mean national annual death toll due to tornadoes is 87 persons. Death and injuries associated with tornadoes have declined since the 1950s, thanks to advances in severe weather forecasting. 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.

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 structures. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita scale (**Table 5.8**). After 2005, the Enhanced Fujita Scale (**Table 5.9**) was utilized. The Enhanced Fujita Scale rates the intensity of a tornado based on damaged caused, not by its size. The tornado size is not necessarily an indication of its intensity.

Table 5.8: 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	Roof 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 5.9: 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	Roof 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

Tornados 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.

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

There have been 3 reported tornadoes in Ontonagon County from 1950-2019 (**Map 5.3**). **Table** lists these events. The total reported property damages were estimated at \$270,000.

Table 5.10: Tornado Events in Ontonagon County, 1950-2019

Date	Magnitude	Description and Location	Property Damages
06/30/1953	F1	No detailed description of damages, but it had a track of 10.9 miles and was 500 yards wide.	\$250,000
05/12/1988	F0	No detailed description of damages, but it was 0.2 miles long and 10 yards wide.	No reported damages
08/19/2011	EF0	Winds were estimated around 85 mph when the tornado touched down at the River Pines RV Park and Campground and moved towards the northeast on the east side of the Ontonagon Golf Course. Reported damages included snapped and uprooted trees, snapped power poles, a flipped boat, minor roof damage, and some structural damage to a garage.	\$20,000


Map 5.3: Reported Tornadoes in Ontonagon County, 1955-2019




**Recorded Tornadoes 1950-2019
Ontonagon 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 July 2020

Tornado Magnitude* and Path



0



1

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





Tornado damage from August 19, 2011 event (Source: [NWS Marquette](#))

Occurrence Probability and County Vulnerability

Due to the sparse history of tornado occurrence in Ontonagon County, the probability of a future event is low. There has been only one reported tornado from 2010 through 2019. If an event were to occur, the entire county is vulnerable to tornadoes due to their unpredictability and the lack of resident preparedness to such an event. Tornadoes can occur 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 in the county are a concern due to the large number of people present and the potential for the facility to be used as a storm shelter. Hospitals and medical facilities are also of concern, particularly if there are many tornado related injuries.

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 an area's 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.

Overlap with Other Sections of Hazard Analysis

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, artificial lakes, municipal water supplies, or for energy generation. 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 302 dam failures in Michigan since 1888.¹⁰

¹⁰ Michigan Department of Environment, Great Lakes, and Energy (EGLE)

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.

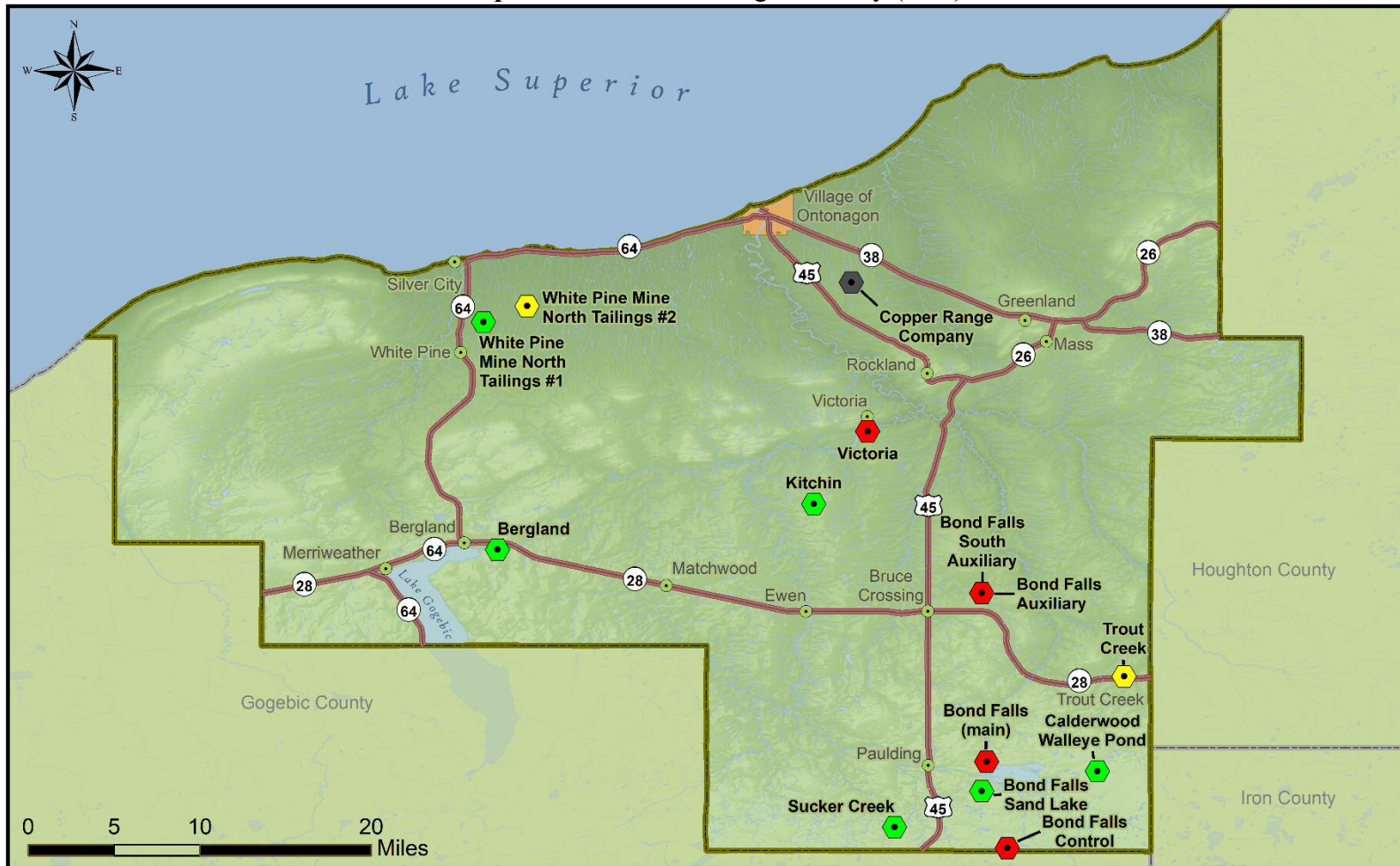
Ontonagon County has several dams within its geopolitical boundaries that have been built over the years for flood control, hydroelectric generation, and recreation. The National Inventory of Dams (NID) lists 14 total dams located in Ontonagon County (**Table 5.11; Map 5.4**), half of which are for hydroelectric generation. Seven are of low hazard potential, two are of significant hazard, and four are of high hazard potential. The high hazard potential dams are the Bond Falls Main Dam, Bond Falls Control Dam, Bond Falls Auxiliary Dike, and Victoria Dam. Ontonagon County also has several beaver dams, which have not been inventoried. If beaver dams are a nuisance or appear as if they will fail, the county does have a permit to eradicate the beavers and dams.

Table 5.11: Dams in Ontonagon County¹¹

Dam	River
Bergland Dam	West Branch Ontonagon River
Bond Falls Auxiliary Dike	Middle Branch Ontonagon River
Bond Falls Control Dam	Middle Branch Ontonagon River
Bond Falls Main Dam	Middle Branch Ontonagon River
Bond Falls Sand Lake Dike	Middle Branch Ontonagon River
Bond Falls South Auxiliary Dike	Middle Branch Ontonagon River
Calderwood Walleye Pond Dam	West Branch Trout Creek
Copper Range Company Dam	Bear Creek
Kitchin Dam	Tributary of South Branch Ontonagon River
Sucker Creek Dam	Sucker Creek
Trout Creek Dam	Trout Creek
Victoria Dam	West Branch Ontonagon River
White Pine Mine North Tailings Dam #1	Bedell Creek
White Pine Mine North Tailings Dam #2	Native Creek

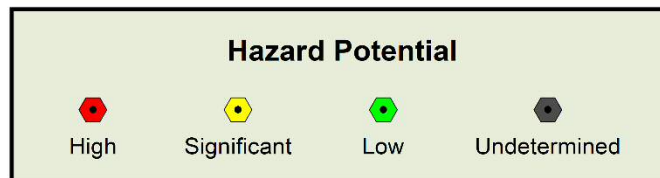
¹¹ National Inventory of Dams. <https://nid.sec.usace.army.mil/>

Map 5.4: Dams in Ontonagon County (NID)



Dam Inventory Ontonagon 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



The Upper Peninsula Power Company (UPPCO) owns and maintains Victoria Dam, which is upstream of the Old Victoria Historical Site in central Ontonagon County on the Ontonagon River. The water is used for power generation and is operated at about 80 percent of the time each year because water can be stored upstream of Victoria for use and release during dry periods. The least amount of generation is during July and August when the river runs low. The greatest amount of water spilled is during spring snowmelt. After the water passes through the turbines, it is discharged into the West Branch of the Ontonagon River, where it flows into the main Ontonagon River and finally into Lake Superior at the Village of Ontonagon.

UPPCO also owns and maintains three storage dams upstream of Victoria Dam: Bond Falls Reservoir, Bergland Dam, and Cisco Dam. The water held by these facilities flows directly to Victoria. Bergland Dam is located on the West Branch of the Ontonagon River at the north end of Lake Gogebic. Cisco Dam is on the Cisco Branch of the Ontonagon River at the north end of the Cisco Chain of Lakes. Bond Falls Reservoir is located on the Middle Branch of the Ontonagon River. It consists of a main dam, three earth filled dikes, and a canal.



Victoria Dam Site (Source: [Ontonagon Chamber of Commerce](#))

Historical Occurrence

There have not been any reported dam failures within Ontonagon County. Beaver dam failures may have occurred, but these events are typically small and not reported. The Ontonagon County Road Commission is responsible for beaver dam removal and eradication.

All hydroelectric dams in the county are regularly maintained and have emergency action plans (EAPs) in place to deal with emergencies as required by Michigan EGLE and the Federal Energy Regulatory Commission (FERC). The plan must include a description of actions to be taken by the dam owner in case of an emergency.

UPPCO works with the Ontonagon County Emergency Manager to ensure that the public is prepared to evacuate areas below the dams during flooding events. Standard operating procedures for each dam are updated annually, and regular full-scale exercises are performed to minimize risk and vulnerability. Dam failure response training is completed via tabletop and functional exercises. UPPCO models and analyses show that if the Victoria Dam did fail, the Village of Ontonagon would experience moderate flooding four to five hours after failure – the Village would be under six inches of water. However, if the Bond Falls Dam fails, the Village would suffer catastrophic flooding about eight to nine hours after failure; the Village would be under six feet of water.

Occurrence Probability and County Vulnerability

Dam failure is a significant risk in the county because of the large area downstream potentially affected by facility failures. Excessive rainfall and accelerated spring melt-off can influence potential dam failure. While probability of a dam failure may be low, the failure of the Victoria Dam would have high to extreme severity. Stream reaches below the dam and the three other hydroelectric dams on the Middle Branch Ontonagon River are areas where people could be impacted by a sudden, unanticipated water release. The 100-year floodplain outlined for riverine and urban flooding in the Village of Ontonagon is very similar to the inundation that would occur at a full breach of Victoria or Bond Falls Dams. The downtown area of the Village along with many neighborhoods would be flooded, displacing many residents from their home and loss of critical infrastructure. There is limited development in areas that would be affected by the failure of the Bond Falls, Bergland, and Cisco Dams; therefore, severity of failure of these dams is predicted to be only moderate.

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

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 has 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 manufactured channels and pipes.

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 also a 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 areas 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.

Flash floods are brief, heavy flows on small streams or normally dry creeks and differ from riverine floods in extent and duration. The cause of flash floods is normally locally intense thunderstorms with significant rainfall resulting in high velocity water often carrying large amounts of debris. These conditions can be exacerbated by secondary or cascading events such as beaver dam failure. Spring is highest-risk due to saturated or frozen ground with little infiltration capacity, along with quick rise in temperature, rapid snowmelt and intense precipitation.

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

Ontonagon County has been affected by several minor and major floods, most due to heavy rainfall of significant snowmelt. Comprehensive studies of the Ontonagon River and its floodplain was completed in 1970. The U.S. Army Corps of Engineers released a report on floodplain characteristics, historical floods, and details regarding Lake Superior shoreline erosion in the county. Flooding along the Ontonagon River has a distinct past with occurrences recorded as far back as 1912. The Village of Ontonagon experienced riverine flooding in 1922, 1923, 1942, and 1963.¹² Most were caused by spring snow melt and ice jams in the Ontonagon River.

The flood on April 1, 1963 was one of the worst in the county. The flood almost damaged all properties and businesses in the downtown area of the Village of Ontonagon.¹³ A combination of unseasonably warm weather and thick ice left from one of the coldest recorded winters resulted in flooding on the Ontonagon River. The downtown area was flooded with two to three feet of icy water; buildings along the south side of River Street (the downtown corridor) had up to four feet of water. Damage estimates were over \$500,000.



River Street in Ontonagon following the April 1, 1963 flood (Source: [TV6 & FOX UP](#))

From 1996-2019, five flooding events were reported, and details of these events are listed below. Total estimated property damage from these events is estimated at \$817,000.

- April 20-27, 1996: Heavy snowmelt caused flooding over roads and minor property damage. Total reported property damage was \$40,000.
- April 14-20, 2002: After record setting snowfall in February and March (over 100 inches of snowfall), snow quickly melted over this short period of time. In addition to the snowmelt, two inches of rainfall and record high temperatures in the 70s and 80s occurred from April 10-12. An additional storm on April 18, where 1.5 inches of rain fell, exacerbated flooding issues. In Ontonagon County, Highway M-28 was closed for three days near Bergland and Merriweather Townships due to high water. Many secondary roads were also closed due to flooding and washouts from flooding creeks and streams. All six Western Upper Peninsula counties and Dickinson, Marquette, and Menominee Counties were affected. A Presidential Major Disaster Declaration was granted to six U.P. counties; Ontonagon County was part of the declaration. Total estimated property damage for the county was \$212,000; combined with other affected U.P. counties, the damage amount was \$18.542 million.
- May 11-13, 2003: Heavy rainfall of two to five inches of rain fell throughout the western U.P. Several roads washed out and closed, including Highway M-28 between Bruce Crossing and Bergland Township. The Middle Branch of the Ontonagon River flooded and overflowed its banks. There was no estimated property damage in the county, but other counties were affected with \$2 million in damages.
- May 25, 2010: Severe thunderstorms resulted in flash flooding. The Ontonagon Sheriff's office reported roads in and near Ontonagon were washed out due to heavy rainfall of two to three inches in less than an hour. Flooding on River Street in the Village of

¹² USACE. (1970 September). "Floodplain Information on Ontonagon River Ontonagon, Michigan and Lake Superior Shoreline, Ontonagon County, Michigan." <https://www.govinfo.gov/app/details/CZIC-gb1225-m5-f6-1970>

¹³ Bohnak, Karl. *So Cold a Sky: Upper Michigan Weather Stories*. Cold Sky Publishing, 2006, 226-227.

Ontonagon forced water over the sidewalks and into some businesses. Estimated property damage was \$15,000.

- April 28-30, 2013: Late season melting of significant snowpack caused flooding across Ontonagon County. It caused moderate flooding of roads in the Bergland, Bruce Crossing, and Rockland areas from the 28th into the 30th. Minor flooding continued into early May. Basement flooding was reported. A portion of Highway M-28 from Bergland to Bruce Crossing was closed for multiple days due to road flooding. Several county roads were also reduced to one traffic lane. Meanwhile, the spillway of the Victoria Dam near Rockland ran at full capacity but suffered no damage. Small stream flooding also occurred throughout the region. The Village of Ontonagon saw little detrimental impact from this flood. Governor Rick Snyder declared a State of Disaster in Ontonagon County, where nearly \$550,000 in property damage occurred due to the flooding, mainly to roadway infrastructure.

Flood Insurance in Ontonagon County

In Ontonagon County, communities that participate in the FEMA National Flood Insurance Program (NFIP) are Carp Lake Township, Ontonagon Township, and the Village of Ontonagon.¹⁴ There are 20,000 communities nationwide that participate in the program. The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances. Other compliance and implementation activities are encouraged. Accordingly, the Village of Ontonagon Master Plan discusses the Village floodplain early on, ensuring that the threat of flooding remains at the forefront of development decisions. Many of the projects in the Action Plan are intended to address flooding in the Village. NFIP puts 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." Ontonagon County does not have repetitive loss or severe repetitive loss structures.

FEMA, during a flood hazard assessment, develops a Flood Insurance Study and Flood Insurance Rate Map (FIRM). The FIRM is used by lenders to determine flood insurance requirements and by insurance agents to determine flood insurance premium rates 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 Ontonagon County, Carp Lake Township, Ontonagon Township, and the Village of Ontonagon all have identified SFHAs.

Occurrence Probability and County Vulnerability

Countywide, from 2010 to 2019, two flood events were reported in Ontonagon County – a frequency of 0.2 events per year. While this indicates a low probability of occurrence, flooding is

¹⁴ FEMA. Community Status Report Book – Communities Participating in the National Flood Program. <https://www.fema.gov/cis/MI.html>

still a moderate risk within the county. Both events caused significant infrastructure and property damage and flooding events can affect population areas around the county.

Large areas in the Village of Ontonagon that have previously been subjected to flooding, including established residential, commercial, and industrial areas, remain subject to a 100-year flood. Ice jams near the mouth of the river often add to the problem during spring snowmelt. SFHAs along several other rivers have also been identified: Iron River (Carp Lake Township), Firesteel River (Ontonagon Township), Sleeping River (Ontonagon Township), McCarthy Creek (Ontonagon County), Cranberry River (Ontonagon Township), Flintsteel River (Ontonagon Township), and Paddy's Creek (Ontonagon Township). A few inland lakes in Carp Lake Township are also affected: Lake of the Clouds, Bass Lake, and Clark Lake. McMillan Township, including the community of Ewen, has been affected by flooding of the Ontonagon River, particularly of the Middle Branch at Bond Falls. In Bergland and Matchwood Townships, flooding has occasionally inundated and required closure of Highway M-28.

Communities within the county recognize the problems associated with their location and have taken steps to prevent loss by upgrading facilities to deal with the flood risk and identifying evacuation areas. Because of unpredictable river discharge and heavy ice jams, potential for flooding is evident. Probability is low to moderate based on three events in a 10-year period. Within the county, the highest probability is in the Village of Ontonagon. Severity is low to moderate in most jurisdictions but extreme in the Village of Ontonagon.

The Real Property State Equalized Values (SEVs) in the designated 100-year flood zone in the Village of Ontonagon total over \$5,000,000, and the Personal Property SEVs for the same area total \$9,000,000. Additionally, the Village Office, the Department of Public Works, and the Ontonagon Fire Hall are located within the deepest area of the floodplain. Specific data regarding impact on other identified flood areas in Ontonagon County are unavailable.

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 state's 41 shoreline counties, which includes Ontonagon 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.

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. Worst case scenarios tend to involve inhabited structures that, over years, have had adjacent lands eroded away and now stand dangerously close to lake waters or shoreline cliffs. Roads and structures may be just one storm away from falling into the lake when the shoreline is significantly eroded to the extent that it reaches a structure's foundation and the area's important infrastructure.

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 (data from 1918-2020). The modern range of fluctuation between periods of high and low water is 1-meter.

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

Ontonagon County has a total of 52 miles of Lake Superior shoreline. Despite having many miles of shoreline, a 2013 shoreline erosion study completed by EGLE showed that there were no high-risk erosion areas in the county. However, since 2018, Lake Superior water levels have been above normal and continue to reach record highs.¹⁵ The lake is on average about a meter higher than normal throughout most seasons (lake levels do fluctuate seasonally). This has caused significant shoreline erosion along Lake Superior, particularly in the Village of Ontonagon and Carp Lake Township. In the Village of Ontonagon, high Lake Superior water levels have damaged the East Pier path, Marina Park, and boardwalks.¹⁶

¹⁵ NOAA GLERL. The Great Lakes Dashboard. https://www.glerl.noaa.gov/data/dashboard/GLD_HTML5.html

¹⁶ Gardner, P. (2020, March 30). "Numbers show impact of Michigan coastline flooding and erosion from high water." MLive. <https://www.mlive.com/news/2020/03/numbers-show-impact-of-michigan-coastline-flooding-and-erosion-from-high-water.html>



CR107 washout near the Porcupine Mountains Wilderness State Park
(Source: Michigan DNR)

In Carp Lake Township, the main entrance road to Porcupine Mountains Wilderness State Park is threatened by high lake levels and shoreline erosion. County Road (CR) 107, the only entrance to the park from the east, is under continual threat of eroding away due to Lake Superior wave action and erosion. If CR107 were to erode, the alternative entrance would create an 80-mile detour through Gogebic County. Prior to high water levels, the road was about 30 to 40 feet away from the shoreline.¹⁷ Now about 80% of the road is 20 feet or less away from the water.¹⁸ To protect the road, the MDNR in collaboration with the Ontonagon County Road Commission recently completed a project to fortify the shoreline and protect the road from washing away. Other permanent protective measures are being discussed, which includes realigning the road away from the shoreline.

Occurrence Probability and County Vulnerability

Even though there are no shoreline areas designated as high-risk by EGLE, shoreline erosion and flooding are active, ongoing processes within Ontonagon County. The probability of an event is high, particularly in the shoreline jurisdictions of Carp Lake Township, Ontonagon Township, Bohemia Township, and the Village of Ontonagon. Mandatory setbacks required for shoreline development do help minimize the vulnerability of Ontonagon County to these hazards, but with rising Lake Superior water levels, risk of flooding may increase. Critical infrastructure and critical facilities near shorelines are most at risk to erosion and flooding. Despite efforts to protect the road, CR107 is still highly vulnerable to shoreline erosion.

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 very high or low average rainfall. The level or 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.

¹⁷ Meyer, B. (2020, January 30). "As Land Falls into Great Lakes, Workers, Regulators Scramble to Address Water Level 'Crisis.'" WXP. <https://www.wxpr.org/post/land-falls-great-lakes-workers-regulators-scramble-address-water-level-crisis#stream/0>

¹⁸ Householder, S. (2019, December 18). "Beach erosion threatens access to Porcupine Mountains Wilderness State Park." WLUC. <https://www.uppermichiganssource.com/content/news/Beach-erosion-threatens-access-to-Porcupine-Mountains-Wilderness--566292481.html>

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 time. However, the threat and hazards from drought will not disappear and in the long-term is expected to greatly worsen.

Historical Occurrence

Ontonagon County is part of a larger climate division (Division 1), which includes the following counties: Baraga, Dickinson, Gogebic, Houghton, Keweenaw, Marquette, Menominee, and Iron Counties. This climate division is used to assess the presence and severity of drought conditions in regional divisions. The most extreme drought to impact Division 1 was in January 1977, where the Palmer Drought Severity Index (PDSI) hit a record low of -7.33, the all-time Michigan record. Only one drought incident (at least 8 months long) occurred in the past 10 years in Division 1 during 2011-2012 where there was a recorded 12-month drought period.

Table 5.12: Significant Droughts affecting Michigan Division 1 Counties

Year of lengthy drought incidents	Length of Droughts affecting Division 1
1895-1896	10 Months
1908-1909	10 Months
1910-1911	16 Months
1921-1922	8 Months
1925-1926	11 Months
1930-1931	12 Months
1933-1934	9 Months
1948-1949	12 Months
1963-1964	9 Months
1976-1977	8 Months
1986-1987	12 Months
1989-1990	13 Months
1998	9 Months
2006-2008	22 Months
2008-2009	12 Months
2011-2012	12 Months

Other recorded instances show that the 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 Ontonagon County has limited cultivated land, drought does not significantly affect agriculture. However, even a minor drought is one of the primary factors of wildfire potential and is a major hazard for that reason alone. In August and September 2007, all 83 counties in Michigan received drought disaster declaration from the U.S. Department of Agriculture due to the crop losses from drought.¹⁹ Wildfire dangers were escalated, due to the dry conditions, and the Michigan Department of Natural Resources released a statement prohibiting the use of fire on or adjacent to forest lands for 75 counties in Michigan.

Although stream and reservoir levels may drop during an event, 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). The Village of Ontonagon and smaller nearby communities (White Pine, Silver City, and Porcupine Mountain Wilderness State Park) do rely on Lake Superior for drinking water, but the rest of the county does not depend on surface water for water sources. Temporary droughts have not limited the use of Lake Superior as a resource nor diminish groundwater reserves to a notable extent.

Occurrence Probability and County Vulnerability

¹⁹ Emergency Management and Homeland Security Division. (April 2019). “2019 Michigan Hazard Analysis”, EMHSD PUB-103. https://www.michigan.gov/documents/msp/MHA_2019__full_update_natural_hazards_653708_7.pdf

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, but especially communities that rely on the water levels in Lake Superior for drinking water. 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 occurs naturally, but becomes dangerous when it threatens humans 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 are closely connected with them (such as tourism, recreation, agriculture, and natural resource extraction).

Wildfires

Hazard Description

Forests cover approximately 49% (18.2 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 4.2 million acres of softwood and 13.1 million acres of hardwoods. While vast forest cover is a boon 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 of homes, timber, and wildlife. Long-term effects include

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, the main cause (47%) of wildfires in Michigan is burning yard debris, 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 fuel²⁰.

Climate Change Considerations

The average wildfire seasons has extended 78 days longer across the United States, and large wildfires burn more than twice the area they did in 1970²¹. 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

Forests cover approximately 90% of Ontonagon County. This forest cover is an asset for both industry and recreation. However, it also leaves the county highly vulnerable to wildfires (**Map 5.5**). Increased development in and around rural areas has changed the nature of the threat from wildfires. Not only can acres of valuable timber and wildlife habitat be lost, but also life and property. In August 1896, the Village of Ontonagon and surrounding rural areas were devastated by a wildfire that destroyed almost every building in the village. The summer was unusually dry, which likely contributed to the severity of the fire. Historical estimates reported that a total of 344 buildings burned, which included the courthouse and jail, a bank, three schoolhouses, and two iron bridges.²² One person was killed in the disaster.

On October 20, 2000, the Little Carp River wildfire occurred in the Porcupine Mountains Wilderness State Park.²³ It was caused by a lightning strike. The wildfire was unique due to time of year (late fall) and size (over 1,200 acres). No facilities or injuries were reported. Tree loss occurred, primarily to hemlocks. Despite being contained and suppressed, the fire smoldered into November.

Occurrence Probability and County Vulnerability

²⁰ Michigan Department of Natural Resources, https://www.michigan.gov/michiganprepares/0,4621,7-232-65025_65201---,00.html

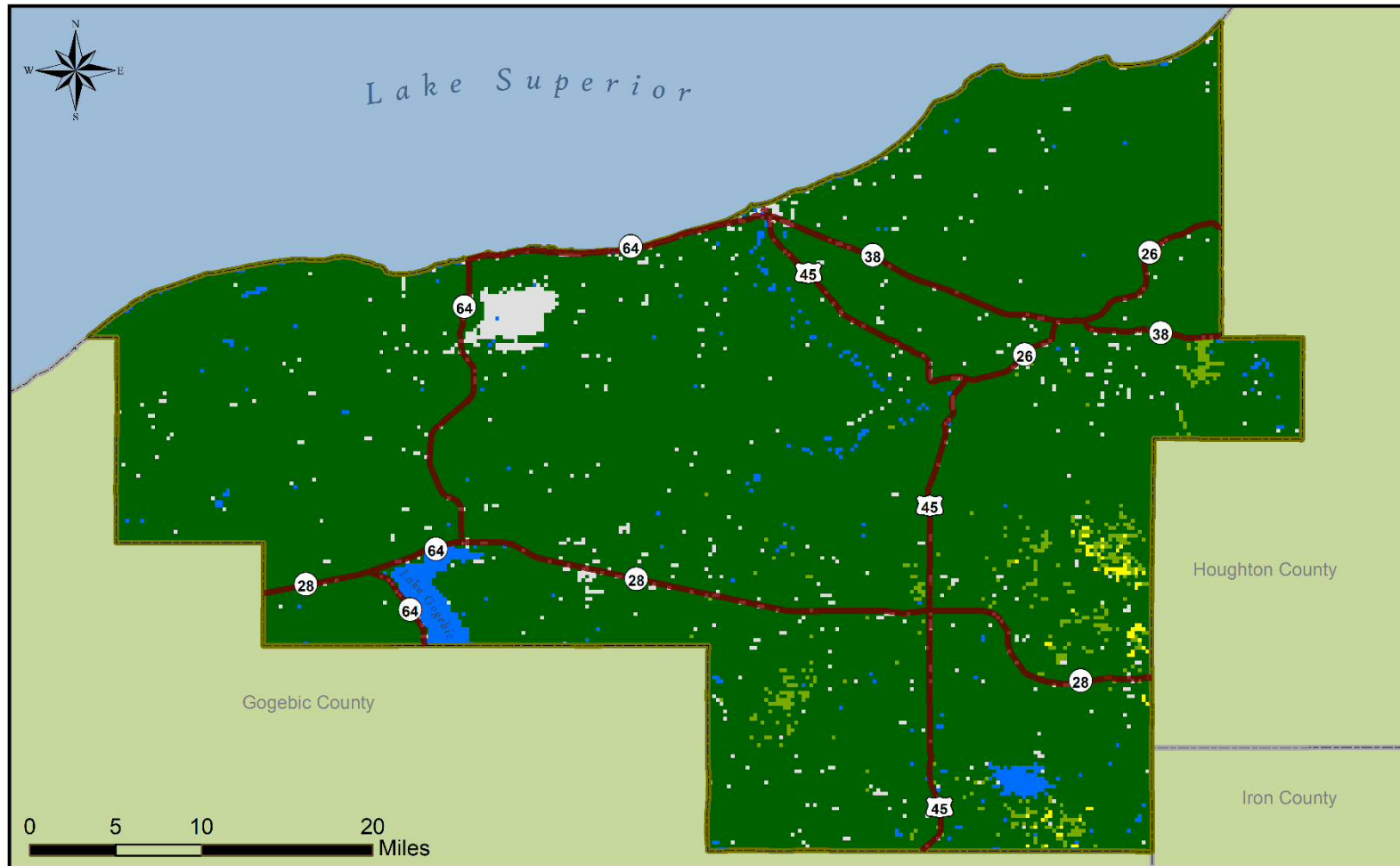
²¹ Center for Climate and Energy Solutions, <https://www.c2es.org/content/wildfires-and-climate-change/>

²² "The Ontonagon Fire." <http://hometownchronicles.com/mi/ontonagon/1896fire.htm>

²³ "Little Carp River Wildfire." LandScope America. <http://www.landscape.org/connect/conservation-projects/project/99987#>

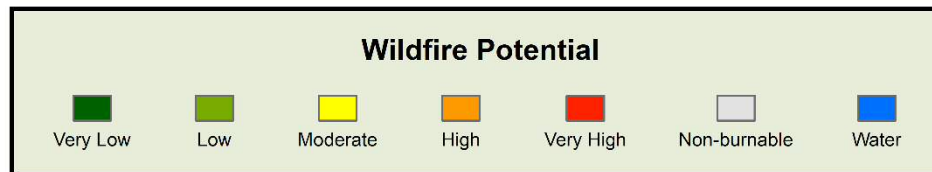
Ontonagon County has an ongoing risk of wildfires due to the tremendous amount of forest cover and urban infringement in some rural areas. Due to the high amount of forest cover, the probability of a wildfire is high throughout the county. Severity is moderate to potentially extreme in the heavily forested environment. Increased development in rural areas can increase the potential damage from wildfires. Ensuring that new development has adequate emergency access and protective buffers is one way to mitigate some of the risk. 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.

Map 5.5: Wildfire Hazard Potential in Ontonagon County



Wildfire Hazard Potential
Ontonagon 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>



Invasive Species

Hazard Description

An invasive species is defined as a species that is 1) non-native (alien) 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 very 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 wellbeing 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 Michigan's growing season, species that had been previously found only in warmer areas to the south have started to appear. While the definition of invasive species specifically refers to species introduced by humans, to distinguish these patterns from naturally

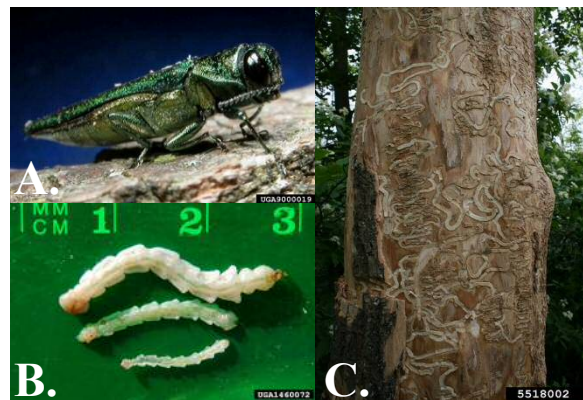
occurring ones, species transported by human action can be more likely to survive as climatic changes occur.

Historical Occurrence²⁴

Ontonagon County’s large amount of forest cover, lakes, and rivers are all threatened by both terrestrial and aquatic species that have been found throughout the County. There have been over 2,300 reported locations of invasive species, most of which are terrestrial plants.²⁵ 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 Ontonagon County:

Invasive Insects

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. 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 Ontonagon County,²⁶ but due to its proliferation in nearby counties, it may have an unreported presence.



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

Asian longhorned beetle (*Anoplophora glabripennis*): The Asian longhorned beetle (ALB) is a potential threatening 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 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

²⁴ All images in this section, except Sea lamprey photo B, are from www.bugwood.org

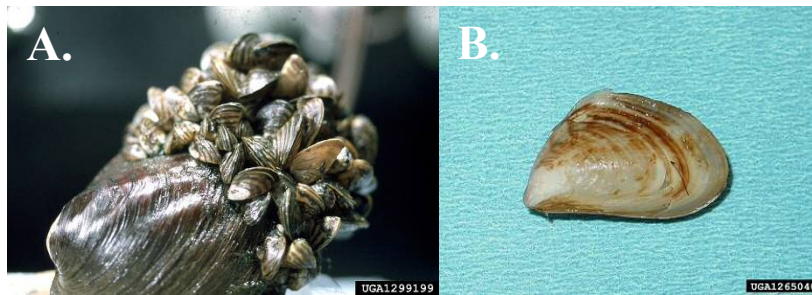
²⁵ Midwest Invasive Species Information Network. Data Map by State and County. www.misin.msu.edu

²⁶ Emerald Ash Borer Story Map. www.aphis.usda.gov/aphis/maps/plant-health/eab-storymap

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.

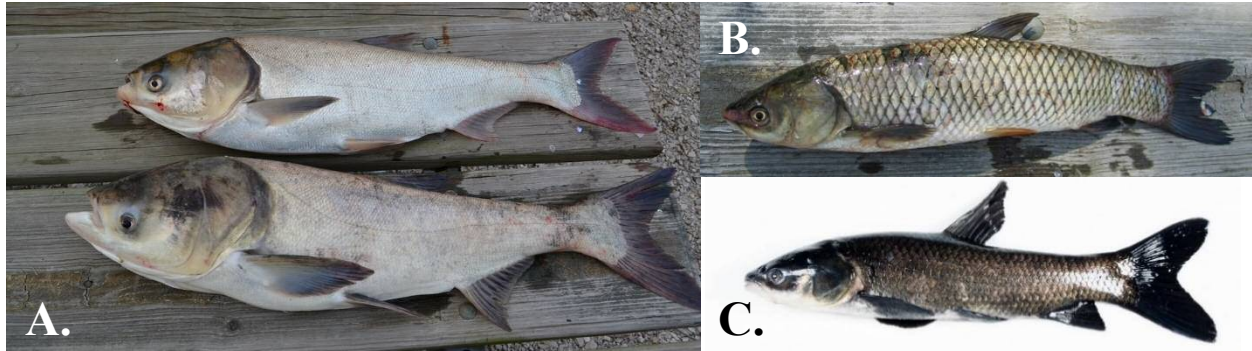
Common and glossy buckthorn (*Rhamnus cathartica*; *Rhamnus frangula*): The common and glossy buckthorn are small shrubs or trees that can grow in a variety of areas, such as roadsides, pastures, old fields, and woodlots. Native to Europe and Asia, buckthorns were brought to the U.S. in the early 1800s as an ornamental plant. Both buckthorns can spread quickly through seeds distributed by birds and wildlife. These shrubs can crowd out native and understory plants. The buckthorn can also host viruses and fungi that are harmful to other plants.

Invasive Aquatic Species



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

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 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.



Asian carp varieties: silver carp (A. top), bighead carp (A. bottom), grass carp (B), and black carp (C). (Asian Carp Regional Coordinating Committee; asiancarp.us)

Asian carp: This invasive fish species was originally introduced from Arkansas fish farms in the 1970s for use in aquaculture farms. After flooding and accidental release, carps found their way into the Mississippi River and other waterways. Asian carp include Bighead (*Hypophthalmichthys nobilis*), Black (*Mylopharyngodon piceus*), Grass (*Ctenopharyngodon idella*) and Silver (*Hypophthalmichthys molitrix*) varieties. While the carp have not established themselves in the Great Lakes, all varieties are well-adapted to the climate of the Great Lakes due to its similarity to their native range in Asia. Recent data shows that invasive carp are about 10 miles away from electric barriers installed near Chicago to prevent their migration into Lake Michigan. If any Asian carp do make it into the Great Lakes, they pose significant harm to the Great Lakes ecosystems and fisheries, by disrupting the food chain that supports native fish. This can negatively impact recreational and commercial fishing opportunities throughout Michigan. Additionally, carp are a human health hazard because they can leap a considerable distance out of water when disturbed by motion, such as from boat motors. Bighead and silver carp can grow to be 50 to 100 pounds, which can cause severe injuries to boaters.



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

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 scraps 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.

Occurrence Probability and County Vulnerability

The probability of future occurrence for invasive species is high for Ontonagon County and will rise due to the continual transport of goods and services and expanding global trade. This has created opportunities for many organisms to be transported and establish themselves in new regions. There are several invasive species that have yet to be found in Ontonagon County or the 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 county and its population are 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 results 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. Earthquake 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.

In Ontonagon County, which has a history of mining operations, this may have been the cause to the only reported earthquake. On January 14, 1988, a magnitude 3.6 earthquake was detected about 3.5 miles from Bergland. No event details were listed.

Occurrence Probability and County Vulnerability

The probability of an earthquake happening anywhere in Ontonagon County is very low – nearly zero. Due to the low probability of an earthquake, no critical facilities nor jurisdictions 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 solution 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 Michigan, 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. Many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. Unfortunately, records of abandoned mines are often sketchy and sometimes non-existent; it is often difficult to determine exactly where the mines were located. 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 often can swallow up whatever is built upon them.

Historical Occurrence



*Wooden shaft-houses and several other buildings at National Mine in Rockland
(Source: [MTU Archives](#))*

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 Michigan's history. Michigan's Lake Superior region has been home to significant copper mining operations since the mid-1800s. Ontonagon County is considered part of the Copper Country, which includes Houghton, Keweenaw, and parts of Gogebic Counties. Near White Pine in Ontonagon County, the target strata

in the White Pine mining operations were on an anticline that was mined both a shallow depth of 100 feet and as deep as 2,900 feet. Over-mining of pillars in shallow parts of the mine caused collapse and subsidence at the surface of the mine during the 1980s.

There are over 800 underground mines in Michigan, with more than 2,300 other openings. Many mines were opened in the 1840s and even though many mine sites have been inspected by a county mine inspector, some are still unknown and/or unmarked. There are very limited records of the locations of shafts, and the extent of underground mines and proximity to the surface may be unknown. This is also the case in Ontonagon County. Additionally, the county does not currently have a mine inspector. The extensive White Pine Mine and older copper mines are subject to subsidence problems.

Many underground mines are located along the West Branch of the Ontonagon River, between the north shore of Lake Gogebic and the community of Mass City (**Map 5.6**). Mines continue along M-26 north towards Houghton County. These underground mines were focused on copper ore mining, while mines near Porcupine Mountains Wilderness State Park (Carp Lake Township) has a mix of copper and silver mining.²⁷ Based on MDNR maps of underground mine locations, the following local jurisdictions have been identified as having overlap between the locations of known copper mines and properties and infrastructure that are in use within or near such areas: areas near M-64 and M-107, Carp Lake Township, Greenland Township (including areas near M-38), Matchwood Township, and Rockland Township (including areas near U.S. 45).

In 2017, Highland Copper Company began exploration work on property near the Porcupine Mountains Wilderness State Park. The exploratory drilling was to determine if copper mining would be feasible in the area. While subsidence currently is not a risk, the exploration work did cause significant soil erosion along Gogebic County Road 517 in April 2018.²⁸ It is unknown if exploration drilling or mining has occurred at the site since 2018.

Occurrence Probability and County Vulnerability

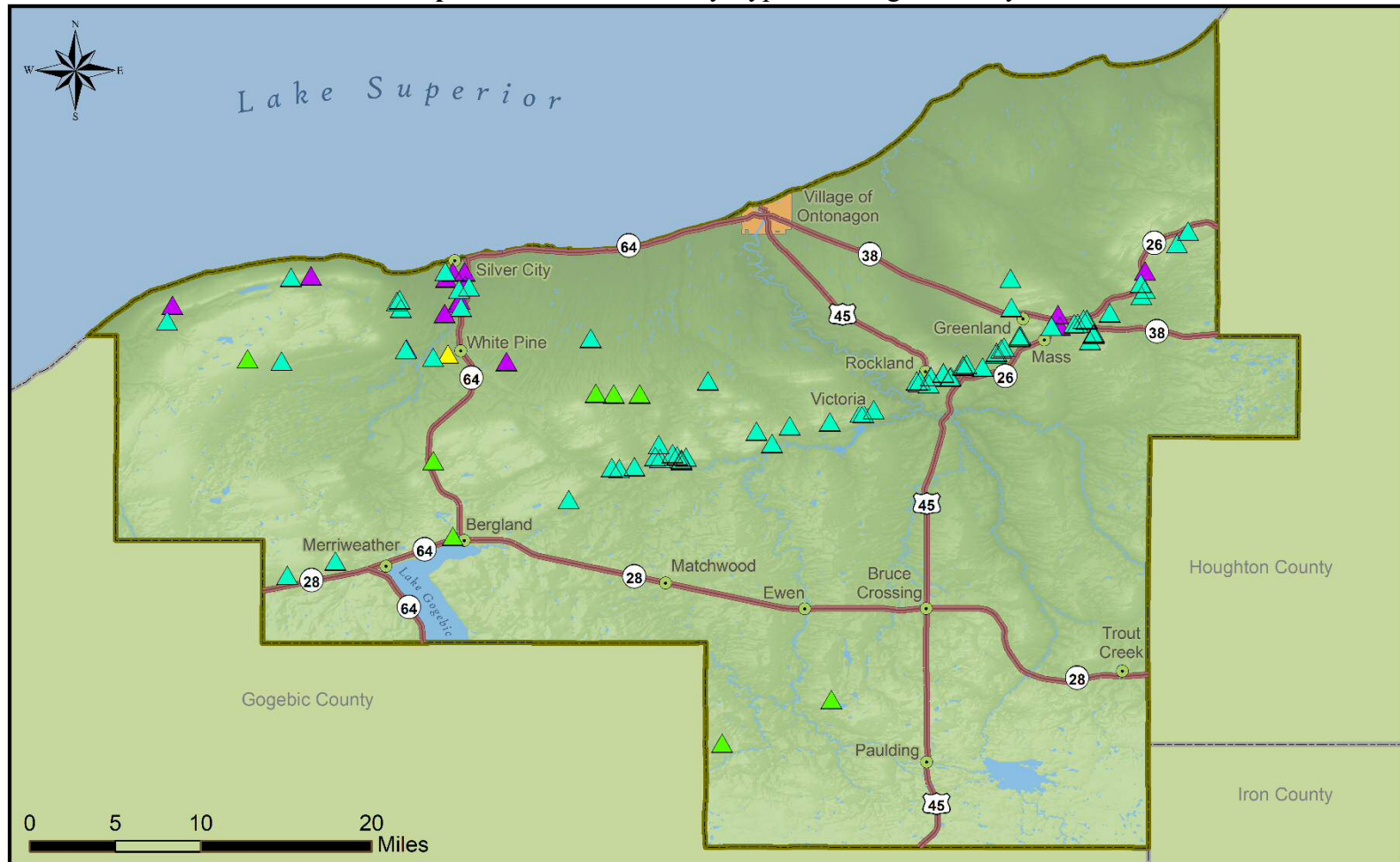
Michigan has not had a catastrophic subsidence incident that involved death, injury, or widespread property damage. However, smaller subsidence incidents have occurred that involved a single site or structure. Subsidence will continue to pose some risk in the future because of both known and unknown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

²⁷ MDNR. (2003). Ontonagon County Underground Mines.

http://www.dnr.state.mi.us/spatialdatalibrary/pdf_maps/Geology/Mines/Ontonagon.pdf

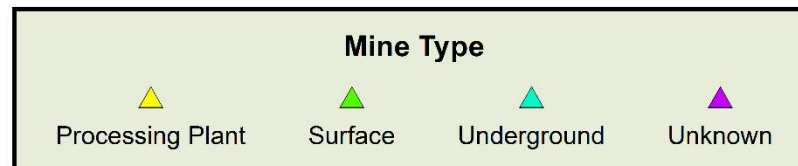
²⁸ Gordan, V. (2018 January 16). Copper mining company reaches settlement with state over erosion in UP state park. Michigan Radio. <https://www.michiganradio.org/post/copper-mining-company-reaches-settlement-state-over-erosion-state-park>

Map 5.6: Mine Locations by Type, Ontonagon County



Mine Locations Ontonagon 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



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 Gas Pipeline Accidents

This section covers many related types of events that stem from breakdowns or weaknesses in the 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 a community states of emergency, evacuations, impairment or loss of economically significant or critical facilities, or multiple casualties.

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 Fires

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

There are currently no licensed scrap tire facilities in Ontonagon County, nor known incidents of scrap tire fires. Other scrap tire sites may be in the county, but they are not officially registered so their locations are unknown. Because of the lack of official scrap tire collection sites, tires can be improperly disposed in fields and roadsides throughout the county.

In the summer of 2019, the Superior Watershed Partnership and Great Lakes Conservation Corps collected scrap tires throughout Ontonagon, Baraga, Alger, and Marquette Counties from different areas, such as forests, coastlines, and residential areas.²⁹ In total, over 2,000 tires were collected from private and public lands. In 2020, the program is expanding to other U.P. communities to collect and remove scrap tires throughout the area.

Occurrence Probability and County Vulnerability

There have been no known scrap fire tire incidents in Ontonagon 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. Regular collection of scrap tires is uncommon. Although the probability of a scrap fire tire is very low, severity is high as a small mistake on either a register 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. Direct property losses due to fire exceed \$9 billion per year countrywide 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

²⁹ Jahfetson, J. (2020, May 29). “Tired of Tires: Superior Watershed Partnership, Great Lakes Conservation Corps assist U.P. communities with clean-up project.” The Mining Journal. <https://www.miningjournal.net/news/front-page-news/2020/05/tired-of-tires/>

Michigan, residential fires account for 72.4% of all structural fires and cause nearly 82% of fire fatalities.³⁰

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 focuses 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.

Historical Occurrence

Structural fires are of special concern in Ontonagon 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. In 2002, Ontonagon County had 33 fires resulting in \$1,405,250 of damage and 26 fires in 2003 resulting in \$200,630 of damage. 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).

During Labor Day weekend in 2008 (August 31-September 1), a severe structure fire destroyed an entire block of buildings in the downtown area of the Village of Ontonagon.³¹ Human error was reported as the cause of the fire. One structure started to burn, and wind carried it to the next. Nearby buildings also had exterior fire or smoke damage. Fire departments throughout the area were called in to assist with fire suppression. In total, seven buildings were destroyed. Estimated damages were about \$250,000.



Damages due to the 2008 Labor Day fire in the Village of Ontonagon (Source: [Henry Kisor](#))

On October 18, 2013, the Bergland Foods Store in Bergland Township was destroyed by fire. A family living behind the store heard three small explosions and saw black smoke coming from

³⁰ U.S. Fire Administration, Fire Statistics by State. www.usfa.fema.gov/data/statistics/states/michigan.html

³¹ TV6 & FOX UP. (2013, September 5). *Ontonagon remembers downtown fire* [Video]. YouTube. <https://www.youtube.com/watch?v=fZuBO6vYFeI>

the building. The building and apartment behind it were destroyed from the fire. No one was injured in the fire. Debris left by the fire was not cleaned up until August 2016.



Firefighters spray water on the back portion of the Bergland Foods Store after being destroyed in a fire on October 18, 2013 (Photo: Cortney Ofstad/Daily Globe)³²

Other notable structural fire events in Ontonagon County were the following:

- September 7, 2012: A small structure fire caused by a propane explosion was reported in Ewen (McMillan Township). A small propane leak was ignited in the home, which caused the house to shake and caused the small fire. No injuries were reported, and the fire was extinguished.³³
- August 12, 2014: A two-story building was destroyed following an explosion and fire in the Village of Ontonagon. The explosions were believed to be caused by oxygen tanks that were inside the home. No injuries were reported, but the home was a total loss.³⁴
- February 11, 2018: Two people were killed in a house fire in Trout Creek (Interior Township). The cause of the fire was not reported, and the home was a total loss.³⁵

Local law enforcement and emergency services participate in educational programs at Ontonagon and Ewen-Trout Creek schools as part of the 911 Camp. The camp is designed to teach students about what each department does and basic safety skills, such as electric and fire safety and how to properly use a fire extinguisher. All students are provided with a smoke detector and information to take home to share with their family.

³² Ofstad, C. (2013, October 19). "Fire destroys Bergland Food Store." *Daily Globe*.
<https://www.yourdailyglobe.com/story/2013/10/19/news/fire-destroys-berglan-food-store/1557.html>

³³ MTI Industries, Inc. (2012, September 7). "Propane explosion to blame for structure fire."
<https://www.mtiindustries.com/propane-explosion-to-blame-for-structure-fire/>

³⁴ Tucker, J. (2014, August 12). "Ontonagon house leveled by early morning explosion." *Daily Globe*.
<https://www.yourdailyglobe.com/story/2014/08/12/news/ontonagon-house-leveled-by-early-morning-explosion/3408.html>

³⁵ Kline, A. (2018, February 13). "Updated: Names of the two victims killed in housefire released." WLUC.
<https://www.uppermichiganssource.com/content/news/Two-dead-in-Trout-Creek-house-fire-473747163.html>

Occurrence Probability and County Vulnerability

The probability of a structural fire in Ontonagon County is highly likely with potentially extreme severity throughout the county. Severity is highest in villages and communities with densely populated neighborhoods. Unfortunately, local fire departments do not maintain archived records of previous loss, making an estimate of vulnerability difficult and unreliable. The county has multiple fire departments with mutual aid agreements to respond to structural fires. Education and operational smoke detectors can often mitigate the loss from this type of hazard.

Due to an older housing stock, compact development in downtown Village of Ontonagon, and remote development, Ontonagon County is vulnerable to fire. Certain zoning ordinances can help reduce vulnerability by improving safety and reducing potential losses from fires. Examples include property setbacks and ensure road widths are wide enough to allow easy access for emergency vehicles. Vulnerability to structure 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. Required training has greatly increased which has made firefighter recruitment and retention more difficult.

Hazardous Materials: Fixed Site Incidents

Hazard Description

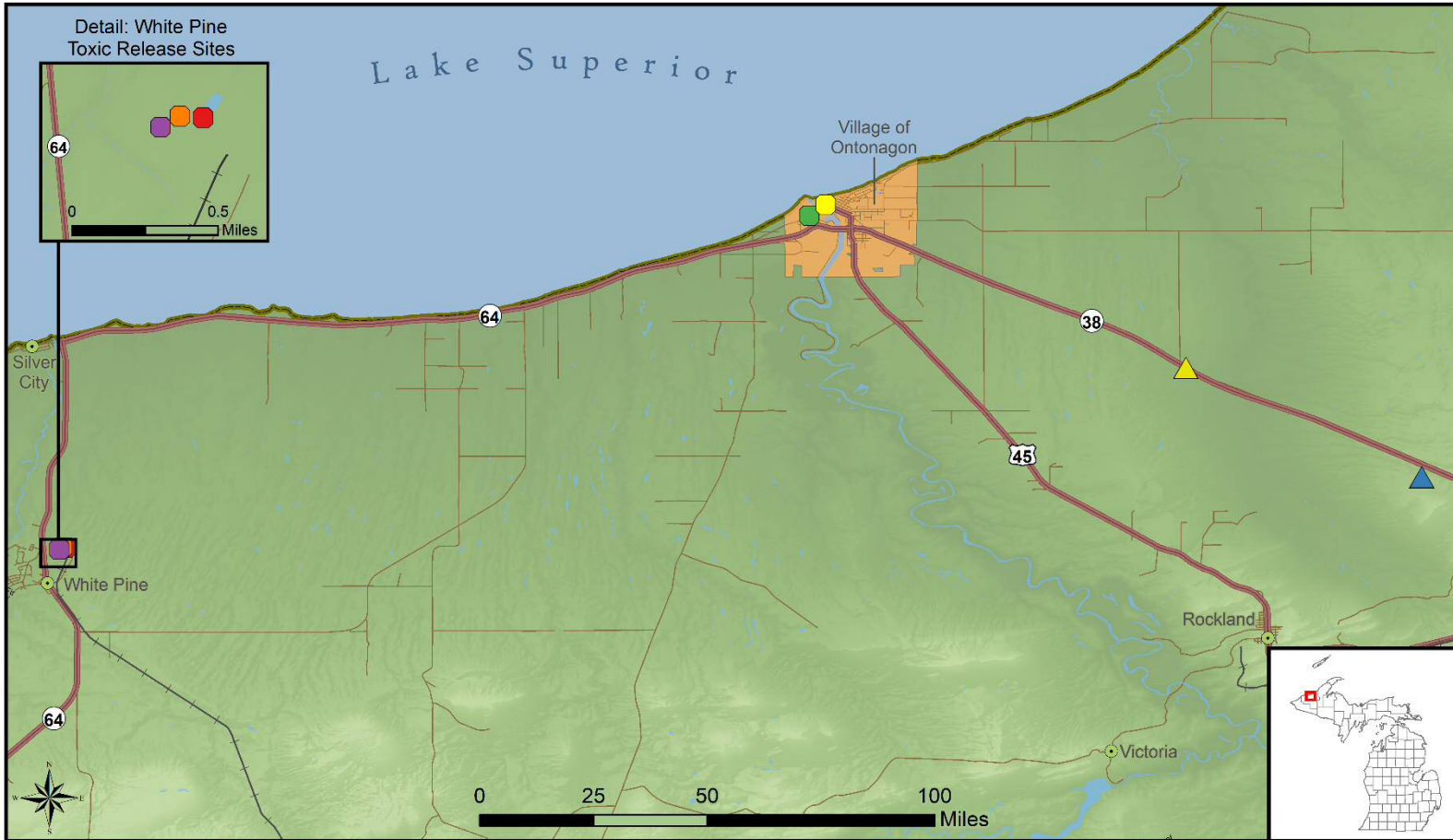
As new technologies have developed, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities. Hazardous materials, if released, pose a potential risk to life, health, property, or the environment due to their 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. Areas at highest risk 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. Currently there are no sites required to report under Title III, but there are locations in the county that contain hazardous materials (**Map 5.7**).

Map 5.7: Toxic Release Sites and Landfills in Ontonagon County



**Toxic Release Sites and Landfills
Ontonagon County, Michigan**

Data sources: Michigan GIS Open Data Portal, USGS (DEM), Specialized Information Services – National Library of Medicine (TOXMAP*). Created by WUPPDR, May 2019

*TOXMAP was retired 16 December 2019

Toxic Release Sites/Landfills	
■	Copper Range Co
■	Lake Shore Inc
■	Smurfit-Stone Container Enterprises Inc
■	White Pine Copper Refinery Inc
■	White Pine Electric Power LLC
▲	Ever-Green Landfill
▲	K&W Landfill



White Pine Mine has a long history of copper mining, dating back to the early 1900s. The Calumet and Hecla Mining Company started the mine in 1909 and created four shafts to mine the area. In the 1930s, the Copper Range Company purchased the mine and adjacent lands to expand mining. Despite war related recessions following both World Wars I and II and change in ownership, the mine operated until 1982 when copper prices were no longer profitable following the Vietnam War.³⁶ After the intensive copper mining and processing ended, mineral exploration continued into the 2010s while machinery and smelters were dismantled and sold.



Aerial view of mining operations at White Pine Mine and surrounding area, 1985-1990 (Source: [Michigan Tech Archives](#))

Copper was processed at the site and any mine waste or tailings were impounded on three separate facilities: South Dam, North Pond No. 1, and North Pond No. 2. All tailings ponds flow into Perch Creek then into Mineral River, finally draining into Lake Superior. From 1975-1980, research on the discharge of the river into Lake Superior indicated that the Mineral River accounted for about 37% of the total chloride load from the U.S. into the lake.³⁷ High chloride concentrations in freshwater can harm aquatic organisms, such as fish, and hinder survival and reproduction.³⁸ Increased chloride concentration may also create favorable habitat for invasive aquatic species, such as the Eurasian water milfoil, which can tolerate high chloride levels. While the research was completed when mining was still occurring, residual chemical and other mining leachates from tailings may still be filtering into waterways via the same water channels. Mine tailings typically include copper, silver, sandstone, trace metals, and trace flotation reagents.³⁹ Tailings pond remediation occurred in the late 1990s in response to failed attempts to establish vegetation on the sites.

Since the mine closed, North Pond No. 2 is inspected every four years by engineers hired by the Copper Range Company. Reports are then filed with EGLE. The tailings ponds are also inspected weekly by a mine employee, who checks for signs of erosion and reports the water level.⁴⁰ Dam inspection report submission and weekly assessments are required by EGLE as the dam is considered a ‘significant hazard potential.’

³⁶ Rosenmeyer, T. (1999). “White Pine Mine Ontonagon county, Michigan.” *Rocks and Minerals*, 74(3).

³⁷ Lang, G. (1983). “The Mineral River – A Unique Tributary Chloride Load to Lake Superior.” *Journal of Great Lakes Research*, 9(4): 584-587. <https://www.glerl.noaa.gov/pubs/fulltext/1983/19830004.pdf>

³⁸ Hunt, M., Herron, E., and Green, L. (2012). “Chlorides in freshwater.” *URI Watershed Watch*. The University of Rhode Island – College of Environment and Life Sciences. <http://cels.uri.edu/docslink/ww/water-quality-factsheets/Chlorides.pdf>

³⁹ EPA. (1992). “Mine Site Visit: Copper Range Company, White Pine Mine.” <https://archive.epa.gov/epawaste/nonhaz/industrial/special/web/pdf/copper4.pdf>

The Smurfit-Stone Container Corporation Paper Mill, located on the Ontonagon River in the Village of Ontonagon and closed in 2010, was a corrugated paper-making plant. The mill produced 280,000 tons of medium a year when it was open. After the plant was shuttered, the facility was demolished. The property has remained undeveloped. Across the Ontonagon River is the Lake Shore Systems, Inc. facility, located on the Ontonagon shipyard. The company designs and manufactures heavy equipment for maritime and mining industries. They also perform water testing for the Ontonagon River and Lake Superior.⁴¹

There are two landfills in Ontonagon County: K&W Landfill operated by Waste Management and Ever-Green Landfill and Recycling Center operated by Ever-Green Landfill and Recycling, LLC. K&W Landfill, in Greenland Township, is a municipal solid waste landfill that accepts non-hazardous materials and receives waste from the following counties: Baraga, Gogebic, Houghton, Keweenaw, and Ontonagon. Ever-Green Landfill and Recycling Center is a Type III low hazard industrial landfill in Ontonagon Township.^{42,43} A type III landfill can receive any waste that is not considered municipal and can include the following: construction and demolition waste, industrial waste, or hazardous waste from small quantity generators.

Abandoned structures are scattered throughout Ontonagon County and any potential pollutants or hazardous materials in these structures are typically unknown. Hazards become larger issues when individuals enter abandoned structures and accidentally encounter chemicals or other hazardous materials. An accidental mercury spill was reported on July 28, 2019 at an abandoned garage and vacant lot in Mass City. Children entered an abandoned repair facility garage and found about a half cup of mercury in a small bottle. The spill was considered small, contained, and not a threat to the surrounding neighborhood. The Health Department, EPA, and hazardous materials cleanup crews were dispatched to clean-up and monitor air quality in the area.



EPA crew cleaning up mercury spill at abandoned repair facility garage in Mass City (Source: WLUC/Ontonagon County Emergency Management Coordinator)

⁴⁰ Vissers, J. (2020, November 14). “White Pine Mine tailings pond disappearing, still inspected as dam.” *The Daily Mining Gazette*. <https://www.mininggazette.com/news/features/2020/11/white-pine-mine-tailings-pond-disappearing-still-inspected-as-dam/>

⁴¹ Tucker, J. (2017, January 13). “Lake Shore Systems discusses future of Ontonagon facilities.” *The Daily Globe*. <https://www.yourdailyglobe.com/story/2017/01/13/news/lake-shore-systems-discusses-future-of-ontonagon-facilities/7823.html>

⁴² Michigan DEQ [EGLE]. (2013). Solid Waste Disposal Area Operating License: Ever-Green Landfill and Recycling Center, LLC. https://www.michigan.gov/documents/deq/DEQ-OWMRP-SW_Ever-Green_OpLicense_416656_7.pdf;

⁴³ Tucker, J. (2013 May 2010). “Solid Waste Committee OKs new landfill in Ontonagon.” *The Daily Globe*. http://www.yourdailyglobe.com/home/cms_data/default/photos/stories/id/9/3/493/4598558.pdf

Occurrence Probability and County Vulnerability

Probability of a fixed-sited incident is very low due to the limited number hazardous sites in the county. However, if an event were to occur, the outcome can range from a moderate to high severity. Since the county is remote, any fixed site incident may not be noticed immediately and can cause significant environmental impacts before it is properly addressed. This is the case where historical toxic release sites were located (e.g., White Pine). Population density, though low, near the two landfills in Greenland and Ontonagon Townships is vulnerable to any leaks or air pollution from the landfill, but regulations are in place to protect these residents and surrounding ecosystems.

Hazardous Materials: Transportation Accident

Hazard Description

Due to 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 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.⁴⁴ 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 not had a large-scale, serious hazardous material transportation incident, 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. As a major manufacturer, user, and transporter of hazardous materials, Michigan will always be vulnerable to the threat of a serious hazardous material transportation incident.

Historical Occurrence

M-28 through southern Ontonagon County is a major transportation route for trucks traveling through the region. There are also two railroads that bisect the county, one to the Village of

⁴⁴ 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>

Ontonagon and the other to White Pine. While certain types of hazardous freight materials may be transported on these two rail routes, the possibility of a railway accident is near zero as these routes are not regularly used. The county also has many miles of shoreline susceptible to shipping accidents on Lake Superior. The types and amounts of hazardous materials 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, the Ontonagon County Emergency Coordinator occasionally receives notices for passage of hazardous materials trucks passing through the county.

Occurrence Probability and County Vulnerability

In Ontonagon County, the probability of a hazardous materials transportation accident is low based on history, but there is a considerable risk. This is due to the high level of trucking traffic, proximity to shipping channels, and gasoline transmission lines within the county. Areas most susceptible and have a higher probability of experiencing an accident are corridors near M-28 and the immediate shorelines of Lake Superior. The potential severity of an event could range from low to extreme, depending on location and type of hazardous material involved in the accident.

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 fine 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 (H₂S) 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

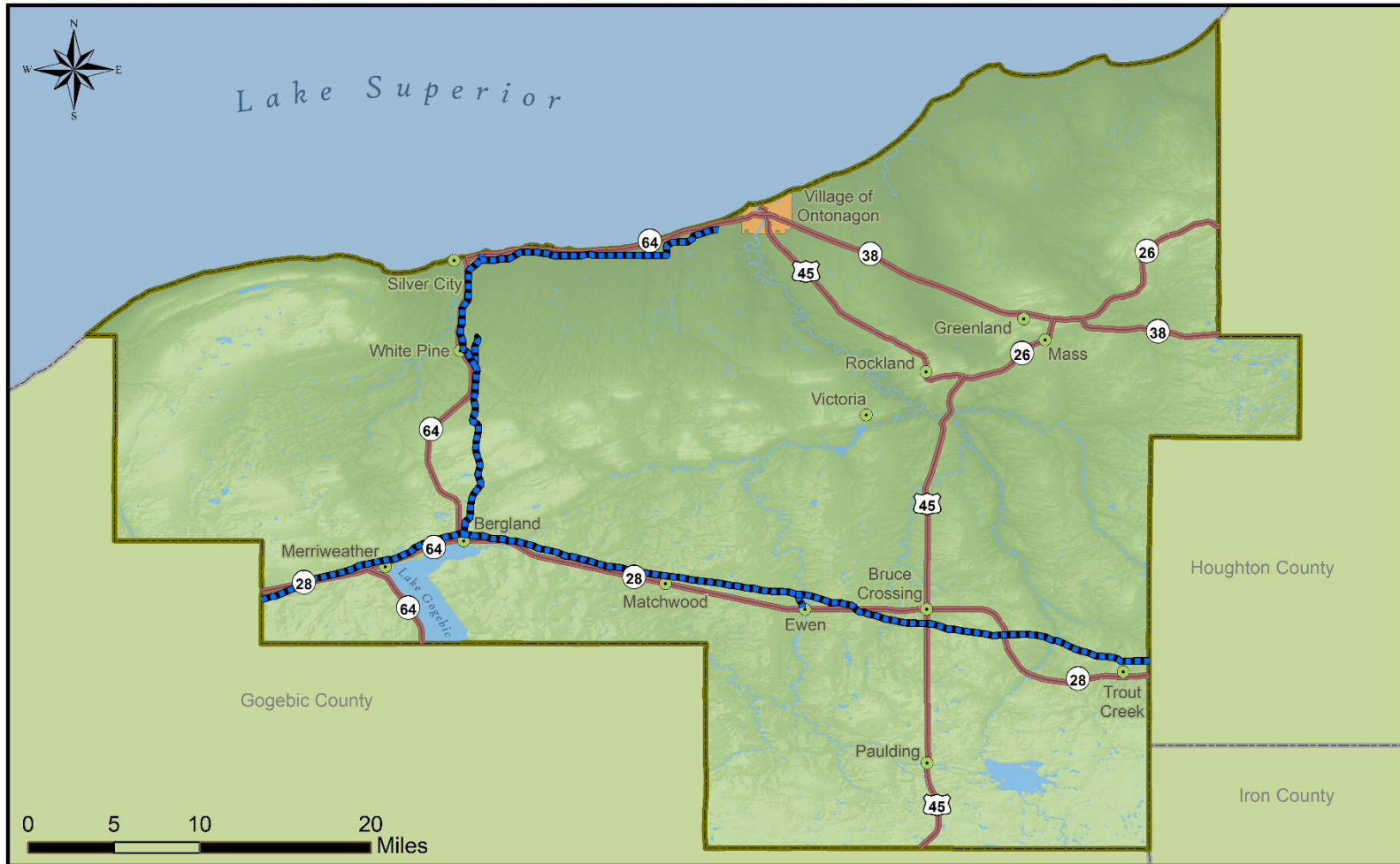
Northern Natural Gas has a natural gas pipeline that delivers natural gas to markets in Ontonagon County and surrounding areas (**Map 5.8**). The pipeline runs across the southern portion of Ontonagon County, through Interior, Stannard, McMillan, Matchwood, and Bergland Townships. In Bergland Township, the pipeline continues southwest towards Gogebic County and a spur goes north through Carp Lake Township. Near the Lake Superior shoreline, the pipeline then goes east towards Ontonagon Township and the Village of Ontonagon. For communities and residents without access to natural gas, there are two propane storage facilities in Ontonagon County: Settler's Coop in Bruce Crossing and FerrellGas in Ontonagon. There has been no known petroleum or natural gas incident in Ontonagon County.

Occurrence Probability and County Vulnerability

There is a risk of a natural gas pipeline or fixed-site propane or petroleum incident in Ontonagon 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. 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 low, but vulnerability is higher than optimal due to the condition of aging lines.

Most jurisdictions in Ontonagon County are vulnerable to a pipeline incident; the pipeline bisects 9 of the 12 jurisdictions. Built infrastructure, such as road, culverts, and utility transmission lines, are most vulnerable to pipeline and natural gas incidents. For the public who use natural gas in their homes or live nearby the natural gas pipeline, 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 vulnerability of municipalities and facilities to pipeline incidents.

Map 5.8: Pipelines in Ontonagon County



Pipelines Ontonagon 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

Gas Transmission Pipeline



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 and 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 become 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, heating and air conditioning, water, sewage disposal and treatment, storm draining, communications, and transportation. When one or more of these utility systems fail due to disaster or other cause, 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 drainage systems fail from damage or capacity overload, serious flooding can occur.

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 altered ways of life.

Many of the hazards considered in this plan could result in infrastructure failures and any resulting infrastructure failures are dangerous in Ontonagon County due to its harsh climate and remoteness. Ontonagon County is served by a several systems, including power, 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

Natural gas service is provided by SEMCO in the Village of Ontonagon, while other residents rely on propane services. Electric service in Ontonagon County is provided by Upper Peninsula Power Company (UPPCO), We Energies, Xcel Energies, and Ontonagon County REA. Service provider varies regionally within the county. 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.



Shoreline erosion threatens County Road 107 in Ontonagon County (Source: MDNR via [Keweenaw Report](#))

Roads are an essential infrastructure in the county as other forms of transportation infrastructure is either unavailable or unreliable. Based on the highest percentage of lane miles rated “good,” Ontonagon County ranked 12th out of 83 counties in the state of Michigan.⁴⁵ Of the 802.62 lane miles in the county, 207 miles were rated good (32.4%). Majority of roads in Ontonagon County are in fair condition (39% or 246.14 miles). About 29% or 185.58 miles were rated poor. Any large-scale disruptions to the road system in Ontonagon County may be largely disruptive as there are fewer networks of roads. Blocked roads or roads in poor condition that are closed affect

many more square miles than in a larger city. This is currently the issue on County Road (CR) 107, the main entry and only year-round paved access road on the east end of the Porcupine Mountains Wilderness State Park. It is slowly eroding away due to high lake levels (see Shoreline Flooding and Erosion for more detailed description of erosion issue). If this road became inaccessible, the detour to access the park can add up to 80 miles. In addition to adding mileage and time to visitor travel, it also increases the amount of time it takes for emergency response to arrive to the park.

The erosion and undermining of CR107 also threaten a municipal water line and an electric utility line. In addition to infrastructure along CR107, water systems and wastewater systems throughout the county can also be affected by failure or secondary failure and may be compromised by aging facilities.

Occurrence Probability and County Vulnerability

Probability of infrastructure failure is high, 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 future occurrences 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 Ontonagon County have partial or complete backup power sources (e.g., standby generators), such as the hospital and some fire/police stations.

⁴⁵ Levin, S. (2019 September 19). “These Michigan counties have the best road ratings.” MLive. <https://www.mlive.com/news/g661-2019/05/bc20bc6c406124/these-michigan-counties-have-the-best-road-ratings.html>

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 an emergency of disaster-level situation. 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 bus, a local public transit bus, or a school bus. Air transportation accidents can result in tremendous 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 may be equipped or trained to handle. If any of these accidents were to occur in a poor or rural community, an event can easily overwhelm the available resources in these areas.

Michigan has 19 airports with commercial passenger service,⁴⁶ 72 local bus transit systems serving 89 million passengers annually, 19 marine passenger ferry services and 3 intercity rail passenger corridors composed of 586 miles of track and serving 22 communities. Transportation services provided in Ontonagon County include school buses, non-emergency medical transport for elderly and veterans, and county-wide public transit services.⁴⁷

Historical Occurrence

While there have been minor transportation accidents within the county, there is no history of a large passenger transportation accident in Ontonagon County. In 2017, the Michigan State Police reported 322 car accidents in the county with one fatality and 35 injuries.⁴⁸ Many accidents were winter weather related, particularly during the first few snowfalls in the county. The one fatality occurred on June 2, 2017, when an empty dump truck crashed through guardrails, rolled over, and fell into a gully near Agate Falls on M-28. The driver was killed in the accident. Traffic was rerouted for nearly six hours. In 2018, deer related car accidents (216 incidences) comprised of more than half (66%) of all car accidents in Ontonagon County. A total of 329 crashes were reported in the county that year.⁴⁹ Almost all car accidents in Interior Township were deer caused (26 of 28 crashes).

⁴⁶ Michigan Department of Transportation Aeronautics – Commercial Service Airports. www.michigan.gov/aero/0,4533,7-352-79155_79156_79388---,00.html

⁴⁷ Get Around the Western U.P. website: <https://www.getaroundwup.org/transit>

⁴⁸ MSP. (2017). 2017 Year End Traffic Crash Statistics. https://www.michigan.gov/documents/msp/2017_Year-End_for_Web_621451_7.pdf

⁴⁹ Mack, J. (2019 October 15). “See number of 2018 deer crashes in your Michigan county, city, or township.” MLive. <https://www.mlive.com/news/g66l-2019/10/fa953518fe5490/see-number-of-2018-deer-crashes-in-your-michigan-county.html>

Snowmobile accidents are also an unfortunate common occurrence in Ontonagon County. In the winters of 2018-2019 and 2019-2020, three fatalities occurred.^{50,51} Speed or operator error and tree collisions were typically cited in these accidents. The Ontonagon County Sheriff, Michigan DNR Conservation Officers, and U.S. Forest Service Officers monitor snowmobile trails and respond to any accidents or careless riding that may occur.

On August 3, 2019, an airplane that departed the Gogebic County Airport that was supposed to arrive to the Ontonagon Airport was reported missing as it did not arrive as scheduled. Ground search teams, with assistance from the Civil Air Patrol, located the aircraft in an extremely remote and inaccessible area of Carp Lake Township. The pilot, who was the lone occupant of the airplane, was found deceased at the crash site.

Occurrence Probability and County Vulnerability

Though Ontonagon County based transportation conveyances are susceptible to few major passenger accidents, the risk presented by bypass-through traffic on the two east-west highway routes is considerable. The probability of an event is low, but if an accident were to occur, the severity would be high, particularly in communities that are located along major transportation routes. However, a relatively low volume of commercial traffic means that any incident would likely be isolated and of a small scale. 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. 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

The civil disturbance hazard now shifts farther beyond the emphasis on prisons that had been a part of its original concept in earlier planning documents. Prison disturbances are still considered a hazard, but these “disruptions” encompasses ongoing social, economic, political, and environmental issues in any society. Emergency management typically deals with recognized disasters and emergency events rather than social problems more broadly. Most civil disturbance events are rooted in other human circumstances. The most probable circumstances may involve reaction to other emergency or disaster events if overwhelming to or poorly handled by responders or governmental agencies. There are few, if any, historical records of such incidences escalating to the point of a civil disturbance emergency in Michigan.

⁵⁰ MDNR. (2020). Michigan Snowmobile Fatality Summary, 2018-2019.

https://www.michigan.gov/documents/dnr/MISnowFatalitySum_2018-2019_642716_7.pdf

⁵¹ MDNR. (2020). Michigan Snowmobile Fatality Summary, 2019-2020.

https://www.michigan.gov/documents/dnr/2019-2020_Michigan_Snowmobile_Fatality_summary_674461_7.pdf

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, 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 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.

Protest, 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 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 Ontonagon County in recent history. In the past decade, there have been only minor concerns affecting the general population, including a Rainbow Family gathering, but these crowds typically do not cause a disturbance in local communities.

Occurrence Probability and County Vulnerability

The risk for a civil disturbance is minimal in Ontonagon County. The probability of an incident is low throughout the county. There is still risk of disturbances due to governmental and resource extraction activities in the area. The Ontonagon County Courthouse in the Village of Ontonagon 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. 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 common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, many people. An additional effect of public health emergencies is the number of “worried well,” individuals who think they are unwell, who can overwhelm the system by seeking treatment. 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. 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 (foot-and-mouth disease and the West Nile encephalitis virus). Most recently, the novel Coronavirus disease (COVID-19) global pandemic has infected over 84 million people worldwide, with over 20 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).⁵² This number continues to increase due to

⁵² State of Michigan. Coronavirus – Michigan Data. https://www.michigan.gov/coronavirus/0,9753,7-406-98163_98173---,00.html

the highly contagious character of COVID-19 and the continuing global pandemic. In Ontonagon County, 252 cases have been confirmed and 13 confirmed deaths. 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 is responsible for addressing and trying to prevent public health emergencies within the county and Baraga, Houghton, Keweenaw, and Ontonagon counties. It does so by distributing public information for both preparedness and notification, establishing a regional hotline in the event regular telephone system are overwhelmed. They also distribute and administer vaccines or countermeasures, if necessary. The Health Department also protects and treats emergency responders and has the sole power of quarantine should it become necessary. The Health Department also provides 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 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 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 Ontonagon County. Testing kits are offered at no cost at the Western U.P. Health Department. 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 Ontonagon 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 public health emergencies 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 because of a different hazard altogether. Extreme cold, subsidence, flooding, infrastructure failure, and sabotage are a few examples of what can cause a disruption in water or sewer service.

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.”⁵³ While it is not an infectious disease outbreak, deaths due to drug overdoses are now greater than deaths due to car crashes in Michigan.⁵⁴ The state has the 14th highest overdose death rate in the country. In 2017, there were 2,686 drug overdose deaths in Michigan and was 12.1% higher than drug overdose deaths in 2016.⁵⁵ 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.

⁵³ Epidemic Disease Occurrence. Center for Disease Control and Prevention.

<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html>

⁵⁴ “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/>

⁵⁵ 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

Historical Occurrence

The most likely public health threat in Ontonagon County is influenza-type illnesses, which is the most common communicable disease, with an average mortality rate of 14.2 per 100,000 Western U.P. residents from 2015-2017.⁵⁶ Michigan's average mortality rate is 14.3. However, influenza by itself, which can be widespread, rarely becomes a public health emergency.

There is potential in Ontonagon County, as in all areas, for a larger disease outbreak as an isolated event or secondary to flooding or another type of incident. While the number of cases in the county is low, this does not mean that the illness is not present in the community or that there is no risk for infection. If a virus, such as COVID-19, infects a large portion of the population in the county, it could overwhelm local facilities that are equipped to deal with this type of emergency. Aspirus Ontonagon Hospital is an 18-bed critical access hospital offering 24-hour emergency treatment, and Upper Great Lakes Ontonagon Family Health Center clinic nearby offers primary care services. Despite awareness and planning, shortages of supplies, hospital rooms, and medical professionals to respond to the COVID-19 pandemic and other future disease outbreaks can cause significant harm to the public.

Of increasing threat are opioid and meth-related issues. In the Upper Peninsula, babies are treated for neonatal abstinence syndrome (NAS) at a higher rate than anywhere else in Michigan— 29 per 1,000 births in 2016.⁵⁷ There are no NICU treatment centers in the county to deal with a rising concern of addicts and those seeking treatment. The Upper Peninsula Substance Enforcement Team (UPSET) is a multi-jurisdictional narcotics task force that serves all U.P. counties, and collaborates with local, state, and federal agencies to assist with local or state police in apprehension. They are 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, which targets the Western Upper Peninsula in increased narcotics enforcement. Since 2016, UPSET West detectives have made 48 felony arrests, but are fighting a growing meth supply as heroin supply decreases.⁵⁸ In Ontonagon County, there have been multiple arrests related to the sale, production, and distribution of narcotics that involve UPSET.

From 2005-2012, Ontonagon County had the highest reported binge-drinking rates in Michigan. About 33.3% of the county's population, 41% of men and 26% of women, reported binge drinking at least once a month.⁵⁹ Binge drinking is a serious public health problem, but it is preventable. Binge drinking is associated with many health issues, such as unintentional injuries

⁵⁶ Michigan Department of Health and Human Services, Community Health Information. www.mdch.state.mi.us/pha/osr/chi/IndexVer2.asp

⁵⁷ Kovanis, G. (2018 May 30). The tiniest addicts: How U.P. babies became part of the opioid epidemic. *Detroit Free Press*. <https://www.freep.com/story/news/local/michigan/2018/05/03/opioid-epidemic-drug-addicted-babies/335398002/>

⁵⁸ *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/>

⁵⁹ Tanner, K. (2015 April 25). Where is binge drinking the highest? *Detroit Free Press*. <https://www.freep.com/story/opinion/contributors/raw-data/2015/04/24/binge-drinking-us-county/26332545/>

(car crashes, falls, alcohol poisoning), violence, and alcohol use disorders amongst other problems.⁶⁰

On September 28, 2006, a mercury spill was reported in the woodshop at Ontonagon Junior-Senior High School.⁶¹ Students found a rubber tube containing mercury in the back of a drawer. When the tube was picked up, approximately a pound of mercury spilled onto the floor. The students reported the spill to the teacher and were quarantined. The woodshop and adjacent storage room were secured and kept off-limits to unauthorized entry. Through the guidance of the Michigan DEQ (now EGLE), Michigan Department of Community Health, and the WUPHD, the school hired an environmental contractor from Wisconsin to clean up the spill and monitor air quality in the school. The spill was successfully cleaned up and air quality was deemed safe for students and teachers to use the woodshop.

Another less urgent issue is that of dilapidated buildings, which are abundant in many jurisdictions in Ontonagon County. These structures are often associated with asbestos, a component of past insulation materials which has been found to cause health problems, and with other hazards.

Occurrence Probability and County Vulnerability

Public health emergencies can arise from a wide range of causes and exhibit varying levels of severity. In Ontonagon County, the probability of a public health emergency is highly likely, as some health emergencies are currently occurring in the county (i.e., opioid and meth-related health emergencies and COVID-19). The severity of a public health emergency, like 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 deal with this type of emergency, such as long-term care facilities and rural medical centers.

All individuals are vulnerable to the hazards of an epidemic, but vulnerable populations are at higher risk of succumbing to an illness. The remoteness of the county could also be problematic during a large-scale emergency. In Ontonagon County, the greatest susceptibility to most types of public health emergencies is the Village of Ontonagon, due to higher population and tourists from Porcupine Mountains Wilderness State Park. However, events dealing with natural resource contamination would affect the Village the most 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, restaurants, etc. Individual wells and septic systems and public water, sewer, and electric facilities are also vulnerable to a public health emergency. They may infect,

⁶⁰ CDC. (2019 December 30). “Binge Drinking.” Center for Disease Control and Prevention: Alcohol and Public Health. <https://www.cdc.gov/alcohol/fact-sheets/binge-drinking.htm>

⁶¹ Michigan Department of Community Health. (2007 April 3). Ontonagon High School Mercury Release – Ontonagon, Michigan. <https://www.atsdr.cdc.gov/HAC/pha/OntonagonHighSchoolMercurzRelease/OntonogonHighSchoolHC033007.pdf>

transport, or have secondary impacts if not available or limited in service. Almost all local communities in Ontonagon 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 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 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.

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 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.

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.

Historical Occurrence

While there have been acts of terrorism and sabotage within Michigan, there is no recorded history of these events occurring in Ontonagon County.

Occurrence Probability and County Vulnerability

The probability of sabotage and terrorism in Ontonagon County is very low but should not be ignored as these incidents can occur at any level. Most potential target facilities are in the populated areas. Vulnerable critical facilities include, but are not limited to, water treatment plants, dams, and private wells. 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. If an incident does occur, severity is impossible to predict.

SECTION 6: Risk Assessment

The hazard profiles presented in the *Hazard Analysis* 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, literature review, 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 Risk Analysis Methodology
- Hazard Priority Risk Index and Ranking
- Hazard Summary

Differential Vulnerability

Numerous variables can affect the vulnerability of the county to hazards, including climate, location, scale, and time of day. Time of year also affects vulnerability. The population in many jurisdictions varies by season, and response capabilities are often compromised in winter.

Although Ontonagon 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 Ontonagon 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 Ontonagon 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 Ontonagon 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 in Ontonagon County

Jurisdiction (Population)	Extreme Temperatures	Fog	Hail	Ice & Sleet Storms	Lightning	Severe Winds	Snowstorms and 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
Ontonagon County (6,072)	X	X	X	X	X	X	X	X				X	X	X	X		X	X	X	X		X	X	X	X	X
Bergland Township (485)									X	X						X					X					
Bohemia Township (48)											X					X										
Carp Lake Township (702)									X	X	X					X					X					
Greenland Township (585)									X							X										
Haight Township (181)									X							X										
Interior Township (408)									X												X					
Matchwood Township (76)									X	X						X					X					
McMillan Township (432)									X												X					
Ontonagon Township (2,217)									X	X	X					X					X					
Rockland Township (221)									X							X										
Stannard Township (717)									X							X					X					
Village of Ontonagon (1,448)									X	X	X										X					

Table 6.2: State-equalized value for Ontonagon County, 2020

**** REAL ****						Total Real	Personal	Total Real & Personal	
Township/City	Agricultural	Commercial	Industrial	Residential	Timber Cutover				
Bergland Township	\$0	\$2,259,900	\$123,500	\$36,389,000	\$487,800	\$39,260,200	\$1,643,550	\$40,903,750	
Bohemia Township	\$89,831	\$97,561	\$9,750	\$12,862,905	\$789,255	\$13,849,302	\$280,438	\$14,129,740	
Carp Lake Township	\$44,450	\$2,150,250	\$2,572,050	\$24,814,000	\$4,234,650	\$33,815,400	\$3,747,150	\$37,562,550	
Greenland Township	\$1,799,400	\$1,667,300	\$20,850	\$17,907,600	\$2,156,600	\$23,551,750	\$2,330,550	\$25,882,300	
Haight Township	\$313,400	\$286,050	\$4,280,900	\$14,001,950	\$1,858,300	\$20,740,600	\$737,500	\$21,478,100	
Interior Township	\$751,250	\$268,510	\$576,710	\$12,023,716	\$1,002,750	\$14,622,936	\$1,343,236	\$15,966,172	
Matchwood Township	\$2,838,560	\$0	\$135,510	\$6,293,776	\$2,833,940	\$12,101,786	\$613,650	\$12,715,436	
McMillan Township	\$1,956,150	\$1,297,550	\$38,250	\$13,790,400	\$1,129,900	\$18,212,250	\$1,558,050	\$19,770,300	
Ontonagon Township	\$1,025,450	\$6,034,600	\$1,279,400	\$75,292,200	\$3,738,050	\$87,369,700	\$6,549,750	\$93,919,450	
County Total Real and Personal									\$344,433,848

Source: Michigan Department of Treasury Assessed & Equalized Valuation

Hazard Extent

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

Table 6.3: Hazard Extent in Ontonagon County

Weather Hazards	
Extreme Temperatures	Extreme heat event extent is measured through the heat index, which is temperature in relation to percentage of humidity. The highest recorded temperature was on July 31, 2006, where heat indices were 100°F to 105°F. Extreme cold extent is generally measured through the wind chill temperature index. The coldest recorded temperature occurred over two days on January 21-22, 2013. Wind chills were between -35°F to -40°F. 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 the fog itself is not hazardous.
Hail	Hail extent is defined by the hail stone size. The largest hail stone sizes reported in Ontonagon County is 1.75 inches. Future events may result in larger hail stones.
Ice and Sleet Storms	The extent of ice and sleet storms can be classified by meteorological measurements and by evaluating its societal impacts. The most significant ice storm occurred on April 26, 2017 when over one inch of ice from freezing rain, combined with heavy, wet snowfall, damaged trees and about 35-50 miles of trails in the Porcupine Mountains Wilderness State Park.
Lightning	The frequency of cloud-to-ground lightning flashes per square mile can be used as a method to measure extent. Ontonagon County receives approximately 0.75 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 75 mph (65 knots) on July 21, 2016 in the Village of Ontonagon. Note that future events may result in stronger winds.
Snowstorms and Blizzards	The extent of winter storms can be measured by amount of snowfall received (in inches). On March 24, 1996, a winter storm resulted in 20-28 inches of snow accumulating overnight within the county. Future events may result in greater snow accumulation.
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 (Table 5.8 and Table 5.9). According to NCEI, three tornadoes have historically occurred in Ontonagon County. The most recent tornado reported was an EF0 on August 19, 2011 near the Village of Ontonagon.
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 14 dams in the county, half are used for hydroelectric generation, and four of the 14 are 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. Although no dam failures have been reported, a future event may occur.
Riverine and Urban Flooding	Flood extent in Ontonagon County is measured by the duration and magnitude of an event. On April 1, 1963, a flood damaged almost all properties in downtown Ontonagon; snowmelt from an especially brutal winter and unseasonably warm temperatures melted snowpack which overburdened the Ontonagon River, and the downtown area flooded 2-4 feet. Damage estimates were over \$500,000.
Shoreline Flooding and Erosion	The extent of erosion can be defined by the rate (in feet) of erosion that occurs designated by EGLE. There are no areas that are considered a high-risk erosion shoreline in Ontonagon County, but due to rising lake levels, this may change. Areas may experience a higher rate of erosion in the future.
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 the Modified Mercalli Intensity (MMI) scale and the distance of the epicenter from Ontonagon County. It was determined that this hazard does not threaten the county.
Subsidence (Ground Collapse)	Subsidence is measured by total displacement material volume from the event, as well as monetary damages to infrastructure and properties.
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	Extent is measured by the spatial extent of an incident, and volume of

Incidents	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.
- Ontonagon County emergency manager 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

To draw some meaningful planning conclusions on hazard risk for Ontonagon 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, which is described further below, is to categorize and prioritize all potential hazards for Ontonagon 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 using 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 Ontonagon County jurisdictions to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for Ontonagon 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 Ontonagon County Local Planning Team (LPT) in gaining consensus on the determination of those hazards that pose the most significant threat to Ontonagon 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 Ontonagon 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:

$$\text{PRI VALUE} = [(\text{PROBABILITY} \times .30) + (\text{IMPACT} \times .30) + (\text{SPATIAL EXTENT} \times .20) + (\text{WARNING TIME} \times .10) + (\text{DURATION} \times .10)]$$

According to the weighting scheme, the highest possible PRI value is 4.0. Applying the weighting scheme to Ontonagon County, the highest score of 3.3 was calculated for snowstorms and blizzards. 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 software was unable to be utilized in estimating potential losses from hazards. To improve model accuracy and future hazard mitigation planning, Ontonagon 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 Summary Table

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 Local Planning Team (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 Ontonagon 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	2.4
Fog	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.2
Hail	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.3
Ice and Sleet Storms	Likely	Minor	Large	12 to 24 hours	Less than 6 hours	2.5
Lightning	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.0
Severe Winds	Likely	Limited	Small	Less than 6 hours	Less than 24 hours	2.9
Snowstorms and Blizzards	Highly Likely	Critical	Large	12 to 24 hours	Less than one week	3.3
Tornadoes	Unlikely	Critical	Negligible	Less than 6 hours	Less than 6 hours	2.4
Hydrological Hazards						
Dam Failures	Possible	Critical	Small	6 to 12 hours	Less than 24 hours	2.4
Riverine and Urban Flooding	Likely	Limited	Moderate	6-12 hours	Less than one week	2.7
Shoreline Flooding and Erosion	Highly Likely	Limited	Small	Less than 6 hours	More than one week	2.9
Drought	Possible	Minor	Large	Less than 6 hours	More than one week	2.5
Ecological Hazards						
Wildfires	Likely	Limited	Small	12-24 hours	Less than 24 hours	2.2
Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
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	Highly	Limited	Small	Less than	Less than	2.4

(Ground Collapse)	Likely			6 hours	6 hours	
Technological (Industrial) Hazards						
Scrap Tire Fires	Unlikely	Minor	Small	Less than 6 hours	Less than 24 hours	1.5
Structural Fires	Highly Likely	Critical	Small	Less than 6 hours	Less than 24 hours	2.9
Hazardous Materials: Fixed Site Incidents	Likely	Minor	Small	12-24 hours	More than one week	2.3
Hazardous Materials: Transportation Accident	Possible	Limited	Small	Less than 6 hours	More than one week	2.0
Petroleum and Natural Gas Incidents	Possible	Limited	Moderate	Less than 6 hours	Less than one week	2.0
Infrastructure Hazards						
Infrastructure Failures & Secondary Technological Hazards	Likely	Critical	Moderate	Less than 6 hours	More 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	Highly Likely	Catastrophic	Moderate	12 to 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 Ontonagon 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 Ontonagon 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: Conclusions on Hazard Risk for Ontonagon County

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

Hazard Summary

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

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

Hazard mitigation activities will focus on mitigating loss due to these priority hazards in Ontonagon 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 Ontonagon County and its municipal jurisdictions to follow reduce potential exposure and losses identified as concerns in the Risk Assessment portion of this plan. The Local Planning Team and the Emergency Manager reviewed the risk assessment to identify and develop these actions. This section includes:

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

Overview of Mitigation Strategy Development

In formulating Ontonagon 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 Local Planning Team, 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 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 Ontonagon 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 Local Planning Team 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: Actions 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 Ontonagon 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

The goals of the Ontonagon County Hazard Mitigation Plan were crafted early in the planning process through a facilitated discussion and brainstorming session with the Local Planning Team (for more details, please see the summary of the second Local Planning Team meeting in Section 3: Planning Process). Each of the following goal statements represent a broad target for Ontonagon County and its jurisdictions to achieve through the implementation of their own specific Mitigation Actions Plans. These goals were reviewed at the Local Planning Team Meeting (October 2019) and confirmed to still be valid with few changes for the 2020 Ontonagon 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 Ontonagon 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. It has been determined by the Ontonagon County Local Planning Team that the above 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.

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, number 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 Ontonagon 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 Ontonagon 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, however these planning initiatives generally present significant opportunities to integrate mitigation principles into the local decision-making process.

Table 7.1 provides a summary of relevant local plans, ordinances and programs already in place or under development for Ontonagon 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.

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

Jurisdiction	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
Bergland Township		✓	✓			✓		✓		✓*		✓	✓	
Bohemia Township								✓						
Carp Lake Township			✓*			✓*		✓				✓	✓	✓
Greenland Township								✓						
Haight Township								✓						
Interior Township			✓			✓		✓				✓	✓	
Matchwood Township								✓						
McMillan Township								✓						
Ontonagon Township								✓						✓
Rockland Township								✓						
Stannard Township								✓				✓	✓	
Village of Ontonagon	✓		✓*			✓		✓		✓		✓	✓	✓
Ontonagon County						✓		✓						

**Plan under development*

Mitigating Hazards in Ontonagon County

The following is an overview of potential activities by category and general recommendations within each activity category for Ontonagon 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 Ontonagon County, the County itself is responsible for all electrical, mechanical, and plumbing code enforcement and for building code enforcement in all jurisdictions except Bergland Township, Carp Lake Township, Interior Township, Stannard Township, and the Village of Ontonagon, which 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 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. Of the 12 local jurisdictions in Ontonagon County, only five are zoned. Four have Master Plans but are currently going through updating.



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 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 provide 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.

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.



Bioswales are vegetated, or mulched 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.

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. 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.⁶² 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.⁶³

Emergency Services

Local emergency services authorities, resources, and facilities throughout Ontonagon 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

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

⁶² Farmland and Open Space Preservation Frequently Asked Questions. MDARD.

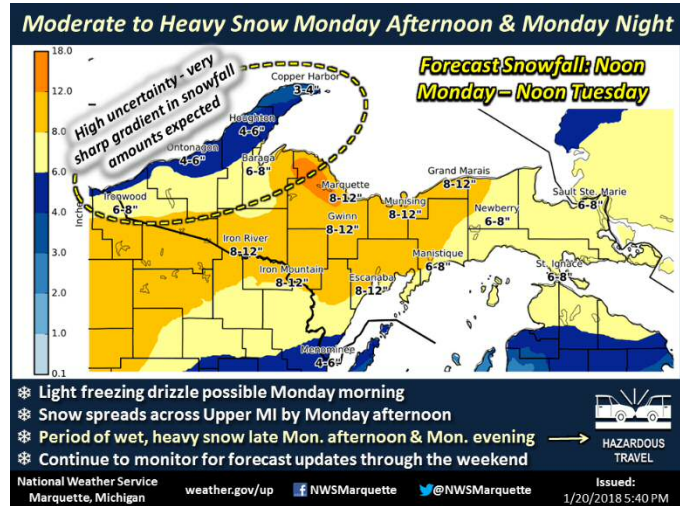
https://www.michigan.gov/mdard/0,4610,7-125-1599_2558-10312--,00.html

⁶³ 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

rainfall, soil moisture, and stream flows upstream and then calculating flood levels for downstream locations. Discerning the time 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:



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

- 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 part of the Emergency Action Plan (EAP). An EAP ensures that the community responds efficiently and appropriately to an incident. 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 primary 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 Crossing Improvements
- Levees/Floodwalls/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: 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 village or township must perform routine maintenance on these drainage systems or they (or residents in the watershed) may petition the County Road Commission (Ontonagon County does not have a drain commissioner) to establish a county drain which after approval by the County Board of Commissioners, 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 (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 Ontonagon County and its local 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 Ontonagon 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 B.

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		
Michigan Department of Environment, Great Lakes, and Energy	Michigan Department of Natural Resources	Michigan Economic Development Corporation
Michigan Department of Transportation		
Other - Local		
Gogebic-Ontonagon Community Action Agency	Keweenaw Land Trust	Superior Health Foundation
Portage Health Foundation	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 Ontonagon 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 Ontonagon 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 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 will monitor and evaluate the plan implementation overtime to assess the effectiveness of the plan at achieving its stated goals. They will work with Ontonagon 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 5-year action plan set out by the Local Planning Team for Ontonagon 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 Ontonagon County and its communities. All the activities identified in this section are consistent with the following mitigation goals identified in Section 7:

- 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 Ontonagon 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.

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 by the Emergency Manager, this does not limit the County's or a local community's ability to pursue identified projects as funding becomes available. Several 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, jurisdiction, timeline, projected costs if available, and ways that Ontonagon 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

The tables below summarize the status of the mitigation action items from the 2005 (**Table 8.1**) and 2013 (**Table 8.2**) Hazard Mitigation Plans.

Table 8.1: 2005 Hazard Mitigation Action Items

2005 Item	Status
Update Village of Ontonagon Land Use Plan and Zoning	Completed
Ontonagon Harbor Dredging	Ongoing
Village Drainage Study and Improvement	Ongoing
Update Stormwater Management Plans and Flood Maps	Ongoing
Improved Emergency Response	Ongoing
Review Plans and Development Regulations	Ongoing
New West Branch Bridge/M28	Completed
Mine Shaft Safety	Ongoing
Update Shoreline Erosion Map and Identify Future Mitigation Activities	Partially Completed
Public Information/Education Program	Ongoing
Insurance	Ongoing
Relocation of Village Office, Department of Public Works and Firehall	Ongoing
Adopt Hazard Mitigation Plan and Update Regularly	Ongoing

Table 8.2: 2013 Hazard Mitigation Action Items

2013 Item	Status
Ontonagon Harbor Dredging	Ongoing
Village Drainage Study and Improvement	Not completed ⁶⁴
Snow Removal	Ongoing
Update Stormwater Management Plans and Flood Maps	Ongoing
Drainage Improvements and Maintenance	Ongoing
Improved Emergency Response	Completed
Review Plans and Development Regulations	Ongoing
New South Branch Bridge/M28	Not completed ⁶⁴
Mine Shaft Safety	Ongoing
Public Information/Education Program	Ongoing
Insurance	Ongoing
Relocation of Village Office, Department of Public Works, and Fire Hall	Not Completed ⁶⁴
Backup Power for Emergency Facilities/Designated Shelters	Ongoing
Adopt Hazard Mitigation Plan and Update Regularly	Ongoing

⁶⁴ Action items were not completed due to lack of funding to complete projects. The community also shifted priorities and these action items were no longer being pursued.

Action Items

Some action items are carried over from the 2013 Hazard Mitigation Plan. Several of these are ongoing activities that will continue indefinitely. One project has been completed since the last plan update, while others have not been completed as funding has not been available. No large-scale changes in land development have occurred in Ontonagon County. Most construction has been incremental or adjacent to already developed areas. The most likely site of land development in the county is in White Pine, where the former copper mine remains a site for possible re-use. Projects have been listed by priority, set by the Ontonagon County Emergency Manager, with Action Item 1 being the most important project to be completed in the next five years.

The 2020-2025 Ontonagon County action items seek 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 party, an estimated deadline, projected cost, potential funding sources, and an outline of how the action would benefit the county.

Action Item 1: Reroute/Repair County Road 107 to Porcupine Mountains Wilderness State Park

County Road 107 (CR107) is the only year-round access to the main park entrance, visitor center, and park headquarters of the Porcupine Mountains Wilderness State Park. The road is under the jurisdiction of the Ontonagon County Road Commission. Recently, over 1.6 miles of CR107 is experiencing erosion and surface undermining due to high Lake Superior water levels and an increase in the frequency and intensity of storm events. In addition to the road, a water utility line and an electric utility line are also in danger of being damaged. To protect the road and associated infrastructure from further shoreline erosion, the county road commission, in partnership with the Michigan Department of Transportation (MDOT), Michigan Department of Natural Resources (MDNR), and the Superior Watershed Partnership, have proposed to do the following to CR107: road reconstruction (200-yards inland from current location), road realignment, bridge construction, installation of culverts, improve storm water infrastructure, and create and install related signage. Erosion control, rock rip-rap replacement, native plant restoration, and stream restoration will also occur. The public will also be regularly engaged and informed throughout the process. Both Carp Lake and Ontonagon Township, along with the Ontonagon County Board of Commissioners have expressed support for this action item.

<i>Responsible Agency:</i>	Ontonagon County Road Commission, Carp Lake Township, MDOT, MDNR, and Superior Watershed Partnership
<i>Deadline:</i>	2023
<i>Cost:</i>	\$11,981,600
<i>Potential Funding Sources:</i>	FEMA Building Resilient Infrastructure and Communities Program, MDOT, Ontonagon County Road Commission
<i>Benefits:</i>	Rebuilding CR107 not only improves year-round access to the park for

visitors, but it also helps ensure public safety, allows year-round access for local businesses and residents, protect community water and electric utility lines, and improves economic benefits to surround rural communities.

Action Item 2: Backup Power for Emergency Facilities and Designated Shelters/Facilities

A limited number of critical facilities throughout the county have backup power or emergency generators, which includes the Sheriff’s Department, hospital, county courthouse, and the volunteer fire departments in Greenland Township and the Village of Ontonagon. Despite some availability for power generation, many other facilities that are considered critical for community health and safety, such as grocery stores and gas stations, do not have access to backup power. Emergency generators should be purchased for a local gas stations near the Village of Ontonagon and other populated communities. These gas stations not only provide fuel, but also a convenience store.

<i>Responsible Agency:</i>	Ontonagon County Emergency Services, Greenland Township, Village of Ontonagon
<i>Deadline:</i>	2022
<i>Cost:</i>	\$27,000 per generator
<i>Potential Funding Sources:</i>	FEMA Building Resilient Infrastructure and Communities Program
<i>Benefits:</i>	Emergency generators provide a secondary source of power in a variety of critical facilities. For example, if a local gas station had backup power, community members and emergency response personnel do not need to travel out of the county to obtain fuel.

Action Item 3: Volunteer Fire Department Outreach, Recruitment, and Retention

All village and township fire departments in Ontonagon County rely on volunteer firefighters. Despite this heavy reliance, it has become increasingly difficult to recruit and train new volunteers. The loss of population in the county and a high median age (58.1 years) have resulted in fewer individuals volunteering to train and become a firefighter. Recruitment should be focused on not only finding individuals who are willing to complete training, but also tracking them through the application and training process to ensure that the individual will become a successful firefighter. Creating a long-term recruitment plan, marketing strategies to younger community members, and potentially developing a citizen’s fire academy are some methods that the county may implement to recruit more volunteers.

<i>Responsible Agency:</i>	Ontonagon County, Ontonagon County Emergency Services
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Varies
<i>Potential Funding Sources:</i>	FEMA Staffing for Adequate Fire & Emergency Response Grant (SAFER) and FEMA Assistance to Firefighters Grant Program
<i>Benefits:</i>	Increasing the number of volunteer firefighters in the county is vital to

the safety of all county communities, critical facilities, and homes. More trained firefighters in the county would result in improved fire prevention programs and an enhanced ability to protect the health and safety of the public. This will also help prevent site-specific fires from becoming catastrophic events, protecting residents and natural resources.

Action Item 4: Mine Shaft Safety

The Western U.P., which includes Ontonagon County, does not have a regional mining rescue organization to assist the county if an accident were to occur at a historical mining site. Emergency response crews lack small space rescue trainings and rescue efforts are typically limited due to the lack of insurance at many historical mines. Priority locations include Rockland and Carp Lake Townships but mine shaft safety is a concern throughout the County. To increase mine shaft safety and prevent accidents, an ongoing safety program that includes capping and other measures should be implemented. As funding is available, the county will prioritize and address hazardous shafts.

<i>Responsible Agency:</i>	Ontonagon County/Mine Inspector
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	\$15,000 per shaft or opening
<i>Potential Funding Sources:</i>	FEMA Hazard Mitigation Grant Program and DOI Abandoned Mines Reclamation Program
<i>Benefits:</i>	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 5: Mine Inspector

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

<i>Responsible Agency:</i>	Ontonagon County, Ontonagon County Emergency Services
<i>Deadline:</i>	2020
<i>Cost:</i>	\$45,000 annually
<i>Potential Funding Sources:</i>	County operating funds, countywide millage, and DOI Abandoned Mines Reclamation Program
<i>Benefits:</i>	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 6: Public Information and Education Programs

Public information is key to mitigating many of the potential hazards in Ontonagon County. 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.

<i>Responsible Agency:</i>	Ontonagon County Emergency Services, DNR, MSU Extension, Gogebic Ontonagon ISD, and other local organizations
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Staff time, cost of programming and materials
<i>Potential Funding Sources:</i>	Organization/agency operating budgets, FEMA, DHS Homeland Security Grant Program, Michigan Invasive Species Grant Program, and other federal and state sources
<i>Benefits:</i>	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 7: 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.

<i>Responsible Agency:</i>	Ontonagon County, local organizations, and EDOs
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Staff time
<i>Potential Funding Sources:</i>	Organization/agency operating budgets and federal and state sources
<i>Benefits:</i>	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 8: Drainage Improvements and Maintenance

Drainage systems are insufficient to handle runoff in several areas throughout the county. Ditches should be added and dredged, and culverts must be kept clear.

<i>Responsible Agency:</i>	Ontonagon County Road Commission, Village of Ontonagon, and Township Public Works Departments
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Varies by project
<i>Potential Funding Sources:</i>	FEMA Building Resilient Infrastructure and Communities Program, organization/agency operating budgets
<i>Benefits:</i>	Inspection and maintenance of the existing drainage system will prevent flooding caused by plugged culverts, insufficient ditches and storm sewers, and improper elevation and leveling of land. Problems will be alleviated in areas where materials are washed into waterways regularly during spring flood conditions. Studies and improvements in the highway corridors will address ongoing spring runoff problems.

Action Item 9: Review Plans and Development Regulations

Ontonagon County’s emergency manager will work with the County Board and County Planning Commission to ensure hazard mitigation is included in ongoing county planning activities. During updates to County plans and regulations, the County will consider actions and recommendations that divert new development from identified hazards, ensure adequate fire and emergency access, require buried utility lines, and preserve open space to protect properties from flooding.

As local land use plans, comprehensive plans, zoning, building codes, and other plans/regulations become due for revision, appropriate hazard mitigation provisions will be considered and incorporated. The Ontonagon County Planning Commission can ensure hazard mitigation measures are addressed during required comment period under the Michigan Planning Enabling Act.

<i>Responsible Agency:</i>	Emergency Manager and Ontonagon County Planning Commission
<i>Deadline:</i>	Ongoing as plans and ordinances are reviewed
<i>Cost:</i>	Staff and Commission time
<i>Potential Funding Sources:</i>	Organization/agency operating budgets
<i>Benefits:</i>	Citizens of Ontonagon County will benefit from plans that protect new development from known hazards and from awareness of methods to do so.

Action Item 10: Snow Removal

Winter is the most critical of seasons within Ontonagon County and the ability of the County Road Commission to keep roads sanded and clear is vital to protecting the public. Snow removal equipment must be purchased as needed.

<i>Responsible Agency:</i>	Ontonagon County Road Commission
<i>Deadline:</i>	Ongoing

<i>Cost:</i>	\$5 to \$6 million
<i>Potential Funding Sources:</i>	FEMA Building Resilient Infrastructure and Communities Program and local funding
<i>Benefits:</i>	Maintenance of safe travel throughout the county is vital to the public, business, and emergency response capabilities.

Action Item 11: Ontonagon Harbor Dredging

Ontonagon Harbor in the Village of Ontonagon needs annual dredging to prevent spring ice dam and flooding problems as well as to ensure harbor access. The U.S. Army Corp of Engineers (USACE) currently does the river dredging at the extent needed, but indications are that funding may be eliminated, so alternate measures must be considered. Furthermore, dredging of sufficient depth to accommodate commercial freight (19 feet) generally cannot be funded by USACE unless shipping operations are already occurring. This policy essentially eliminates more extensive dredging given the harbor's current inactivity. This item remains an ongoing high priority since 2005.

<i>Responsible Agency:</i>	Ontonagon County, Village of Ontonagon
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Approximately \$400,000/year
<i>Potential Funding Sources:</i>	FEMA Building Resilient Infrastructure and Communities Program and USACE
<i>Benefits:</i>	Previous flooding in the Village of Ontonagon has been attributed to the buildup of silt at the mouth of the Ontonagon River. By keep the harbor dredged, the ice flows will not become ice dams. Annually 100,000 to 300,000 tons are removed from the harbor each year.

Action Item 12: Identify and Inventory Datasets for Quantitative Hazard Analysis

Through the hazard mitigation planning process there were many data gaps identified including flood depth grids for rigorous hydrological modeling, structural and wildfire events, abandoned mine status, age, and estimated value of all critical facilities, comprehensive asset inventory, dam inundation modeling for high hazard dams, and updated flood erosion maps for current and rising lake levels.

<i>Responsible Agency:</i>	Ontonagon County Emergency Services, local municipalities, Michigan Department of Natural Resources, and local volunteer fire departments.
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Unknown
<i>Potential Funding Sources:</i>	FEMA Building Resilient Infrastructure and Communities Program and EGLE
<i>Benefits:</i>	Comprehensive risk assessment including both qualitative and quantitative analysis.

Action Item 13: Flood Insurance

Not all hazards can be mitigated prior to occurrence, but by maintaining insurance property owners can protect themselves from loss due to hazards. Property owners should be notified about insurance coverage or opportunities that they may be eligible for.

<i>Responsible Agency:</i>	Municipalities, residents, business owners, and others
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Varies – specific to property
<i>Potential Funding Sources:</i>	FEMA National Flood Insurance Program (only in participating communities), organization/agency operating budgets, and individual property owners
<i>Benefits:</i>	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 its local jurisdictions can also educate citizens on the importance of maintaining adequate property insurance.

Action Item 14: Adopt Hazard Mitigation Plan and Update Regularly

By adopting the Ontonagon 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, in coordination with the Emergency Operation Plan update, will review the hazard mitigation plan annually 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 Ontonagon 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.

<i>Responsible Agency:</i>	Ontonagon County Emergency Services
<i>Deadline:</i>	Every five years
<i>Cost:</i>	Staff time
<i>Potential Funding Sources:</i>	FEMA and organization/agency operating budgets

Benefits:

The adoption of the Hazard Mitigation Plan commits Ontonagon 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 Ontonagon County.

Appendix

Appendix A: County Capability Snapshot

Appendix B: Mitigation Funding and Resources

Appendix C: County Letter to Commit Match

Appendix D: Public Participation

Appendix E: Meeting Materials

Appendix F: State Document Review

Appendix G: Plan Adoption

Appendix A: County Capability Snapshot

Ontonagon County

2020-2025

Hazard Mitigation Plan



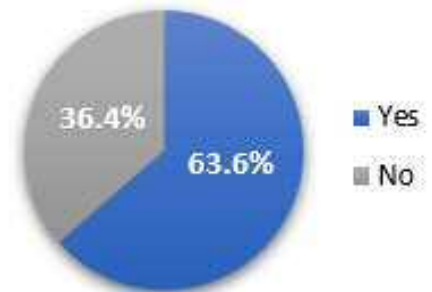
FAST FACTS

Area: 1,316 sq. miles	Climate: humid continental	Growing Season: 100 days	Population: 6,072
Housing: 5,679 unites	Average Household Income: \$36,073	Poverty Rate: 15.5%	Disability: 14.4%

PUBLIC SURVEY SUMMARY

Respondents are very concerned about extreme weather temperatures, wildfires, severe winds, and snowstorms and blizzards. In the last five years, most households have experienced severe winds or windstorms at 50.0%, the second most common hazard experienced was flooding at 33.3%. Respondents were asked whether they had taken actions to make their home or community more resistant to hazards. Half (50.0%) 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 internet radio, phone, and internet - social media.

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



DISASTER DECLARATIONS

Ontonagon County has experienced eight presidential declarations since 1965. Three has 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
COVID-19	March 13, 2020
COVID-19 Pandemic	March 20, 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	
<ul style="list-style-type: none"> Snowstorms & Blizzards Riverine & Urban Flooding Severe Winds Invasive Species 	<ul style="list-style-type: none"> Public Health emergencies Shoreline Flooding & Erosion Structural Fires Transportation Accidents
Moderate Risk	
<ul style="list-style-type: none"> Infrastructure Failures & Secondary Technological Hazards Ice & Sleet Storms Drought Extreme Temperatures 	<ul style="list-style-type: none"> Tornadoes Dam Failures Subsidence (Ground Collapse) Sabotage & Terrorism
Low Risk	
<ul style="list-style-type: none"> Hail Hazardous Materials: Fixed Site Incidents Wildfires Fog Earthquake 	<ul style="list-style-type: none"> Lightning Hazardous Materials: Transportation Accidents Petroleum & Natural Gas Incident 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 Ontonagon County and its communities. All activities are consistent with the following mitigation goals:

- Goal 1:** Protect lives and property within Houghton 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
Reroute/Repair County Road 107 to Porcupine Mountains Wilderness State Park	2023	\$11,981,600
Backup Power for Emergency Facilities and Designated Shelters/Facilities	2022	\$27,000/generator
Volunteer Fire Department Outreach, Recruitment, and Retention	Ongoing	Varies
Mine Shaft Safety	Ongoing	\$15,000/opening
Mine Inspector	2021	\$45,000/year
Public Information and Education Programs	Ongoing	Staff Time
Reduce possibility of damages and losses resulting from disease/pandemic hazards	Ongoing	Staff Time
Drainage Improvements and Maintenance	Ongoing	Varies
Review Plans and Development Regulations	Ongoing	Staff Time
Snow Removal	Ongoing	\$5 to \$6 million
Ontonagon Harbor Dredging	Ongoing	\$400,000/year
Identify and Inventory Datasets for Quantitative Hazard Analysis	Ongoing	Unknown
Insurance	Ongoing	Varies
Adopt Hazard Mitigation Plan and Update Regularly	Every 5 years	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: Mitigation Funding and Resources

Federal Resources.....1
State Resources.....2
Other – Local Nonprofits & Foundations.....15
Other – National Nonprofits & Foundations.....17

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>

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>

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>

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>

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>

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>

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>

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>

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

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

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 is 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>

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>

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

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>

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>

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>

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>

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>

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>

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>

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>

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>

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>

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

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>

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

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>

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>

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>

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>

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>

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>

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>

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>

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>

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>

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>

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>

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>

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

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

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

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

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

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

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

Scrap 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

Scrap 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

Scrap 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

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

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

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

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

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

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

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

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

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

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>

Michigan Community Revitalization Program: Promotes community revitalization.

Additional Information:

<https://www.michiganbusiness.org/49a841/globalassets/documents/reports/fact-sheets/communityrevitalizationprogram.pdf>

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>

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>

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

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>

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>

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>

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.wupldr.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 C: County Letter to Commit Match

Ontonagon County Board of Commissioners

Courthouse, 725 Greenland Road

Ontonagon, MI 49953

Telephone (906) 884-4255

Fax (906) 884-6796

Chairperson: Carl Nykanen
Vice Chairperson: John Cane

Commissioners: Richard Bourdeau
Robert Nousiainen
Bryan Hamilton

November 16, 2018

Jerald Wuorenmaa, Executive Director
Western Upper Peninsula Planning and Development Region (WUPPDR)
400 Quincy St 8th Floor
Hancock, MI 49930

Dear Mr. Wuorenmaa:

Ontonagon County understands that WUPPDR intends to apply, or already has, for Federal Emergency Management Agency (FEMA) funding to update the Ontonagon 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 cost 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. Ontonagon County looks forward to working with you to complete its Hazard Mitigation Plan update.

Sincerely,



Carl R. Nykanen
Board Chair

An Equal Employment Opportunity Employer

Appendix D: Public Participation

2019 Ontonagon County Hazard Mitigation Public Opinion Survey

We need your help!

Ontonagon County is currently updating their five-year hazard mitigation plan as required by the Federal Emergency Management Agency (FEMA). A committee and staff in Ontonagon 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/OntoHazMitPublicInput>

Although participation in this survey is optional, we strongly encourage you to respond. All responses will be kept confidential. **Please respond by July 12, 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!

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.

1. Where do you live in Ontonagon County?

- | | | |
|--|---|---|
| <input type="checkbox"/> Village of Ontonagon | <input type="checkbox"/> Greenland Township | <input type="checkbox"/> McMillan Township |
| <input type="checkbox"/> Bergland Township | <input type="checkbox"/> Haight Township | <input type="checkbox"/> Ontonagon Township |
| <input type="checkbox"/> Bohemia Township | <input type="checkbox"/> Interior Township | <input type="checkbox"/> Rockland Township |
| <input type="checkbox"/> Carp Lake Township | <input type="checkbox"/> Matchwood Township | <input type="checkbox"/> Stannard Township |
| <input type="checkbox"/> Outside Ontonagon County; please specify: _____ | | |

2. During the past five (5) years, have you or someone in your household directly experienced a hazard in Ontonagon 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)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fog	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice and Sleet Storms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lightning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winds (Windstorms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snowstorms and Blizzards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornados	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GEOLOGIC HAZARDS					
Earthquakes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide /Mudslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Subsidence (sink holes or ground collapse)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HYDROLOGICAL HAZARDS					
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flooding due to precipitation event or snowmelt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
Shoreline Flooding and Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ECOLOGICAL HAZARDS					
Invasive Species (Emerald Ash Borer/Asian Carp)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INDUSTIRAL HAZARDS					
Scrap Tire Fires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structural Fires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous Materials, Transportation-Related (e.g. waste spill from traffic accident)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INFRASTRUCTURE HAZARDS					
Infrastructure failure & resulting hazards (e.g. power outage)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation Accidents (car crashes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUMAN RELATED					
Civil Disturbances (rioting)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public Health Emergencies (disease epidemic)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sabotage/Terrorism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

- | | |
|--|--|
| <input type="checkbox"/> Not Located in a floodplain | <input type="checkbox"/> Property is elevated or otherwise protected |
| <input type="checkbox"/> Too expensive | <input type="checkbox"/> Insurance company will not provide |
| <input type="checkbox"/> Property never floods | <input type="checkbox"/> Never considered / didn't know about it |
| <input type="checkbox"/> Other (specify): _____ | |

9. What are the most effective ways for you to receive information during or immediately following a hazard emergency?

- | | |
|--|---|
| <input type="checkbox"/> Newspaper | <input type="checkbox"/> Mailings |
| <input type="checkbox"/> Television | <input type="checkbox"/> Public Forums / Meetings |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Other (specify): _____ |
| <input type="checkbox"/> Internet – Social Media (Facebook or Twitter) | _____ |
| <input type="checkbox"/> Internet – Government Website Postings | _____ |
| <input type="checkbox"/> Phone | |

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. <u>Prevention</u> 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. <u>Property Protection</u> Modification or removal of existing buildings to protect them from a hazard. Examples include purchase, relocation, raised elevation, and structural retrofits (updates).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. <u>Natural Resource Protection</u> Preservation or restoration of the functions of natural systems while minimizing hazard losses. Examples include floodplain protection, forest management, and slope stabilization.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. <u>Structural Projects</u> 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. <u>Emergency Services</u> 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. <u>Public Education and Awareness</u> 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please feel free to provide any additional comments in the space provided:

THANK YOU FOR YOUR PARTICIPATION!



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June 14, 2019

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 Baraga, Gogebic, Houghton, Iron, Keweenaw, and Ontonagon Counties and the Keweenaw Bay Indian Community along with the Emergency managers are contracting WUPPDR to update each of these Hazard Mitigation Plans.

We are asking that residents in these communities take a short online survey here (available until July 19, 2019): www.wupldr.org/surveys/

For more information or for a paper survey, contact Rachael Pressley at rpressley@wupldr.org or at 906-482-7205, ext. 116

WUPPDR.ORG

Surveys

Rachael Pressley and 3 others

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Western Upper Peninsula Planning & Development Region

Michigan Planning Region 13 | Fax 906.482.9032 | Ph 906.482.7205

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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>

Keweenaw County:

<https://www.surveymonkey.com/r/KewCoHazMitPublic>

Ontonagon County:

<https://www.surveymonkey.com/r/OntoHazMitPublicInput>

If you choose to complete a paper version, return it by July 19, 2019

Upcoming Events

There are no upcoming events.

[View Calendar](#)

Recent News

NOTICE: Special Meeting of Executive Committee, November 18, 2020

2020-2025 Keweenaw County Hazard Mitigation Plan Draft Available for Review – CLOSED

2020-2025 Ontonagon County Hazard Mitigation Plan Draft Available for Review – CLOSED

Results Released from Gogebic County Broadband Survey

2020-2025 Keweenaw Bay Indian Community Hazard Mitigation Plan Draft Available for Review – CLOSED



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

Ontonagon 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 Ontonagon County along with the Ontonagon 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 Ontonagon 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 www.wuppdr.org/surveys and will be available until Friday, July 12, 2019.

The survey link is as follows:

<https://www.surveymonkey.com/r/OntoHazMitPublicInput>

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

Results of 2019 Ontonagon County Hazard Mitigation Survey – Summary

The county survey received 6 responses to the 2019 Ontonagon 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 Your Daily Globe, through Eagle Radio and some jurisdictional websites.

All respondents were residents of Ontonagon County. The majority (33.3% or 2 people) live in the Village of Ontonagon. Four of twelve of the jurisdictions were represented in the survey results. Bergland Township, Bohemia Township, Carp Lake Township, Greenland Township, Interior Township, Matchwood Township, McMillan Township and Ontonagon Township were not represented.

When asked if they or someone in their household directly experienced a hazard in Ontonagon County over the last five years, 60.0% (3 people) said yes. Most comments listed one hazard. The most commonly mentioned hazard that their household experienced was severe winds or windstorms (50.0%; 3 people). The second most common hazard mentioned was flooding (33.3%; 2 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. 100.0% were very concerned or somewhat concerned about extreme weather temperatures (hot/cold). The other top hazards that concerned citizens in Ontonagon County were wildfires (100.0%), severe winds (100.0%), snowstorms and blizzards (100.0%), and invasive species (83.3%). The respondents were either not very concerned or not concerned at all about earthquakes (83.3%), fog (83.3%), scrap tire fires (83.3%).

Respondents were also asked whether they had taken actions to make their home or community more resistant to hazards. Half (50.0%; 3 people) said yes and 2 explained what they had completed. Responses included the following:

- Home improvement projects including fire extinguishers and a carbon monoxide detector.
- Having an emergency preparedness kit at home.

5 respondents (83.3%) said that their home was not located on a floodplain, while 1 (16.6%) did not know if their property was on a floodplain. However, 1 person (16.6%) 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. One person who answered that their listed location flooded:

1 time	0
2 times	0

3 times	0
4 times	0
5 or more times	1 (100.0%)

All of the respondents reported not having flood insurance (100.0%; 6 people). The top reasons listed for not having coverage was because they were not located in a floodplain (83.3%), their property is elevated or otherwise protected (50.0%), insurance company will not provide (33.3%), or the property never floods (33.3%). One responded that it was too expensive.

When asked what the most effective ways are to receive information during or immediately following a hazard emergency (they could check all that apply), 5 people (83.3%) said the phone and 5 people said internet – social media (83.3%). Other responses say they utilize the radio (66.67%), television (50.0%), government websites (16.67%), mailings (16.67%), and public forums (16.67%).

Question 14 in the survey was an additional comment box for the LPT containing 4 responses. These data are also attached to this survey summary.

Respondents were asked how important six categories of community-wide activities that can reduce risk from hazards are for their communities. All six (100.0%) respondents felt both natural resource protection as well as emergency services were very important. 83.3% felt public education and awareness were very important, and 66.6% (4 responses) felt that prevention, property protection, and structural fires were very important.

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? 4 Comments

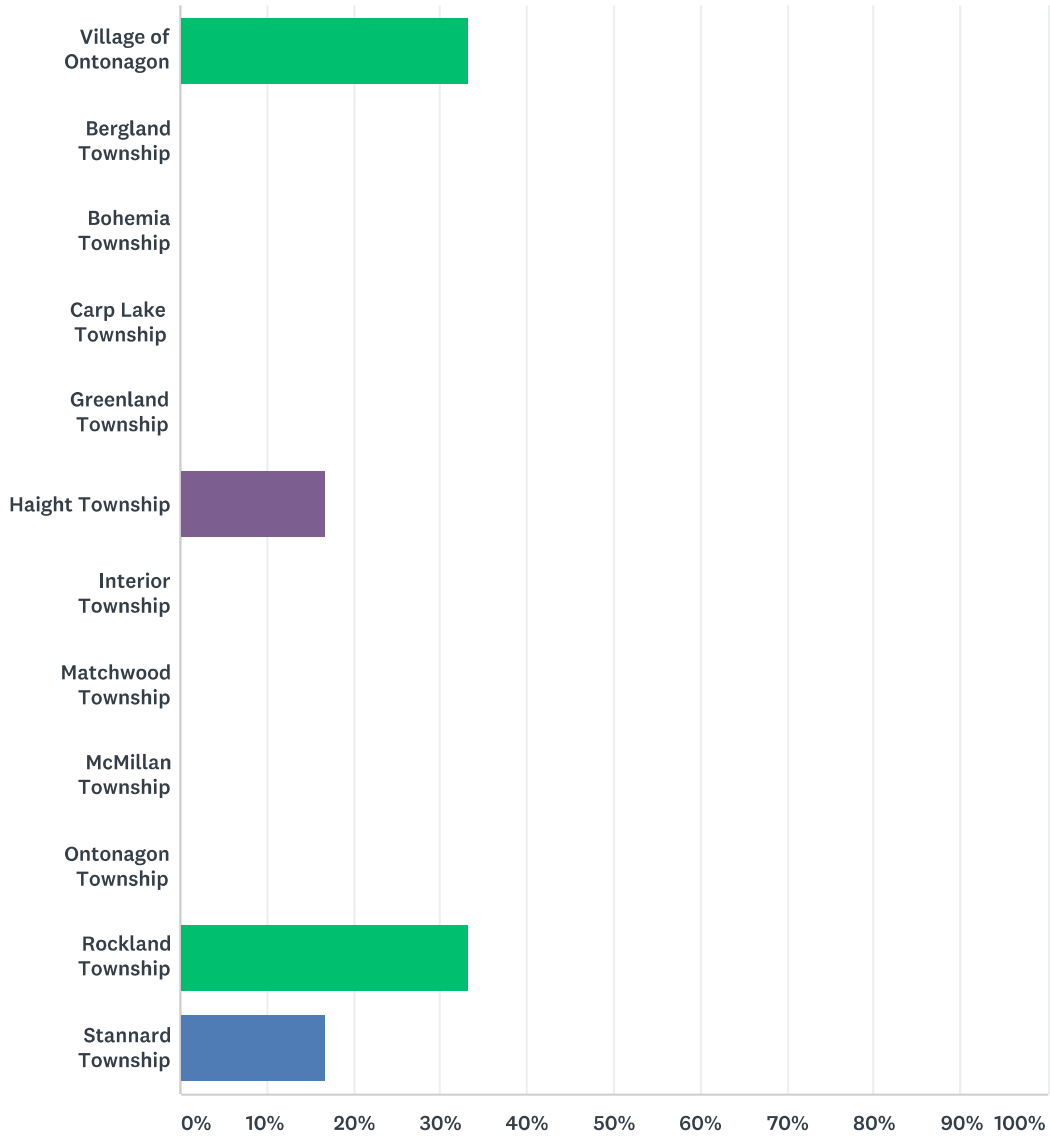
Q14 In your opinion, what are some steps or projects your local government could take to reduce or eliminate the risk for future hazard damages to your community?

Answered: 4 Skipped: 2

#	RESPONSES	DATE
1	Enforce blight policy. Rapid inspection of curve on M26 just West of Mass City. Replacing guard rails on Southwest curve approaching Rockland.	7/9/2019 10:57 AM
2	Inspect and improve infrastructures as needed	7/7/2019 8:48 PM
3	Inspect and repair damaged road culverts more frequently.	6/27/2019 1:20 PM
4	update storm system drains. Provide information multiple ways regarding possible emergencies	6/27/2019 12:02 PM

Q1 Where do you live in Ontonagon County?

Answered: 6 Skipped: 0

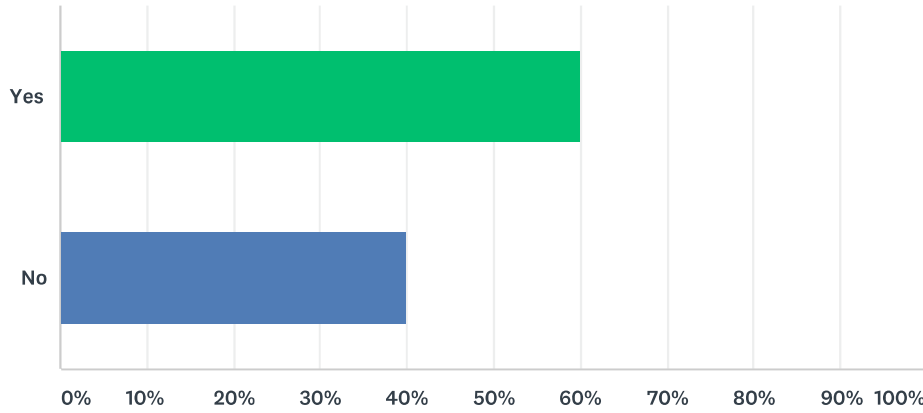


ANSWER CHOICES	RESPONSES	
Village of Ontonagon	33.33%	2
Bergland Township	0.00%	0
Bohemia Township	0.00%	0
Carp Lake Township	0.00%	0
Greenland Township	0.00%	0
Haight Township	16.67%	1
Interior Township	0.00%	0
Matchwood Township	0.00%	0

McMillan Township	0.00%	0
Ontonagon Township	0.00%	0
Rockland Township	33.33%	2
Stannard Township	16.67%	1
TOTAL		6

Q2 During the past five (5) years, have you or someone in your household directly experienced a hazard in Ontonagon County, such as a severe windstorm, flood, or other type of hazard?

Answered: 5 Skipped: 1



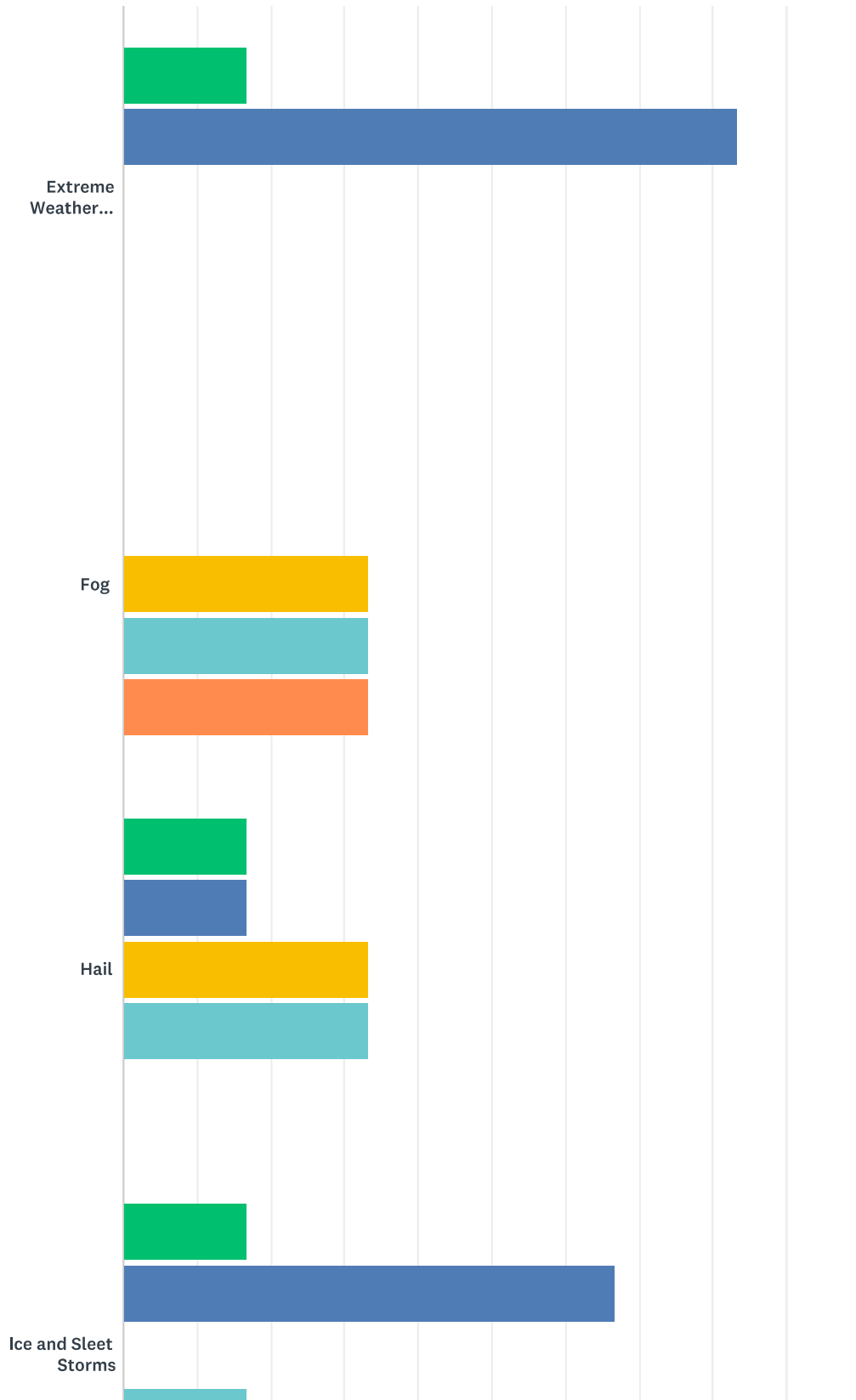
ANSWER CHOICES	RESPONSES	
Yes	60.00%	3
No	40.00%	2
TOTAL		5

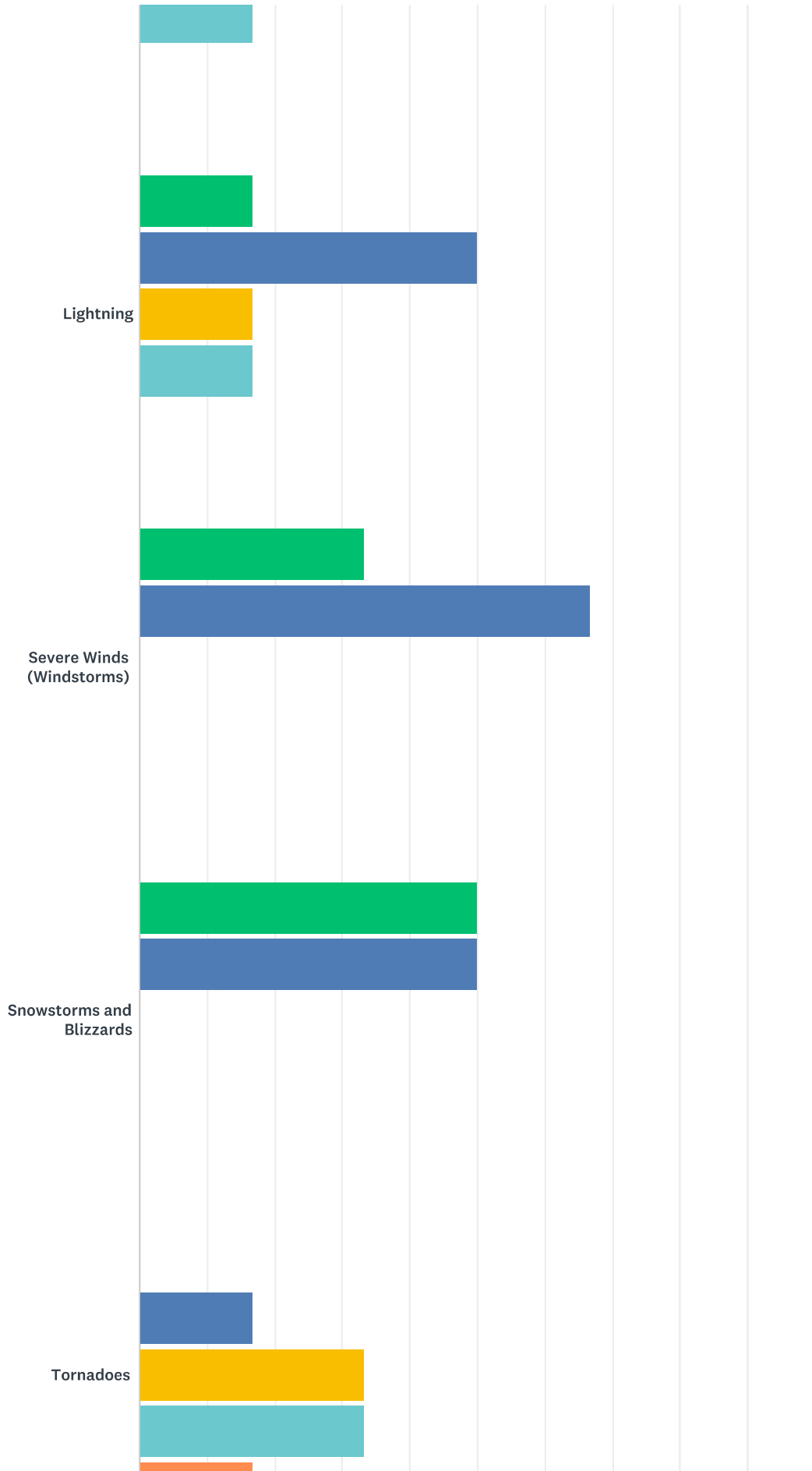
Q3 IF YES, which hazard(s) have you or someone in your household experienced in the past five (5) years?

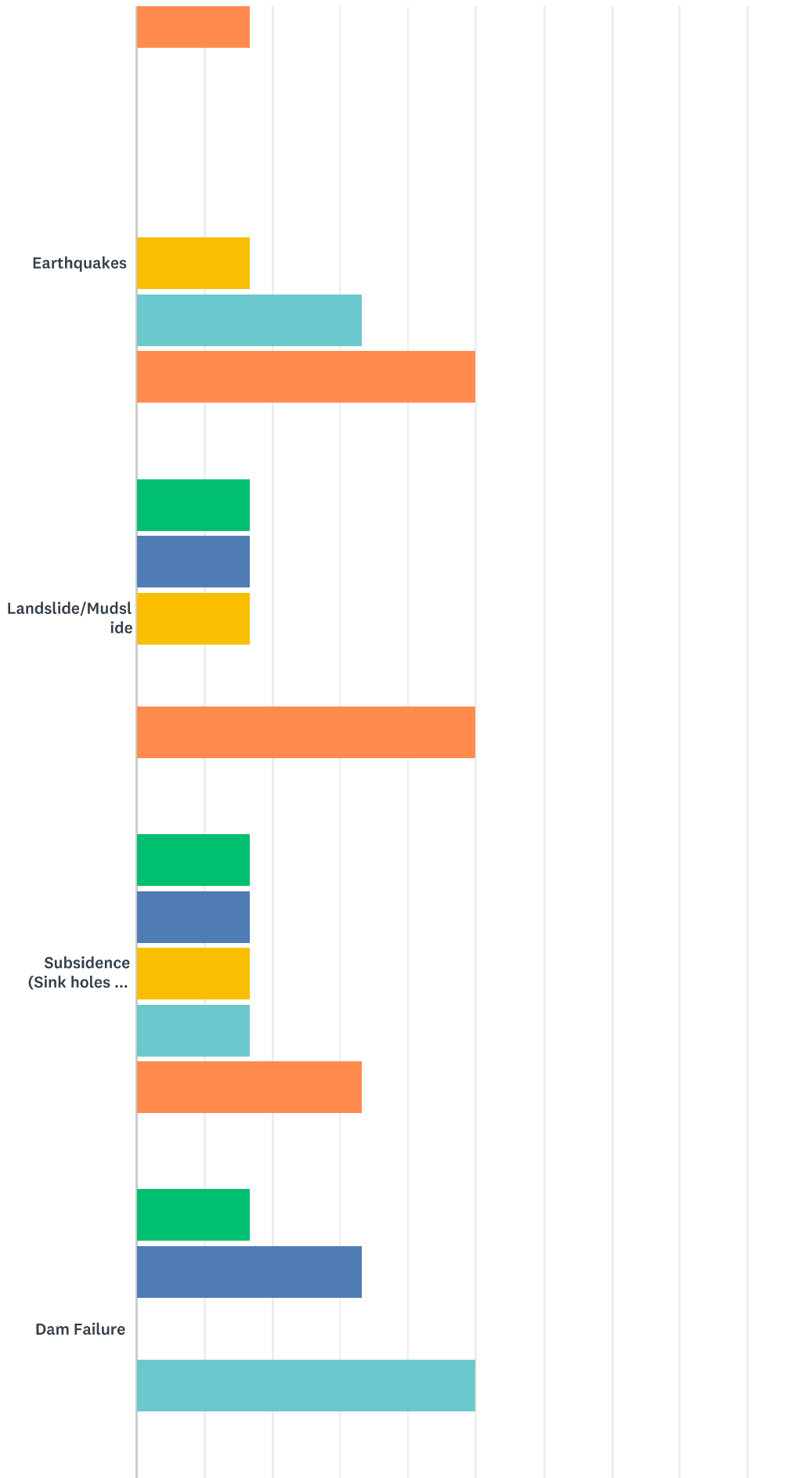
Answered: 3 Skipped: 3

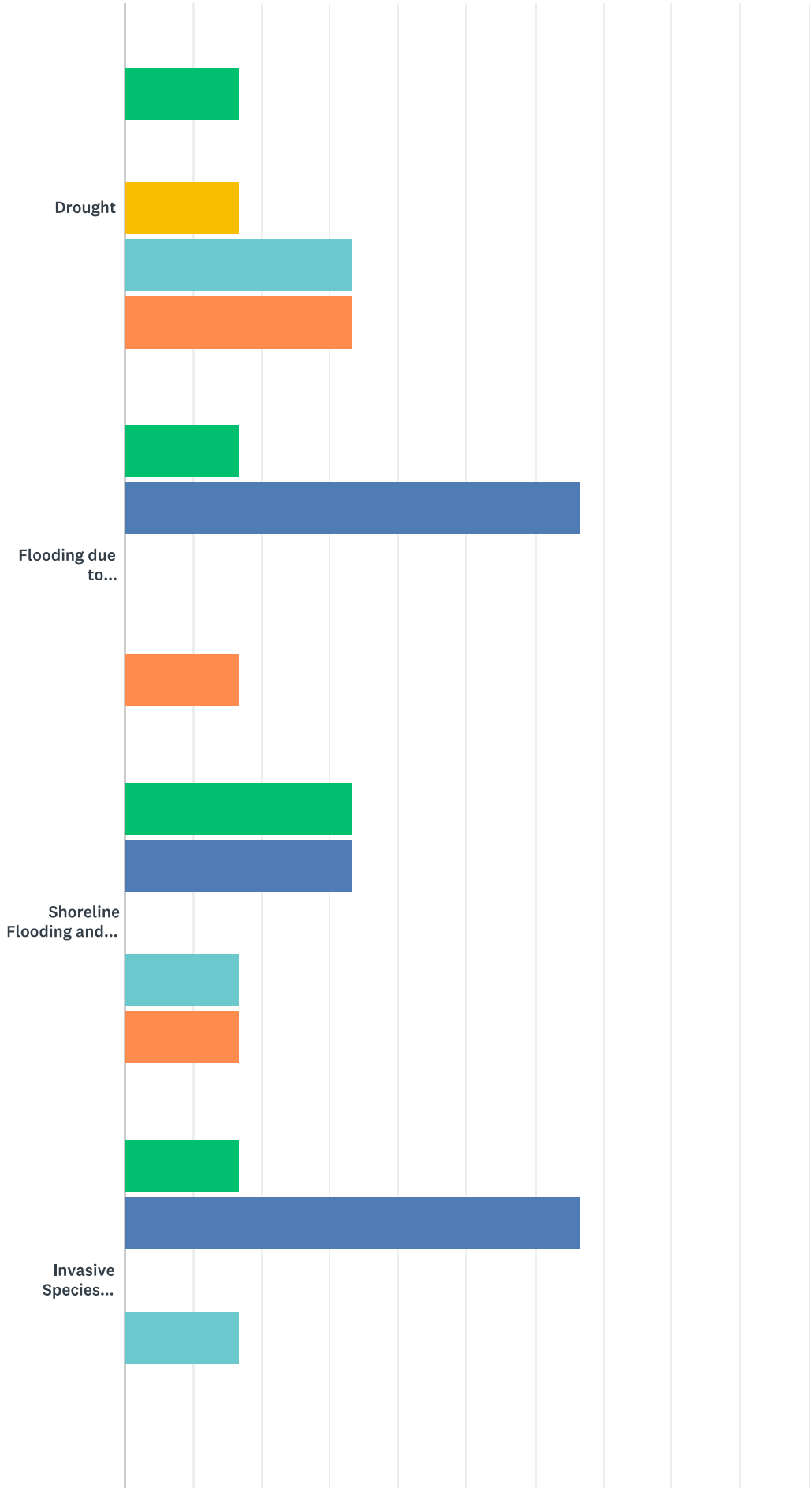
Q4 How concerned are you about the following hazards affecting your home and community in the next five (5) years?

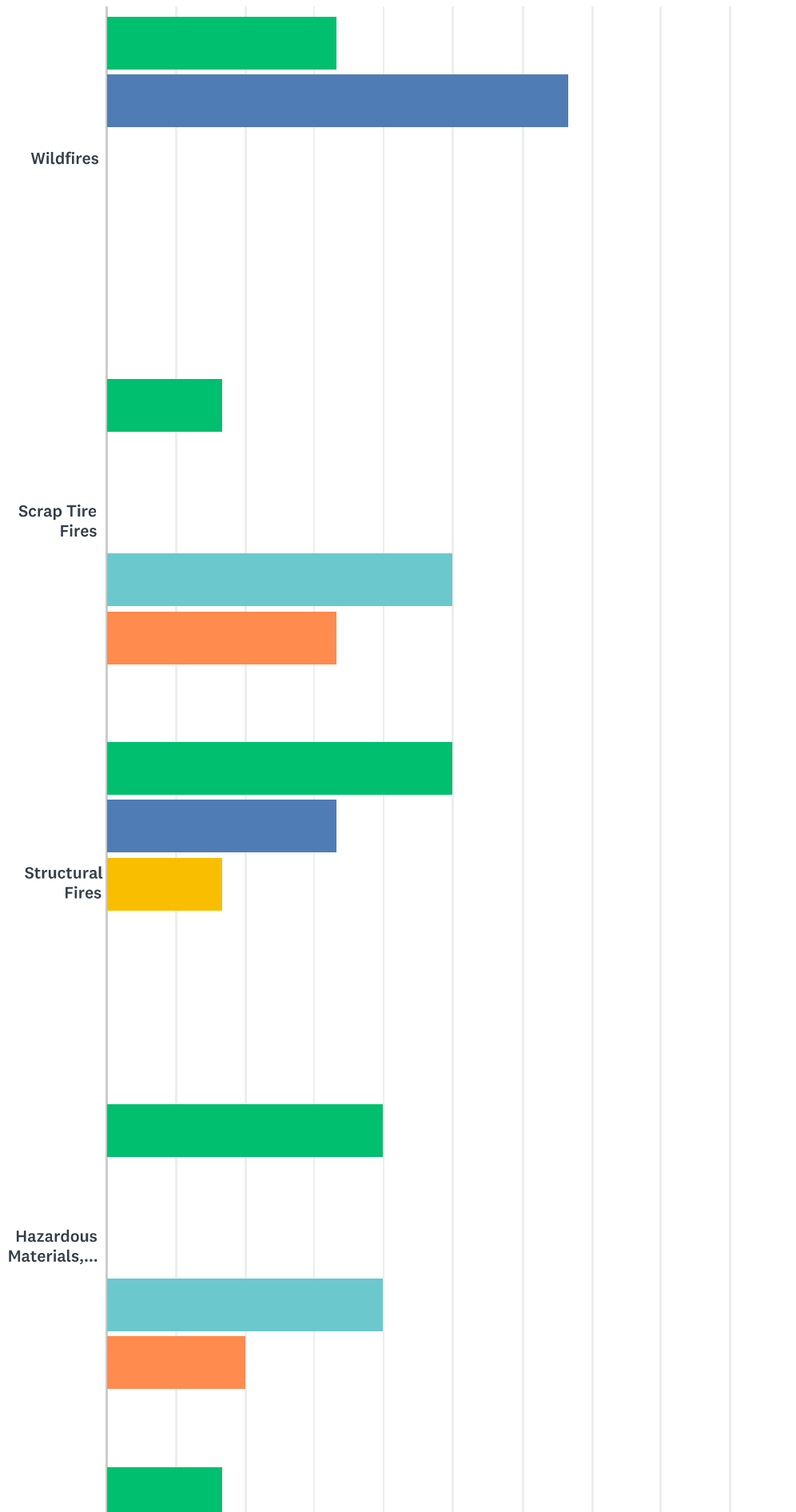
Answered: 6 Skipped: 0

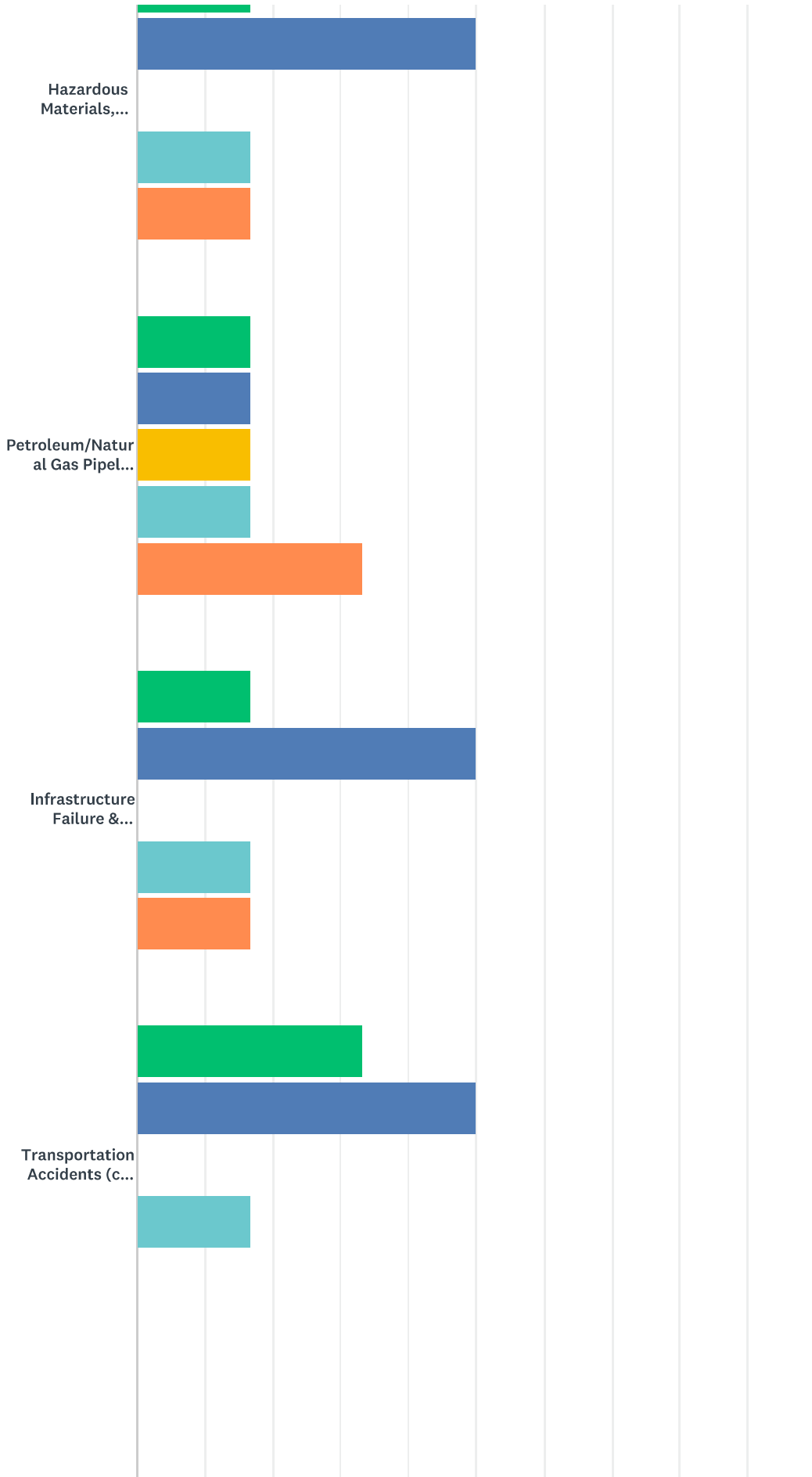


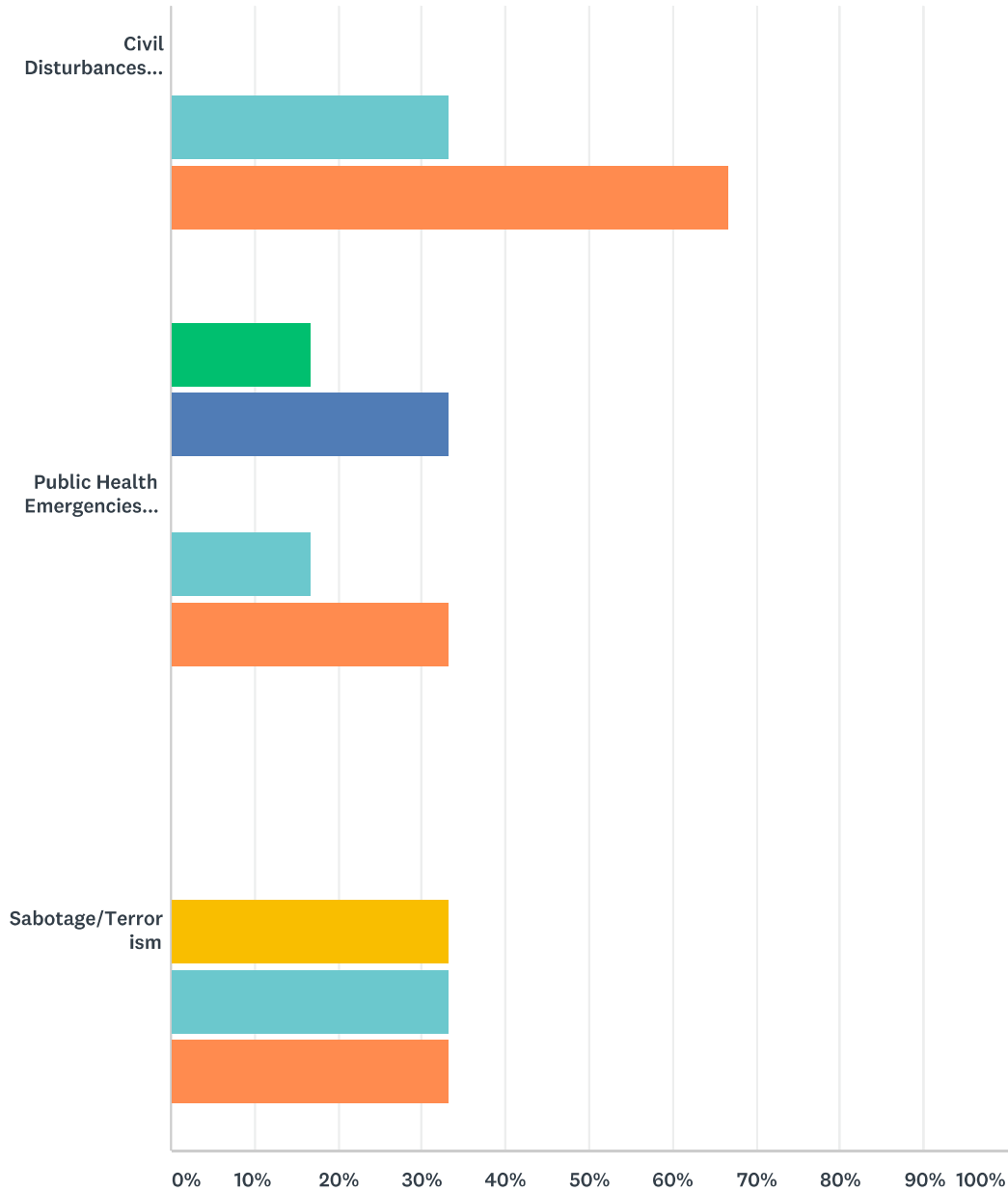












■ Very Concerned
 ■ Somewhat Concerned
 ■ Neutral
■ Not Very Concerned
 ■ Not Concerned

	VERY CONCERNED	SOMEWHAT CONCERNED	NEUTRAL	NOT VERY CONCERNED	NOT CONCERNED	TOTAL
Extreme Weather Temperatures (hot/cold)	16.67% 1	83.33% 5	0.00% 0	0.00% 0	0.00% 0	6
Fog	0.00% 0	0.00% 0	33.33% 2	33.33% 2	33.33% 2	6
Hail	16.67% 1	16.67% 1	33.33% 2	33.33% 2	0.00% 0	6
Ice and Sleet Storms	16.67% 1	66.67% 4	0.00% 0	16.67% 1	0.00% 0	6
Lightning	16.67% 1	50.00% 3	16.67% 1	16.67% 1	0.00% 0	6

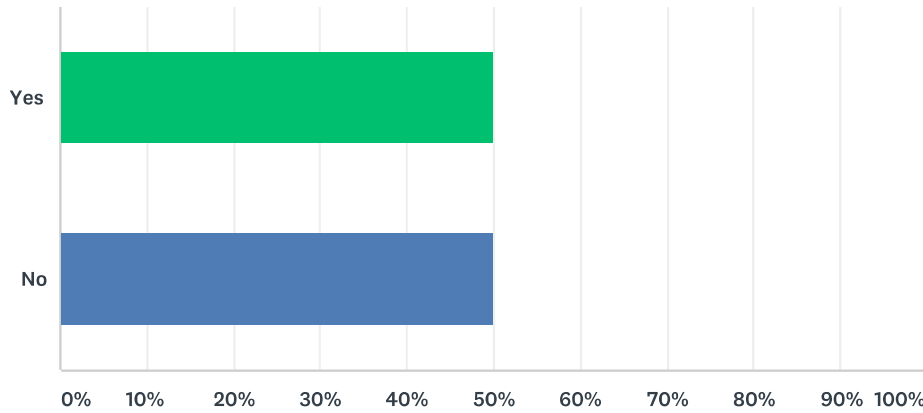
Ontonagon County Hazard Mitigation Public Input Survey

SurveyMonkey

Severe Winds (Windstorms)	33.33% 2	66.67% 4	0.00% 0	0.00% 0	0.00% 0	6
Snowstorms and Blizzards	50.00% 3	50.00% 3	0.00% 0	0.00% 0	0.00% 0	6
Tornadoes	0.00% 0	16.67% 1	33.33% 2	33.33% 2	16.67% 1	6
Earthquakes	0.00% 0	0.00% 0	16.67% 1	33.33% 2	50.00% 3	6
Landslide/Mudslide	16.67% 1	16.67% 1	16.67% 1	0.00% 0	50.00% 3	6
Subsidence (Sink holes or ground collapse, mine-related or not)	16.67% 1	16.67% 1	16.67% 1	16.67% 1	33.33% 2	6
Dam Failure	16.67% 1	33.33% 2	0.00% 0	50.00% 3	0.00% 0	6
Drought	16.67% 1	0.00% 0	16.67% 1	33.33% 2	33.33% 2	6
Flooding due to precipitation event or snowmelt	16.67% 1	66.67% 4	0.00% 0	0.00% 0	16.67% 1	6
Shoreline Flooding and Erosion	33.33% 2	33.33% 2	0.00% 0	16.67% 1	16.67% 1	6
Invasive Species (Emerald Ash Borer/Asian Carp)	16.67% 1	66.67% 4	0.00% 0	16.67% 1	0.00% 0	6
Wildfires	33.33% 2	66.67% 4	0.00% 0	0.00% 0	0.00% 0	6
Scrap Tire Fires	16.67% 1	0.00% 0	0.00% 0	50.00% 3	33.33% 2	6
Structural Fires	50.00% 3	33.33% 2	16.67% 1	0.00% 0	0.00% 0	6
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	40.00% 2	0.00% 0	0.00% 0	40.00% 2	20.00% 1	5
Hazardous Materials, Transportation-related (e.g. waste spill from traffic accident)	16.67% 1	50.00% 3	0.00% 0	16.67% 1	16.67% 1	6
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	16.67% 1	16.67% 1	16.67% 1	16.67% 1	33.33% 2	6
Infrastructure Failure & resulting hazards (e.g. power outage)	16.67% 1	50.00% 3	0.00% 0	16.67% 1	16.67% 1	6
Transportation Accidents (car crashes)	33.33% 2	50.00% 3	0.00% 0	16.67% 1	0.00% 0	6
Civil Disturbances (rioting)	0.00% 0	0.00% 0	0.00% 0	33.33% 2	66.67% 4	6
Public Health Emergencies (disease epidemic)	16.67% 1	33.33% 2	0.00% 0	16.67% 1	33.33% 2	6
Sabotage/Terrorism	0.00% 0	0.00% 0	33.33% 2	33.33% 2	33.33% 2	6

Q5 Have you taken any actions to make your home or community more resistant to hazards?

Answered: 6 Skipped: 0



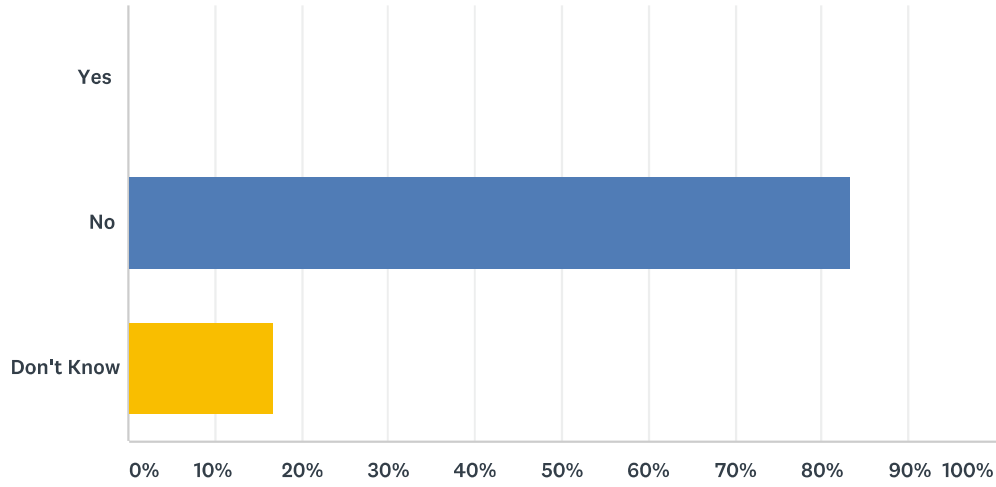
ANSWER CHOICES	RESPONSES	
Yes	50.00%	3
No	50.00%	3
TOTAL		6

Q6 IF YES, please explain:

Answered: 2 Skipped: 4

Q7 Is your home located on a floodplain?

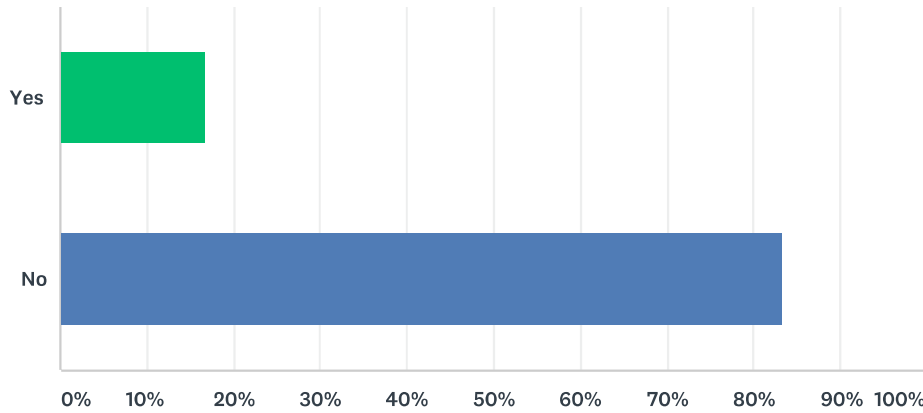
Answered: 6 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	83.33% 5
Don't Know	16.67% 1
TOTAL	6

Q8 Does your street or home flood regularly during significant rain events?

Answered: 6 Skipped: 0



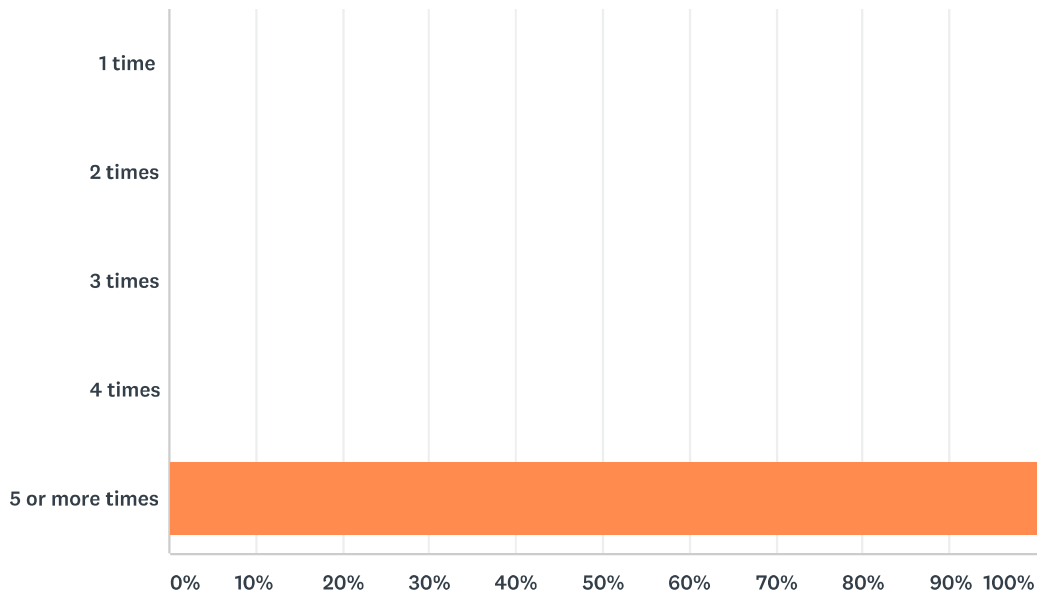
ANSWER CHOICES	RESPONSES	
Yes	16.67%	1
No	83.33%	5
TOTAL		6

Q9 IF YES, what are the closest major cross streets to this location?

Answered: 0 Skipped: 6

Q10 If your street or home does flood regularly during significant rain events, how many times did it flood in the past 12 months?

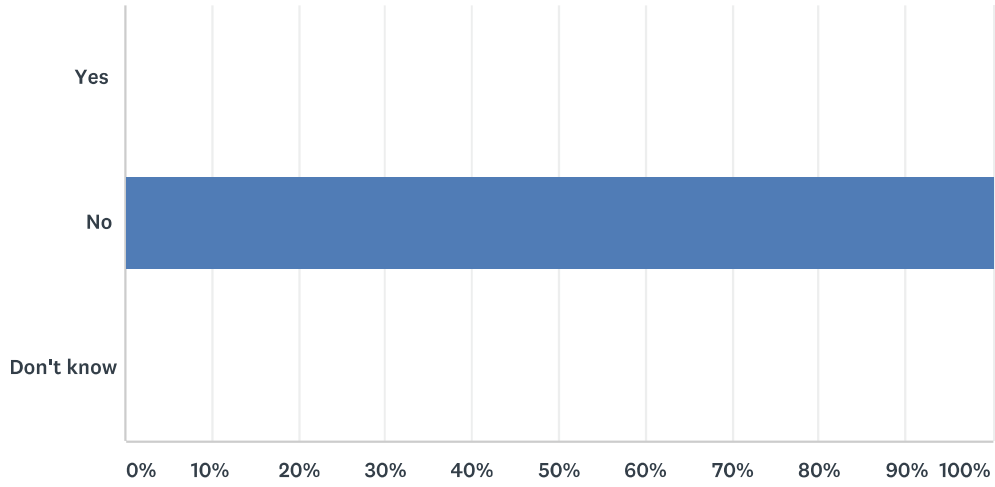
Answered: 1 Skipped: 5



ANSWER CHOICES	RESPONSES
1 time	0.00% 0
2 times	0.00% 0
3 times	0.00% 0
4 times	0.00% 0
5 or more times	100.00% 1
TOTAL	1

Q11 Do you have flood insurance?

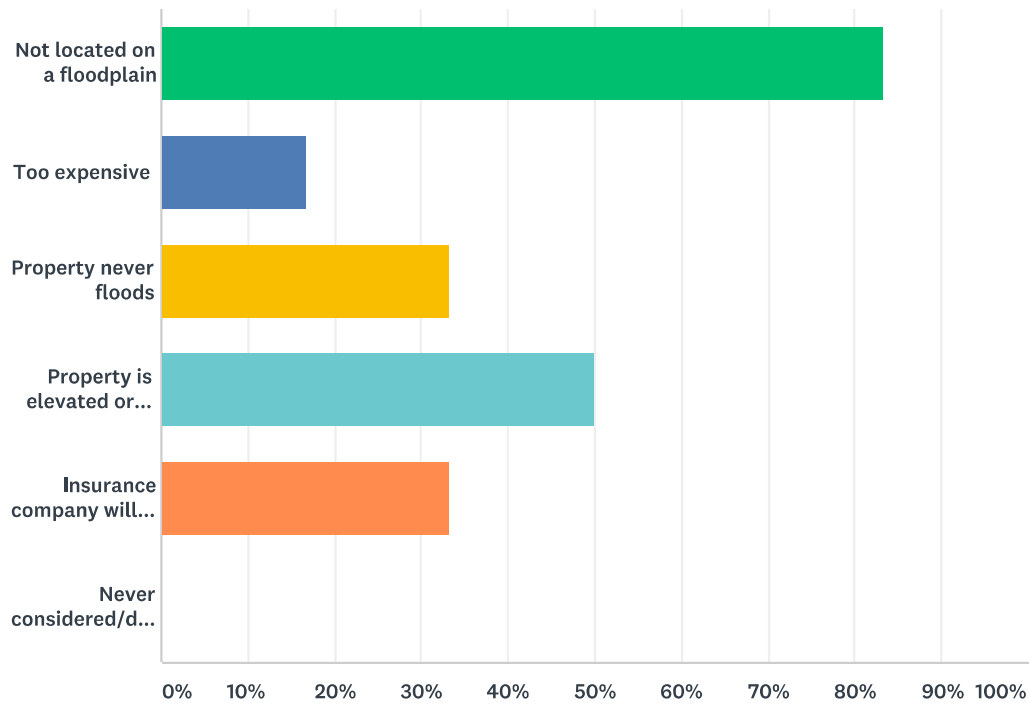
Answered: 6 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	100.00% 6
Don't know	0.00% 0
TOTAL	6

Q12 If you do NOT have flood insurance, please indicate reason(s) below.

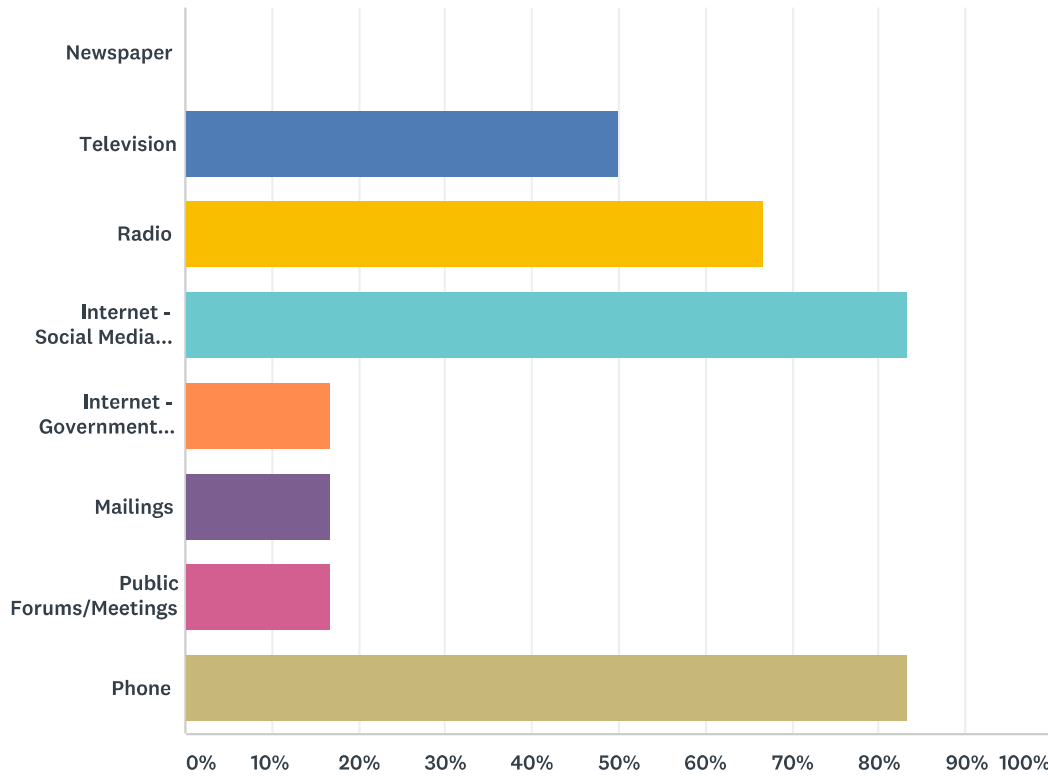
Answered: 6 Skipped: 0



ANSWER CHOICES	RESPONSES	
Not located on a floodplain	83.33%	5
Too expensive	16.67%	1
Property never floods	33.33%	2
Property is elevated or otherwise protected	50.00%	3
Insurance company will not provide	33.33%	2
Never considered/didn't know about it	0.00%	0
Total Respondents: 6		

Q13 What are the most effective ways for you to receive information during or immediately following a hazard emergency? (Check all that apply)

Answered: 6 Skipped: 0



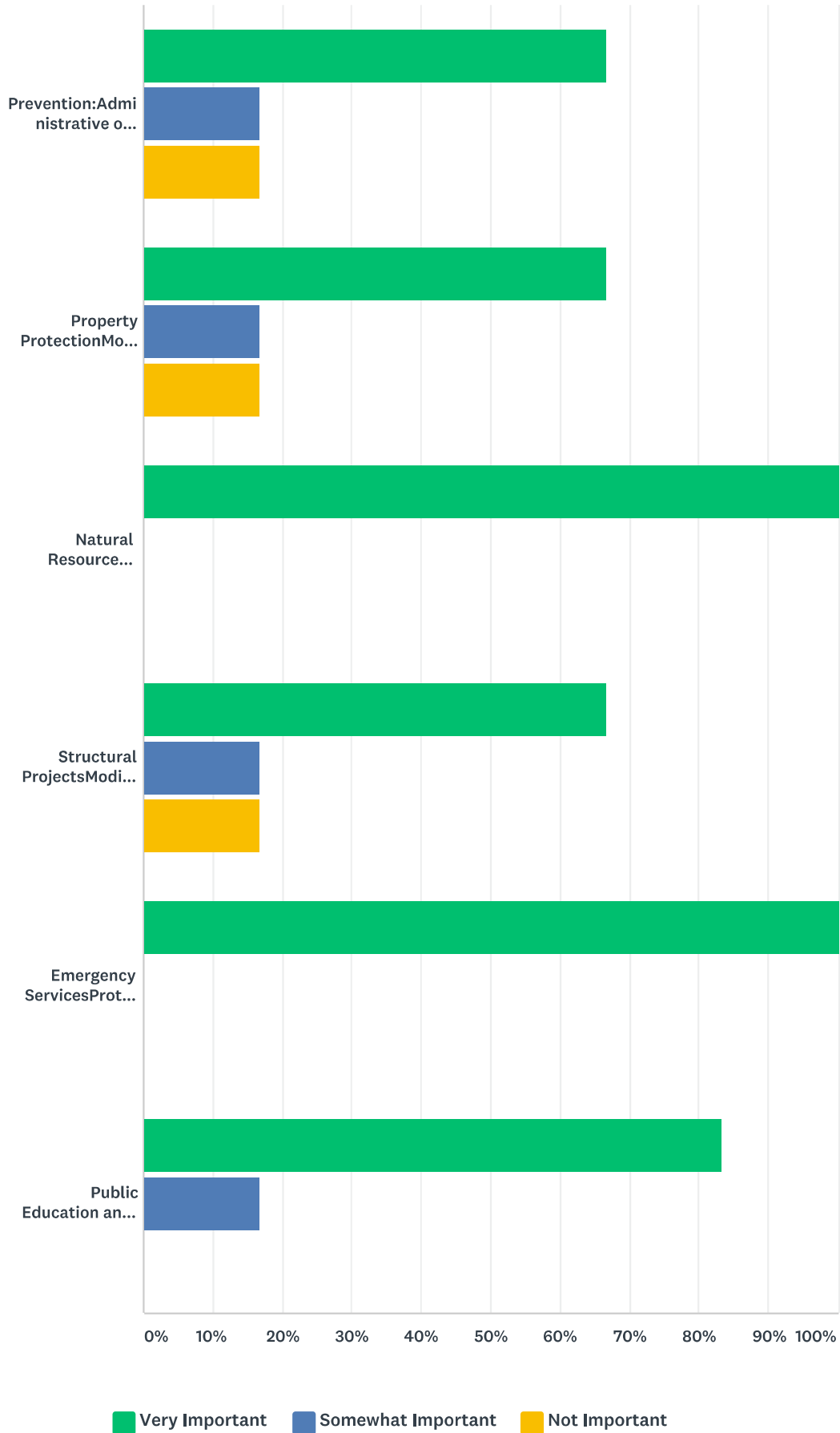
ANSWER CHOICES	RESPONSES	
Newspaper	0.00%	0
Television	50.00%	3
Radio	66.67%	4
Internet - Social Media (Facebook or Twitter)	83.33%	5
Internet - Government Website Postings	16.67%	1
Mailings	16.67%	1
Public Forums/Meetings	16.67%	1
Phone	83.33%	5
Total Respondents: 6		

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: 4 Skipped: 2

Q15 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:

Answered: 6 Skipped: 0



	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	TOTAL
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.	66.67% 4	16.67% 1	16.67% 1	6
Property ProtectionModification or removal of existing buildings to protect them from a hazard. Examples include purchase, relocation, raised elevation, and structural retrofits (updates)	66.67% 4	16.67% 1	16.67% 1	6
Natural Resource ProtectionPreservation or restoration of the functions of natural systems while minimizing hazard losses. Examples include floodplain protection, forest management, and slope stabilization.	100.00% 6	0.00% 0	0.00% 0	6
Structural ProjectsModification 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.	66.67% 4	16.67% 1	16.67% 1	6
Emergency ServicesProtection 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.	100.00% 6	0.00% 0	0.00% 0	6
Public Education and AwarenessInforming 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.	83.33% 5	16.67% 1	0.00% 0	6

Q16 Additional comments:

Answered: 0 Skipped: 6

Q3 IF YES, which hazard(s) have you or someone in your household experienced in the past five (5) years?

Answered: 3 Skipped: 3

#	RESPONSES	DATE
1	Windstorm with downed trees	7/9/2019 10:57 AM
2	Severe windstorm and flooding in the general area.	6/27/2019 1:20 PM
3	severe windstorm and flooding. Winter Storms more severe in recent history	6/27/2019 12:02 PM

Q6 IF YES, please explain:

Answered: 2 Skipped: 4

#	RESPONSES	DATE
1	fire extinguishers and carbon monoxide sensor	7/7/2019 8:48 PM
2	Have in house emergency preparedness kit assembled.	6/27/2019 1:20 PM

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: 4 Skipped: 2

#	RESPONSES	DATE
1	Enforce blight policy. Rapid inspection of curve on M26 just West of Mass City. Replacing guard rails on Southwest curve approaching Rockland.	7/9/2019 10:57 AM
2	Inspect and improve infrastructures as needed	7/7/2019 8:48 PM
3	Inspect and repair damaged road culverts more frequently.	6/27/2019 1:20 PM
4	update storm system drains. Provide information multiple ways regarding possible emergencies	6/27/2019 12:02 PM

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@wuppd.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)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fog	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice and Sleet Storms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lightning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winds (Windstorms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snowstorms and Blizzards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornados	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GEOLOGIC HAZARDS					
Earthquakes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide /Mudslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Subsidence (sink holes or ground collapse)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HYDROLOGICAL HAZARDS					
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flooding due to precipitation event or snowmelt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shoreline Flooding and Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ECOLOGICAL HAZARDS					
Invasive Species (Emerald Ash Borer/Asian Carp)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INDUSTIRAL HAZARDS					
Scrap Tire Fires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structural Fires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous Materials, Transportation-Related (e.g. waste spill from traffic accident)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
INFRASTRUCTURE HAZARDS					
Infrastructure failure & resulting hazards (e.g. power outage)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation Accidents (car crashes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUMAN RELATED					
Civil Disturbances (rioting)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public Health Emergencies (disease epidemic)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sabotage/Terrorism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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!



2020-2025 Ontonagon County Hazard Mitigation Plan Draft Available for Review – CLOSED

July 27, 2020 by [Jerry Wuorenmaa](#)

Ontonagon County has worked with the Western UP Planning and Development Region (WUPPDR) to develop the Ontonagon County 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. The plan's purpose is to identify hazard risks throughout the community and to become better prepared for them.

The draft of the 2020-2025 Ontonagon County Hazard Mitigation Plan will be available through November 23, 2020 for public review and comment prior to plan adoption.

Copies of the plan draft will be available at WUPPDR (400 Quincy St.) in Hancock and at the Ontonagon County Clerk's Office (725 Greenland Rd.) in Ontonagon, and; online at https://www.wuppdr.org/wp-content/uploads/2020/10/OntoCoHazMitPlan_DRAFT.pdf

Written comments will be considered by WUPPDR in cooperation with Ontonagon County, as appropriate. Comments must be received by November 23, 2020 and may be mailed to WUPPDR, 400 Quincy St., 8th Floor, Hancock, MI 49930 or emailed to Rachael Pressley, Assistant Regional Planner, at rpressley@wuppdr.org.

Upcoming Events

There are no upcoming events.

[View Calendar →](#)

Recent News

[NOTICE: Special Meeting of Executive Committee, November 18, 2020](#)

[2020-2025 Keweenaw County Hazard Mitigation Plan Draft Available for Review – CLOSED](#)

[2020-2025 Ontonagon County Hazard Mitigation Plan Draft Available for Review – CLOSED](#)

[Results Released from Gogebic County Broadband Survey](#)

[2020-2025 Keweenaw Bay Indian Community Hazard Mitigation Plan Draft Available for Review – CLOSED](#)

Appendix E: 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
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 Ontonagon County Hazard Mitigation Plan
 Local Planning Team Meeting #1 – May 23, 2019 (10:00am)
 720 Greenland Rd., Ontonagon

Last Name	First Name	Representing	Email Address	Phone
Kecher	Mike	Ont Co Emer	[REDACTED]	[REDACTED]
Kontath	Dale	Ont Co Sheriff	[REDACTED]	[REDACTED]
Preiss	Stacy	County Clerk	[REDACTED]	[REDACTED]
Baird	Teb	Baird News Office	[REDACTED]	[REDACTED]

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 the comment box. If at the end of the checklist any information or hazards are missing please take note of it and contact: rpressley@wuppdrr.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, emotionally, financially, etc.

Location – The geographic areas in the county planning area that are affected by the hazard. Note whether the hazard is present on county lands; if 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 extent of the hazard?

Impact – the consequence or effect of the hazard on the county government and its assets. List specific vulnerable agencies/populations/property 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.



County Hazard Mitigation Plan Update – Local Planning Team
August 20, 2019

AGENDA

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:

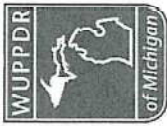
Executive Director – Jerald Wuorenmaa, jwuorenmaa@wuppdr.org

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



2020 Ontonagon County Hazard Mitigation Plan
 Local Planning Team Meeting #2 – October 31, 2019 (11:00am Eastern)
 720 Greenland Rd., Ontonagon

Last Name	First Name	Representing	Email Address	Phone
BAIRD	Teddy			
Freiss	Stacy	Ontonagon County		
Kocher	Mike	"EM		
Rantala	Ake	Sheriff		

Past Mitigation Activities: Ontonagon County

2005 Mitigation Program Action Items

2005 Item	Status
Update Village of Ontonagon Land Use Plan and Zoning	Completed
Ontonagon Harbor Dredging	Ongoing
Village Drainage Study and Improvement	
Update Stormwater Management Plans and Flood Maps	
Improved Emergency Response	Ongoing
Review Plans and Development Regulations	Ongoing
New West Branch Bridge/M28	Completed
Mine Shaft Safety	Ongoing
Update Shoreline Erosion Map and Identify Future Mitigation Activities	Partially Completed
Public Information/Education Program	
Insurance	Ongoing
Relocation of Village Office, Department of Public Works and Firehall	
Adopt Hazard Mitigation Plan and Update Regularly	

2013 Mitigation Program Action Items

2013 Item	Status
Ontonagon Harbor Dredging	Ongoing
Village Drainage Study and Improvement	
Snow Removal	Ongoing
Update Stormwater Management Plans and Flood Maps	
Drainage Improvements and Maintenance	Ongoing
Improved Emergency Response	Ongoing
Review Plans and Development Regulations	Ongoing
New South Branch Bridge/M28	
Mine Shaft Safety	Ongoing
Public Information/Education Program	Ongoing
Insurance	Ongoing
Relocation of Village Office, Department of Public Works, and Fire Hall	
Backup Power for Emergency Facilities/Designated Shelters	
Adopt Hazard Mitigation Plan and Update Regularly	

Action Items: An important step in the mitigation process is to build upon the general recommendations for mitigations activities and identify specific action items for Ontonagon County. All activities should be consistent with Mitigation Goals.

Example Action Item from the 2013 Update:

Action Item: Relocation of Village Office, Department of Public Works and Fire Hall

These Village of Ontonagon Critical Facilities are located in the deepest part of an identified floodplain. Relocation of the facilities outside of the floodplain would insure the facilities' protection. This project is carried over from the 2005 plan; its extensive cost has precluded implementation.

Responsible Agency: Village of Ontonagon

Deadline: 2018

Cost: \$3 to \$4.5 million

Potential Funding Sources: FEMA Hazard Mitigation Grant Program and local

Benefits: The Village of Ontonagon is the largest community in the County and the center for response activities. Relocation of the Village Office, Department of Public Works, and Fire Hall would protect these critical structures from flooding and would improve response during an incident.

Appendix F: State Document Review

Appendix G: Plan Adoption