



**IRON COUNTY**

**2020-2025**

**Hazard  
Mitigation  
Plan**



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## SECTION 1: Introduction

This section provides a general introduction to the Iron 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.

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



upon the community. The Iron 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 Iron 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 Iron 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 Iron 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, and
- 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 Iron County (see Section 6: *Vulnerability 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 Iron County. The geographic scope (i.e., planning area) for the Plan includes the entire area of Iron County.

## Authority

This Hazard Mitigation Plan has been adopted by Iron 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 Iron 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 Iron County in preparation of the Hazard Mitigation Plan. It consists of the following nine subsections:

- Overview of Hazard Mitigation Planning
- History of Hazard Mitigation Planning Iron County
- Preparing the 2020 Plan
- The 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 Iron 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 Iron County

Iron 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 *Iron County Ad-hoc Committee* and organized by the *Iron County Emergency Management Office*. The committee included planning professionals from the Western U.P. Planning & Development Region (WUPPDR), Iron County emergency managers, county road engineer, and county commission. The final plan was adopted on February 15, 2005.

In 2012, Iron 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, in order 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 and the final plan was adopted by the Iron County Board of Commissioners on November 14, 2013. It was 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, Iron 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 State Hazard Mitigation Office.

### 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.

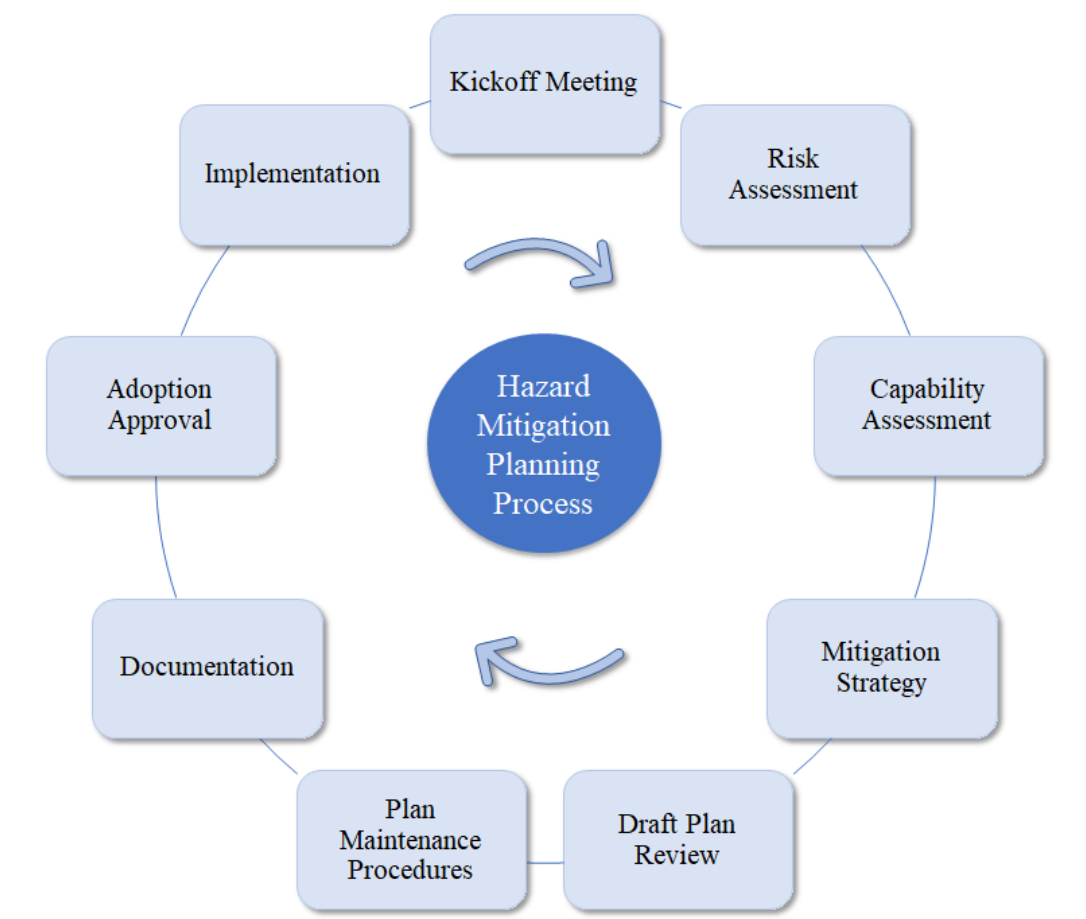
Plan updating and review procedures were established in the previous versions of this plan and were used, in addition to the requirements discussed above, to prepare the 2020 update. These procedures provide the general guidelines for the updating and reviewing the plan on a five-year basis. These procedures 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 was reviewed and updated with the identified results. The State of Michigan Hazard Mitigation Plan was reviewed extensively to incorporate relevant material into the Iron County Hazard Mitigation Plan update.

The planning process included several steps (**Figure 2.1**) that were completed over the course of several months.

**Figure 2.1:** Hazard Mitigation Planning Process





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

The *Community Profile*, located in Section 3, provides a general overview of Iron 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 Iron County. It also assesses the overall risk to hazards in the county. For hazards that impact individual jurisdictions, the *Risk Assessment* aims to identify the vulnerabilities that are found in those jurisdictions. Additionally, this section prioritizes and ranks countywide hazards from high to low risk.

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

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

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

## The Planning Team

The Iron 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 Iron County (**Table 2.1**) have participated in the development of the 2020 Iron 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

County	City	Village	Township
Iron	Caspian	Alpha	Bates
	Crystal Falls		Crystal Falls
	Gaastra		Hematite
	Iron River		Iron River
			Mansfield
			Mastodon
			Stambaugh

**Iron County Local Planning Team**

The participants listed in **Table 2.2** represent the members of the Iron County Local Planning Team who participated in the development of the Plan. The planning process was led at the county level by the Iron 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:** Iron County Local Planning Team

Name	Agency/Jurisdiction
Vernon Jones	Iron County Emergency Coordinator
John Lortie	Iron County/Crystal Falls Fire Department
Joel Bach	EMS – MedEvac
Melody Snyder	Aspirus UP Hospital
Jessica Perry	Dickinson-Iron District Health Department
Steve Simbob	Iron County Medical Care Facility
Tom Karvala	Iron County Mine Inspector/Caspian-Gaastra Fire Department
Tom Clark	Iron County Drain Commission
Matt Zika	National Weather Service
Paul Campbell	Michigan State Police - Iron Mountain Post
Mark Valesano	Iron County Sheriff’s Office
Gene Smith	Iron County
Geno Basanese	Michigan State Police: Iron Mountain Post

## 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 20, 2019, during which the mitigation plan update process was present. 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 23, 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 Iron County based on the quantitative prioritized risk assessment are the following: 1) Invasive Species; 2) Snowstorms and Blizzards; 3) Extreme Temperatures; 4) Public Health Emergencies; 5) Structural Fires

#### Capability Assessment Discussion

- In Iron County, the City of Caspian and the City of Iron River participate in the National Flood Insurance Program (NFIP).
- The City of Crystal Falls has adopted and implement/enforce a comprehensive plan, building codes, and zoning ordinances.
- The City of Crystal Falls and City of Iron River have administrative and technical capability, with adequate staff resources to implement local government programs.

#### Review of Existing Mitigation Plan Goals, Objectives, and Actions

The existing goals from the 2013 Iron 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 Iron County means to accomplish. The goals are listed in Section 8 of this plan.

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

## **Involving the Public**

One of the fundamental components of Iron 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 Iron 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 Input 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 E.

## **Involving Stakeholders**

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

- Vernon Jones, Iron County Emergency Coordinator
- John Lortie, Iron County/Crystal Falls Fire Department
- Joel Bach, EMS – MedEvac
- Melody Snyder, Aspirus UP Hospital
- Jessica Perry, Dickinson-Iron District Health Department
- Steve Simbob, Iron County Medical Care Facility
- Tom Karvala, Iron County Mine Inspector/Caspian-Gaastra Fire Department

- Tom Clark, Iron County Drain Commissioner
- Matt Zika, National Weather Service
- Paul Campbell, Michigan State Police - Iron Mountain Post
- Mark Valesano, Iron County Sheriff's Office
- Gene Smith, Iron County

In addition to the Local Planning Team meetings, Iron 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 Iron 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 Iron County. This information has been updated to reflect the community profile for the 2020 plan. It consists of the following seven subsections:

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

### Geography, Environment, and Land Use

Iron County is in the southwestern part of Michigan's Upper Peninsula, along the border of Wisconsin. The county was created in 1885 after severing from Ely Township in Marquette County. It was named after the iron ore that was discovered near the Paint River in 1846. Mining grew steadily until the depression of 1894, during which 23 of the area's 26 mines went out of business. The second largest industry, lumber, kept the economy going. Mining saw a brief revival in the early part of the 20<sup>th</sup> century, but the last mine closed in 1978. The City of Crystal Falls serves as the County seat. **Map 3.1** shows a map of Iron County with the locations of its municipal jurisdictions.

Iron County's total area is 1,231 square miles that are comprised of hilly uplands, with elevations from 1,200 to 1,800 feet above sea level, and forests. Forests cover over 80% of the county and primarily consist of northern hardwoods, pine, fir, and spruce (**Map 3.2**). The county contains 2,175 lakes and over 900 miles of rivers and streams.

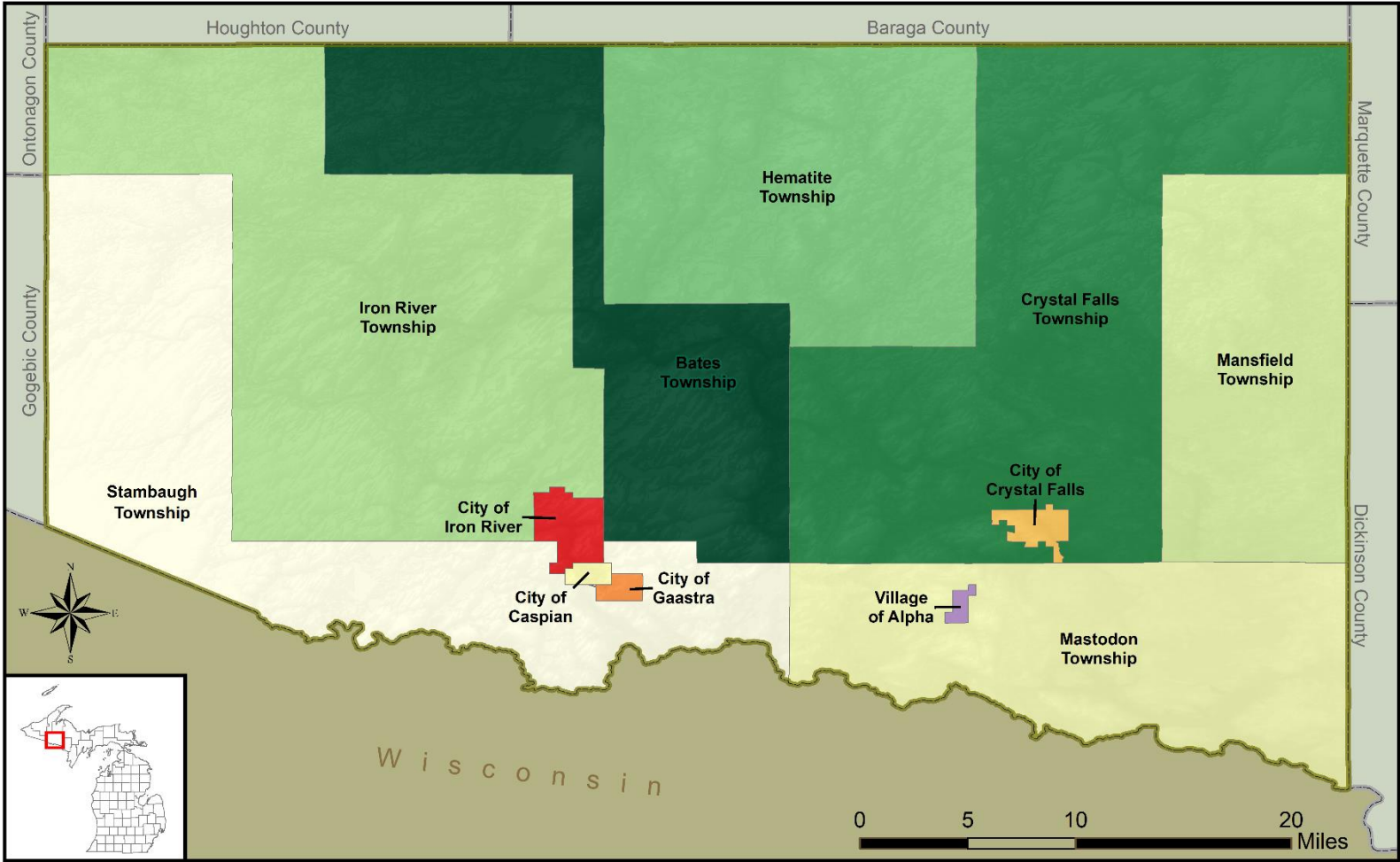
Most of Iron County lies within the Lake Michigan Basin, but the Northwest corner lies within the Lake Superior Basin and the Southwest corner flows to the Mississippi River (**Map 3.3**).<sup>1</sup> The basins differ by changes in elevation that guide the direction of water flow to each corresponding body of water. The county experiences long, cold winters and short, hot summers with limited lake effect precipitation and more extreme temperatures due to its inland location. Its abundance of inland lakes combined with varying topography from glaciation creates a varied climate throughout the county.<sup>2</sup>

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<sup>1</sup> Iron County Watershed Coalition. [www.ironcountywatershedcoalition.org/](http://www.ironcountywatershedcoalition.org/)

<sup>2</sup> USDA NRCS – Soil Survey of Iron County, Michigan 1997

Map 3.1: Iron County Municipalities



**Local Units of Government  
Iron County, Michigan**

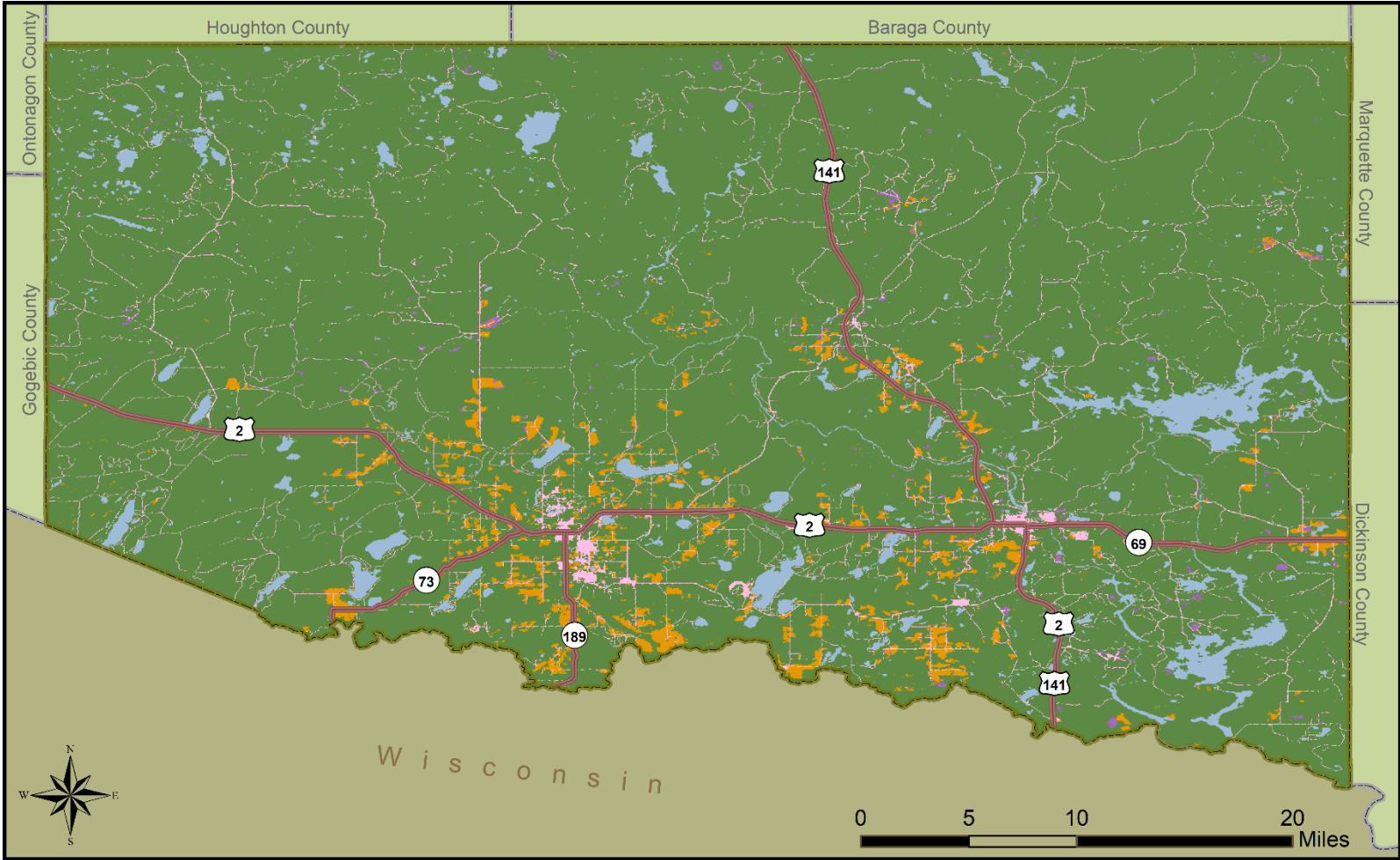
Boundary data was derived from Michigan's Open Data Portal; DEM was derived from elevation data available through the USGS; Created by WUPPDR November 2020

Township		City		Village	
	Bates		Caspian		Alpha
	Caspian		Crystal Falls		
	Crystal Falls		Gaastra		
	Gaastra		Iron River		
	Hematite		Mastodon		
	Iron River		Stambaugh		
	Mansfield				



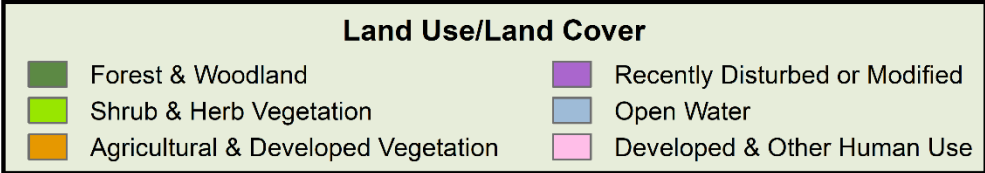


Map 3.2: Land Use/Cover in Iron County



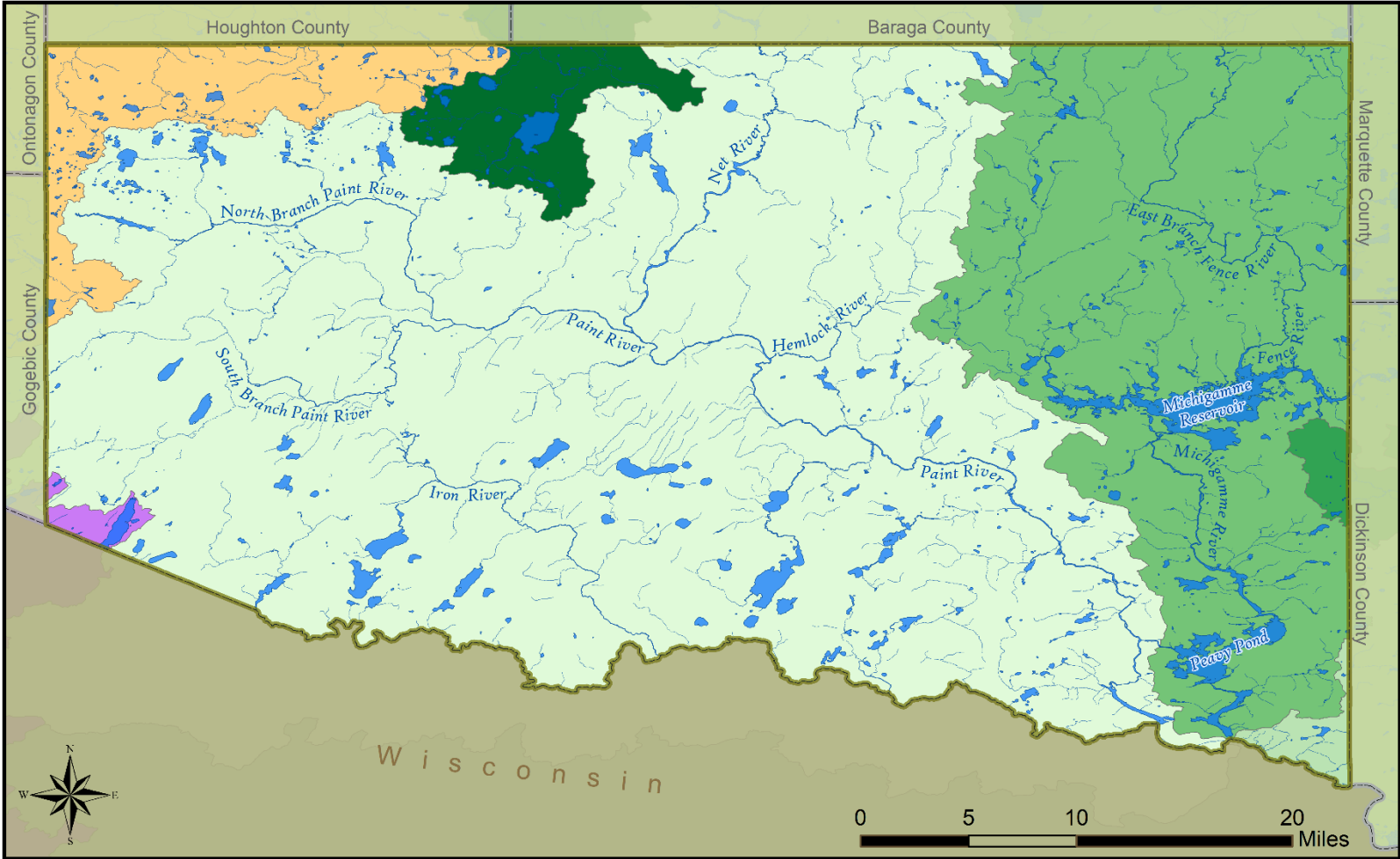
### Land Use/Land Cover Iron County, Michigan

Boundary data was derived from Michigan's Open Data Portal; Land Use/Land Cover data downloaded from the USGS; Created by WUPPDR November 2020





Map 3.3: Watersheds in Iron County



**Watersheds  
Iron County, Michigan**

Boundary and watershed data was taken from Michigan's Open Data Portal; Created by WUPPDR November 2020

Watershed/Basin			
	Brule		Menominee
	Ontonagon*		Upper Wisconsin**
	Cedar-Ford		Michigamme
	Sturgeon		

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



The growing season in Iron County is roughly 84 days. Average temperatures in January are a low of -1 degrees Fahrenheit and a high of 21 degrees Fahrenheit. In July, average temperatures are a low of 50 and a high of 77.<sup>3</sup> Average rainfall is 29.4 inches, while snowfall averages 85 inches, though it can vary widely. Large amounts of winter snowfall can often result in heavy spring runoffs.

Soil development in Iron County has been influenced by Pleistocene glaciation as the soils formed on top of outwash plains, moraines, drumlins, kettles and kames that deposited over Middle Precambrian bedrock. The soils are predominantly deep, loamy types but range from deep, sandy soils to loamy soils over gravel and sand. Less drained swampy areas reside in the depressions that are adjacent to higher elevation areas.<sup>2</sup>

Many rivers flow through Iron County and some are considered the best trout streams in Michigan. The Brule, Cooks Run, Ford, Iron, and Paint Rivers are considered top-quality trout streams and provides prime trout habitat and fishing. The Paint River is the largest in the County, with a watershed of 601 square miles, followed by the Michigamme River, which has a watershed drainage area of 303 square miles. Part of the East Branch of the Ontonagon River flows into the northwest corner of Iron County. Many waterfalls and rapids are also found in the county; the most famous of which are Chipmunk Falls and Little Bull Rapids. All the main rivers in Iron County are in the Lake Michigan watershed. The largest lakes in Iron County are the Chicagon (1,100 acres) and Perch (990 acres) Lakes.

Land use and development in Iron County is directed by local zoning ordinance in all but Hematite Township, which has no zoning ordinance in place. There are additional non-regulatory restrictions on development including topography and access limitations and a legacy of abandoned mine shafts with associated hazards. Land use is greatly influenced by the historic mining past and ownership patterns.

Over half of the county's acreage is forestland, all of which are open to the public. About 178,000 acres of the Ottawa National Forest occupy the western half of Iron County, while 79,428 acres of the Copper Country State Forest are found in the eastern half. Outside of the state and national forestland, residential use is concentrated in and around the cities of Iron River and Crystal Falls. It is also dispersed among several small communities, lakes, and rivers. Commercial use is centered in Crystal Falls and Iron River, typically along major transportation routes.

Iron County is also home to Bewabic State Park, located four miles west of Crystal Falls. It is located on the northwestern shore of Fortune Lake. It covers 315 acres and offers hiking, camping, fishing, swimming, a boat ramp, and a 129-site campground. The Iron Belle Trail, the longest designated state trail in Michigan, passes east-west through the county. The multi-use trail follows US-2, a designated national biking route in the U.P.

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<sup>3</sup> NOAA-NCDC: 1981-2010 Summary of Normals, Stambaugh 2 SSE, MI, US

## Population and Demographics

Iron County is comprised of seven townships, two villages, and five incorporated cities. It also has numerous small former mining communities where populations remain concentrated. The county’s total 2017 estimated population was 11,291 (**Table 3.1**). A third of the county’s population was found in the Iron River area in the western half of the county, which includes Iron River, Caspian, and Gaastra. Crystal Falls, in the eastern half of the county, was the second largest population center (1,696 residents). Since the last hazard mitigation plan update, the county has seen a 4.6% decline in population.

**Table 3.1:** Municipal Populations for Iron County, 1960-2017

Municipality	U.S. Census (Decennial)					ACS (5-Year Estimates)		
	1960	1990	2000	2010	1960-2010 Change	2012	2017	2012-2017 Change
Bates Twp.	1,224	966	1,021	921	-24.8%	1,017	951	-0.1%
Crystal Falls Twp.	1,443	1,614	1,722	1,743	20.8%	1,828	1,530	-16.3%
Hematite Twp.	523	366	352	338	-35.4%	351	275	-21.7%
Iron River Twp.	2,025	1,398	1,585	1,027	-49.3%	1,159	1,051	-9.3%
Mansfield Twp.	302	248	243	241	-20.2%	203	245	-20.7%
Mastodon Twp.	667	654	668	656	-1.6%	483	654	35.4%
Stambaugh Twp.	1,092	1,186	1,248	1,140	4.4%	1,132	1,117	-1.3%
Village of Alpha	317	219	198	145	-54.3%	101	169	67.3%
Village of Mineral Hills <sup>a</sup>	311	200	214	-	-	-	-	-
City of Caspian	1,493	1,031	997	906	-39.3%	839	511	-39.1%
City of Crystal Falls	2,203	1,922	1,791	1,469	-33.3%	1,540	1,696	-10.1%
City of Gaastra	582	376	339	347	-40.4%	247	383	-55.1%
City of Iron River	3,754	1,929	3,386	3,029	-19.3%	3,038	2,878	-5.3%
City of Stambaugh <sup>a</sup>	1,876	1,319	1,243	-	-	-	-	-
Iron County	17,184	13,175	13,138	11,817	-31.2%	11,837	11,291	-4.61%

<sup>a</sup> As of 2000, consolidated into City of Iron River; Source: U.S. Census and ACS

According to the American Community Survey (ACS) for 2017, the median age for persons in Iron County was 53.8 years. 28.9% of the county’s population was comprised of persons 65 years old and over. The poverty rate for persons within Iron County was estimated at 14.2%. People that identified as white constituted 95.8% of the county’s population; next was American Indian/Alaska Native comprising of 1.2% of the population. **Table 3.2** displays the most recent estimates for demographic data on race distribution for Iron County.

**Table 3.2:** Race Percentages in Iron County, 2017<sup>4</sup>

Race	People	Percent
White	10,822	95.8
Black	89	0.8
American Indian/Alaska Native	138	1.2
Asian	52	0.5
Other	55	0.5
Two or More Races	135	1.2
Total Latinx Population ( <i>ethnicity</i> )	205	1.8

## Housing and Infrastructure

In 2017, there were 9,303 housing units in Iron County, a 1.1% increase from 2012. Of these, 5,315 were inhabited, with 4,392 households considered owner occupied (82.6%), and 923 households considered renter occupied (17.4%). Seasonal or recreational housing makes up many housing units in the county due to increasing numbers of retirees and the popularity of vacation cabins and hunting camps. The average household size is two persons. Median home values in Iron County in 2017 were \$76,700 for owner-occupied units, a 2.13% increase from 2012.

### Schools

Schools are some of the largest institutions in the county and could potentially see great impacts from the hazards discussed in this plan. Iron County is served by two school districts, West Iron Public Schools and the Forest Park School District, both of which are part of the Dickinson-Iron Intermediate School District. West Iron Public Schools serve the cities of Iron River, Caspian, and Gaastra, and the townships of Bates, Iron River, and Stambaugh. Forest Park School District serves the Crystal Falls, Alpha, and Amasa. **Table 3.3** shows the school districts, grade levels, number of students, and number of instructors at each of the schools in Iron County.<sup>5</sup>

**Table 3.3:** Schools in Iron County, 2019

School District/School Name	Location	Grades	Students	Instructors
<b>Forest Park School District</b>				
Forest Park School	Crystal Falls	Pre-K-12	440	34
<b>West Iron County Public Schools</b>				
Stambaugh Elementary School	Iron River	Pre-K-5	383	25
West Iron County Middle School	Iron River	6-8	207	20
West Iron County High School	Iron River	9-12	241	22

### Public Works

Iron County has a Road Commission responsible for county roadway maintenance. The Iron County Road Commission office and garage is in Iron River. An additional garage is in Crystal

<sup>4</sup> Data from the 2013-2017 American Community Survey 5-year Estimates.

<sup>5</sup> MI School Data. Student Enrollment Counts and Staffing Information. [www.mischooldata.org](http://www.mischooldata.org)

Falls. Most municipalities have public works agencies for maintenance and development of transportation and other infrastructure. Townships also have staff for maintenance of facilities and utilities. All such agencies are resources for implementation of related mitigation actions.

### **Roads**

Several primary highways pass throughout Iron County (**Map 3.4**) including US-141 from the north through Crystal Falls and US-2 which passes through the southern portion of the county from west to east and joins US-141 to Wisconsin. Other highways include M-69, M-189, M-73, and Forest Highway 16. The County's history is promoted along its roadways with a designated heritage route that follows US-2, County Road 424, and M-189 through both Crystal Falls and Iron River. There are 16 miles of US-2 that is a state-designated Heritage Route.

### **Rail**

Iron County has one remaining active railroad line – the Escanaba and Lake Superior Railroad Company. The line runs from Green Bay, WI via Channing to Amasa and onto Sidnaw in southern Houghton County.

### **Ports**

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

### **Airports**

There are two airports in Iron County: Iron County Airport, located six miles southeast of Crystal Falls, and Stambaugh Airport, in Iron River. The Iron County Airport has a 3,700-foot asphalt runway, which is in poor condition, and a 2,700-foot turf runway that can accommodate single- and twin-engine planes. Three aircraft are based at this field, which sees an average of 150 aircraft operations per year (about three per week). The Iron County Airport is unattended and offers no services except tiedown parking.

The Stambaugh Airport has a 2,000-foot asphalt runway, which is in poor condition, and can accommodate single- and light twin-engine planes. Six aircraft are based at the field and the airport sees about 44 aircraft operations per week (as of December 2014). The field is unattended and offers no services except tiedown parking for aircraft and flight instruction.

The Ford Airport in Kingsford, MI is the closest airport with regularly scheduled passenger service. The Ford Airport is located about 20 miles southeast of Crystal Falls. The airport has no control tower, with approach and departure services provided by Minneapolis ARTCC. There are two asphalt runways, one that is 6,500-feet in length and the other 3,810-feet in length. Delta Airlines (operated by Skywest Airlines) offers daily flights Sunday through Friday to Detroit, MI and Minneapolis/St. Paul, MN. There is an additional flight on Saturday to Minneapolis/St. Paul. Northern Airways provides charter services to customer requested destinations. The airport also offers fuel, parking, airframe service, powerplant service, flight instruction, and aircraft rental. 33 aircraft are based at the field, with an average of 134 operations each week. 62% of flights are






Map 3.4: Transportation in Iron County



### Transportation Iron 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 November 2020

	Iron County Airport		Railroad
	Stambaugh Airport		State Highway
			Road



air taxi, 21% commercial, 10% are transient general aviation, 7% local general aviation, and less than 1% is military based.

**Transit**

Indian Trails Bus Company provides regularly scheduled long-distance passenger service, with a daily trip to Duluth, Minnesota and to other Upper Peninsula areas, such as Ironwood, Hancock, Marquette, and St. Ignace. Iron River and Crystal Falls are two stops on Indian Trails routes in the U.P.

**Employment and Industry**

In 2017, the median household income for Iron County was \$36,773 and median worker income was \$25,862. The state unemployment rate for 2017 was 7.4%, and for Iron County the rate was 5.7%. 14.2% of people in Iron County are reportedly below the federal poverty level.

Iron County’s economy is comprised of three dominant sectors: health care and social assistance, retail trade, and manufacturing (**Table 3.4**). The county’s largest employer is the Iron County Medical Care Facility, which employs about 368 persons. Other significant employers include Ski Brule, Lake Shore Systems, and Connor-AGA Sports Flooring Corporation.

The economy of Iron County has been primarily one of extraction. Though the last iron mine closed in 1978, the timber industry is still going strong. It has shifted from the great pine to hardwoods and now pulp. Manufacturing is dominated by lumber and forest products, naval equipment, and machine tooling. Agriculture has been primarily for subsistence, except for potato farming and canola, which is used for making cooking oil. Tourism, particularly forest-based recreation, is the second largest component of the economy.

**Table 3.4:** Employment by Sector in Iron County, 2017<sup>6</sup>

Employment Sector	Percentage
Educational Services; Healthcare and Social Assistance	24.5
Retail Trade	12.4
Manufacturing	11.9
Arts, Entertainment, Recreation; Accommodation & Food Service	9.0
Construction	8.7
Public Administration	5.5
Professional, Scientific, Management, and Administrative and Waste Management Services	5.4
Transportation and Warehousing; Utilities	5.3
Other services, except public administration	5.1
Agriculture, Forestry, Fishing, Hunting, and Mining	4.3
Finance and Insurance; Real Estate, Rental and Leasing	3.9
Information	3.0
Wholesale Trade	1.1

<sup>6</sup> Data USA: Iron County, MI. <https://datausa.io/profile/geo/iron-county-mi>

## 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

Iron County is primarily serviced by the Iron County Sheriff’s Department. The office is in the Iron County Courthouse Complex in Crystal Falls. Staff consists of the Sheriff, Undersheriff, eleven officers and deputies, and six dispatchers who work in conjunction with the 911 dispatchers. The Sheriff’s Office also supports a Victim Service Unit – a team of trained volunteers dedicated to helping victims or survivors work through a crisis or crime. The Unit will be called out for homicides, suicides, traumatic deaths, serious injury accidents, fires, natural disasters, and any other crimes of incidences that expose victims or survivors to emotional or physical trauma. Local police departments include Iron River, Crystal Falls, and Caspian. The nearest State Police post is in Iron Mountain, approximately 20 miles southeast of Crystal Falls.

The Iron County Correctional Facility is located next to the Sheriff’s Office. The jail holds all prisoners arrested within the county and can accommodate a total of 50 inmates. The jail is staffed by 8 full-time and 3 part-time correctional officers. Jail operations are handled by the Sheriff Department’s Jail administrator.

### Fire

There are five fire departments that serve Iron County (**Table 3.5**). Most fire departments in Iron County are volunteer.

**Table 3.5:** Fire Departments in Iron County<sup>7</sup>

Fire Department	Location	Service Area		Staff*
		Sq. mi.	Population	
Alpha-Mastodon Twp VFD	Alpha	131	668	17
Amasa-Hematite Twp VFD	Amasa	192	338	13
Crystal Falls Fire Authority	Crystal Falls	352	4239	21
Caspian-Gaastra VFD	Caspian	3	2726	51
West Iron County FD	Iron River	575	5000	29

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

### Medical

Iron County has one hospital, Aspirus Iron River Hospital and Clinics. Formerly part of the NORTHSTAR Health System, the hospital officially became Aspirus Iron River Hospital and Clinics in 2014. The hospital is a 25-bed critical access hospital that has an emergency department and walk-in clinic and a variety of diagnostic services. Aspirus also has a clinic in Crystal Falls. The Aspirus Crystal Falls Clinic provides primary care and laboratory services, occupational and physical therapy, diabetic education and memory clinic services. The Ice Lake

<sup>7</sup> Michigan Department of Licensing and Regulatory Affairs Fire Service Directory. <https://fireservicedirectory.apps.lara.state.mi.us/>



Family Health Center, part of the Upper Great Lakes Family Health Center near the hospital, provides primary care and laboratory services as well as behavioral health services.

The Iron County Medical Care Facility, located in Crystal Falls, is owned and operated by Iron County. It provides medical care, treatment, and supervision for elderly, chronically ill, or disabled persons requiring long-term care or services of lesser intensity than those provided in hospitals. The facility has 200 staffed beds. The Iron River Care Center, another assisted living facility in Iron River, has 69 staffed beds. Iron County is serviced by the Dickinson-Iron District Health Department from its office in Iron River.

Emergency response is provided by Greater Iron County EMS., Inc., which is in Iron River. Two air services based at Ford Airport provide medical transport: Valley Med Flight, an urgent need full service fixed-wing and helicopter provider, and Northwoods AirLifeline, a volunteer operated fixed-wing service that provides non-emergency, long distance transport to patients with critical needs.

### Emergency Management Office

The Iron County Emergency Management Office is in Crystal Falls at the Iron County Courthouse. The office is responsible for preparedness and disaster education and awareness. The Emergency Management Office ensures interagency coordination before, during, and after disasters or emergencies, whether it is a small water break or catastrophic event

### Siren Coverage

Iron County is serviced by five sirens, all near population centers. The sirens are currently used for fire alert only. **Table 3.6** shows the siren location, range, and estimated population coverage for Iron County.

**Table 3.6:** Siren Locations in Iron County

Siren Site	Remote Activation	Range (radius) (miles)	Estimated Population Covered	Location
Amasa (Town Hall)	N	2	350	109 W. Pine St.
Crystal Falls (Fire Hall)	N	5	2,000	401 Superior Ave.
Iron River (City Hall)	N	10	2,000	106 W. Genesee St.
Caspian (City Hall)	N	5	1,000	340 E. Caspian Ave.
Alpha (Fire Hall)	N	1.5	220	404 Main St.

## 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 a community’s critical facilities. 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

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 Iron County. Tourism is a draw to Iron County; understanding and inventorying the important and visited locales of the county provides a more thorough understanding of assets to the community. 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 Iron County

Facility Name	Location
<b>Emergency Services</b>	
Caspian City Police Department	Caspian
Caspian-Gaastra Fire Department	Caspian
Iron River Police Department	Iron River
Iron County Sheriff	Crystal Falls
Crystal Falls Police Department	Crystal Falls
Crystal Falls Fire Department	Crystal Falls
West Iron County Fire Department	Iron River
Ironwood National Guard Amory	Iron River
<b>Equipment Storage Facilities</b>	
Iron River Public Works Garage	Iron River
<b>Medical Facilities</b>	
Aspirus Iron River Hospital	Iron River
Upper Great Lakes Ice Lake Family Health Center	Iron River
Iron River Care Center	Iron River
Iron River Senior Center	Iron River

Victorian Heights Assisted Living Housing	Crystal Falls
<b>Daycare Centers/Schools/Camps</b>	
Forest Park Preschool Tot Lot	Crystal Falls
Forest Park School	Crystal Falls
Iron River Christian Academy	Iron River
Iron River Head Start Center	Iron River
Lissa's Little Hilltoppers	Iron River
Over the Rainbow Child Care	Crystal Falls
Stambaugh Elementary School	Iron River
Tammy's Tykes	Iron River
West Iron County Middle School	Iron River
West Iron County Schools Preschool/Child Care Center	Iron River
Lake Ellen Camp	Crystal Falls Twp.
Camp Batwagama	Bates Twp.
Camp Gibbs	Iron River Twp.
Camp Sagola	Crystal Falls
Covenant Point Bible Camp	Iron River Twp.
Fortune Lake Lutheran Camp	Crystal Falls Twp.
<b>Utility/Drinking Water/Wastewater Services</b>	
West Iron County Wastewater Treatment Facility	Gaastra
Electrical Substation	Iron River
Electrical Substation	Crystal Falls
Hemlock Falls Dam	Crystal Falls
Little Bull Dam	Mastodon Twp.
Michigamme Falls Dam	Crystal Falls
Peavy Falls Dam	Crystal Falls
Way Dam	Crystal Falls
<b>Other Notable/Vulnerable Structures and Facilities</b>	
Alpha Village Hall	Alpha
Crystal Falls Township Hall	Crystal Falls Twp.
DNR Offices	Crystal Falls Twp.
Iron County Courthouse	Crystal Falls
Dickinson-Iron District Health Department	Iron River
Iron County Road Commission	Iron River
Stambaugh Township Hall	Stambaugh Twp.
Iron River Township Hall	Iron River
Bates Township Hall	Bates Twp.
Caspian City Clerk Office	Caspian
Iron County Housing Commission	Crystal Falls

## Cultural Assets

Iron County has several historic sites that tell the story of the area and provide a variety of recreational and educational opportunities to residents and visitors alike. A few of the sites have been recognized by the State and Federal government, and others are locally recognized historic sites. A few notable historic sites in Iron County include:

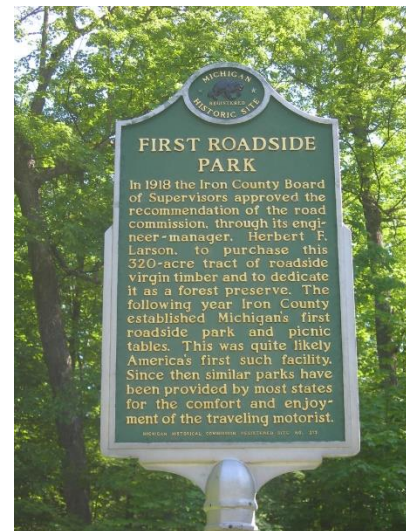
- *Iron County Museum* – On Museum Road, south of Iron River, the Iron County Museum is a 10-acre outdoor museum with 22 buildings that reveal the early pioneer, mining and logging days. Containing over 100 exhibits, it is the County’s largest collection of historic objects and information. Over 100 exhibits include the largest miniature logging display in the world, glass dioramas of underground mining, Native American artifacts, the home of composer Carrie Jacobs-Bond, and the Wildlife Art Gallery of Lee LeBlanc. The museum is a registered National Historic Site.
- *Pentoga Park Indian Burial Grounds* - Located at the south end of Chicagon Lake, Pentoga Park is the site of a pre-European Native American settlement and permanent area headquarters where Ojibwa Bands congregated. Wooden burial structures have endured time to protect and mark the graves of these ancient bands. When Chief Edwards moved west in 1891, he disposed of these lands with their traditional burial grounds. The county purchased the land in 1924 to develop a park on the beautiful shores of Chicagon Lake, and to preserve the burial grounds as a tribute to Native Americans.
- *Alpha Circle Historic District* – Located along County Road 424 and established in 1914, the same year as the Village, the Alpha Circle contains several buildings on the National Register of Historic Places. The 4 ½-acre site is an example of early engineering. All of the significant public buildings were constructed around a traffic circle.
- *Iron County Courthouse* - At 2 South Sixth Street at the top of the hill in Crystal Falls, the wealth and pride of the pioneers are revealed through the architecture and construction of their County Courthouse. Located in the Historic District, it is the most architecturally significant building in the county. Due to the use of regional materials in its construction and the numerous and varied tributes to the area’s influential cultures, the building is an accurate reflection of the days when Iron was King. The courthouse is a registered National Historic Site.
- *Harbour House* – Located on 4th Street in Crystal Falls and originally built in 1900, this Queen Anne Colonial Revival home has been restored and is now a museum. The first-floor furnishings and decorations reflect the artisanship and culture available to wealthy mine town residents. The six rooms on the second-floor display artifacts of past regional



*Iron County Courthouse (Source: Andrew Jameson licensed under [CC BY-SA 3.0](#))*

influences, such as logging and mining, military veterans, and the Ojibwe Indians. Harbour House is a registered National Historic Site.

- **Mansfield Location & Pioneer Church** – Mansfield Location is located seven miles north of Highway M-69 on Mansfield Cutoff Road, while Pioneer Church is located one mile north on Stream Road. In 1893, the Michigamme River broke through and flooded the underground mine. Visitors can rediscover the risk miners faced every day, as 27 miners descended into the dark earth tunnels never to return and can walk across the Michigamme River on the historic concrete filled spandrel arch bridge built in 1915. Just west of the Mansfield mine disaster are some of the original buildings from the community, including the Mansfield church, which was completely restored in 1987 and serves as a landmark and reminder of the small mining settlement.
- **Amasa Museum** - Located 12 miles north of Highway US-2 just off US-141 on Pines Street in Amasa, the museum is in the Main Street Historical District. The building, formerly the township hall, is an example of late 1800s balloon style architecture. The main floor has many pictorial displays of the mining and logging industries that helped build Amasa, as well as Amasa School and Triangle Ranch memorabilia. An ongoing renovation of the second floor will result in a replica of "The Streets of Old Amasa." The importance of Amasa as a major hub for logging and rail transportation can be seen in the old depot that stands sturdy against time. The museum is a registered National Historic Site.
- **Fortune Pond** - Located 3/4 mile north of Highway US-2 on New Bristol Road, 2 miles west of Crystal Falls, the site is an example of the many mines that have been reclaimed by nature after the impact of mining. This mine produced 1,316,905 tons of iron ore from 1953 to 1958. It had one shaft with two drifts used to drain the 210-foot-deep pit. The pit is 1,930 feet long by 750 feet wide. A once major mining operation now lends itself to a scuba diver and angler paradise.
- **Be-wa-bic State Park** - Four miles west of Crystal Falls on Highway US-2, this 315-acre state park has wonderful public log buildings built by the Civilian Conservation Corps in the 1930s and includes fascinating stonework along the beach and parking lots. Interpretive signage on the upper level near the campgrounds provides the visitor with an opportunity to see how the early settlers cleared the land for lumbering, mining, agriculture, and tourism. The state park is a registered National Historic Site.
- **Larson Park** - On Highway US-2, four miles east of Iron River, Larson Park was established in 1919 by early road engineer Herbert Larson. Noting the lack of public rest areas along his way, he became determined to provide a stop for travelers where they could relax, rest, and share information before proceeding on their journey. While not the original



[First Roadside Park Marker](#) by [jimmywayne](#) licensed under [CC BY-NC-ND 2.0](#)



site, which was on Stager Lake, the State Register sign commemorates Larson's efforts here as the first roadside picnic site in Michigan and perhaps the entire United States.

- Apple Blossom Trail - Begins on Brady Avenue in Caspian across from the Iron County Museum. This restored walking/biking trail along the banks of the Iron River was originally the major corridor for the rail lines that hauled thousands of tons of iron ore from local mines to the steel mills of Chicago and Indiana.
- Lake Ottawa Recreation Area & Campground - A 30-minute hike to "Orville's Bench" on the Ge-Che primitive trail in the Ottawa National Forest will introduce you to one of the most breathtaking natural views in the county. Along the shore of this pristine lake, archeologists affirm, are the remnants of some of the area's earliest residents: prehistoric Indians dating back at least 2000 years. Several site reconstructions have been created from recent archeological digs sponsored by the U.S. Forest Service.
- Mile Post Zero & Treaty Tree - This site, on Ottawa Lake Road off Highway M-73 one mile south of US-2, is where Captain Thomas Cram placed the first marker at the survey point establishing the Wisconsin-Michigan state boundary in 1840. As part of the settlement of the "Toledo War" between Michigan and Ohio, most of the Upper Peninsula of Michigan was granted to Michigan for the "Toledo Strip," which was granted to Ohio. He made a treaty for passage with Chief Ca-Sha-O-Sha and the band of Ojibwa (Chippewa) near a large tamarack tree at the headwaters of the Brule River.

- Camp Gibbs Recreation Area - Approximately two miles west of Iron River and ten miles north of US 2, this property was purchased by the United States from the Michigan Mineral Land Company in 1934. In 1935, Camp Gibbs was established as a Civilian Conservation Corp (CCC) camp. Nineteen buildings were constructed, including barracks, a kitchen, a shower room, a bakery, garages, and storage space for the CCC workers. It is a unique example of vernacular American architecture of the period. The materials and methods of construction represent a time when frugality was critical to the survival of society. In the 1940s the State of Michigan Social Welfare Commission used the camp to house indigent people from all over the state.



Camp Gibbs (Source: [rossograph](#) licensed by [CC BY-SA 4.0](#))

## Disaster Declaration

Since 1965, Iron County has experienced a total of six presidential disaster declarations, shown in **Table 3.8**. Two 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 Iron County, 1965-2019

Event	Declaration Date	Declaration Number
Drought	March 2, 1977	3035
Blizzards and Snowstorms	January 27, 1978	3057
Flooding	May 6, 2002	1413
Hurricane Katrina Evacuation*	September 7, 2005	3225
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, Iron 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**
    - Flood 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

**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.



- Petroleum and Natural Gas Incidents
- **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:** Descriptions of Identified Hazards

Hazard	Description
<b>NATURAL HAZARDS</b>	
<b>WEATHER</b>	
<b>Extreme Temperatures</b>	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.
<b>Fog</b>	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.
<b>Hail</b>	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
<b>Ice and Sleet Storms</b>	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.

<b>Lightning</b>	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.
<b>Severe Winds</b>	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.
<b>Snowstorms and Blizzards</b>	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.
<b>Tornadoes</b>	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% below that of the surrounding atmosphere.
<b>GEOLOGIC</b>	
<b>Earthquakes</b>	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.
<b>Subsidence (Ground Collapse)</b>	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.
<b>HYDROLOGIC</b>	
<b>Dam Failure</b>	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.
<b>Riverine and Urban Flooding</b>	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.
<b>Drought</b>	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.
<b>ECOLOGICAL</b>	
<b>Invasive Species</b>	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).
<b>Wildfires</b>	An uncontrolled fire in grass, brush, or forested areas.
<b>TECHNOLOGICAL HAZARDS</b>	
<b>INDUSTRIAL</b>	
<b>Scrap Tire Fires</b>	A large, uncontrolled fire that burns scrap tires that are being stored for recycling or reuse.
<b>Structural Fires</b>	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.
<b>Hazardous Materials: Fixed Site Incidents</b>	An uncontrolled release of hazardous materials from a <b>stationary location</b> 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.
<b>Hazardous Materials: Transportation Incidents</b>	An uncontrolled release of hazardous materials during <b>transport</b> that can pose a risk to health, safety, property, or the environment. Hazardous materials are transported over highway, railway, seaway, airway, and pipeline systems.
<b>Petroleum and Natural Gas Incidents</b>	The uncontrolled release of petroleum, natural gas, or hydrogen sulfide, a poisonous by-product.
<b>INFRASTRUCTURE</b>	
<b>Infrastructure Failure and Secondary</b>	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,

<b>Technological Hazards</b>	water, storm drainage, communications and transportation. If infrastructure failure results from a natural hazards event, it is termed a <b>secondary</b> or <b>cascading technological hazard</b> .
<b>Transportation Accidents</b>	A crash or accident involving air, land, or water-based commercial passenger carrier resulting in death or serious injuries.
<b>HUMAN-RELATED HAZARDS</b>	
<b>Civil Disturbances</b>	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.
<b>Public Health Emergencies</b>	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).
<b>Sabotage and Terrorism</b>	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](http://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](http://www.ncdc.noaa.gov)

National Centers for Environmental Information Storm Events Database, NOAA, U.S. Department of Commerce: [www.ncdc.noaa.gov/stormevents](http://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](http://www.nws.noaa.gov)

NWS GIS Portal, NWS, NOAA, U.S. Department of Commerce: [www.weather.gov/gis](http://www.weather.gov/gis)

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

## SECTION 5: Hazard Analysis

This section of the Plan describes the hazards identified by Iron 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,<sup>8</sup> 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 by 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 Iron 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 Iron County and its participating jurisdictions that have a recognizable geographic boundary (i.e., hazards that are known to occur in certain areas of Iron 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

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

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<sup>8</sup> Historical occurrences for hazards were sourced from NOAA's Storm Events Database, unless indicated otherwise.



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, causing events such as more frequent and severe hurricanes and winters that fluctuate towards either extreme, warm with light snowfall or cold with heavy snowfall.

In Iron County, weather hazards already vary greatly by season and from year to year. Because Iron County is prepared to handle severe winter weather, damage from this type of event is controlled by snow management. Collapsing roofs are a variable problem and dependent upon age of buildings and building codes. Residents are acclimated to severe winter weather. However, transportation is a hazard and is discouraged during severe winter weather events.

When it is not winter, thunderstorms, hail, high winds, and flood hazards are more variable and less location dependent. Due to the variability and inability to control these types of storm events response plans are the best mitigation. Flooding over the last few years has been an expected spring condition, but Iron County is susceptible to drought due to its agricultural lands and reliance on well water. A sustainable period of drought could cause hardships to both agricultural areas and the community at large if water resources are depleted.

Unlike other western Upper Peninsula counties, Iron County tends to be more subject to extreme temperatures and summer weather events and less subject to severe winter precipitation. This is due to the county's inland southern location, which is squarely in the path of southwesterly weather patterns versus lake effect snow systems.

## 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, shown in **Figure 5.1**, uses air temperature and humidity to determine the heat index or apparent temperature. The major threats of extreme heat are heat exhaustion and heatstroke (a major medical emergency). **Table 5.2** shows the dangers associated with different heat index temperatures.

Figure 5.1: NOAA’s National Weather Service Heat Index Chart<sup>9</sup>

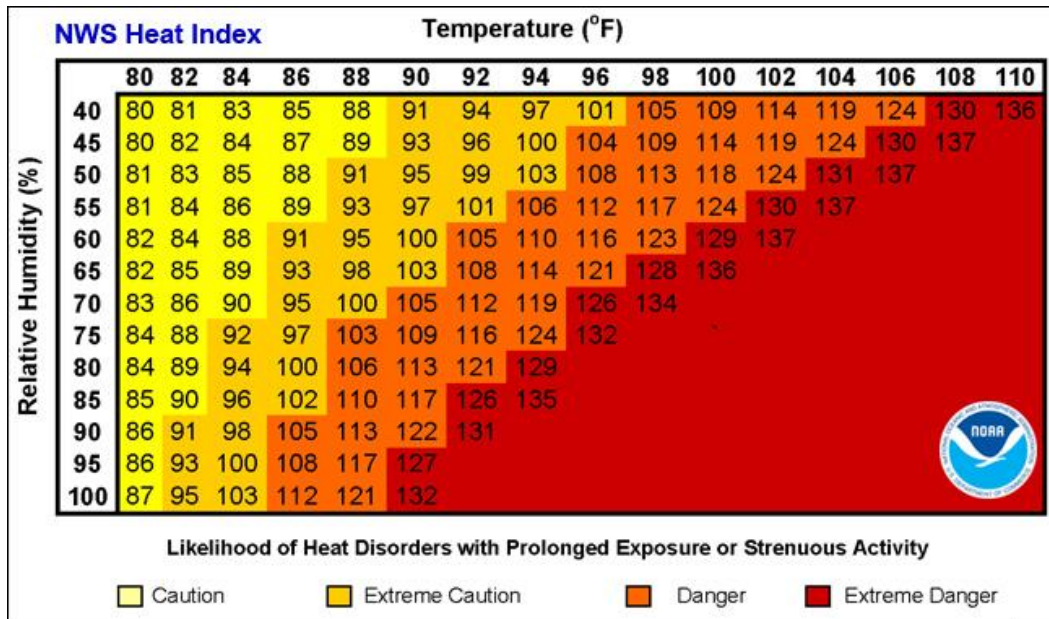


Table 5.1: Heat Index and Related Heat Disorders

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.

<sup>9</sup> National Weather Service (NWS). Heat Index – Weather.gov: [www.weather.gov/safety/heat-index](http://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 Iron 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. Iron County, with its inland location, can experience high temperatures and severe cold temperatures. Monetary damages are generally minimal, though schools are often closed during these events.

From 1996-2019, there were six reported instances of extreme cold and wind chill and 31 cold/wind chill events. Only one heat event was reported on July 31, 2006, where temperatures were over 90°F and heat indices were in the 100-105°F range. No damages were reported for any of these events, but the cold has caused two deaths in Iron County. From February 8-11, 2011, arctic air and gusty winds resulted in wind chill readings near -25°F. A Caspian man died of exposure to the cold on the 8<sup>th</sup>. Another extreme cold event from January 15-16, 2019, where morning temperatures were around 10°F and sub-zero wind chill, resulted in the death of an elderly man.

## **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 ten years, there have been three extreme cold/wind chill events (frequency of 0.3 events per year) and no extreme heat events. 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. The county is somewhat more vulnerable to extreme heat than cold, as residents are less accustomed to heat.

All Iron 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 increased impact demand on electric utilities and may cause power outages to critical facilities. Critical facilities vulnerable to the extreme cold include water or wastewater services. 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**

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

### **Occurrence Probability and County Vulnerability**

While only two fog events were reported (none in the past 10 years), fog is a common occurrence in Iron County. 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, 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 range 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. **Table**

5.4 provides an overview of all reported hail events in Iron County. From 1955-2019, 55 hail events were reported throughout the county (**Map 5.1**).

The most significant hailstorm event in Iron County occurred on June 9, 2000, where severe thunderstorms moved into the county in the early morning hours, producing hail of up to 1.75 inches in diameter. The hail caused extensive damage to homes, businesses, and vehicles. About 700 vehicles and 575 homes suffered hail damage, mostly in a west-southwest to east-northeast swath 1.5 to 2 miles wide across the northern two thirds of Iron River. Stambaugh, Gaastra, and Alpha also experienced large hail, but little property damage. Total estimated property damage was \$4.1 million, which includes damages reported in neighboring Dickinson County. Other than this event, there was no damage recorded as hail damages were minor and incurred by individual property owners.

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

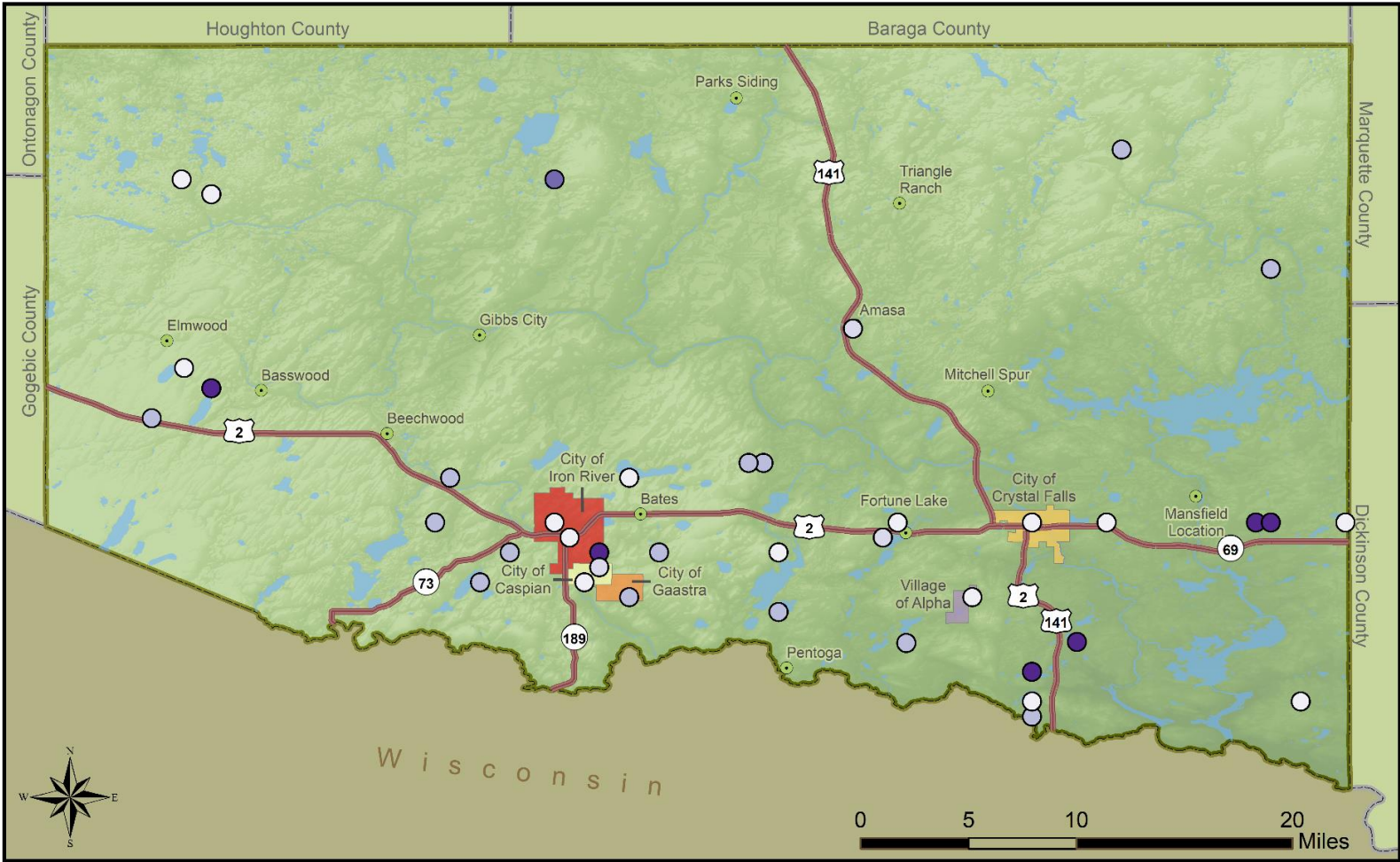
Hail Size Reported	Number of Events
¾"	16
0.9"	8
1"	18
1 ¼"	1
1 ½"	3
1 ¾"	9
<b>TOTAL</b>	<b>55</b>

### Occurrence Probability and County Vulnerability

From 2010-2019, 12 hail events were reported in Iron County – a frequency of 1.2 events per year. Thus, the probability of a hailstorm is likely, and severity is highly variable. Property damage due to hail is generally minor and incurred by individual property owners. There are no known locations in the county that have a higher susceptibility to hail, as such this hazard is assumed to uniformly impact the county. However, some communities may have structures that are more vulnerable to hail damage than others. Damage to homes, vehicles, and buildings, such as broken windows, dented roofs, and damaged siding, is frequently reported. Critical facilities in all Iron County communities are vulnerable to receive similar damage from hail. Hail should not negatively impact the services a critical facility provides



Map 5.1: Hail Events in Iron County



**Recorded Hail Events 1955-2018  
Iron 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  
Created by WUPPDR November 2020

Hail Size (Inches)					
0.75	0.88	1	1.25	1.5	1.75



## Ice and Sleet Storms

### Hazard Description

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

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

### Climate Change Considerations

Climate change seems likely to cause an increase in the number of ice and sleet storm events. Average temperatures 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 cause treacherous ice cover on frozen surfaces, weigh down cables and tree branches, and cause infrastructure failures. Even though Michigan winters have been shortening a bit over time, 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.

### Historical Occurrence

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

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

Date	Type of Storm	Description and Location	Property Damages
12/18/2002	Ice Storm	Freezing rain caused ice to form on roads, cars, trees, and other objects.	No reported damages
12/30/2004	Ice Storm	Ice accumulation of a quarter inch or more on roads county wide	No reported damages

01/01/2005	Sleet	Reported sleet accumulation of a half inch to an inch occurred, causing hazardous travel.	No reported damages
02/04/2019	Ice Storm	About a quarter inch to 1.5 inches of ice accumulation was reported in Amasa. Iron County Dispatch reported icy roads and tree damage from the storm.	\$2,000

**Occurrence Probability and County Vulnerability**

One ice storm was reported in the past 10 years – a frequency of 0.1 events per year. While ice and sleet storms do not appear to occur at a frequent rate, the probability of an event in Iron County is likely to occur. Severity is variable, but generally low to moderate. This is the case throughout the county. Though the effects of an ice storm have some similarities to a snowstorm, vulnerability to ice and sleet storms is higher due to the lack of familiarity to residents.

The vulnerability of Iron 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. Lightning tends to occur where electrical charges build up, and these charges also favor the shortest paths for the lightning currents to travel along. 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 produced 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<sup>10</sup>. Because it is virtually impossible to provide complete protection to individuals and structures from lightning,

<sup>10</sup> “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>.

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, Iron County experiences approximately 1.5 to 3 lightning strikes per square mile per year.<sup>11</sup> Two lightning events have been reported in Iron County, one of which resulted in extensive property damage. On May 13, 1998, a resort cabin burned down after it was struck by lightning, causing an estimated \$50,000 in damages. The second reported lightning strike occurred on September 24, 2019 northwest of Crystal Falls. A tree, that was estimated to be three and a half feet in diameter, was struck and split in pieces. While there were only two reported lightning strike in the county, lightning strikes still may have occurred, but these events usually do not have any recordable damage or were not reported.

### **Occurrence Probability and County Vulnerability**

The probability of occurrence for future lightning events throughout Iron County for any given year is low (frequency of occurrence for the past 10 years is 0.1). The county is in an area that has low lightning strike density. However, the greatest impact of lightning is its ability to cause wildfires, which has a potential for much greater severity than lightning itself. Additionally, the likelihood of a lightning event causing damage to human life or property is negligible, but when a damaging event does occur its severity is extreme at the discharge site.

All communities in Iron County are equally vulnerable to lightning strikes as there is really no way to determine 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 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 would need to be done to determine what facilities in the county are at a higher risk and might need greater protection.

## **Severe Winds**

### **Hazard Description**

Severe wind, or straight-line winds, sometimes occurs during severe thunderstorms and other weather systems and can be very damaging to communities. Severe winds with velocities over 58 mph may be confused with tornado occurrence. Locally, lesser events termed high winds and thunderstorm winds can cause similar damage as severe winds. Severe winds can cause damage

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<sup>11</sup> Vaisala National Lightning Detection Network. <https://www.vaisala.com/en/product/1256>

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**

Historically in Iron County, windstorms are rarely a singular event. They usually accompany other severe weather – particularly thunderstorms and occasional blizzards. From 1955-2019, 73 severe wind events were reported in Iron County. Of these, 68 were associated with thunderstorms and 24 events had reported property or crop damage (**Table 5.6**). Total reported estimated property damages due to severe winds is \$155,000 and estimated crop damages were \$2 million. Severe wind events were widespread throughout the county (**Map 5.2**). The largest estimated wind gust recorded in Iron County since 1955 was 80 knots (about 92 miles per hour) occurring twice. The first on August 9, 2005 near Iron River and was the result of a thunderstorm squall line. The second time on July 8, 2007 near Crystal Falls due to thunderstorm winds.

**Table 5.6:** Significant Severe Wind Events in Iron County, 1955-2019

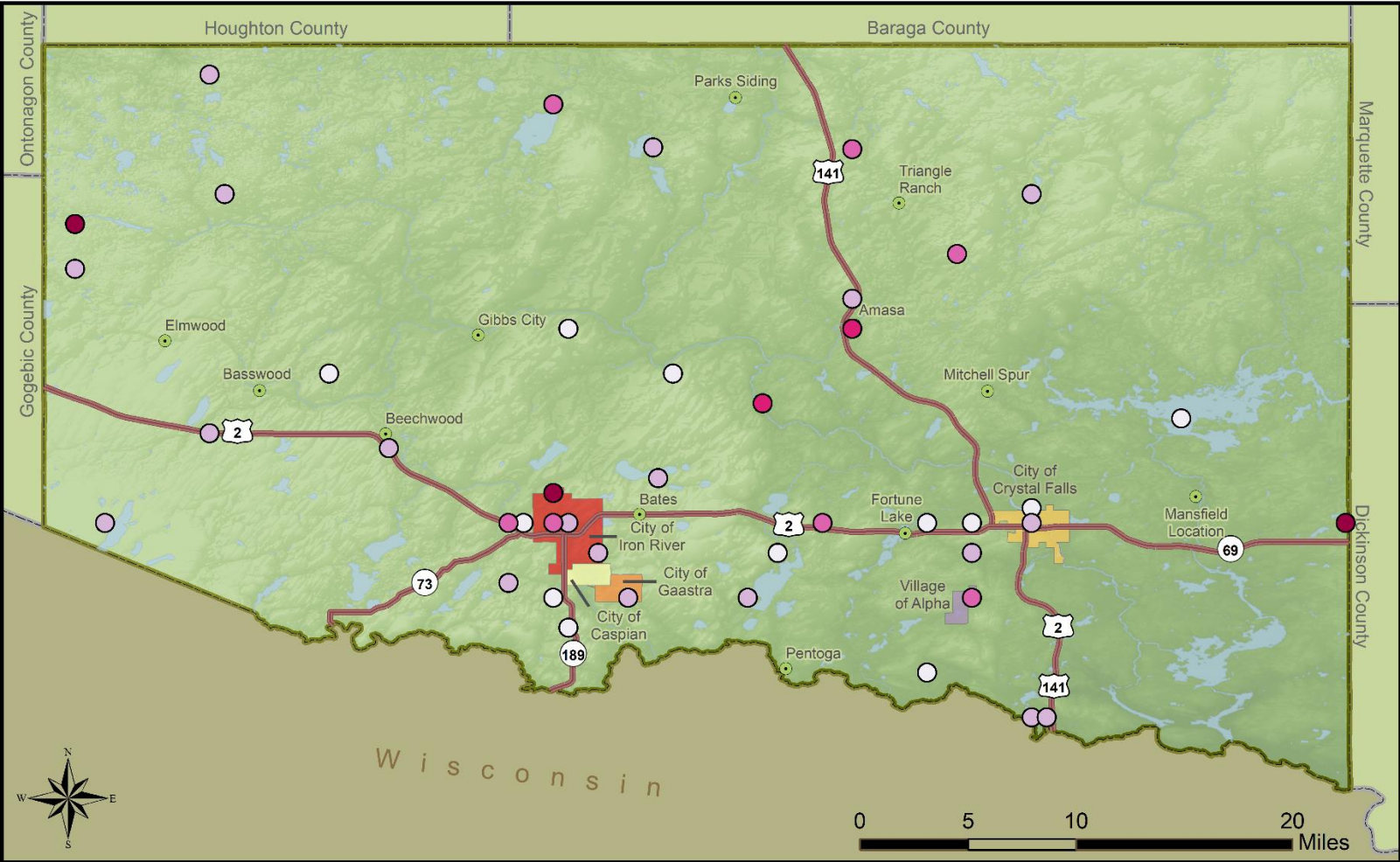
Date	Event Description and Location	Property Damages
08/07/1996	A series of microbursts struck multiple communities in Iron County. First was in Iron River here severe trees (12-20 inches in diameter) were downed. High winds tore off aluminum sheeting off a roof, broke several windows, and drove a 2x4 piece of wood into the siding of a house. Another microburst was 9 miles SE of Iron River, downing trees covering a 100-foot swath. The final area was 6 miles west of Crystal Falls, resulting in additional downed trees.	\$5,000
11/11/1998	A deep low-pressure system produced strong winds over the U.P. with sustained wind speeds of 30 to 40 mph and gusts as high as 87 mph. Damage was reported throughout the region with downed trees, signs, and utility poles.	\$2 million (crop damages)
09/11/2000	Winds of 63 mph in Crystal Falls downed a tree which fell on top of a pick-up truck, crushing it.	\$3,000
05/24/2007	Isolated severe thunderstorms downed trees and branches across roads in Gaastra area.	\$1,000
06/20/2007	Large birch trees downed due to winds of 63 mph near Crystal Falls	\$1,000
07/08/2007	Severe thunderstorms near Crystal Falls produced winds of up to 92 mph, downing several one-foot diameter pine trees. Damage path was about 0.6 miles in width.	\$2,000



07/25/2008	Strong thunderstorm winds near Elmwood knocked down numerous 8 to 10-inch diameter trees; some fell onto Highway 16.	\$3,000
04/30/2010	Thunderstorm winds (about 63 mph) near Iron River uprooted numerous birch trees and caused roof damage to multiple homes.	\$30,000
08/31/2010	Thunderstorm winds (about 63 mph) knocked over a large tree onto a house near Iron River.	\$15,000
10/26/2010	Thunderstorm winds (about 63 mph) downed trees throughout the county. Bates-Amasa Road was closed due to fallen debris from the storm. Forest Park school was closed the following day (27 <sup>th</sup> ) due to the storm.	\$5,000
09/29/2011	High winds (57 mph) in the area downed power lines. Crystal Falls fire department experienced a power outage.	\$2,000
05/30/2013	A tree was down on a power line due to thunderstorm winds near Rogers. The tree was on fire.	\$1,000
07/21/2016	Thunderstorm winds (65 mph) caused multiple downed trees near Beechwood.	\$3,000
03/08/2017	High winds (57 mph) caused a one-foot diameter, 60-foot-tall tree to fall on a house 3 miles NW of Bewabic State Park (Crystal Falls).	\$40,000
04/09/2017	High winds (80 mph) caused numerous downed trees across Bates-Amasa Road, resulting in its closure. Numerous trees were downed in the Amasa area as well.	\$20,000
06/03/2017	Thunderstorm winds cause multiple trees to fall near the intersection of US-2 and Forest Highway 16. A large truck was hung up on one of the downed trees.	\$5,000
06/11/2017	Several clusters of severe thunderstorms resulted in winds near 63 mph and caused a tree to fall on a home south of Crystal Falls.	\$8,000
09/22/2017	A line of strong thunderstorms brought nickel to quarter sized hail and strong wind gusts (about 60 mph). There were reports of snapped power poles and several medium to large diameter trees downed near Stambaugh and Young's Golf Course.	\$5,000

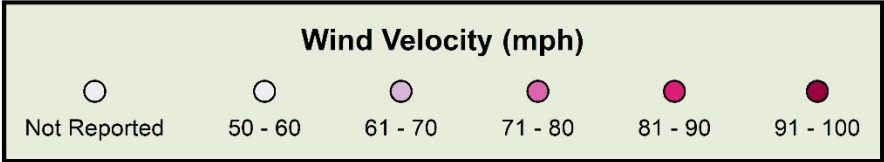


Map 5.2: Severe Wind Events in Iron County



**Recorded Wind Events 1955-2018  
Iron 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  
Created by WUPPDR November 2020



## **Occurrence Probability and County Vulnerability**

Most severe wind events are classified as thunderstorm winds, which are of concern to the area. In the past 10 years, there were 16 severe wind events, with 13 associated with thunderstorms – a frequency of 1.6 severe wind events per year and 1.3 thunderstorm wind events a year. The probability of a future severe wind event is likely. Severity ranges from low to high, depending on wind strength. All jurisdictions in Iron County are at risk of high or severe winds.

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

## **Snowstorms and Blizzards**

### **Hazard Description**

Snowstorms are a period of rapid snow accumulation that is usually accompanied with high winds and cold temperatures. This event can be 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.

Blizzards are the most dramatic of all snowstorms as it is characterized by low temperatures and strong winds of over 35 mph. 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 even in counties without lake shoreline.

### **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**

Unlike other western U.P. counties, Iron County exclusively experiences *system snow*, which is heavy snow or snow associated with winter storm/weather and results from weather fronts moving across the county. Due to its inland location, Iron County does not experience *lake effect snow*, which is almost exclusively focused on areas close to Lake Superior. Iron County has experienced 118 winter weather events (blizzard, heavy snow, winter storm, and winter weather) from 1996-2019. Note that some winter weather events include freezing rain in addition to snow.

**Table 5.8** summarizes the total number of winter storm events. Of these storms, three events had reported property damages. Snowstorm events with property damages are listed below:

- January 24-27, 1997: Heavy snow throughout Upper Michigan resulted in over a foot a snow throughout the U.P. In Iron River, the heavy snow accumulation caused the roof of the Iron River Reporter to collapse, destroying the building. Total reported property damage was \$600,000.
- November 9, 2011: A low pressure system dropped heavy snow over the county. A spotter near Iron River measured nine inches of snow in less than 12 hours. Wet heavy snow and high wind gusts of up to 30-mph caused minor car accidents, power outages, and some tree damages. West Iron County Schools were closed, while Forest Park School had a two-hour delay. Total reported property damage was \$5,000.
- November 27, 2019: Dense heavy snow, combined with strong northeast to east winds with 35 to more than 50mph gusts downed trees and power poles throughout the region and county. An estimated total of 10 inches fell in about six hours. Approximately 30% of residences in Iron County lost power during the storm. Many businesses closed due to power outages. Total reported property damage was \$30,000.

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

Snowstorm Type	Number of Events	Total Property Damage
Blizzard	3	\$0
Heavy Snow	17	\$600,000
Winter Storm	47	\$35,000
Winter Weather	51	\$0
<b>TOTAL</b>	118	\$635,000

**Occurrence Probability and County Vulnerability**

The probability of a snowstorm event in Iron County is very high. From 2010-2019, there were 7.1 snowstorm and winter related events in the county – a frequency of 7.1 events per year. The risk of a snowstorm is always present during the winter months, but future events are expected to

be of low or moderate severity. The vulnerability of all communities in Iron County is relatively low due to the preparedness of the residents. Like most of the U.P., the county is aware of and accustomed to dealing with large amounts of snow.

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
<b>F0</b>	Gale Tornado	40-72 MPH	Some damage to chimneys; branches break off trees; shallow-rooted trees blown over; damages to signs
<b>F1</b>	Moderate Tornado	73-112 MPH	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving cars pushed off roadways
<b>F2</b>	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.
<b>F3</b>	Severe Tornado	158-206 MPH	Roof and some walls torn off well-constructed homes; most trees uprooted
<b>F4</b>	Devastating Tornado	207-260 MPH	Well-constructed homes leveled; structures with weak foundations blown away; cars thrown; large objects can turn into missiles.
<b>F5</b>	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
<b>EF0</b>	Gale	65-85 MPH	Some damage to chimneys; branches break off trees; shallow-rooted trees blown over; damages to signs
<b>EF1</b>	Moderate	86-110 MPH	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving cars pushed off roadways
<b>EF2</b>	Significant	111-135 MPH	Considerable damage. Roofs torn off homes; mobile homes demolished; large trees snapped or uprooted; light objects can turn into missiles.
<b>EF3</b>	Severe	136-165 MPH	Roof and some walls torn off well-constructed homes; most trees uprooted
<b>EF4</b>	Devastating	166-200 MPH	Well-constructed homes leveled; structures with weak foundations blown away; cars thrown; large objects can turn into missiles.
<b>EF5</b>	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**

In Iron County, there have been seven tornadoes recorded since 1950 (**Table 5.10; Map 5.3**). The total reported property damages from these tornado events were \$47,300.

**Table 5.10:** Tornado Events in Iron County, 1950-2019

Date	Magnitude	Description and Location	Property Damages
08/09/1958	F1	33-yard-wide tornado reported west of Iron River	\$300
08/15/1978	F1	Touchdown at north end of Hagerman Lake destroying a garage, two outhouses, and uprooted several trees. Two injuries occurred to an elderly couple. They were standing inside the garage when it was destroyed.	\$25,000
06/20/1979	F0	33-yard-wide tornado with a 0.1-mile track north of Lake Emily.	\$2,500
06/14/1981	F2	90-yard-wide tornado with a 1.3-mile track went through Mansfield Township.	\$2,500
07/14/1995	EF0	Tornado touched down near Michigamme Reservoir. Cause several trees that were about 18-inches in diameter to fall.	\$0
04/30/2010	EF0	A tornado touched down approximately 1.5 miles northwest of Iron River. The tornado uprooted trees and caused some damage to a few buildings before lifting off the ground.	\$15,000

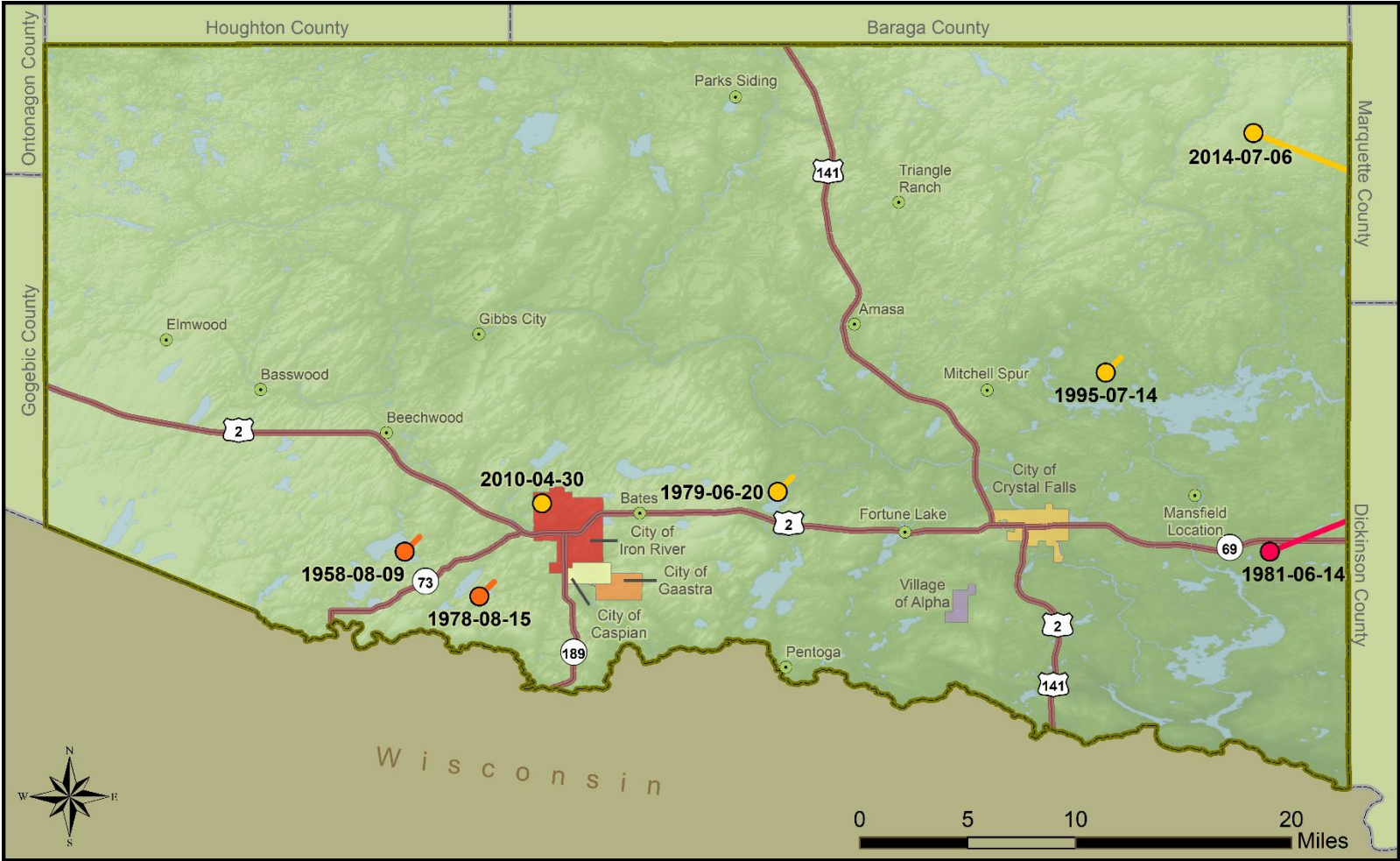


07/06/2014	EF0	Weak tornado touched down in northeast Iron County then moved into southwest Marquette County. The tornado downed or snapped off numerous trees along its 3.5-mile path.	\$2,000
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*Surveyed tornado damage following an April 30, 2010 event (Source: NWS Marquette).*

Map 5.3: Tornadoes in Iron County



**Recorded Tornadoes 1950-2019  
Iron 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; Created by WUPPDR November 2020

**Tornado Magnitude\* and Path**

0 (yellow dot)      1 (orange dot)      2 (pink dot)

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



## Occurrence Probability and County Vulnerability

The probability of a future tornado is low due to the infrequent occurrence of them in Iron County. There have been two reported tornadoes in the past ten years (2010-2019) – a frequency of 0.2 events per year (a 0.02% chance of happening). However, if an event were to occur, the entire county is vulnerable to tornadoes due to their unpredictability and lack of preparedness in the county. 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 being 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
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 Description

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 287 dam failures in Michigan since 1888.<sup>12</sup> Other failures have occurred since then, including the catastrophic failures of Edenville and Sanford dams in June 2020.

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.

Iron County has several dams within its boundaries that have been built over the years for flood control, hydroelectric generation, and recreation. The National Inventory of Dams listed 14 dams

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<sup>12</sup> Michigan Department of Environment, Great Lakes, and Energy (EGLE)



located in Iron County (**Map 5.4**). Six were designated as low hazard potential, while eight were of high hazard potential. The high hazard potential dams are the following: Way Dam (Michigamme Reservoir Dams), all Way Dike Dams (B-G), and Peavy Falls (Pond) Dam. The Brule Dam, a hydroelectric dam on the Brule River on the Michigan-Wisconsin border, was also included as a dam with potential to impact Iron County. The dam was listed as in Florence County, Wisconsin. The dam has a high hazard potential.

We Energies owns and maintains 10 dams in Iron County: Hemlock Falls, Lower Paint, Michigamme Falls, Peavy Falls, Way Dam, and all associated Way Dikes. It also owns and maintains the Brule Dam and the Michigamme Reservoir. Combined, these dams can generate up to 31,600 kilowatts of energy.<sup>13</sup>

The Peavy Falls Project drains approximately 704 square miles and its reservoir has a surface area of 3,160 acres with a volume of 64,300 acre-feet. Constructed in 1943, its structure consists of a multiple-arch dam with two gravity sections, an intake section, and a three-gate spillway section. The powerhouse is 1,200 feet downstream and is fed through a tunnel. The Lower Paint Diversion Canal empties into Peavy Falls Reservoir on the west side about one mile above the dam. During periods of extreme floods and pond surcharge events, the Canal can spill 4,000 cubic feet per second from the Michigamme River at Peavy Falls into the Paint River basin.

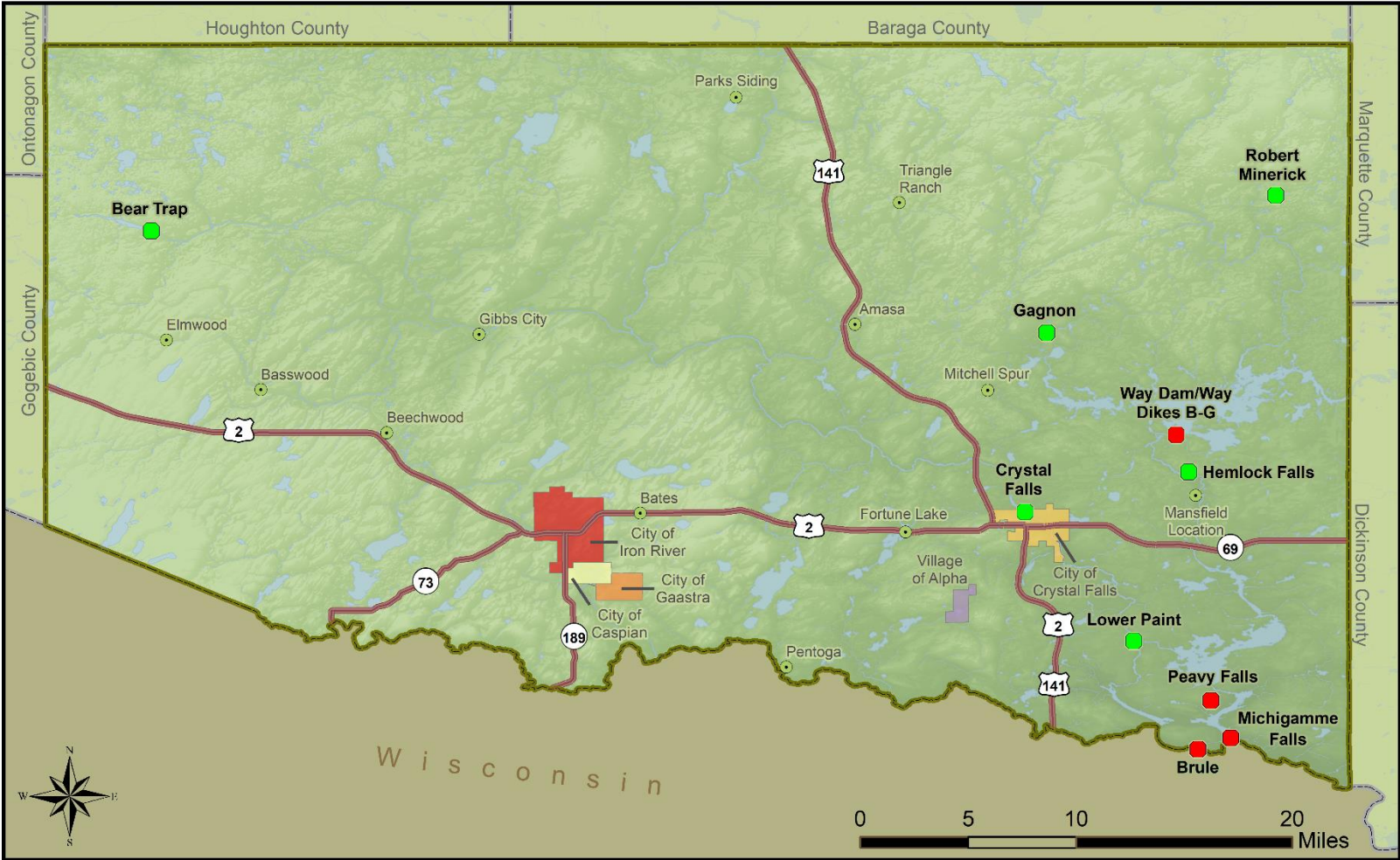
The Paint River Dams include the City of Crystal Falls Paint Project and Lower Paint Hydroelectric Project. The City of Crystal Falls Paint Project is located six miles upstream of the Lower Paint Project and is operated as a run-of-river hydroelectric project for the City of Crystal Falls and includes a small impoundment. The dam is owned by the city and provides a portion of the electricity used by residents. The Crystal Falls Dam and Power Plant is listed on the National Register of Historical Places. The Lower Paint Hydroelectric Project impounds a 340-acre reservoir six mile upstream of the mouth of the Paint River.

The Michigamme River Dams in Iron County include the Way Dam Hydroelectric Project which is 25 miles northwest of the City of Iron Mountain (Dickinson County), and the Hemlock Falls Hydroelectric Project which is three miles downstream of the Way Dam. The Way Dam, constructed in 1941, impounds a 6,568-acre reservoir and the Hemlock Falls Project, constructed in 1953, impounds a 75-acre reservoir. The Republic Dam in Marquette County is upstream of these two dams, which is a small impoundment with a 15- to 20-foot dam previously used as a water supply for the closed Republic Mine.

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<sup>13</sup> We Energies. (2016). "We Energies' generating system: Hydroelectric Power Plants." <https://www.we-energies.com/home/HydPP.pdf>

Map 5.4: Dams in Iron County (NID)



### Dam Inventory Iron 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 November 2020

**Hazard Potential**

- High (Red dot)
- Low (Green dot)





If the Peavy Falls Dam were to fail, several dams downstream would be directly impacted by flood waters from this failure. The dams that would be impacted by the failure include the following: Michigamme Falls Hydroelectric Project (Iron County, 4 miles south of Peavy Falls), Twin Falls Hydroelectric Project (Iron Mountain), Kingsford Hydroelectric Project (Kingsford, MI), Big Quinnesec Falls Hydroelectric Project (border of WI and MI), Little Quinnesec Falls Hydroelectric Project (Niagara, WI), Sturgeon Falls Dam (4 miles southeast of Norway, MI), Chalk Hill Hydroelectric Project (23 miles southeast of Iron Mountain), White Rapids Hydroelectric Project (25 miles southeast of Iron Mountain), Grand Rapids Dam (15 miles north of Menominee, MI), Park Mill Dam (Menominee, MI and Marinette, WI), and the Menominee Dam (Menominee, MI and Marinette, WI). Also indirectly affected by surcharged backwater effects of the Michigamme or Menominee Rivers would be the Brule Hydroelectric Project (2 miles northeast of Florence, WI).

Iron County also has lake-level control structures on several lakes throughout the county. Lake-level, or water, control structures are damlike structures that are used to control the direction or rate of flow of water and maintain a desired water surface elevation. Notable control structures are on the Fortune Lakes, Sunset Lake, and Stager Lake. The Iron County Drain Commissioner is responsible for checking and maintaining the lake levels on all three lakes. The lakes must be within the range set by the Iron County Circuit Court. The Drain Commissioner routinely checks the lakes to ensure they are at the proper level. An inspection was completed on all three structures in 2017.<sup>14</sup> A summary of each report and brief description of the structure is included below:

- **Fortune Lakes:** The timber control structure was in stable condition, like its condition in 2014. The structure is a popular location for water recreation portaging. Beaver dams were also located near the control structure.
- **Sunset Lake:** The structure was in fair condition, as water was flowing across the entire structure during the time of inspection. It is located near the Sunset Lake outlet into Sunset Creek. The inspection report stated that the structure itself did not appear to have much impact on the lake level. It also stated that a water level gauge needed to be re-installed to allow for a more accurate reading of lake levels.
- **Stager Lake:** The structure was in good condition during inspection. It is located at the creek outlet for Stager Lake.

### **Historical Occurrence**

There have not been any reported events related to dam failure in Iron County. Beaver dam failures may have occurred, but these events are typically small and not reported. Beavers also cause most lake level problems in the county, particularly on the three lakes with water control structures. The Drain Commissioner is responsible for beaver dam eradication, particularly when they negatively impact lake levels.

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<sup>14</sup> General Energy Company. (2018, February 13). "Tri-Annual Level Inspection – October 20, 2017. (Sunset Lake, Fortune Lakes, and Stager Lake). GEC #990-34." <https://ironmi.org/wp-content/uploads/2018/03/2017-Iron-County-Lake-Level-Inspection.pdf>

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 Regulatory Commission (FERC). The plan must include a description of actions to be taken by the dam owner in case of an emergency. Standard operating procedures for each dam are updated at least annually and regular full-scale exercises are performed to minimize risk.

### **Occurrence Probability and County Vulnerability**

Dams are important components of Iron County's infrastructure and provide benefits to all citizens. However, as history has demonstrated dams can fail and cause disastrous consequences, causing loss of life, property, and natural resources. Many existing dams are getting older, and development continues in potential inundation zones downstream from dams. Dam failure will always pose as a risk within Iron County due to the large area and numerous small dams downstream from larger dams. Excessive rainfall and accelerated spring melt-off can influence potential dam failure. While most dams are rated as having a high hazard potential, the probability of a failure is low.

Overall severity of a dam failure, especially one cascading to affect multiple dams, could range from low to extreme. This kind of failure is a countywide concern since a dam failure could potentially affect waterways in communities not directly in the path of floodwater releases. Communities most vulnerable to a dam failure are Mansfield and Mastodon Townships and the City of Crystal Falls. However, a vulnerability analysis for dam failure has not been conducted for all dams in Iron 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, Iron 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 have increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via natural drainage now quickly runs off streets, parking lots, and rooftops, through man-made channels and pipes.

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

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.

All 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**

Iron County has been affected by several minor and major floods, most due to heavy rainfall or significant snowmelt. Several areas in Iron County are susceptible to riverine and urban flooding.

From 1996 to 2019, 10 flooding events have been reported and details of these events are listed below, as reported in the NOAA Storm Events Database. Total estimated property damage for all these events is \$765,000.

- April 20-27, 1996: Minor flooding throughout the County damaged sewer systems. Total reported property damage was \$130,000.
- July 14-15, 1999: Between two and seven and a half inches of rain fell over the southern half of Iron County late at night on July 14 through the early morning hours of July 15. Area roads experience considerable damage and many secondary roads were down to one lane. Several roads were washed out and closed. 75 homes in the area had flood basements and some businesses in downtown Iron River were flooded and closed. Total reported property damage was \$225,000.
- April 15-20, 2002: Record setting snowfall in February/March set the stage for a large flood event in April. The snowpack held over 11 inches of water and quickly melted during a six-day period, releasing water into nearby rivers, creeks, streams, and lakes. While this snow melt was occurring, over two inches of rainfall occurred with record high temperatures in the 70s and 80s increasing the rate of snowmelt. In Iron County, there was flooding along local rivers. Local roads were flooded, and some homes and businesses had to be evacuated due to rising water. Total estimated damage for Iron County was \$280,000, while estimated damages for the western U.P. was \$18.5 million.
- May 12-14, 2003: Due to heavy rainfall, widespread riverine flooding was reported throughout the western U.P. 3.79 inches of total rainfall was reported at Paint Lake in Iron County. Several roads were washed out and closed and many rivers, such as the Paint and Brule Rivers. No damages were reported in Iron County.
- April 19-23, 2004: A storm system produced heavy rainfall and severe thunderstorms throughout the western U.P. 2.2 inches of rain was measured at Amasa. Minor flooding was reported near the Paint River at Crystal Falls.
- July 2-3, 2012: An estimated three to four inches of rain was reported causing flash floods, washing out U.S. Forest Service roads around Perch Lake, north of Iron River. Total reported damages were \$10,000.
- October 17-18, 2016: Heavy rains caused flash flooding and partial/full washouts of several roads in Iron County. The most significant road damage was reported in the Alpha Township area, along County Road 424. Total estimated damages were \$100,000.
- June 11, 2017: Heavy rainfalls washed out a culvert on Highway M-73 at Baumgartner Road. The road was



*M-73 culvert washout on June 11, 2017 (Source: [MDOT \(NWS Marquette\)](#))*

closed due to this washout. The road was repaved then reopened on July 10.<sup>15</sup> Total estimated damages were \$20,000.

- April 19, 2019: Gages Creek overflowed its banks onto private property east of Peavy Pond. Minor flooding was also reported on the Paint and Michigamme Rivers from April 23-26. No damages were reported.

### **Flood Insurance in Iron County**

In Iron County, two cities, Caspian and Iron River, participate in the FEMA National Flood Insurance Program (NFIP).<sup>16</sup> Most other communities do not regularly experience severe flooding. There are more than 21,800 communities nationwide that participate in the program. Communities have enrolled in the program due to a flooding event or imminent threat from one, hence enrollment in the emergency programs. Participating communities encourage their residents to purchase insurance through NFIP if the resident feels as if they have the need for coverage. The NFIP makes federally back flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances. NFIP puts a special focus on mediation of insured structures that have suffered more than one loss of at least \$1,000 within a rolling 10-year period since 1978; these are referred to as “repetitive loss properties.” Iron County does not have repetitive loss or severe repetitive loss structures.

Rates are determined based on a Flood Insurance Study and Flood Insurance Rate Map (FIRM), which FEMA develops during a flood hazard assessment. The FIRM is used by lenders to determine flood insurance requirements and by insurance agents to determine flood insurance premiums for specific properties. The FIRM includes areas within the 100-year flood boundary, which are termed “Special Flood Hazard Areas” (SFHAs). A 100-year flood does not refer to a flood that occurs every 100 years, but to a flood level with a 1% or greater chance of being equaled or exceeded in any given year.

In Iron County, low lying areas along the Iron River were identified as subject to inundation. The narrow corridor where the river goes through the City of Iron River is designated as a Flood Zone AE (SFHA). Two small, isolated locations designated as Flood Zone A (SFHA) are also found in the City of Iron River, along the west side of the city on either side of County Road 653 (Gibb City Road). Designations of A and AE are similar, but AE is determined using more detailed methods and includes Base Flood Elevations. Both zones are considered 100-year flood zones. The City of Crystal Falls also experiences frequent flooding of the Paint River, and while the city has completed a Floodplain Management Plan, the county has not acted to enable the city to participate in the NFIP.

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<sup>15</sup> LaCombe, Andrew. (2017 July 11). “M-73 reopens in Iron County.”

<https://www.uppermichiganssource.com/content/news/M-73-reopens-in-Iron-County-433843223.html>

<sup>16</sup> FEMA. Community Status Report Book – Communities Participating in the National Flood Program.

<https://www.fema.gov/cis/MI.html>



## **Occurrence Probability and County Vulnerability**

From 2010 to 2019, four flood events were reported in Iron County (frequency of 0.4 events per year), equating to a low probability of occurrence during an average year. Of these four events, three resulted in property damage – an estimated total of \$130,000. However, riverine and urban flooding remain a moderate risk in Iron County because it can affect several major population areas, particularly communities that are near the Paint and Iron Rivers. Riverbanks north of the Paint River Dam in the City of Crystal Falls and Crystal Falls Township, segments of the Iron River in the Cities of Iron River and Caspian, and other areas with inadequate culverts can become overburdened and cause occasional flooding and washouts. Additionally, with the impacts from climate change, flooding frequency and severity may increase, particularly when combined with an influx of rain and/or snowmelt runoff.

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

## **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.

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 its surround 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**

Although Iron County has not had a localized drought severe enough to be recorded, the U.S. Midwest has been significantly affected by drought in five years since 1981.<sup>17</sup> These wide-ranging droughts have little long-term impact on wild flora and fauna, and since Iron County has little cultivated land, drought has not significantly affected agriculture. Furthermore, the county has no drinking water sources dependent on surface water,<sup>18</sup> and temporary droughts have not diminished groundwater reserves to a notable extent. Stream and reservoir levels may also drop, but 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). However, even a minor drought is one of the primary factors of wildfire potential and is a major hazard for that reason alone.

Iron County is part of a larger climate division (Division 1), which includes the following counties: Baraga, Dickinson, Gogebic, Houghton, Keweenaw, Marquette, Menominee, and Ontonagon 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

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<sup>17</sup> Michigan State Hazard Mitigation Plan: [https://www.michigan.gov/documents/msp/MHMP\\_480451\\_7.pdf](https://www.michigan.gov/documents/msp/MHMP_480451_7.pdf)

<sup>18</sup> Michigan Environmental Council. "Find your public water type." Drinking Water Toolkit. [https://www.midrinkingwater.org/find\\_your\\_public\\_water\\_type](https://www.midrinkingwater.org/find_your_public_water_type)

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.<sup>19</sup>

### **Occurrence Probability and County Vulnerability**

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

## **Ecological Hazards**

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

1. Wildfires
2. Invasive Species

These types of hazards deal with biological ecosystems and their effects on human economy and the built environment. The most well-known ecological hazard is wildfire, which occur naturally, but become dangerous when they threaten humans that live in areas where the disaster event will periodically take place. Wildfires can cause damage and threaten 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 Michigan's total land area and provide Michigan 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.

Michigan's landscape 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.

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<sup>19</sup> Michigan Hazard Analysis, 2019.

[https://www.michigan.gov/documents/msp/MHA\\_2019\\_full\\_update\\_natural\\_hazards\\_653708\\_7.pdf](https://www.michigan.gov/documents/msp/MHA_2019_full_update_natural_hazards_653708_7.pdf)

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 included scorched and barren land, loss of wildlife habitat, soil erosion, landslides, water sedimentation, and loss of recreational opportunities.

According to the Michigan Department of Natural Resources, 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 fuel.<sup>20</sup>

### **Climate Change Considerations**

The average wildfire season has extended 78 days longer across the United States, and large wildfires burn more than twice the area they did in 1970.<sup>21</sup> 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**

Forest cover nearly 90% of Iron County (**Map 5.5**). Since 2007, wildfires have burned on approximately 647 acres of land in Iron County.<sup>22</sup> Many were caused by debris burning. The extensive forest cover is an asset for both industry and recreation. However, it also leaves the county highly vulnerable to wildfire. 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.

### **Occurrence Probability and County Vulnerability**

Iron County has an ongoing risk of wildfires due to the high amount of forest cover and development 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. Risk is greater due to human activities in the outdoors but also the remoteness of many areas of the county and their inaccessibility to emergency responders.

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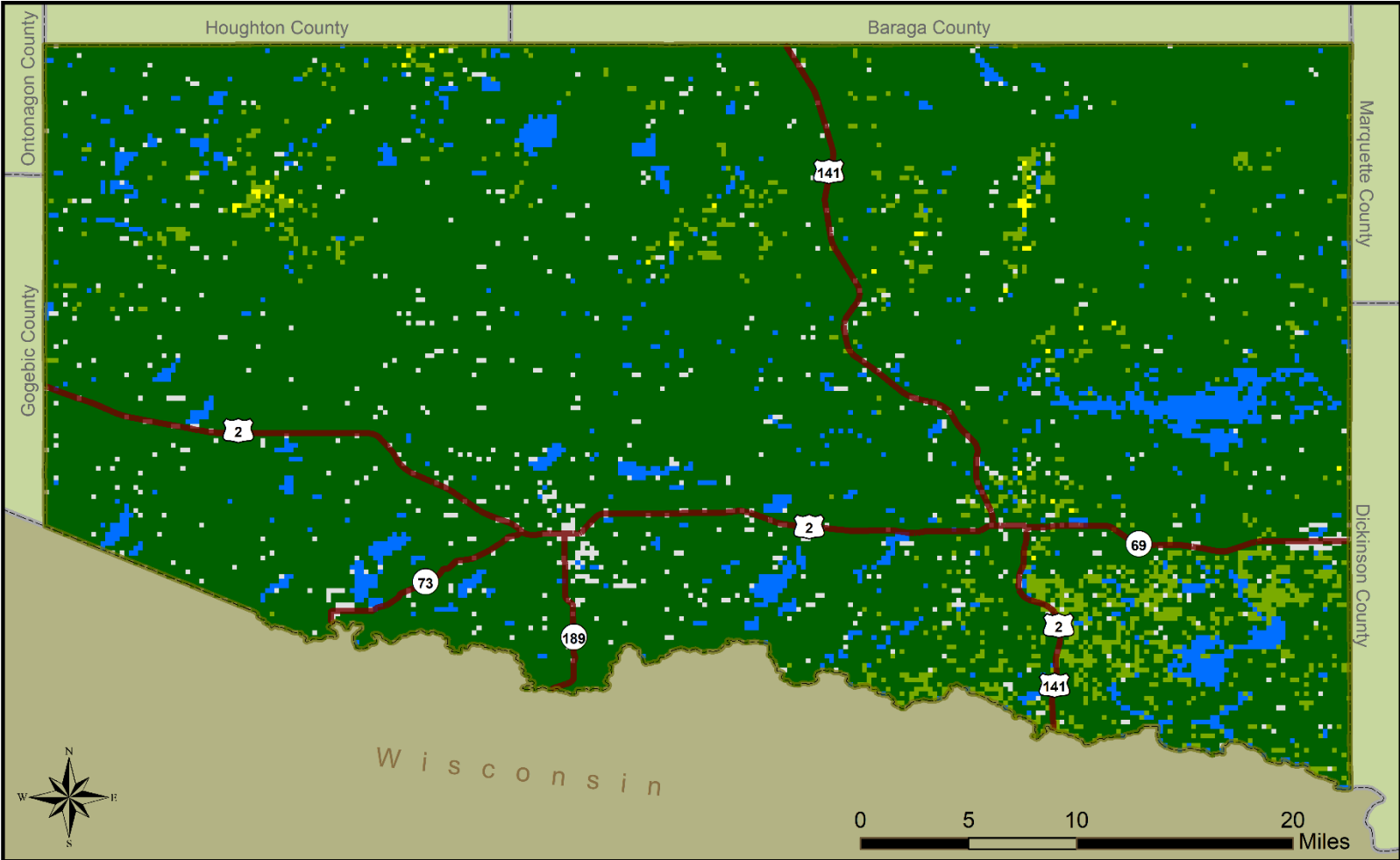
<sup>20</sup> Michigan Department of Natural Resources, [https://www.michigan.gov/michiganprepares/0,4621,7-232-65025\\_65201---,00.html](https://www.michigan.gov/michiganprepares/0,4621,7-232-65025_65201---,00.html)

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

<sup>22</sup> Wildland Fire: Michigan DNR. Fire Incident Management application. [www.mcgi.state.mi.us/wildfire/mcgi.html](http://www.mcgi.state.mi.us/wildfire/mcgi.html)

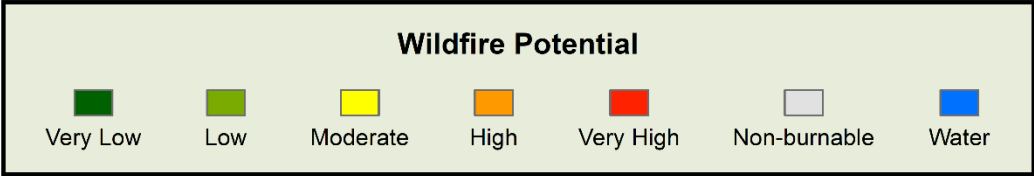
Increased development in rural areas can increase the potential damage from wildfires. Ensuring that new development has adequate emergency access and protective buffers is one way to mitigate some of the risk. All areas of the County have some vulnerability to wildfire, but extent varies greatly by 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 Iron County



**Wildfire Hazard Potential  
Iron County, Michigan**

Boundary data was derived from Michigan's Open Data Portal; Hazard data was developed by the USDA and USFS; Created by WUPPDR November 2020



## **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 well-being can occur due to animal disease or plant/animal infestation. Invasive species can also create serious public safety threats; some invasive insects can cause significant damage to trees (disease or death) and may lead to partial/total tree collapse.

Terrestrial species are likely to have more public awareness than aquatic ones. Although there have been well-publicized aquatic species of concern (e.g., zebra mussels, Asian carp), people tend to be more aware of the impacts of terrestrial species, unless their recreational or business activities are impacted by aquatic species.

### **Climate Change Considerations**

Due to the lengthening of 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



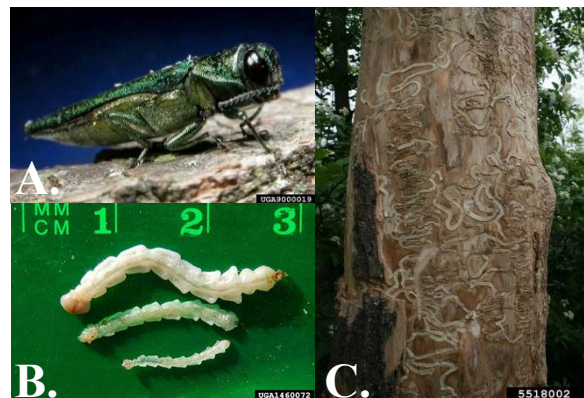
occurring ones, species transported by human action can be more likely to survive as climatic changes occur.

### Historical Occurrence<sup>23</sup>

Due to Iron County’s large amount of forest coverage, lakes, and rivers, both terrestrial and aquatic species have been found throughout the County. There have been over 2,400 reported locations of invasive species, most of which are terrestrial invasive plants.<sup>24</sup> The following are some examples of reported invasive species that have been found or threaten the local ecosystem in Iron 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% 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 Iron County,<sup>25</sup> 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.



*Asian longhorned beetle (Kenneth R. Law, USDA APHIS PPQ)*

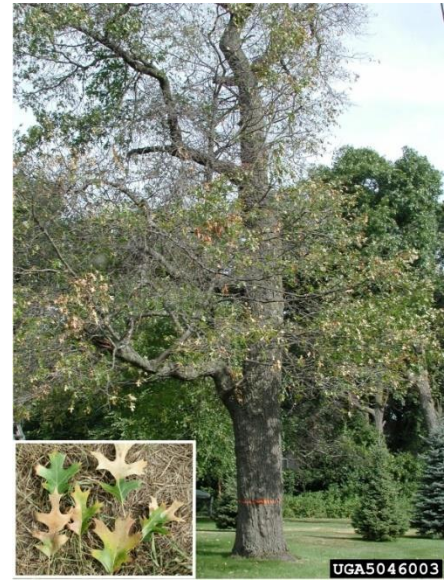
<sup>23</sup> All images in this section, except Sea lamprey photo B, are from [www.bugwood.org](http://www.bugwood.org)

<sup>24</sup> Midwest Invasive Species Information Network. Data Map by State and County. [www.misin.msu.edu](http://www.misin.msu.edu)

<sup>25</sup> Emerald Ash Borer Story Map. [www.aphis.usda.gov/aphis/maps/plant-health/eab-storymap](http://www.aphis.usda.gov/aphis/maps/plant-health/eab-storymap)

### Invasive Diseases

Oak wilt (*Bretziella fagacearum*): Oak wilt is a disease caused by the fungus *Bretziella fagacearum*, which can kill healthy red oaks and affect other kinds of oak trees. Symptoms include leaf discoloration and sudden leaf loss. When a red oak becomes infected with the fungus, the tree will eventually die and there is no treatment that will save the infected tree. The disease spreads from tree to tree through underground root contact, where tiny, sap-feeding beetles carry fungal spores from infected trees to healthy oaks. To stop the disease from spreading, treatments are available to oak trees surrounding an infected one.



Oak wilt symptoms (Joseph O'Brien, USDA Forest Service)

### Invasive Plants

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.



Common (A) and glossy (B) buckthorn (A. Leslie J. Mehrhoff, University of Connecticut; B. Robert Routledge, Sault College)

## Invasive Aquatic Plants

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



*Eurasian watermilfoil (Chris Evans,  
University of Illinois)*

Purple loosestrife (*Lythrum salicaria*): Purple loosestrife thrives in shorelines, roadsides, and wetlands. It is a perennial invasive plant and can spread quickly, replacing native vegetation which reduces food, shelter, and nesting sites for turtles, birds, frogs, and other wildlife. Seeds can germinate in water, but it prefers shorelines that are not always flooded. Purple loosestrife was first introduced to the U.S. in the 1800s from Europe as an ornamental plant and for bee keeping. It has since spread to every U.S. state.

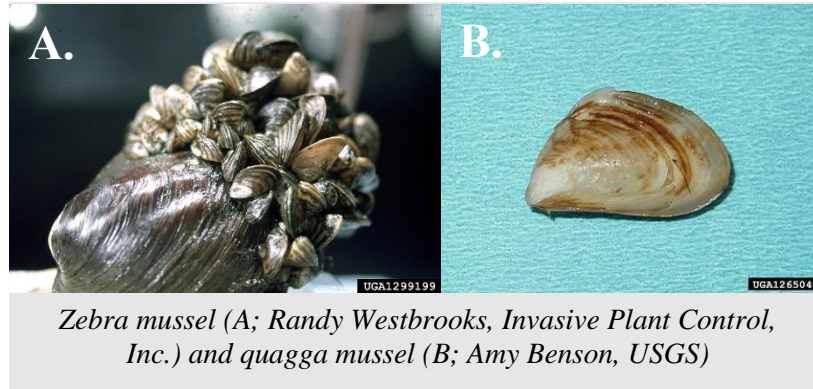


*Purple loosestrife  
(Linda Wilson,  
University of Idaho)*

## Invasive Aquatic Species

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





### Occurrence Probability and County Vulnerability

The probability of future occurrence for invasive species is high for Iron 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 Iron 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.

### **Occurrence Probability and County Vulnerability**

The probability of an earthquake happening anywhere in Iron County is very low – nearly zero. Any detectable earthquakes in the county would most likely be caused by mining exploration or underground mines in the region. 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 mines and surrounding 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. Lateral flow of subsurface materials, which can occur on the thick glacial clay deposits in the Great Lakes region, results in gradual lowering of the ground surface as load bearing walls slowly move away from one another.

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 oftentimes can swallow up whatever is built upon them. Risks from subsidence appear to have increased over time, and wear and stress continues to accumulate on aging mining structures.

### **Historical Occurrence**

Michigan has a rich mining heritage and a wide variety of mineral resources, most notable of which are copper ore, iron ore, sand, gravel, coal, salt, oil, and gas. Underground mining has occurred on a significant scale throughout Michigan's history. Michigan's Lake Superior region has been home to significant iron ore mining operations since the 1800s. In the mid-1800s, Iron County became a focus of iron ore mining. The Menominee Range, one of the larger iron districts in the Western U.P. and includes Dickinson County, is named after the Menominee River which runs through it. Iron ore was first detected in Iron County in 1846, near the Crystal



Falls area.<sup>26</sup> At the peak of the mining era in 1920, nearly 7 million tons of iron ore was shipped out of the Menominee Iron Range.

There are over 800 underground mines throughout 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. In most regions, there are limited records of the locations of shafts, and the extent of underground minds and proximity to surface to the surface may be unknown.

Iron County has approximately 135 abandoned mine parcels and a mine inspector elected to deal with safety measures at abandoned sites. Two studies have been done on the mines in Iron County including the "Assessment of Inactive Iron Mines in East Iron County, Michigan" and the "Study of Mine Subsidence and Acid Water Drainage in the Iron River Valley, Iron County, Michigan." Critical areas were identified where mine subsidence has the potential to affect life or property due to the presence of roads, railroads or buildings. Areas that have been identified as critical in east Iron County include:

1. Michigan Mine #2: A shaft underlies the Park City Road east of Amasa, and a stope is located nearby south of the road.
2. Warner Mine: Underground workings intersect the Warner Mine Road at a point between the Gibson Mine location and Old Highway US-141 about one mile southeast of Amasa.
3. Tobin-Columbia Mine: A section underlies Tobin Road at one point about one half mile southwest of Crystal Falls and nearly underlies it at another.
4. Dunn-Richards Mine: Stopes underlie the Tobin-Alpha Road at two locations about one mile southwest of Crystal Falls.
5. Chicagon Mine: Workings underlie a section of the Chicagon Mine Road west of Krans Road, about 8 miles west of Crystal Falls south of US-2.

Critical areas identified in the Iron River District include:

1. Davidson #1 Mine: Surface subsidence cracks affect Mineral Avenue.
2. Cardiff-Homer Mines: Deep stopes underlie 16th Street (9th level).
3. Homer-Wausea Mine: Stopes are located at 35 to 150 feet distance from 16th Street at depth (10th and 12th levels).
4. Beta-Nanaimo Mine: A 53-foot vertical opening 18 feet wide at a depth of 310 to 350 feet is located beneath Highway US-2 west of Iron River.
5. Delta Mine: A stope of 40 feet in maximum vertical dimension lies 224 feet below US-2 west of the Iron River and just east of the intersection with River Avenue and Genesee Street. Also, the west margin of a 325-foot-deep stope lies 40 feet east of the railway south of US-2.
6. Chatham Mine: Stopes underlie the Selden Road at least 270 feet upward from the 1,050-foot level. Also, the railway passes over a 60-foot-wide by 500-foot-long stope at a depth of about 325 feet.

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<sup>26</sup> Menominee Iron Range. <http://geo.msu.edu/extra/geogmich/menominee-iron-range.html>

7. Riverton Mine: Stopes from the 4th and 6th level of this early mine underlies the railway west of Stambaugh in the Iron River valley.
8. Bengal Mine: The north edge of the subsidence pit from this top slicing mine very nearly extends to Ninth Street. At depth, some of the stopes lie within 15 feet of the center line of Ninth Street.
9. Baker Mine: The uppermost workings are within 170 feet of the surface and within 80 feet of the bedrock. A county road overlies these workings.
10. Hiawatha Mine (Stegmiller Lease): A stope underlies Selden Road at a depth of about 300 feet. The stope has a vertical height of approximately 150 feet. Workings also underlie the railway.
11. Dober-Isabella Mines: Workings from both mines underlie 19th Street. The Isabella workings are shallower, with stope tops at 195 feet and 600 feet below the surface.

Fatal mine cave-ins have occurred in Iron County (1912 and 1918) while mines were still in operation. The first accident was due to a mine ceiling cave in, while the other was due to a rush of water and sand flooding lower levels of the mine causing a cave in. After the mines closed, there were still incidents involving old mines. An incident of subsidence occurred in spring 1996 in Amasa when an opening about 12 meters in diameter and about 27 meters deep to bedrock suddenly appeared a short distance from several homes.

On April 19, 2001, there was a cave-in of 3,360 cubic yards of soil at the abandoned Baltic Mine Pit in the City of Gaastra, leaving four feet of ground between the mine pit and the city's main (and only) sewer line to the wastewater treatment plant. This cave-in was the second major subsidence incident at that site; a previous cave-in occurred in August 2000. County Road 424, which runs parallel to the sewer line, also partially collapsed due to this cave-in. To mitigate further damage to the sewer line, the City of Gaastra applied for a Hazard Mitigation Grant Program grant to relocate the line outside of the known subsidence area. The city successfully completed the project, along with taking steps to stabilize the roadway shoulder and prevent further ground collapse.

In April 2013, a sinkhole was found in the City of Iron River's disc golf course.<sup>27</sup> The course is located on the old Riverton Mine, which operated from 1882 to 1931. The sinkhole was approximately 20 feet wide and about 15 to 20 feet deep. After the sinkhole was found, the Iron River Public Works Department fenced off the area to prevent individuals from getting too close to the hole and the course was closed as a safety precaution. The hole was subsequently filled with mining material and the course was reopened in June. Other sinkholes are present at the disc course but are fenced off for safety.<sup>28</sup>

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<sup>27</sup> Younk, N. (2013, April 17). "Sinkhole in Iron River." *The Daily News*.  
[www.ironmountaindailynews.com/news/local-news/2013/04/sinkhole-in-iron-river/](http://www.ironmountaindailynews.com/news/local-news/2013/04/sinkhole-in-iron-river/)

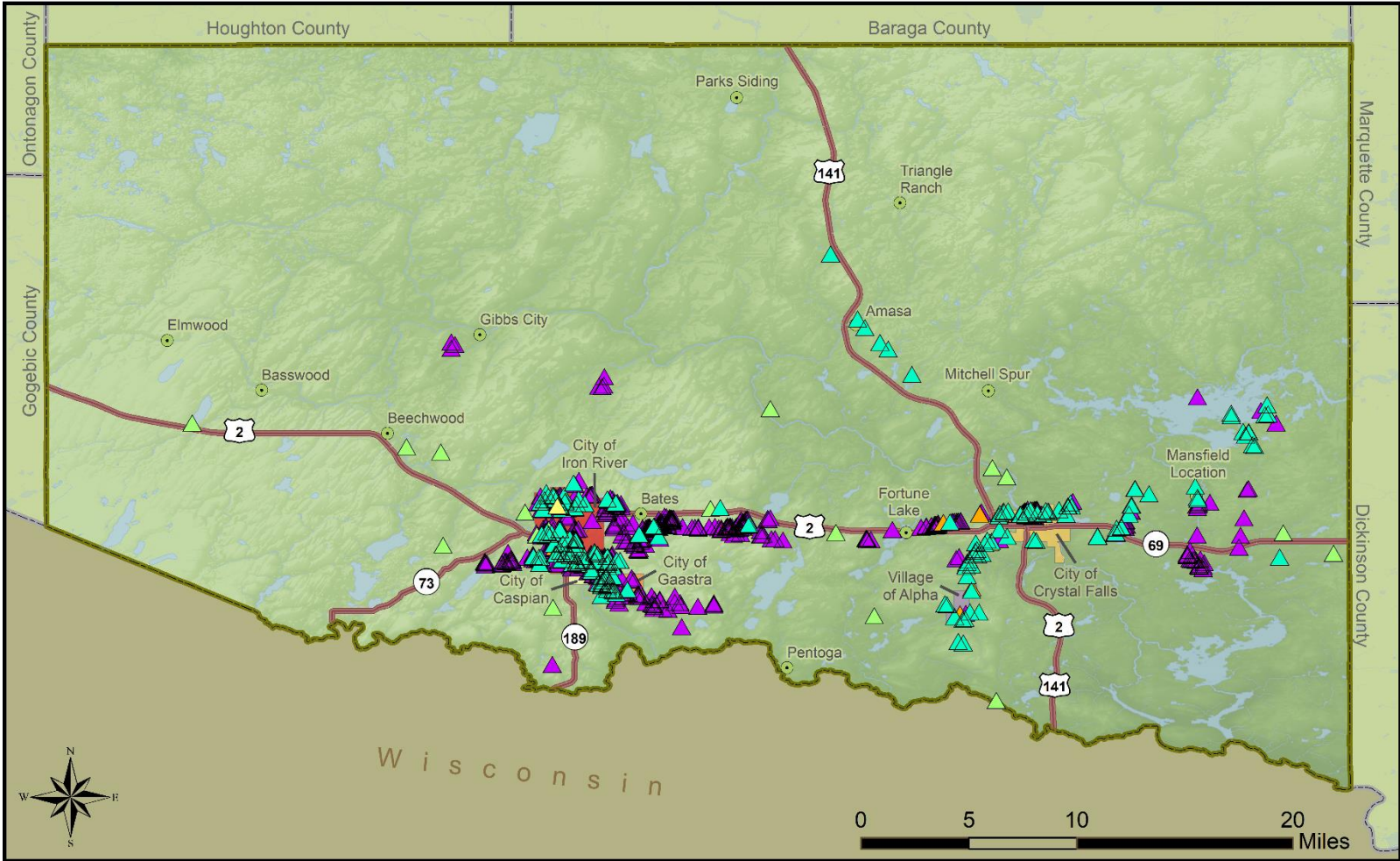
<sup>28</sup> Younk, N. (2013, June 3). "Disc golf course reopens." *The Daily News*.  
[www.ironmountaindailynews.com/news/local-news/2013/06/disc-golf-course-reopens/](http://www.ironmountaindailynews.com/news/local-news/2013/06/disc-golf-course-reopens/)

### **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. According to the LPT, there is approximately 1-2 mine collapses per year and lack of funding to build fencing around these locations. Most mine shafts are on private land and continue to pose a risk. Municipalities along M-69, U.S. 2 and U.S. 141, particularly the Cities of Iron River, Caspian, Gaastra, and Crystal Falls and the Village of Alpha, have a greater number of historical mines and are more vulnerable to subsidence compared to other locations in the county (**Map 5.6**).

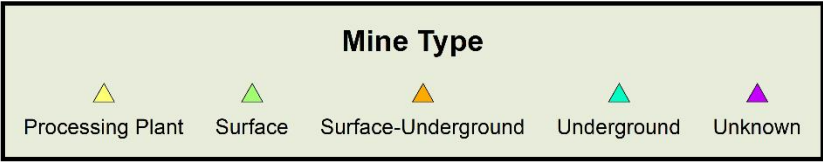
Although there are several old mines in Iron County, many have been well documented through studies and assessments done in the 1970s and 1980s. The studies found that some data are incomplete and many of the old mines are near buildings, roads, trails, and other structures. Subsidence will continue to pose some risk in the future because of both known and unknown potential hazards. The probability of future occurrence is moderate, based upon known and estimated subsidence events. An estimate of vulnerability is not possible due to the varied history and unpredictable nature of subsidence problems

Map 5.6: Mine Location by Type in Iron River



**Mine Locations  
Iron 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 and the U.S. Geological Survey; Created by WUPPDR November 2020



## 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 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 an array of extremely hazardous substances across diverse situations that typically involve industrial or warehousing operations. Fixed site incidents include 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 Fire

### **Hazard Description**

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



hazard. Scrap tire fires may also require temporary evacuation of some residences and businesses and even close roadways.

Michigan generates approximately 10 million scrap tires each year. Whole tires are banned from disposal in Michigan landfills due to their associated problems. Stockpiled tires can be breeding grounds for mosquitoes and can be homes to snakes and other small mammals (rats, opossums, raccoons). 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 no licensed scrap tire collection facilities in Iron County. The closest scrap tire collection facility is in Kingsford, MI (Dickinson County). Local tire or automotive repair shops may also collect scrap tires, but collection is typically limited to auto shop customers. Unofficial or small sites may likely be in Iron County due to the lack of easily accessible or permanent scrap tire collection facilities in the county. Their locations are unknown.

In 2019, the city of Iron River received a grant to collect up to 2,000 scrap tires. In 2020, the Superior Watershed Partnership and Great Lakes Conservation Corps collected car and truck tires throughout the U.P. through a grant from EGLE.

### **Occurrence Probability and County Vulnerability**

There have been no officially reported scrap fire tire incidents in Iron County, though small, isolated events have occurred. Risk is low due to heavy regulation of scrap tire collection sites. An additional but unknown risk exists due to the possibility of unknown and unlicensed storage areas. Although the probability of a scrap fire tire is very low, severity is high as a small mistake on either a register or unregistered site can spark a severe fire – particularly where regulation is lax.

## **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 Michigan, residential fires account for 72.4% of all structural fires and cause nearly 82% of fire fatalities.<sup>29</sup>

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

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<sup>29</sup> U.S. Fire Administration, Fire Statistics by State. [www.usfa.fema.gov/data/statistics/states/michigan.html](http://www.usfa.fema.gov/data/statistics/states/michigan.html)



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 Iron County because almost half of the buildings were built before 1940 and are located close together. Many of these older homes, as well as numerous camps and cabins in the woods, are also heated by wood burning stoves. Michigan has a relatively high fire death rate at 12.3 deaths per million people, whereas the national rate is 10.9 per million (both as of 2016). Of the total fires, 1% was determined to be arson or suspicious.

In 2017, Iron County had 39 total fires (3 were considered suspicious) that resulted in \$214,700 in property damage.<sup>30</sup> Fatal fires were rare in the county. On April 26, 2016, a 59-year-old Iron River woman was killed in structure fire.<sup>31</sup> On December 26, 2016, an Iron River man was killed in a house fire. The house was considered a total loss.

### **Occurrence Probability and County Vulnerability**

The probability of a structural fire in Iron County is likely with the potential of extreme severity throughout the county. Severity is highest in communities with densely populated neighborhoods and in the downtown areas of Crystal Falls and Iron River. 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 for inter-departmental assistance to deal with structural fires. Education and operational fire detectors can often mitigate the loss from this type of hazard.

Due to an older housing stock, compact downtown areas, and remote development, Iron County is vulnerable to structure fires. 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.

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<sup>30</sup> Bureau of Fire Services Annual Report: Fiscal Year 2017. [https://www.michigan.gov/documents/lara/FINAL\\_-\\_FY17\\_Annual\\_Report\\_Rev.\\_1-29-18\\_612553\\_7.pdf](https://www.michigan.gov/documents/lara/FINAL_-_FY17_Annual_Report_Rev._1-29-18_612553_7.pdf)

<sup>31</sup> Boehm, A. (2016 April 26). "Iron River woman dies in structure fire." <https://www.uppermichiganssource.com/content/news/Iron-River-woman-dies-in-structure-fire-377169261.html>

## **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 Toxic Release Inventory (TRI) tracks the management of over 650 toxic chemicals that pose a threat to human health and the environment. Facilities in certain industry sectors that use these chemicals must report how each are managed through recycling, energy recovery, treatment, and releases to the environment. A release is defined as either land disposal or emitted to the air or water. In the TRI database, the Oldenburg Group Inc., now known as Lake Shore Systems, Inc, was the only facility located in Iron County required to report any chemical releases (**Map 5.7**). The facility was considered a small quantity generator that manufactured construction machinery and other transportation equipment. It last reported to the TRI in 2015.

There are no known facilities in Iron County with supplies of Extremely Hazardous Substances that require reporting under the Superfund Amendments and Reauthorization Act (SARA) Title III. Title III identifies what steps facilities, the state, and local communities must take to protect their public from hazardous materials accidents. There have been no catastrophic hazardous material spills in Iron County. While there are facilities that have supplies of Extremely Hazardous Substances, they are isolated and in relatively small quantities. Risk to the public is minimal since few, if any applicable, sites exist.

Map 5.7: Toxic Release Inventory Sites in Iron County



**Toxic Release Sites  
Iron County, Michigan**

Data sources: Michigan GIS Open Data Portal, USGS (DEM), Specialized Information Services – National Library of Medicine (TOXMAP\*). Created by WUPPDR, November 2020

\*TOXMAP was retired 16 December 2019

**Toxic Release Sites**

★ Lake Shore Systems, Inc.



## Occurrence Probability and County Vulnerability

The probability of a fixed-site incident is low, but severity, if an event were to occur, can range from moderate to high. The chemicals that are being used in Iron County are isolated and exist in relatively small quantities. Though risk to the public is minimal, some vulnerability is presented by limited availability of trained response teams, the closest of which is in Ironwood.<sup>32</sup> The City of Iron River is vulnerable to a fixed site incident due to the presence of a facility that has submitted reports to the TRI

## Hazardous Materials: Transportation Accident

### Hazard Description

Because of the extensive use of chemicals in society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments daily through local communities. A transportation 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. 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.

### Historical Occurrence

In Iron County, Highways U.S. 2 is the major transportation route for trucks traveling to and from Canada. U.S. 141 is also an important trucking route, though not necessarily for hazardous materials. Other high-volume roadways in the County include M-69, M-73, and C.R. 189. The Escanaba and Lake Superior Railroad also bisects the county and may carry certain types of hazardous freight materials. The line runs from Green Bay via Channing to Amasa and on to Ontonagon. The types and amounts of hazardous materials transported on trucks traveling this route are often unknown. While there are State and Federal restrictions for the transport of

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<sup>32</sup> Ansami, R. (2014 April 30). "IPSD serves as haz-mat response team for UP." *Daily Globe*. <https://www.yourdailyglobe.com/story/2014/04/30/news/ipsd-serves-as-haz-mat-response-team-for-up/2760.html?m=false>

hazardous materials, this information is not required to be passed on to local units of government potentially affected by a transportation accident.

On September 25, 2017, US Highway 2 in Iron River was closed from Gibbs City Road to Wild Rivers Road due to a fuel spill. The truck had an open valve that spilled nearly 200 gallons of diesel fuel on nearly one mile of the highway.<sup>33</sup>

A fatal car accident occurred on September 24, 2019 when a vehicle collided into a fuel tanker truck on M-95 at the M-69 intersection in Sagola Township. The fuel tanker leaked, which closed the highway and prompted the evacuation of some nearby homes and businesses. This was done as precaution. The clean-up took approximately seven and a half hours. Traffic had to be rerouted during that time.<sup>34</sup>

### **Occurrence Probability and County Vulnerability**

In Iron County, the probability of a hazardous materials transportation accident is moderate based on history, but there is a considerable risk. This is due to the high level of trucking traffic and gasoline transmission lines within the county. Damage estimates for previous events were unavailable, but potential severity of an event could range from low to severe. Severity also varies due to the lack of people to respond to an event. Areas most susceptible and have a higher probability of experience an accident are corridors near major transportation routes, such as U.S. 2, U.S. 141, and M-69. The Cities of Crystal Falls and Iron River are most vulnerable to a hazardous waste event because the major routes cross through these communities. Critical facilities in those locations, including schools and a hospital, may become vulnerable if an accident were to occur on the nearby highway (U.S. 2). Facilities typically have a plan in place if an event were to occur.

## **Petroleum and Natural Gas Incidents**

### **Hazard Description**

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

Michigan is both a major consumer and producer of natural gas and petroleum products. Michigan is the largest residential liquefied petroleum gas market in the nation due mostly to

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<sup>33</sup> “Update: Truck spills diesel fuel on US-2.” ABC 10 News. <https://abc10up.com/2017/09/26/8339710/>

<sup>34</sup> “Fatal crash, fuel spill forces evacuation in Sagola.” *The Daily News*. [/www.ironmountaindailynews.com/news/local-news/2019/09/fatal-crash-fuel-spill-forces-evacuation-in-sagola/](http://www.ironmountaindailynews.com/news/local-news/2019/09/fatal-crash-fuel-spill-forces-evacuation-in-sagola/)



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 (H<sub>2</sub>S) 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.

There are three large pipeline systems that transect Iron County and transport natural gas, via high pressure lines, and crude oil to refining centers in the Midwest (**Map 5.8**). The ANR line comes from Wisconsin to Iron River, whereas the Great Lakes Transmission line bisects the county from east to west transporting natural gas. The Enbridge line transports crude oil and other products and passes from west to east across the county. There are also propane storage facilities in Iron County; two located south of Iron River, Krist Oil and AmeriGas, and one west of Iron River, Marlow Gas.

### **Historical Occurrence**

There have been five isolated pipeline incidents in Iron County.<sup>35</sup> The worst incident was a hairline crack along the Enbridge pipeline near Crystal Falls in November 1999. This event resulted in the release of natural gas and 222,600 gallons of crude oil leached into the ground. The apparent cause of the hairline crack was wear caused by the freeze-thaw cycle of the underlying rock over a long period of time. About 500 people were evacuated from the area after responders ignited a vapor cloud that burned for about 36-hours. About 12,600 gallons spilled in 1968, though no cause was listed. In 1972, a 252,000 spilled due to a weld failure. There was also a fire during that spill that injured two people. On November 11, 2017, an inspection revealed a pinhole leak in the pipeline, but no oil was spilled.

On March 15, 2002, a Great Lakes Gas Transmission Company pipeline in Crystal Falls failed and caused a two-month shutdown. Gas was released, but it did not ignite. However, it created a crater that was 30 feet deep.<sup>36</sup> There were no deaths or injuries, but the cost to repair the issue was about \$4 million.

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<sup>35</sup>Ellison, G. (2017, April 26). “Enbridge Line 5 has spilled at least 1.21M gallons in past 50 years.” *MLive*. [https://www.mlive.com/news/2017/04/enbridge\\_line\\_5\\_spill\\_history.html](https://www.mlive.com/news/2017/04/enbridge_line_5_spill_history.html)

<sup>36</sup> Great Lakes Gas Transmission Company CPF No. 3-2002-1003-H. [https://primis.phmsa.dot.gov/comm/reports/enforce/documents/320021003H/320021003H\\_CAO\\_03282002.pdf](https://primis.phmsa.dot.gov/comm/reports/enforce/documents/320021003H/320021003H_CAO_03282002.pdf)

Map 5.8: Pipeline Location and Incidents in Iron County



**Pipelines  
Iron 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 November 2020

**Pipelines and Incidents**

 Natural Gas Pipeline Failure, 2002	 Gas Transmission Pipeline
 Crude Oil Leak, 2017	 Crude Oil Pipeline



## Occurrence Probability and County Vulnerability

There is a risk of a natural gas pipeline or fixed-site propane or petroleum incident in Iron 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 Iron County are vulnerable to a pipeline incident; the pipeline bisects 7 of the 12 jurisdictions. The City of Iron River also receives natural gas service from the pipeline. 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 vulnerable of municipalities and facilities to pipeline incidents.

## 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 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 system, 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 Iron County due to its harsh climate and remoteness. Iron County is served by several systems, including power, water treatment, and phone, and loss of any or all 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. While power outages are usually of a short duration—up to a few hours—the implications of an extended outage could affect the health and safety of the community.

### **Historical Occurrences**

Electric service in Iron County is provided by We Energies and the Upper Peninsula Power Company. The City of Crystal Falls provides electric services to residents within the city through WPPI Energy. 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. Water systems and wastewater systems can also be affected by failure or secondary failure, but they have been equipped with backup generators to continue to provide service to citizens. However, gas stations within the county are not equipped with emergency generators.

Roads are an essential infrastructure in the county as other forms of transportation infrastructure is either unavailable or unreliable. Of the 846.4 lane miles in the county, 103.3 were rated good (12%). Majority of roads in Iron County are in fair condition (30% or 250.6 miles). About 24% or 205.2 land miles were rated poor.<sup>37</sup> Any large-scale disruptions to the road system in Iron 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.

### **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 populated 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 Iron County have partial or complete backup power sources (e.g., standby generators), such as the hospital and some fire/police stations.

## **Transportation Accidents**

### **Hazard Description**

Transportation accidents can occur on land, air, or water. The one commonality all transportation accidents share is that they can result in mass casualties. Although automobile crashes tragically kill many hundreds of Michigan residents each year, this analysis focuses on the types of accidents that are large enough in scale to potentially cause 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

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<sup>37</sup> 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>



resources in these areas. Michigan has 19 airports with commercial passenger service<sup>38</sup>, 82 local bus transit systems serving 89 million passengers per year, 19 marine passenger ferry services and 3 intercity Amtrak-operated rail passenger corridors composed of 586 miles of track and serving 22 communities<sup>39</sup>.

Iron County is serviced by an Indian Trails regional passenger bus service along U.S. 2, which provides inter- and intrastate transportation. Other transportation services provided in Iron County include the following: school buses, casino buses, public transit services along U.S. 2, and commercial air passenger services at the nearby Ford Airport in Iron Mountain. There are no commercial air passenger services within the County. The Dickinson-Iron Community Services Agency also offers door-to-door transportation to citizens in Iron River from their homes to medical appointments, shopping, and to the local senior center.<sup>40</sup>

### Historical Occurrence

While there has been minor transportation accident within the county, there is no history of a large passenger transportation accident in Iron County. In 2017, the Michigan State Police reported 566 car accidents in the county with 1 fatality and 57 injuries.<sup>41</sup> The one fatality occurred in Iron River Township on January 18, 2017. A sports utility vehicle crashed into an Iron County Commission grader after it cleared off the shoulder of U.S. 2. Three others were injured in the accident. U.S. 2 near the crash was closed for about seven hours.<sup>42</sup>

In 2018, deer related car accidents (346 accidents) made up 71% of all accidents in Iron County. 490 crashes were reported that year.<sup>43</sup> In Mansfield (26 of 31 crashes), Iron River (49 of 60 crashes), and Crystal Falls Townships (93 of 116 crashes), over 80% of car crashes were deer caused. Deer caused accidents were also high in Hematite (75%), Bates (72%), Stambaugh (71%), and Mastodon Townships (70%).

Snowmobile accidents are also of large concern in Iron County. In the winter of 2019-2020, three fatalities occurred.<sup>44</sup> Speed was believed to be a factor in all three February 2020 accidents. The Iron 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 October 3, 2009, a plane crash occurred at the Iron County Airport in Mastodon Township. A single-engine experimental aircraft took off and immediately reported a flight control problem.

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<sup>38</sup> Michigan Department of Transportation Aeronautics – Commercial Service Airports. [www.michigan.gov/aero/0,4533,7-352-79155\\_79156\\_79388---,00.html](http://www.michigan.gov/aero/0,4533,7-352-79155_79156_79388---,00.html)

<sup>39</sup> MDOT Public Transportation. <https://www.michigan.gov/mdot/0,4616,7-151-11056---,00.html>

<sup>40</sup> Get Around the Western U.P. website: <https://www.getaroundwup.org/transit>

<sup>41</sup> MSP. (2017). 2017 Year End Traffic Crash Statistics. [https://www.michigan.gov/documents/msp/2017\\_Year-End\\_for\\_Web\\_621451\\_7.pdf](https://www.michigan.gov/documents/msp/2017_Year-End_for_Web_621451_7.pdf)

<sup>42</sup> “Fatal crash in Iron County.” (2017, January 18). *The Daily News*. [www.ironmountaindailynews.com/news/local-news/2017/01/traffic-crash-reported-west-of-iron-river/](http://www.ironmountaindailynews.com/news/local-news/2017/01/traffic-crash-reported-west-of-iron-river/)

<sup>43</sup> 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>

<sup>44</sup> MDNR. (2020). Michigan Snowmobile Fatality Summary, 2019-2020. [https://www.michigan.gov/documents/dnr/2019-2020\\_Michigan\\_Snowmobile\\_Fatality\\_summary\\_674461\\_7.pdf](https://www.michigan.gov/documents/dnr/2019-2020_Michigan_Snowmobile_Fatality_summary_674461_7.pdf)

The aircraft crashed as it hit the runway. The pilot suffered a head injury, while the passenger only received minor injuries.<sup>45</sup> Another plane accident occurred on June 2, 2017 also at Iron County Airport. A single engine private plane was conducting touch and go maneuvers when a doe deer with a fawn ran across the runway. The pilot veered to avoid hitting the deer and damaged the wheel on the plane. No injuries were reported.<sup>46</sup>

### **Occurrence Probability and County Vulnerability**

The probability of a transportation accident in Iron County is low, but the risk of a large-scale transportation accident is limited by the types of services within the County. The risk presented bypass through traffic on U.S. 2 is considerable and may present elevated probability and severity. 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. With commercial bus transportation, nearby airports, and an influx of tourists throughout the year, the entire county is vulnerable to transportation accidents as it can affect many people. Emergency response plans and awareness of hazardous intersections and roadways are ways to prepare for this type of hazard.

## **Human-Related Hazards**

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

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

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.

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

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<sup>45</sup> Walton, N. (2009). “Pilot injured in Iron County plane crash.” WNMU-FM. <https://www.wnmufm.org/post/pilot-injured-iron-county-plane-crash#stream/0>

<sup>46</sup> “Private plane damaged to avoid deer on runway at Iron County Airport.” (2017, June 2). UP Matters. <https://www.upmatters.com/news/private-plane-damaged-to-avoid-deer-on-runway-at-iron-county-airport/>

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 disturbances in Iron County in recent history. Small protests have occurred in the 1970s due to Project ELF and more recently in response to the Aquila Back Forty Mine and Enbridge Line 5 Pipeline. However, none of these small protests have impeded the function of Iron County.

### **Occurrence Probability and County Vulnerability**

The risk for a civil disturbance exists in Iron County because of governmental, educational, and other activities in the area. The probability of an incident is low throughout the county but may be slightly higher in populated communities along the U.S. 2 corridor. The Iron County Courthouse in the City of Crystal Falls 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).<sup>47</sup> This number continues to increase due to

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<sup>47</sup> State of Michigan. Coronavirus – Michigan Data. [https://www.michigan.gov/coronavirus/0,9753,7-406-98163\\_98173---.00.html](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 Iron County, 778 cases have been confirmed and 32 confirmed deaths at the end of 2020. No area in Michigan is immune to public health emergencies and areas with high population concentrations are more vulnerable to the threat. Additionally, more vulnerable members of society – elderly, children, impoverished individuals, and persons in poor health – are at higher risk than the general population.

The Dickinson-Iron District Health Department is responsible for addressing and trying to prevent public health emergencies within Iron and Dickinson Counties. It does so by working with individuals and organizations prevent premature death, disability, illness, and injury; to prolong life, and to promote public health through disease prevention and control. The Health Department distributes public information for both preparedness and notification by 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 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, campground inspections, and radon testing.

### 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 Iron County. If radon is detected above 4 picocuries per liter (pCi/L), follow-up testing, and resistance techniques should be installed. Approximately 33% of homes tested equal to or above the 4 pCi/L guideline in the county.<sup>48</sup> Two types of testing kits are offered at the Dickinson-Iron

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<sup>48</sup> “Percentage of Elevated Radon Test Results by County.” (2019 December). Michigan EGLE. [https://www.michigan.gov/documents/egle/egle-mmd-map\\_of\\_michigan\\_radon\\_levels\\_667294\\_7.pdf](https://www.michigan.gov/documents/egle/egle-mmd-map_of_michigan_radon_levels_667294_7.pdf)



District Health Department. Radon mitigation includes sealing cracks and venting gasses from the home.

### Individual Wells

Many Iron 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.”<sup>49</sup> While it is not an infectious disease outbreak, deaths due to drug overdoses are now greater than deaths due to car crashes in Michigan.<sup>50</sup> The state has the 14<sup>th</sup> 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.<sup>51</sup> 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.

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<sup>49</sup> Epidemic Disease Occurrence. Center for Disease Control and Prevention. <https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html>

<sup>50</sup> “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/>

<sup>51</sup> 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](https://www.michigan.gov/documents/mdhhs/Drug_Overdose_Deaths_MI_2016-2017_649230_7.pdf)

## Climate Change Considerations

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

## Historical Occurrence

The most likely public health threat in Iron 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.<sup>52</sup> Michigan's average mortality rate is 14.3. However, influenza itself, which can be widespread, rarely becomes a public health emergency.

There is potential in Iron County, as in all areas, for a larger disease outbreak as an isolated event or secondary to flooding or another type of incident. With modern travel, highly contagious diseases can result in a national health emergency, even if the presence of a disease takes time to detect. For example, if reported number of infected cases within a county is low, this does not mean that the illness is not present in the community or that there is no risk of infection. If a virus, such as COVID-19, infects a large portion of the population in the county and becomes an epidemic, it could overwhelm local facilities that are equipped to deal with this type of emergency. Aspirus Iron River Hospital is a 25-bed critical access hospital offering 24-hour emergency treatment. Two other clinics in the county, Aspirus Crystal Falls Clinic and the Ice Lake Family Health Center, provide primary care services. Despite awareness and planning, shortages of supplies, hospital rooms, and medical professionals to respond to the novel coronavirus pandemic and other future disease outbreaks can cause significant harm to the public.

There is potential in Iron County for infectious disease outbreaks, such as chlamydia, hepatitis C, and Lyme disease (high number of cases in nearby Dickinson County).<sup>53</sup> The county is also at risk for substance abuse, foodborne illnesses, and water contamination emergencies. The potential for disease outbreaks and contamination may be isolated events or as events secondary to flooding or other incidents.

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.<sup>54</sup> There are no NICU treatment centers in the county to deal with a rising concern of addicts and those seeking treatment. The Upper Peninsula

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<sup>52</sup> Michigan Department of Health and Human Services, Community Health Information.

[www.mdch.state.mi.us/pha/osr/chi/IndexVer2.asp](http://www.mdch.state.mi.us/pha/osr/chi/IndexVer2.asp)

<sup>53</sup> Upper Peninsula Community Health Needs Assessment 2018. <http://www.wupdhd.org/wp-content/uploads/2018/08/Upper-Peninsula-Community-Health-Needs-Assessment-2018-Second-Edition-1.pdf>

<sup>54</sup> 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/>

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.<sup>55</sup> In Iron County specifically, there have been multiple arrests related to the sale, production, and distribution of narcotics that involve UPSET.<sup>56,57</sup>

Another less urgent issue is that of dilapidated buildings, which are abundant in many jurisdictions in Iron 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 Iron County, the probability of a public health emergency is highly likely, as some health emergencies are currently occurring in the county (e.g., COVID-19 and opioid and meth-related health emergencies). The severity of a public health emergency, such as a disease epidemic, is unpredictable and could potentially be extreme. A large magnitude epidemic could overload facilities that are inadequately equipped to deal with this type of emergency, such as long-term care facilities and rural medical clinics. The drug and substance abuse epidemic are an ongoing problem within the region. There are currently no regional facilities that can assist individuals with an addiction, leaving them vulnerable to drug related health emergencies.

All individuals are vulnerable to the hazards associated with a disease outbreak or epidemic, but vulnerable populations are at a higher risk of succumbing to a public health emergency (e.g., elderly, impoverished individuals, and persons in poor health). The remoteness of the area could also be problematic during a large-scale emergency. In Iron County, the greatest susceptibility to most types of public health emergencies is in more populated areas of the county, such as the cities of Crystal Falls and Iron River. However, events dealing with natural resource contamination could affect these populated areas but originate in rural outlying areas. Public health emergencies tend to be widespread rather than confined to a specific location.

Vulnerable locations include any public gathering areas, such as schools, long-term care facilities, hospitals, restaurants, etc. Individual wells and septic systems and public water, sewer,

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<sup>55</sup> *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/>

<sup>56</sup> Ede, Donny, (2019 Sept. 18). "Four arrested in drug bust in Iron River." *ABC10/CW5.* <https://abc10up.com/2019/09/18/four-arrested-in-drug-bust-in-iron-river/>

<sup>57</sup> *Man pleads guilty to meth-related charges in Iron County.* (2019 April 29). WLUC/FOX UP. <https://www.uppermichiganssource.com/content/news/One-arrested-for-Caspian-meth-bust-Monday-509222841.html>

and electric facilities are also vulnerable to a public health emergency. They may infect, transport, or have secondary impacts if not available or limited in service. Almost all local communities in Iron 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 considered 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; shootings; assassinations; organized extortion; use of radiological, chemical, and biological weapons; information warfare, such as cyber-attacks, 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.

Terrorists fall into five major categories based upon the political cause that motivates their actions. They are the following:

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

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

2. **Religious extremist terrorists** are violent adherents of a specific religion. They tend to be especially committed because they believe their violent actions are supported by their deity. Religious terrorists see themselves fighting a battle of ultimate good against pure evil, in which any action is justified.
3. **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.
4. **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 Iron County.

### **Occurrence Probability and County Vulnerability**

The probability of sabotage and terrorism in Iron County is very low but should not be ignored as these incidents can occur at any level. Most potential target facilities are in populated areas, such as government facilities. 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. An event is most likely to be isolated with a specific target and this unpredictability leads to some vulnerability.



## 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

Currently, there is no reliable way to accurately estimate costs associated with many hazards that affect Iron County. 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 Iron 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 Iron 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 Iron 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 Iron 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, Iron County**

Jurisdiction (Population)	Extreme Temperatures	Fog	Hail	Ice & Sleet Storms	Lightning	Severe Winds	Snowstorms and Blizzards	Tornadoes	Dam Failures	Riverine & Urban Flooding	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
Iron County (11,291)	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X		X	X	X	X	X
City of Caspian (511)															X										
City of Crystal Falls (1,696)									X						X					X					
City of Gaastra (383)															X										
City of Iron River (2,878)															X						X				
Village of Alpha (169)															X						X				
Bates Township (951)															X						X				
Crystal Falls Township (1,530)									X						X						X				
Hematite Township (275)																									
Iron River Township (1,051)															X						X				
Mansfield Township (245)									X						X						X				
Mastodon Township (654)									X						X						X				
Stambaugh Township (1,117)									X						X						X				

**Table 6.2:** State-equalized Value for Iron County, 2020

**** REAL ****						Total Real	Personal	Total Real & Personal	
Township/City	Agricultural	Commercial	Industrial	Residential	Timber Cutover				
Bates Township	\$1,467,802	\$1,453,434	\$503,703	\$65,189,573	\$4,783,232	\$73,397,744	\$4,319,686	\$77,717,430	
Crystal Falls Township	\$2,612,300	\$5,098,600	\$2,683,800	\$89,225,550	\$8,404,600	\$108,024,850	\$16,262,500	\$124,287,350	
Hematite Township	\$319,780	\$846,110	\$190,140	\$22,072,580	\$7,982,010	\$31,410,620	\$577,211	\$31,987,831	
Iron River Township	\$2,646,600	\$1,529,200	\$462,900	\$58,387,500	\$2,982,600	\$66,008,800	\$10,761,100	\$76,769,900	
Mansfield Township	\$1,334,100	\$462,600	\$8,912,400	\$20,892,100	\$2,443,900	\$34,045,100	\$2,860,100	\$36,905,200	
Mastodon Township	\$3,128,800	\$637,000	\$27,021,000	\$59,193,600	\$4,881,200	\$94,861,600	\$5,675,600	\$100,537,200	
Stambaugh Township	\$6,782,908	\$5,804,567	-	\$117,032,637	\$6,335,613	\$135,955,725	\$10,543,007	\$146,498,732	
City of Caspian	-	\$2,192,380	\$226,630	\$10,299,924	-	\$12,718,934	\$2,022,290	\$14,741,224	
City of Crystal Falls	-	\$4,071,527	\$135,460	\$22,023,910	-	\$26,230,897	\$532,060	\$26,762,957	
City of Gaastra	\$86,440	\$161,800	-	\$4,735,207	-	\$4,983,447	\$222,220	\$5,205,667	
City of Iron River	-	\$17,888,641	\$1,782,856	\$35,801,867	-	\$55,473,364	\$5,879,389	\$61,352,753	
<b>County Total Real and Personal</b>									<b>\$702,766,244</b>

Source: Michigan Equalization System. Michigan Department of Treasury. [https://www.michigan.gov/treasury/0,4679,7-121-1751\\_2164\\_66718-183566--,00.html](https://www.michigan.gov/treasury/0,4679,7-121-1751_2164_66718-183566--,00.html)

**Hazard Extent**

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

**Table 6.3:** Hazard Extent in Iron County

<b>Weather Hazards</b>	
<b>Extreme Temperatures</b>	Extreme heat extent is measured through the heat index, which is the temperature in relation to percentage of humidity. The highest heat index was recorded on July 31, 2006, where heat indices ranged from 100-105 degrees Fahrenheit. Extreme cold extent is generally measured through the wind chill temperature index. Subzero wind chills are a normal occurrence in the county. It should be noted that future events may be much hotter or colder than reported incidences.
<b>Fog</b>	The extent of fog is measured by area and number of roads and vehicles affected by a fog event, as fog itself is not hazardous.
<b>Hail</b>	Hail extent is defined by the size of the hail stone. The largest hail stone reported in Iron County was 1.75 inches on June 9, 2000. It should be noted that future events may exceed this.
<b>Ice and Sleet Storms</b>	The extent of ice and sleet storms can be classified by meteorological measurements and by evaluating its societal impacts.
<b>Lightning</b>	The frequency of cloud-to-ground lightning flashes per square mile can be used as a method to measure extent. Iron County receives approximately 1.5 to 3 strikes per square mile per year. Greater strikes per square mile per year are possible in the future.
<b>Severe Winds</b>	The extent of a severe wind event is measured by speed of wind recorded. The highest wind speed recorded from the NCEI data was 92 mph (80 knots) on two occasions: on August 9, 2005 near Iron River and on July 8, 2007 near Crystal Falls. Note that future events may result in stronger winds.
<b>Snowstorms and Blizzards</b>	The extent of winter storms can be measured by the amount of snowfall received (in inches). From 1955-2019, Iron County has experienced 113 blizzard events, totaling \$605,000 in recorded damage. The most expensive event occurred on January 24-27, 1997 when heavy snow resulted in over a foot a snow. In Iron River, the heavy snow accumulation caused the roof of the Iron river Reporter to

	collapse, destroying the building. Total reported property damage was \$600,000.
<b>Tornadoes</b>	Tornado hazard extent is measured by historic tornadoes per county in Michigan provided by the NCEI and MSP, as well as the Fujita/Enhanced Fujita Scale (Tables 5.8 and 5.9).
<b>Hydrological Hazards</b>	
<b>Dam Failures</b>	Dam Failure extent is defined using the Michigan Department of Environment, Great Lakes, and Energy under Dam Safety criteria. Of the 16 dams in the county, 88% are state regulated, and only one of them is classified as significant risk hazard potential. A significant hazard potential indicates that if the dam were to fail there would be no loss of life, but could cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Although no dam failures have been reported, a future event may occur.
<b>Riverine and Urban Flooding</b>	Flood extent in Iron County is measured by the duration and magnitude of an event. In April of 2012, record setting snowfall in February and March melted snowpack of over 11 inches of water in a six-day period, releasing water into nearby rivers, creeks, streams, and lakes. In addition, over two inches of rainfall coinciding with record high temperatures increased the rate of snowmelt. Local roads flooded, and homes and businesses were evacuated. Total estimated damage for Iron County was \$280,000, while estimated damages for the Western U.P. was \$18.5 million
<b>Ecological Hazards</b>	
<b>Wildfires</b>	Extent of a wildfire is determined by the annual average of total acres burned.
<b>Invasive Species</b>	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.
<b>Geological Hazards</b>	
<b>Earthquakes</b>	Earthquake extent can be measured the Modified Mercalli Intensity (MMI) scale and the distance of the epicenter from Iron County. It was determined that this hazard does not threaten Iron County.
<b>Subsidence (Ground Collapse)</b>	Subsidence is measured by total displacement material volume from the event, as well as monetary damages.



<b>Technological (Industrial) Hazards</b>	
<b>Scrap Tire Fires</b>	Extent is measured by the area affected, monetary damages incurred., as well as type of tire products involved.
<b>Structural Fires</b>	Structural fire hazard extent is measured in area affected, time required to extinguish the fire, and incurred monetary damages.
<b>Hazardous Materials: Fixed Site Incidents</b>	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.
<b>Hazardous Materials: Transportation Accident</b>	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.
<b>Petroleum and Natural Gas Incidents</b>	Extent is measured by the spatial extent of an incident, and volume of material lost
<b>Infrastructure Hazards</b>	
<b>Infrastructure Failures and Secondary Technological Hazards</b>	Hazard extent is measured by the type of failure and duration and what cascading effects are because of the hazard.
<b>Transportation Accidents</b>	Extent of a transportation accident can be measured by type of transportation involved and location of accident.
<b>Human Related Hazards</b>	
<b>Civil Disturbances</b>	Extent is measured by potential economic losses through damage to or disruption of operations of governmental facilities or other commercial businesses.
<b>Public Health Emergencies</b>	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.
<b>Sabotage and Terrorism</b>	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
- Iron 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 Iron 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 Iron 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 with 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 Iron County jurisdictions to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for Iron 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 Iron County Local Planning Team (LPT) in gaining consensus on the determination of those hazards that pose the most significant threat to Iron 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 Iron 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 Iron County, the highest score of 3.1 was given to invasive species. 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, Iron 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	
<b>Probability</b>	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	
<b>Impact</b>	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	
<b>Spatial Extent</b>	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	
<b>Warning Time</b>	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	
<b>Duration</b>	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 Iron County

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
<b>Weather Hazards</b>						
Extreme Temperatures	Highly Likely	Limited	Large	More than 24 hours	Less than one week	3.0
Fog	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.4
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	2.6
Lightning	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.6
Severe Winds	Highly Likely	Limited	Small	Less than 6 hours	Less than 24 hours	2.7
Snowstorms and Blizzards	Highly Likely	Critical	Large	12 to 24 hours	Less than one week	3.0
Tornadoes	Unlikely	Critical	Negligible	Less than 6 hours	Less than 6 hours	2.2
<b>Hydrological Hazards</b>						
Dam Failures	Possible	Critical	Small	6 to 12 hours	Less than 24 hours	2.4
Riverine and Urban Flooding	Highly Likely	Critical	Moderate	6-12 hours	Less than one week	2.7
Drought	Possible	Minor	Large	Less than 6 hours	More than one week	2.5
<b>Ecological Hazards</b>						
Wildfires	Likely	Limited	Small	12-24 hours	Less than 24 hours	2.8
Invasive Species	Highly Likely	Limited	Large	More than 24 hours	More than one week	3.1



Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
<b>Geological Hazards</b>						
Earthquakes	Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	2.1
Subsidence (Ground Collapse)	Highly Likely	Limited	Small	Less than 6 hours	Less than 6 hours	2.7
<b>Technological (Industrial) Hazards</b>						
Scrap Tire Fires	Unlikely	Minor	Small	Less than 6 hours	Less than 24 hours	1.8
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
<b>Infrastructure Hazards</b>						
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
<b>Human Related Hazards</b>						
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 Iron 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 Iron 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 Iron County

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

## **Hazard Summary**

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

- Invasive Species
- Snowstorms and Blizzards
- Extreme Temperatures
- Public Health Emergencies
- Structural Fires
- Transportation Accidents
- Wildfires

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

## SECTION 7: Hazard Mitigation

This section of the Hazard Mitigation Plan provides the blueprint which Iron County and its municipal jurisdictions can follow to 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 Hazards in Iron County
- Mitigation Resources
- Updating the 2020 Iron County Hazard Mitigation Plan

### Overview of Mitigation Strategy Development

In formulating Iron County’s mitigation strategy, a wide range of activities were considered 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 human made structures to reduce the impact of hazards.

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

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

The intent of the Mitigation Strategy Section is to provide Iron 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 9: Actions Plans. The MAPs represent 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 Iron 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 Hazard Mitigation Plan.

In preparing their own individual Mitigation Actions Plans, each jurisdiction was given the opportunity to consider 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 Iron 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 Iron County and its jurisdictions to achieve through the implementation of their own specific Mitigation Action Plans. These goals were reviewed at the Local Planning Team Meeting (August 2019) and confirmed to still be valid with few changes for the 2020 Iron 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 Iron 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 of the Michigan State Police.

## Capability Assessment

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. As



in any planning process, it is important to try to establish which goals, objectives and/or actions are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given a local government's planning and regulatory framework, level of administrative and technical support, 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 Iron 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 Iron County to pursue under this Plan, but also ensures that those goals are realistically achievable under given local conditions.

### **Planning and Regulatory Capability**

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

**Table 7.1** below provides a summary of relevant local plans, ordinances and programs already in place or under development for Iron 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 Iron 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
City of Caspian								X	X			X	X *Co	X
City of Crystal Falls	X		X	X		X		X	X	X	X	X	X *Co	
City of Gaastra									X					
City of Iron River	X MP*		X						X			X		X
Village of Alpha									X					
Bates Township			X			X			X					
Crystal Falls Township	X MP*		X			X			X					
Hematite Township	X	X	X	X	X	X			X					
Iron River Township									X					
Mansfield Township									X					
Mastodon Township									X			X		
Stambaugh Township						X			X					

*MP – Embedded in Master Plan; Co – Uses County resources; \* - Plan Under Development*

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## Mitigating Hazards in Iron County

The following is an overview of potential activities by category for Iron 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 Iron County, the County is responsible for all electrical, mechanical, and plumbing code enforcement and for building code enforcement in all jurisdictions. Thorough inspection of property during and after construction ensures that builders are incorporating all the current standards and requirements in effect.

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

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

based on a comprehensive plan for the community. In Iron County, the City of Crystal Falls updated their Master Plan in February 2016. A land use plan is incorporated in the Township of Crystal Falls' Master Plan and Bates Township recently updated and adopted their Master Plan in April 2019.



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

### **Natural Systems Resource Protection**

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

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

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

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

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



*Bioswales are vegetated, 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.*

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

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

Erosion and sedimentation can be controlled through phased construction, minimization of clearing, and stabilization of bare ground with vegetation, and other means. Sediment can be



captured onsite with traps and filters, and water velocity can be slowed by terraces, temporary cover, constructed wetlands, and impoundment.

Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, regulates only earth change activity (primarily construction projects disturbing one or more acres of land or that which is within 500 feet of the water's edge of a lake or stream). Part 31, Water Resources Protection Act, of NREPA addresses most other sources of sediment. In Iron County, the Iron County Road Commission assumes all the responsibilities for the position of Drain Commissioner. 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.<sup>58</sup> 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.<sup>59</sup>

### **Emergency Services**

Local emergency services authorities, resources, and facilities throughout Iron 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

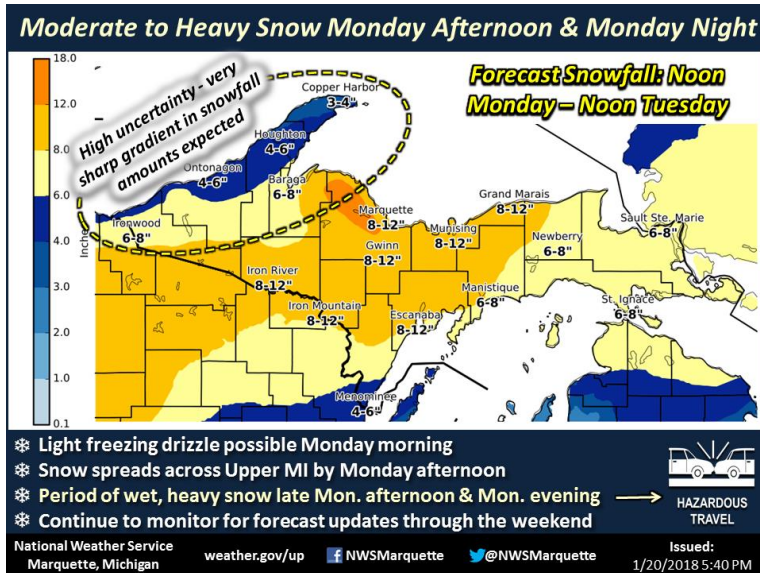
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<sup>58</sup> Farmland and Open Space Preservation Frequently Asked Questions. MDARD.

[https://www.michigan.gov/mdard/0,4610,7-125-1599\\_2558-10312--,00.html](https://www.michigan.gov/mdard/0,4610,7-125-1599_2558-10312--,00.html)

<sup>59</sup> 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](https://www.michigan.gov/documents/mdard/MDARD_Policy_on_Solar_Panel_and_PA116_Land_656927_7.pdf)



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

**Threat Recognition:** The first step in responding to a hazard is being aware that there is potential for an event to occur. With a threat recognition system, adequate warnings can be disseminated, and other response actions can be undertaken. Flood threats can be evaluated by measuring rainfall, soil moisture, and stream flows upstream and then calculating flood levels for downstream locations. Discerning the time 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 in order to distribute information to all affected parties. The NWS notifies the public using two levels: *Watch* and *Warning*. *Watch* refers to conditions that are right for flooding, thunderstorms, tornadoes or winter storms. *Warning* refers to a flood, tornado, etc. has started or has been observed. A more specific warning may be disseminated in a few ways, including:

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

All the systems have their limitations because they reach only certain audiences. TV and radio can provide information, but this method of notification is only effective if people have them on. NOAA radio will only reach those with access to a weather radio. Outdoor warnings can indicate to tune into another information source such as TV or radio, but this type of warning has limited reach and may not be heard by people indoors or in noisy environments. Door-to-door contact is time consuming but preferred when there is enough lead time for an incident. The best warning system is a redundant system that provides notification via numerous methods in order 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 in order to address large floods, erosion, river access and views, and cost of construction and maintenance. Seawalls are often used to protect from erosion due to storm surges along Lake Superior's edge. Seawalls are built along a property edge and are designed to protect a property from the storm surges. Along the Great Lakes they can be significantly impacted by ice movement during the winter months and often have difficulty resisting lake forces.

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

County Drain Commission to establish a county drain 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 Iron 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 Iron 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		
Dickinson-Iron Community Action Agency	Keweenaw Land Trust	Superior Health Foundation
Habitat for Humanity Menominee River	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 Iron 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 Iron 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 a Local Planning Team 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 Iron County to update the plan within five years based on public feedback, the Local Planning Team and State Hazard Mitigation Officer recommendations. The public will also be notified of any plan updates (interim or within five years), and copies will be made available at all local government offices and online.

## SECTION 8: Action Plan

This section highlights the five-year action plan set out by the Local Planning Team for Iron 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 Iron County and its communities. All the activities identified in this section are consistent with the following mitigation goals identified in Section 7:

- Goal 1** Protect lives and property within Iron 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 up-to-date response plans and upgrades as needed.
- Goal 4** Educate citizens to encourage self-help and mitigation of hazards on private property.

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

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

### Past Mitigation Accomplishments

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

**Table 8.1:** 2005 Mitigation Action Items

2005 Item	Status in 2013
NOAA Radio	Completed
Improved Emergency Response	Ongoing
Update Stormwater Management Plans	Not Completed
Review Plans and Development Regulations	Ongoing
Mine Shaft Safety	Ongoing
Public Information/Education Program	Ongoing
Retrofit Underground Pipes	Ongoing
Insurance	Ongoing

**Table 8.2:** 2013 Mitigation Action Items

2013 Item	Status
Acquisition of Blighted Buildings/Properties	Completed
Obtain Needed Firefighting Equipment	Completed
Wellhead Protection	Completed
Pipeline Safety/Training Program	Ongoing
Mine Shaft Safety	Ongoing
Improved/Continuing Emergency Response	Ongoing
Update Stormwater Management Plan	Not completed
Review Plans and Development Regulations	Ongoing
Public Information/Education Program	Completed/Ongoing
Retrofit Underground Pipes	Ongoing
Insurance	Ongoing

Some action items are carried over from the 2013 Hazard Mitigation Plan including several ongoing activities that will continue indefinitely. Four projects have been completed – most notably – the purchase and demolition of blighted buildings in the City of Crystal Falls and the wellhead protection program in Iron River and Stambaugh Townships. The other action items were and are dependent on funding that has not been available. One action item, updating the stormwater management plan, was not completed due to a change in county priorities and lack of funding. No large-scale changes in land development have occurred in Iron County since 2005. Most construction has been incremental within or adjacent to already-developed areas. Iron County, the City of Iron River, the City of Crystal Falls, and Crystal Falls Township have completed, are in progress of completing, or have explored, respectively, new Master Plans. None of these are expected to have a major effect on land use in the County. Note that action item costs are estimated.

### **Action Item 1: Disaster Recovery Plan**

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

<i>Responsible Agency:</i>	Iron County Emergency Manager, the local emergency planning team, and local units of government
<i>Deadline:</i>	2022
<i>Cost:</i>	\$5,000
<i>Potential Funding Sources:</i>	Pre-Disaster Mitigation Grant Program (FEMA)
<i>Benefits:</i>	The ability of a community to successfully manage the recovery process begins with its efforts in pre-disaster preparedness, mitigation, and recovery capacity building. These efforts result in resilient communities with an improved ability to withstand, respond to, and recover from disasters. Pre-disaster recovery planning promotes a process in which the whole community fully engages with and considers the needs and resources of all its members. The community will provide leadership in developing recovery priorities and activities that are realistic, well planned, and clearly communicated.

### **Action Item 2: Pipeline Safety / Training Program**

Natural gas pipelines in Iron County pose risk of leaks and possible explosion threatening life and property in the surrounding area. Emergency responders need training on an ongoing basis to inform them of how to react to one of those problems. Pipelines have been identified as a particular concern for Bates and Iron River Townships.

<i>Responsible Agency:</i>	Pipeline companies, gas utilities (i.e., DTE Energy), and local emergency response
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Staff time
<i>Potential Funding Sources:</i>	Agency operating budget
<i>Benefits:</i>	Residents and the land will be protected in the event of a natural gas pipeline incident.

### **Action Item 3: Mine Shaft Safety**

An ongoing mine shaft safety program is needed and should be implemented. As funding is available, the County will prioritize and address hazardous shafts and stopes. Shafts can be

closed off at their openings (adits) through capping and / or fencing, while stopes, once identified, can be mitigated through internal support and the closure of overlying land. Since 2005, mine shaft safety has been a priority however the overall costs have increased significantly. This has been identified as a particular concern for the City of Iron River, and Iron River Township.

<i>Responsible Agency:</i>	Iron County Mine Inspector
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Estimated \$20,000 - \$75,000 for protective measures.
<i>Potential Funding Sources:</i>	FEMA Hazard Mitigation and BRIC grant programs.
<i>Benefits:</i>	Action to address the numerous abandoned mine shafts throughout the county is necessary to protect people and property. The long history of mining has led to a persistent problem with mine shaft openings, due to improperly capping with materials such as rotting logs and rusting cars. This must be addressed as soon as possible to prevent future incidents.

#### **Action Item 4: Improved / Continuing Emergency Response**

Conduct ongoing reviews of response plans and programs to keep emergency contacts up to date, ensure critical facility information is current, and to identify/incorporate new improved methods of warning and response. Adequacy of shelter facilities, response equipment, and training can be evaluated during these ongoing reviews.

<i>Responsible Agency:</i>	Iron County Emergency Management Office
<i>Deadline:</i>	Ongoing; Incorporate into annual emergency plan revision process.
<i>Cost:</i>	Staff time from agency budget
<i>Potential Funding Sources:</i>	Agency operating budget
<i>Benefits:</i>	Emergency plans that are up to date and incorporate all available methods of warning and response will be most effective in emergency situations thus mitigating loss from hazards.

#### **Action Item 5: Review plans and development regulations**

As land use plans, master plans, zoning, and other plans/regulations are up for revision, appropriate hazard mitigation provisions will be included. The County will consider plans and regulations that diverts new development from identified hazards and prioritize development standards that ensure adequate fire and emergency access, require buried utility lines, and promote open space requirements that protect properties from flooding.

<i>Responsible Agency:</i>	Iron County and all municipalities
<i>Deadline:</i>	Ongoing as plans and ordinances are reviewed.
<i>Cost:</i>	Staff time

*Potential Funding Sources:* Agency operating budgets

*Benefits:* Citizens of Iron County will benefit from plans that protect new development from known hazards and by informing municipalities of methods of protecting their lands from hazards – specifically priority hazards.

### **Action Item 6: Public Information / Education Program**

Public information is the key to mitigating many of the potential hazards in Iron County. Several projects can help to educate the public on potential hazards and how to protect themselves from hazards. Recommended projects include preparing and gathering education materials on hazards affecting Iron County and how citizens can help with mitigation. These materials should be organized and made available at government offices, schools, and other easily accessible public facilities, as well as online. Topics can include property protections and risk reduction.

*Responsible Agency:* Iron County Emergency Manager; Utility companies; Michigan State University Extension; Government agencies

*Deadline:* Ongoing

*Cost:* Staff time

*Potential Funding Sources:* Organization/agency operating budgets

*Benefits:* Organizing applicable educational materials and making them available to the public ensures that the impacts of hazards is being communicated. Through use of newspapers, internet, schools, and public bulletin boards, citizens can be informed with a consistent message.

### **Action Item 7: Retrofit Underground Sewer, Water, and Wastewater Infrastructure**

Aging and un-insulated pipes should be identified and respaced or retrofitted as work is done on underground utilities. More urgent replacements should be done as soon as possible.

*Responsible Agency:* Iron County Road Commission and municipal public works

*Deadline:* Ongoing

*Cost:* Variable, depending on the project

*Potential Funding Sources:* FEMA Pre-disaster Hazard Mitigation Grant Program

*Benefits:* The benefits of each project will vary but will ensure that future risk of water infrastructure failure will be mitigated.

### **Action Item 8: Insurance**

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

*Responsible Agency:* Iron County and local municipalities; property owners



<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Variable
<i>Potential Funding Sources:</i>	FEMA National Flood Insurance Program, organization and agency operating budgets, and individual property owners
<i>Benefits:</i>	All property owners can benefit by protecting themselves and their public facilities from loss. Conventional insurance policies can offer protection, while municipalities participating in NFIP allows for residents to obtain flood insurance.

**Action Item 9: Adopt Hazard Mitigation Plan and Update Regularly**

By adopting the Iron 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 Operations Plan updated, will be reviewed annually to determine whether revisions are needed.

The Hazard Mitigation Plan will be updated every five years in order to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene a Hazard Mitigation Committee representing local agencies, municipalities, townships, 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 Iron 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>	Iron County Emergency Manager
<i>Deadline:</i>	Ongoing
<i>Cost:</i>	Staff Time
<i>Potential Funding Sources:</i>	FEMA and agency operating budgets
<i>Benefits:</i>	The adoption of the Hazard Mitigation Plan commits Iron 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 Iron 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

# Iron County

## 2020-2025

### Hazard Mitigation Plan



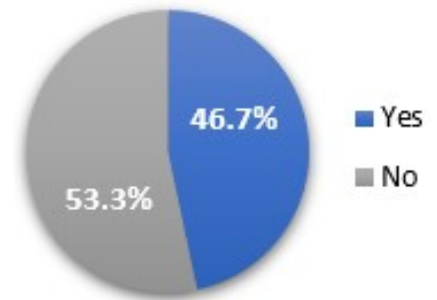
#### FAST FACTS

<b>Area:</b> 1,231 sq. miles	<b>Climate:</b> humid continental	<b>Growing Season:</b> 84	<b>Population:</b> 11,291
<b>Housing:</b> 9,303	<b>Average Household Income:</b> \$36,773	<b>Poverty Rate:</b> 14.2%	<b>Disability:</b> 17.7%

#### PUBLIC SURVEY SUMMARY

Respondents are very concerned about flooding from precipitation or snowmelt, severe winds or windstorms and lightning. In the last five years, most households have experienced severe winds or windstorms at 50.0%, the second most common hazard experienced were flooding and snow. Respondents were asked whether they had taken actions to make their home or community more resistant to hazards. Nearly half (43.8%) 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 radio, internet - social media, and television.

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



#### DISASTER DECLARATIONS

Iron County has experienced six presidential declarations since 1965. Other emergencies and disasters not declared by the president have impacted the county. Listed below are declarations from 1965-2019.

##### Presidential Disaster Declarations

Event	Declaration Date
<b>Drought</b>	March 2, 1977
<b>Blizzards and Snowstorms</b>	January 27, 1978
<b>Flooding</b>	May 6, 2002
<b>Hurricane Katrina Evacuation</b>	September 7, 2005
<b>COVID-19</b>	March 13, 2020
<b>COVID-19 Pandemic</b>	March 27, 2020

Source: FEMA

#### HAZARD RANKING

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

High Risk	
<ul style="list-style-type: none"> <li>Invasive Species</li> <li>Snowstorms &amp; Blizzards</li> <li>Extreme Temperatures</li> <li>Public Health Emergencies</li> </ul>	<ul style="list-style-type: none"> <li>Structural Fires</li> <li>Transportation Accidents</li> <li>Wildfires</li> </ul>
Moderate Risk	
<ul style="list-style-type: none"> <li>Riverine &amp; Urban Flooding</li> <li>Severe Winds</li> <li>Subsidence (Ground Collapse)</li> <li>Ice &amp; Sleet Storms</li> </ul>	<ul style="list-style-type: none"> <li>Lightning</li> <li>Infrastructure Failures &amp; Secondary Technological Hazards</li> <li>Drought</li> </ul>
Low Risk	
<ul style="list-style-type: none"> <li>Sabotages &amp; Terrorism</li> <li>Dam Failures</li> <li>Hail</li> <li>Hazardous Materials: Fixed Site Incidents</li> <li>Tornadoes</li> </ul>	<ul style="list-style-type: none"> <li>Earthquakes</li> <li>Petroleum &amp; Natural Gas Incidents</li> <li>Hazardous Materials: Transportation Accidents</li> <li>Scrap Tire Fires</li> <li>Civil Disturbances</li> </ul>

## 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 Iron County and its communities. All activities are consistent with the following mitigation goals:

- Goal 1:** Protect lives and property within Iron 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
Disaster Recovery Plan	2022	\$5,000
Pipeline Safety/Training Program	Ongoing	Staff Time
Mine Shaft Safety	Ongoing	\$20,000—\$75,000
Improved/Continuing Emergency Response	Ongoing	Staff Time
Review Plans and Development Regulations	Ongoing	Staff Time
Public Information/Education Program	Ongoing	Staff Time
Retrofit Underground Sewer, Water, and Wastewater Infrastructure	Ongoing	Variable
Insurance	Ongoing	Variable
Adopt Hazard Mitigation Plan and Update Regularly	Ongoing	Staff Time

## DATA SOURCES

Michigan Hazard Mitigation Plan, Emergency Management and Homeland Security Division, Michigan Department of State Police: [www.michigan.gov/documents/msp/MHMP\\_480451\\_7.pdf](http://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](http://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](http://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

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## 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>

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**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>

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

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

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

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

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

**Additional Information:** <https://restoreyoureconomy.org/>

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**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>

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Additional Information:** [https://www.michigan.gov/msp/0,4643,7-123-72297\\_60152\\_69727\\_69730\\_69734-15282--,00.html](https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html)

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

**Additional Information:** [https://www.michigan.gov/msp/0,4643,7-123-72297\\_60152\\_69727\\_69730\\_69734-15282--,00.html#Hazard\\_Mitigation](https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html#Hazard_Mitigation)

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**National Flood Insurance Program:** Community participation in the National Flood Insurance Program is mandatory for homeowners, business owners, and renters to purchase flood insurance. Insurance claims can be paid if a federal disaster 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>

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

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

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

**Additional Information:** [https://www.michigan.gov/msp/0,4643,7-123-72297\\_60152\\_69727\\_69730\\_69734-15282--,00.html](https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html)

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

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

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

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**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

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

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

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

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

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

**Additional Information:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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**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/>

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**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](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/landscape/ewpp/?cid=nrcs143_008216)

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



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

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

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

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

**Additional Information:** [https://www.rd.usda.gov/files/ReConnect\\_Program-Factsheet.pdf](https://www.rd.usda.gov/files/ReConnect_Program-Factsheet.pdf)

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

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

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

**Additional Information:** [https://www.rd.usda.gov/files/RD\\_REDI\\_FactSheet\\_6519.pdf](https://www.rd.usda.gov/files/RD_REDI_FactSheet_6519.pdf)

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**Rural Economic Development Loan and Grant Program:** The purpose of the program is to promote rural economic development and job creation projects.

**Additional Information:** <https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program>

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**Rural Energy for America Program:** Provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements.

**Additional Information:** <https://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency>

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**Rural Microentrepreneur Assistance:** Provides loans and grants to Microenterprise Development Organizations (MDOs) to help microenterprises startup and grow through a Rural Microloan Revolving Fund and provide training and technical assistance to microloan borrowers and micro-entrepreneurs.

**Additional Information:** <https://www.rd.usda.gov/programs-services/rural-microentrepreneur-assistance-program>

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**U.S. Department of Energy:** concerned with policies regarding energy and safe handling of nuclear materials

**Tribal Energy Loan Guarantee Program:** The Tribal Energy Loan Guarantee Program (TELGP) is a partial loan guarantee program that can guarantee up to \$2 billion in loans to support economic opportunities to tribes through energy development projects and activities. Can guarantee up to 90 percent of the unpaid principal and interest due on any loan made to a federally recognized Indian tribe for energy development. The tribal borrower will be required to invest equity in the project and all project debt will be provided by non-federal lenders.

**Additional Information:** <https://www.energy.gov/lpo/tribal-energy-loan-guarantee-program>

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**Weatherization Assistance Program:** The U.S. Department of Energy (DOE) Weatherization Assistance Program reduces energy costs for low-income households by increasing the energy efficiency of their homes while ensuring their health and safety. The program supports 8,500 jobs and provides weatherization services to approximately 35,000 homes every year using DOE funds. Through weatherization improvements and upgrades, these households save, on average, \$283 or more every year according to a national evaluation of the program. Since the program began in 1976, WAP has helped improve the lives of more than 7 million families through weatherization services.

**Additional Information:** <https://www.energy.gov/eere/wipo/weatherization-assistance-program>

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**U.S. Department of Health and Human Services (HHS):** protects the health of all Americans and provides essential human services

**Small Health Care Provider Quality Improvement Program:** The purpose of the Rural Quality Program is to support planning and implementation of quality improvement activities for rural primary care providers or providers of health care services serving rural residents. These activities include providing clinical health services to residents of rural areas by funding projects that coordinate, expanded access, contain costs, and improve the quality of essential health care services. The program goal is to promote the development of an evidence-based quality improvement culture and to promote the delivery of cost-effective, coordinated health care services in primary care settings.

**Additional Information:** <https://www.grants.gov/web/grants/view-opportunity.html?oppId=307894>

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**U.S. Department of Housing and Urban Development (HUD):** provide housing with fair and equal access and community development assistance

**Disaster Assistance Resources:** HUD offers many disaster resources and partners with Federal and state agencies to implement disaster recovery assistance.

**Additional Information:** <https://www.hud.gov/info/disasterresources>

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**Rural Capacity Building for Community Development and Affordable Housing:** Enhances the capacity and ability of local governments, Indian tribes, housing development organizations, rural Community Development Corporations, and rural Community Housing Development Organizations (CHDOs), to carry out community development and affordable housing activities that benefit low- and moderate-income families and persons in rural areas.

**Additional Information:** <https://www.hudexchange.info/programs/rural-capacity-building/>

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**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/>

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**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](https://beta.sam.gov/fal/cf4feb36160a4f11ab376036796925b4/view?keywords=Invasive%20and%20Noxious%20Plant%20Management&sort=-relevance&index=cfda&is_active=true&page=1)

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**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](https://beta.sam.gov/fal/c64ad5b621574cf38ea11ccd164e43ce/view?keywords=Plant%20Conservation%20and%20Restoration%20Management&sort=-relevance&index=cfda&is_active=true&page=1)

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**U.S. Department of Labor (DOL):** improve working conditions, advance opportunities for profitable employment and assure work-related benefits and rights

**Disaster Unemployment Assistance:** Financial assistance to individuals whose employment or self-employment has been lost or interrupted as a direct result of a major disaster and who are not eligible for regular employment insurance benefits.

**Additional Information:** <https://oui.doleta.gov/unemploy/disaster.asp>

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**U.S. Department of Transportation (DOT):** responsible for helping to maintain and develop transportation systems and infrastructure

**Emergency Relief Program:** Fund for the repair or reconstruction of Federal-aid highways and roads on Federal lands which have suffered serious damage as a result of natural disasters or catastrophic failures from an external cause. Supplements the commitment of resources by States, their political subdivisions, or other Federal agencies to help pay for unusually heavy expenses resulting from extraordinary conditions.

**Additional Information:** <https://www.fhwa.dot.gov/programadmin/erelief.cfm>

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**U.S. Small Business Administration (SBA):** advocates, aids, assists, and protects the interests of small business concerns

**Disaster Loans:** Provides low-interest disaster loans to businesses of all sizes, private non-profit organizations, renters, and homeowners. Eligible costs must not be covered by personal insurance or FEMA and include repair or replaced real estate, personal property, machinery & equipment, inventory and business assets that have been damaged or destroyed along with economic losses.

**Additional Information:** <https://www.sba.gov/funding-programs/disaster-assistance>

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**Economic Injury Disaster Loans:** Small businesses, small agricultural cooperatives, or private nonprofit organization in a declared disaster area who have suffered substantial economic injury, may be eligible for an Economic Injury Disaster Loan.

**Additional Information:** <https://disasterloan.sba.gov/ela/Information/EIDLLoans>

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**Home and Personal Property Loans:** Homeowners, renters and/or property owners in declared disaster areas may apply for a loan to help recover from disaster-related damages.

**Additional Information:**

<https://disasterloan.sba.gov/ela/Information/HomePersonalPropertyLoans>

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**Lender Match:** The Lender Match program does not provide loans directly to businesses. Instead, it reduces the risk for participating financial institutions by guaranteeing their loans to small businesses-making it easier for them to obtain loans at competitive rates.

**Additional Information:** <https://www.sba.gov/funding-programs/loans>

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**Military Reservists Economic Injury Loans:** Provides funds to help an eligible small business meet its ordinary and necessary operating expenses that it could have met, but is unable to, because an essential employee was called-up to active duty in his or her role as a military reservist.

**Additional Information:** <https://disasterloan.sba.gov/ela/Information/MREIDLLoans>

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## State Resources

**Environment, Great Lakes, and Energy (EGLE):** Supports a sustainable environment, healthy communities, and vibrant economies

**Brownfield Redevelopment Grants:** Brownfield redevelopment grants provide funding to local units of government and other public bodies to investigate and remediate known sites of environmental contamination, which will be used for identified economic redevelopment projects.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-151085--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-151085--,00.html)

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**Brownfield Redevelopment Loans:** Brownfield redevelopment loans facilitate the redevelopment of brownfield properties by providing low-interest loans to local units of government and other public bodies to investigate and remediate sites of known or suspected environmental contamination.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-151086--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-151086--,00.html)

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**Drinking Water Contaminant Remediation Grants:** For drinking water infrastructure, grants shall be awarded to drinking water systems for contaminant remediation efforts or connection to an alternate system.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-492719--.00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-492719--.00.html)

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**Michigan Aquatics Invasive Plant Control Grant Program:** The grants will assist with the prevention, detection, eradication, and control by chemical, physical, or biological methods of aquatic invasive plant species within Michigan inland lakes.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-498017--.00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-498017--.00.html)

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**Nonpoint Source Pollution Control Grants – Clean Michigan Initiative:** To provide funding to implement the physical improvements in approved watershed management plans intended to restore impaired waters and protect high-quality waters. Practices must address specific sources of nonpoint source pollution identified by Michigan's Nonpoint Source Program Plan. Physical improvements are structural and vegetative best management practices.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314499--.00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314499--.00.html)

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**Nonpoint Source Pollution Control Grants – Federal Clean Water Action Section 319:** To provide funding to implement nonpoint source activities identified in EGLE-approved watershed management plans. Implementation activities must address specific sources of nonpoint source pollution identified by Michigan's Nonpoint Source Program Plan.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314500--.00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314500--.00.html)

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**Planning and Construction Grants:** Michigan Coastal Management (MCM) Program provides grant funds to promote vibrant and resilient coastal communities. Approximately \$700,000 for planning and on-the-ground, site-specific projects are available annually in partnership with the National Oceanic and Atmospheric Administration.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314490--.00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314490--.00.html)

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**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](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314505--,00.html)

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**Scarp Tire Law Enforcement Grants:** To issue grants for projects that will result in restricting the illegal dumping or improper disposal of scrap tires.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-495979--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-495979--,00.html)

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**Scarp Tire Market Development Grants:** To issue grants for projects that will result in the development of increased markets for scrap tires.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314506--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314506--,00.html)

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**Source Water Protection Grants:** To provide matching funds to public water supply systems for the development and implementation of a source water protection program to help prevent drinking water sources from becoming contaminated. These funds can be used to develop a Surface Water Intake Protection Program for systems utilizing surface water or to develop a Wellhead Protection Program for those systems that use groundwater sources.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314515--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314515--,00.html)

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**State Revolving Loan Fund:** Provides low-interest loans for water pollution control projects.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314509--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314509--,00.html)

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**Strategic Water Quality Initiatives Fund:** Provides low-interest loans for water pollution control projects involving the on-site upgrade or replacement of failing septic systems or for the removal of groundwater or stormwater from sanitary or combined sewer leads.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314512--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314512--,00.html)

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**Substantial Public Health Risk Project Grants:** For projects to address a substantial public health risk from treatment system failure.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-492720--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-492720--,00.html)

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**Volunteer River, Stream, and Creek Cleanup Grants:** Provides funding to local units of government for volunteer cleanups of rivers, streams, and creeks to improve Michigan waterways of human-made trash.

**Additional Information:** [https://www.michigan.gov/egle/0,9429,7-135-3307\\_3515-314495--,00.html](https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314495--,00.html)

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**Michigan Department of Natural Resources (DNR):** Maintains natural resources such as parks, state forests, and recreation areas.

**Michigan Invasive Species Grant Program:** To address strategic issues of prevention, detection, eradication and control for both terrestrial and aquatic invasive species in Michigan. Annually, \$3.6 million in funding is available.

**Additional Information:** [https://www.michigan.gov/invasives/0,5664,7-324-71276\\_92000---,00.html](https://www.michigan.gov/invasives/0,5664,7-324-71276_92000---,00.html)

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**Michigan Department of Transportation (MDOT):** Maintains all interstate, US and state highways in Michigan.

**Emergency Relief:** Assists with replacing or repairing roadways or roadway structure damage on ALL federal aid highways (major collectors and above) resulting from a catastrophic failure or natural disaster. Also includes debris removal and emergency protective measures such as traffic control and detour signing.

**Additional Information:**

[https://www.michigan.gov/documents/mdot/FHWA\\_Emergency\\_Relief\\_program\\_outline\\_Michigan\\_022113\\_418318\\_7.pdf](https://www.michigan.gov/documents/mdot/FHWA_Emergency_Relief_program_outline_Michigan_022113_418318_7.pdf)

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**Rural Task Force Program:** The money is provided within two funding sources: Surface Transportation Program (STP) Rural for improving the federal aid system; and Transportation Economic Development Fund (TEDF) Category D for building an all-season network.

**Additional Information:** [https://www.michigan.gov/mdot/0,4616,7-151-9621\\_17216\\_54903-227096--,00.html](https://www.michigan.gov/mdot/0,4616,7-151-9621_17216_54903-227096--,00.html)

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**State Infrastructure Bank Loan Program:** Provide loans to public entities for eligible transportation improvements to meet urgent project financing demands.

**Additional Information:**

[https://www.michigan.gov/documents/mdot/Guidelines\\_for\\_Applicants\\_623329\\_7.pdf](https://www.michigan.gov/documents/mdot/Guidelines_for_Applicants_623329_7.pdf)

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**Michigan Economic Development Corporation (MEDC):** Collaborates with other economic partners to assist businesses grow and develop strategies.

**Michigan Business Development Program:** Provide grants, loans, and other economic assistance to businesses for highly competitive projects in Michigan that create jobs and/or provide investment.

**Additional Information:**

<https://www.michiganbusiness.org/4a7f60/globalassets/documents/reports/fact-sheets/michiganbusinessdevelopmentprogram.pdf>

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**Michigan Community Revitalization Program:** Promotes community revitalization.

**Additional Information:**

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

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## Other

### Local Resources & Programs

**Baraga County Community Foundation:** Funding and scholarships available to address community needs. Provide support for non-profits and volunteer organizations in Baraga County.

**Additional Information:** <http://baragacountyfoundation.org/>

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**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>

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**Copper County Habitat for Humanity - Homeownership Program:** For families and individuals in need of decent, affordable housing. Application selection based on level of need, willingness to partner with Habitat for Humanity and the ability to repay mortgage through an affordable payment plan.

**Additional Information:** <https://www.habitat.org/us-mi/houghton/copper-country-hfh>

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**Dickinson Iron Community Action Agency:** Focus and coordinate all available resources that empower individuals to obtain the opportunities to become self-sufficient. Provides 14 different human services including in-home senior services, transportation, weatherization, nutrition and food services. Reach out to the agency to see what other services they provide.

**Additional Information:** <https://www.dicsami.org/>

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**Duck Lake Riparians' Association:** (Gogebic County) Improve, conserve, and safeguard overall welfare of the air, water, and shorelines of Duck Lake in Gogebic County. Assists local government in development and administration of regulations to protect the environment and promote social and recreational activities.

**Additional Information:** <http://www.ducklakeriparians.org/index.cfm>

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**Gogebic Ontonagon Community Action Agency:** Provides food, weatherization, housing, and community development programs. Visit their website or call the agency to find out more.

**Additional:** [http://www.gocaa.org/index.cfm?fuseaction=dep\\_list](http://www.gocaa.org/index.cfm?fuseaction=dep_list)

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**Gogebic Salvation Army Service Extension:** Disaster and emergency response services are provided by a committee of volunteers through the Salvation Army:

**Additional Information:** Tom Bremer (715) 554-0177

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**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>

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**Hancock Salvation Army:** Provides emergency financial assistance and disaster services for Houghton, Keweenaw, and Ontonagon counties.

**Additional Information:** <https://centralusa.salvationarmy.org/hancock>

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**Ishpeming Salvation Army:** Provides emergency financial assistance and disaster services to Baraga County

**Additional Information:** (906) 486-8121

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**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/>

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**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/>

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**Keweenaw Land Trust:** Focus on protection of land, water, and quality of life through conservation, stewardship, and education. Current projects include preservation of wetlands, watersheds, and natural habitat, conservation easements. and educational outreach.

**Additional Information:** <http://www.keweenawlandtrust.org/about.php>

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**Lake Superior Community Development Corp:** Non-profit Native Community Development Financial Institution. Loan programs available to assist with access to home mortgages and decent, safe, and sanitary housing for low- and very-low-income individuals.

**Additional Information:** <https://www.lakesuperiorcdc.com/>

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**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>

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**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/>

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**Superior Watershed Partnership and Land Conservancy:** Implements a variety of conservation and public education projects including pollution prevention, invasive species removal and prevention, water quality and stormwater management, habitat protection and restoration, native plant restoration, climate change adaptation planning and implementation, alternative energy and energy conservation, land protection, watershed restoration, and education programs.

**Additional Information:** <https://superiorwatersheds.org/projects>

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**Western U.P. Planning & Development Region (WUPPDR):** Offers planning support for the counties of Baraga, Gogebic, Houghton, Iron, Keweenaw, and Ontonagon. Services and technical assistance on Hazard Mitigation planning are available. Additionally, information on mitigation and community development funding and resources is also provided.

**Additional Information:** <https://www.wupldr.org/>

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## 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/>

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**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>

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**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>

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**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/>

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**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](http://www.rebuildingtogether.org)

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**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/>

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**Produced by: Western U.P. Planning & Development Region**

Appendix C: County Letter to Commit Match

# IRON COUNTY OFFICE OF THE COUNTY ADMINISTRATOR

2 SOUTH SIXTH STREET, SUITE 7 CRYSTAL FALLS, MI 49920  
PH. 906-875-3301 FAX 906-875-0655

## County Administrator

Eugene C. (Gene) Smith  
gsmith@ironmi.org



## Administrative Assistants

Mary S. Dalpra, FOIA Coordinator  
mdalpra@ironmi.org

Lynette Lorenz  
llorenz@ironmi.org

## Memorandum

November 29, 2018

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

Dear Mr. Wuorenmaa:

Iron County understands that WUPPDR intends to apply, or already has, for Federal Emergency Management Agency (FEMA) funding to update the Iron 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.

Iron County looks forward to working with you to complete its Hazard Mitigation Plan update.

Sincerely,

Gene Smith  
County Administrator

EC: Board of Commissioners  
Emergency management Director Vernon Jones

## Appendix D: Public Participation

# 2019 Iron County Hazard Mitigation Public Opinion Survey

## We need your help!

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

Although participation in this survey is optional, we strongly encourage you to respond. All responses will be kept confidential. **Please respond by July 12.** 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](mailto: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., 8<sup>th</sup> 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 Iron County?

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> City of Caspian       | <input type="checkbox"/> Bates Township         | <input type="checkbox"/> Mansfield Township |
| <input type="checkbox"/> City of Crystal Falls | <input type="checkbox"/> Crystal Falls Township | <input type="checkbox"/> Mastodon Township  |
| <input type="checkbox"/> City of Gaastra       | <input type="checkbox"/> Hematite Township      | <input type="checkbox"/> Stambaugh Township |
| <input type="checkbox"/> City of Iron River    | <input type="checkbox"/> Iron River Township    | <input type="checkbox"/> Village of Alpha   |
- Outside of Iron County; please specify: \_\_\_\_\_

2. During the past five (5) years, have you or someone in your household directly experienced a hazard in Iron 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
<b>WEATHER HAZARDS</b>					
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"/>
<b>GEOLOGIC HAZARDS</b>					
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"/>
<b>HYDROLOGICAL HAZARDS</b>					
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"/>
<b>ECOLOGICAL HAZARDS</b>					
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"/>
<b>INDUSTIRAL HAZARDS</b>					
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"/>
<b>INFRASTRUCTURE HAZARDS</b>					
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"/>
<b>HUMAN RELATED</b>					
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? (*Check all that apply*)

- |  |   |
|--|---|
| <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
<b>1. <u>Prevention</u></b> 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"/>
<b>2. <u>Property Protection</u></b> 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"/>
<b>3. <u>Natural Resource Protection</u></b> 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"/>
<b>4. <u>Structural Projects</u></b> 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"/>
<b>5. <u>Emergency Services</u></b> 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"/>
<b>6. <u>Public Education and Awareness</u></b> 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!**



## PRESS RELEASE

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Western Upper Peninsula Planning and Development Region  
400 Quincy St., 8<sup>th</sup> Floor  
Hancock, MI 49930  
906-482-7205  
info@wuppdr.org

Release Date: June 14, 2019

### **Iron 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 Iron County along with the Iron 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 Iron 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](http://www.wuppdr.org/surveys) and will be available until Friday, July 12, 2019.

The survey link is as follows:

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

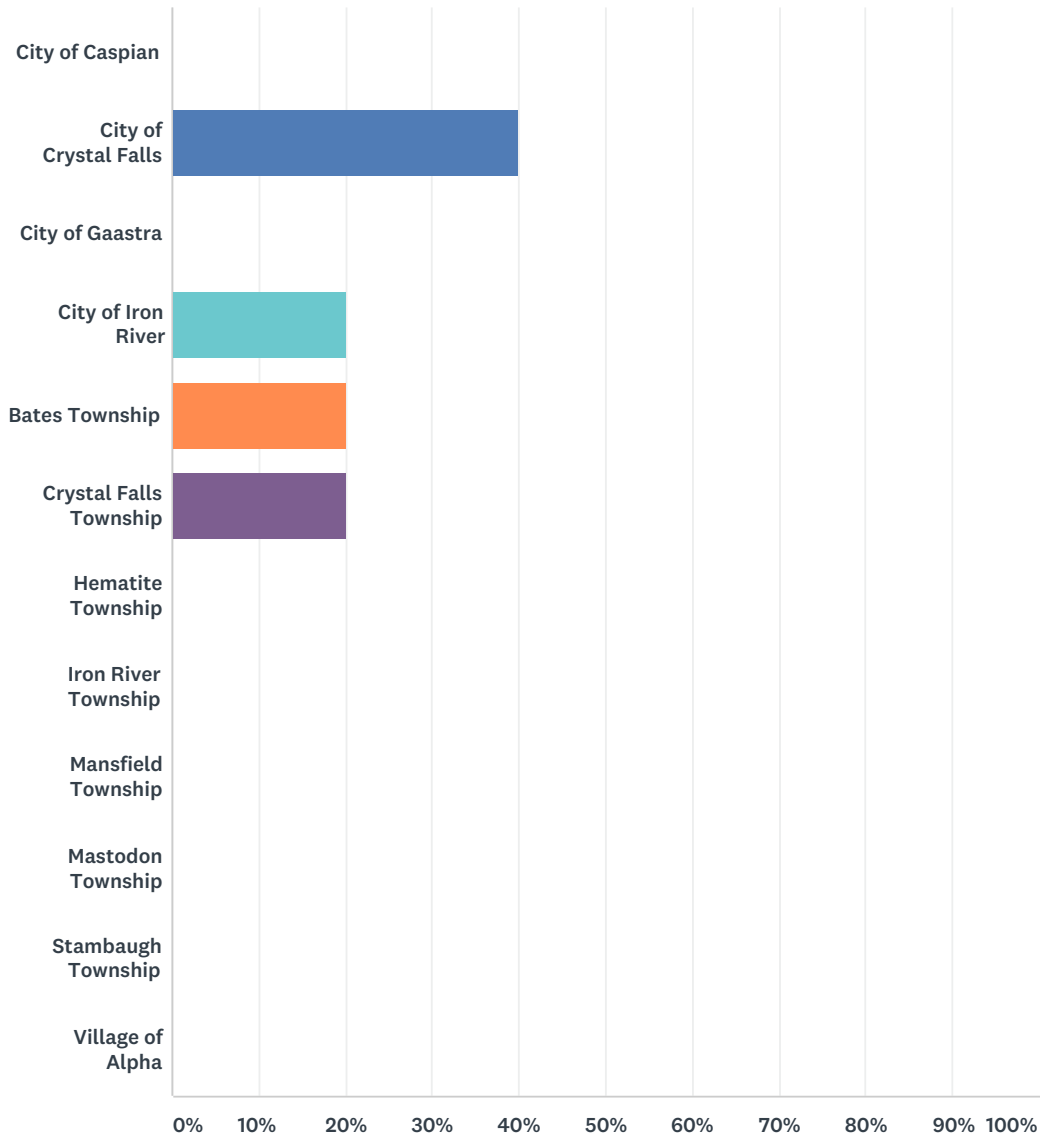
The information you provide will help us better understand local hazard concerns and can lead to mitigation activities that help lessen the impact of future hazard events in your community.

For more information or for a paper survey contact:

Angela Yu, [ayu@wuppdr.org](mailto:ayu@wuppdr.org)  
WUPPDR Assistant Planner  
1-906-482-7205, ext. 118

### Q1 Where do you live in Iron County?

Answered: 5 Skipped: 0



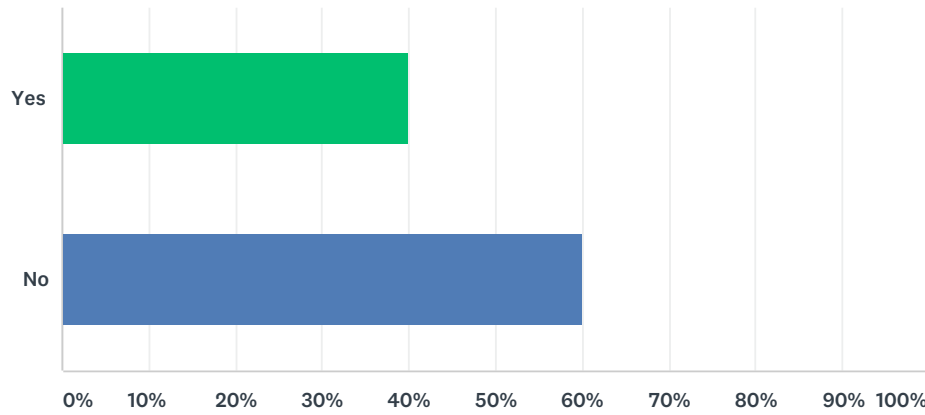
ANSWER CHOICES	RESPONSES
City of Caspian	0.00% 0
City of Crystal Falls	40.00% 2
City of Gaastra	0.00% 0
City of Iron River	20.00% 1
Bates Township	20.00% 1
Crystal Falls Township	20.00% 1
Hematite Township	0.00% 0
Iron River Township	0.00% 0

Mansfield Township	0.00%	0
Mastodon Township	0.00%	0
Stambaugh Township	0.00%	0
Village of Alpha	0.00%	0
<b>TOTAL</b>		<b>5</b>



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

Answered: 5 Skipped: 0



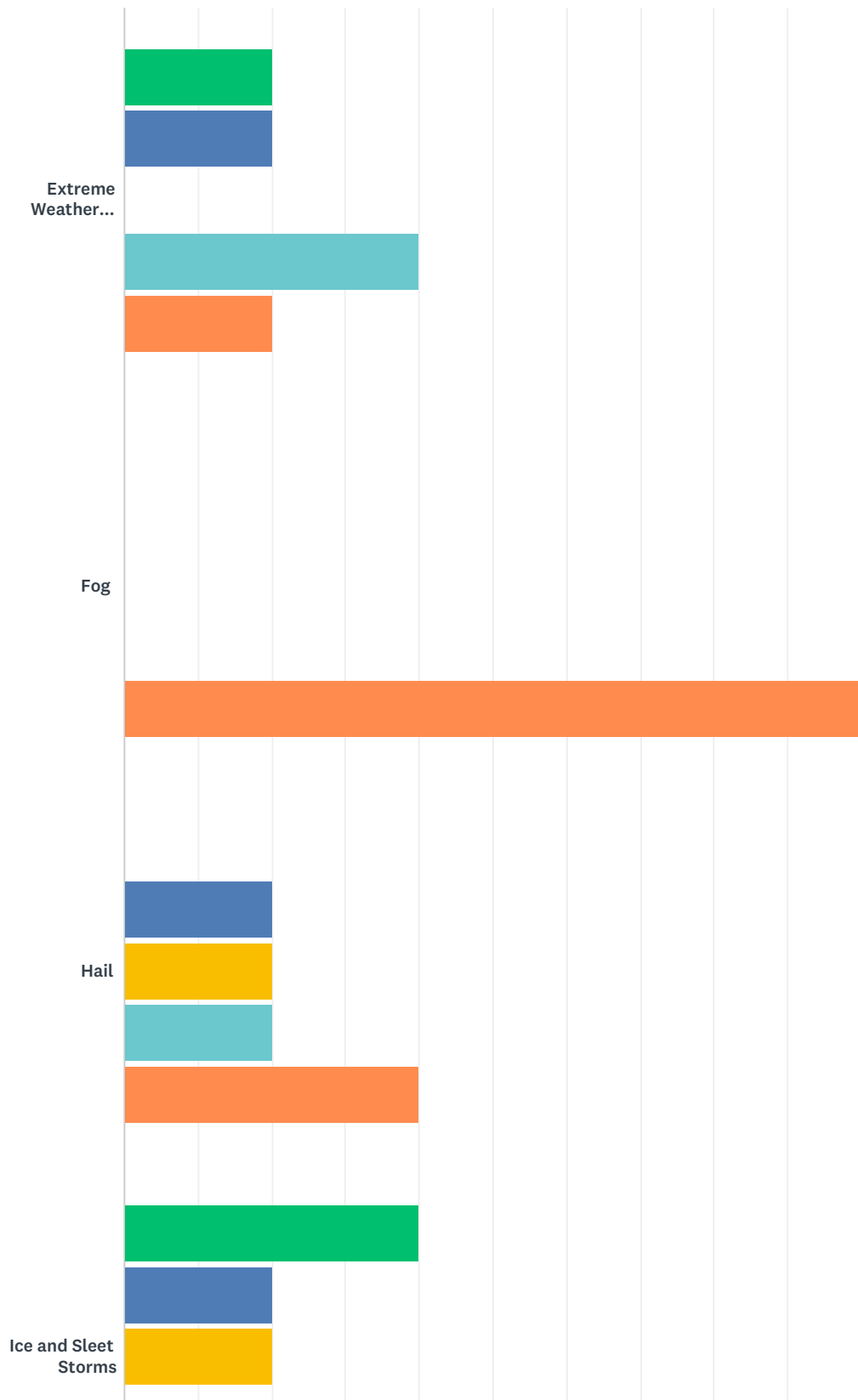
ANSWER CHOICES	RESPONSES	
Yes	40.00%	2
No	60.00%	3
TOTAL		5

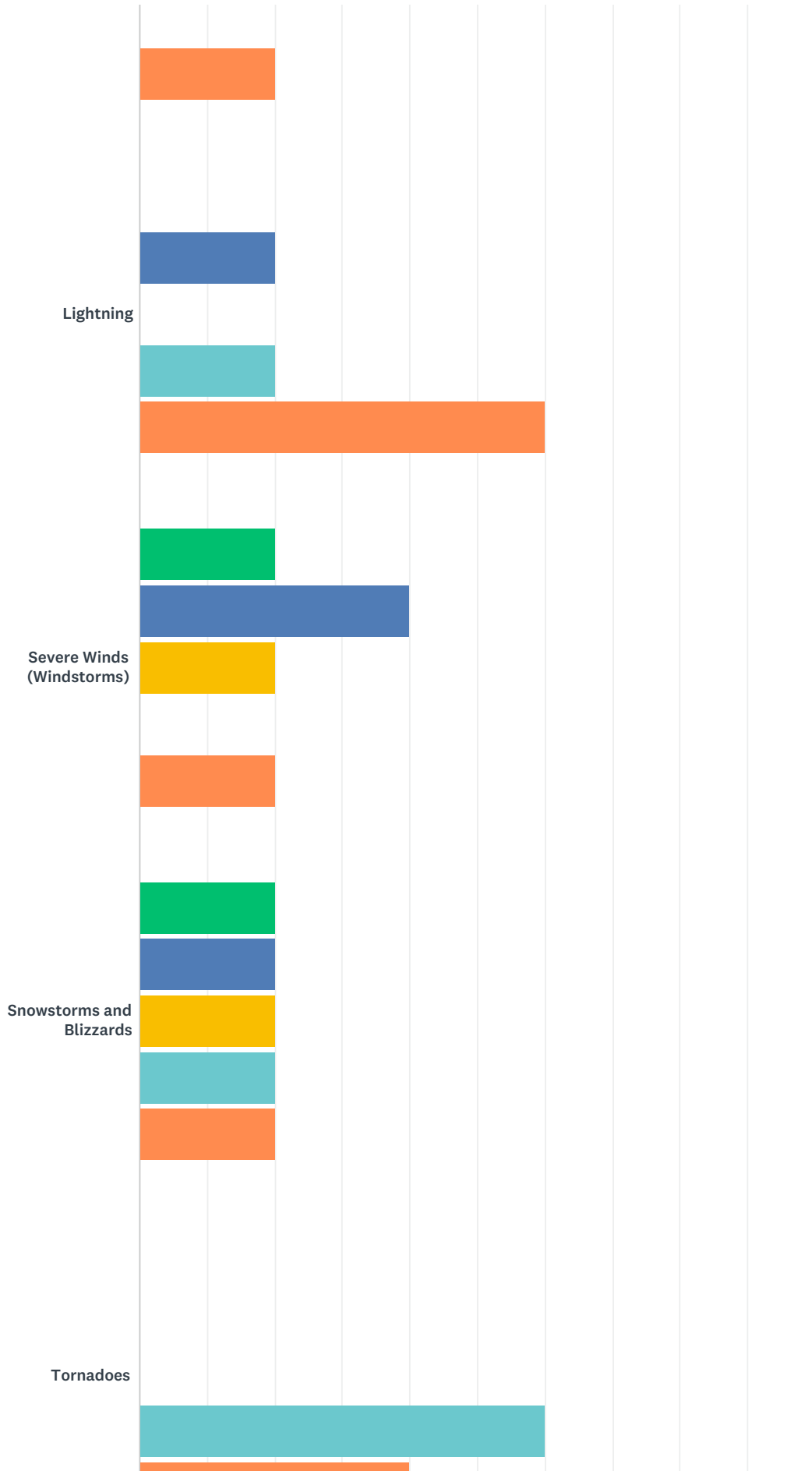
**Q3 IF YES, which hazard(s) have you or someone in your household experienced in the past five (5) years?**

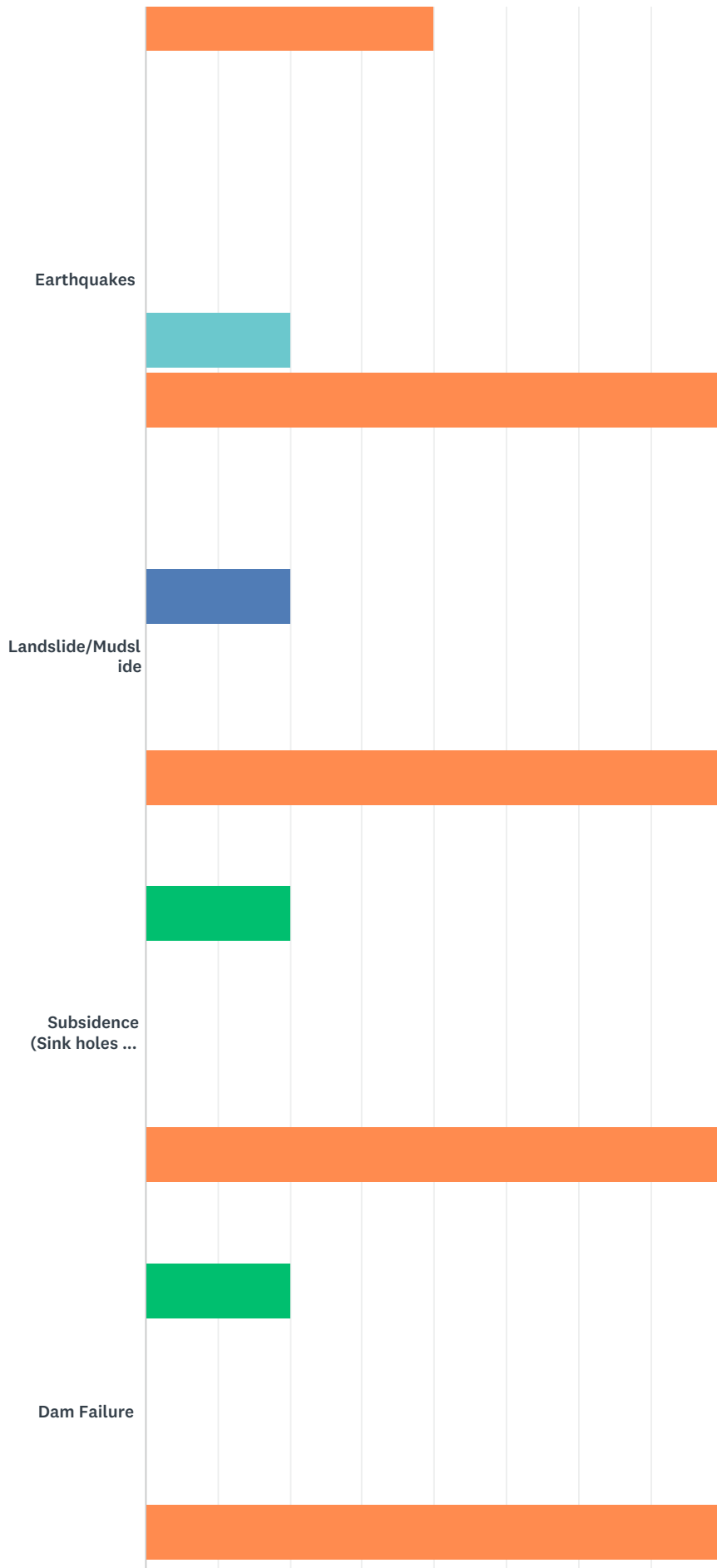
Answered: 2 Skipped: 3

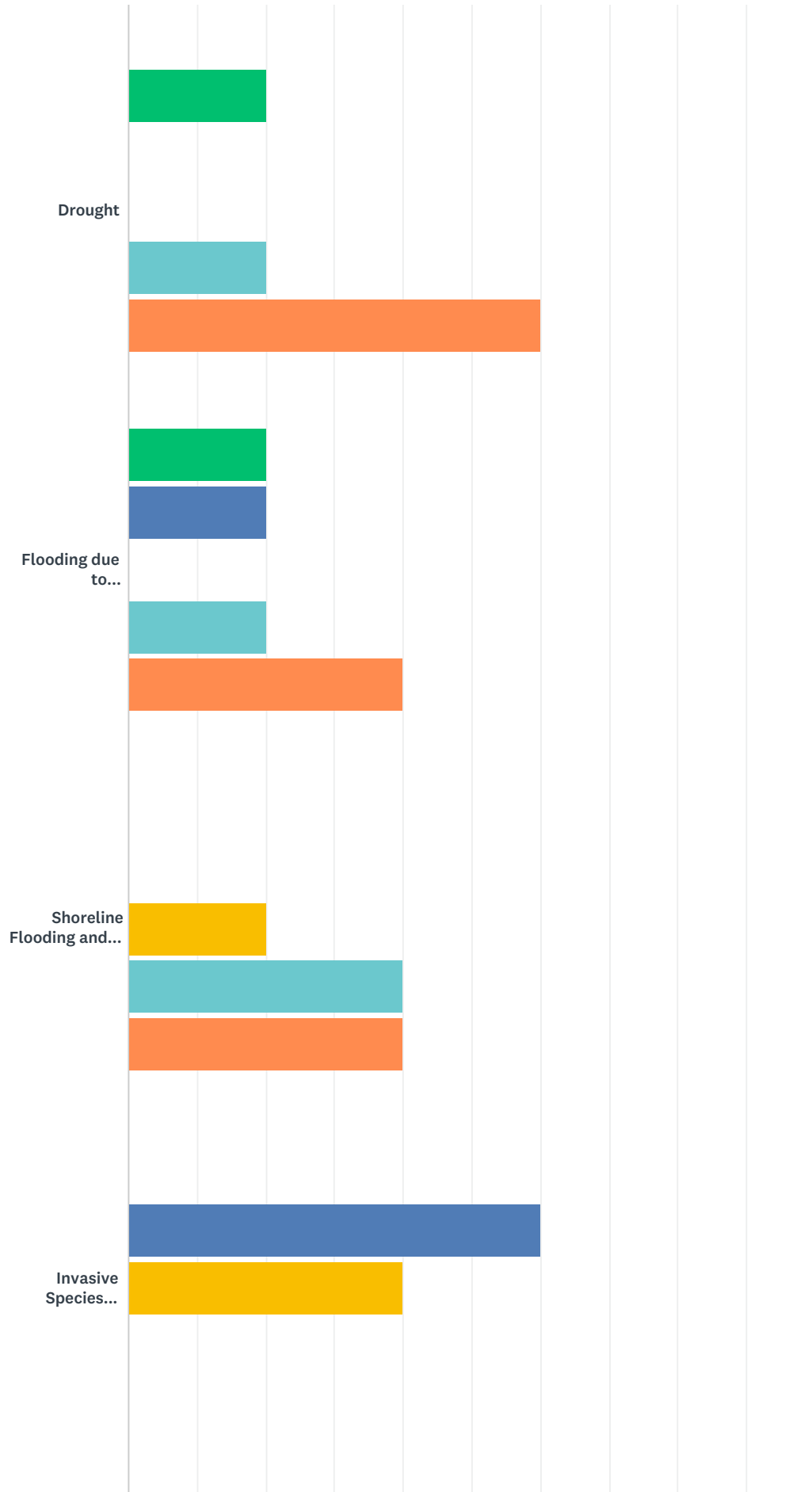
### Q4 How concerned are you about the following hazards affecting your home and community in the next five (5) years?

Answered: 5 Skipped: 0

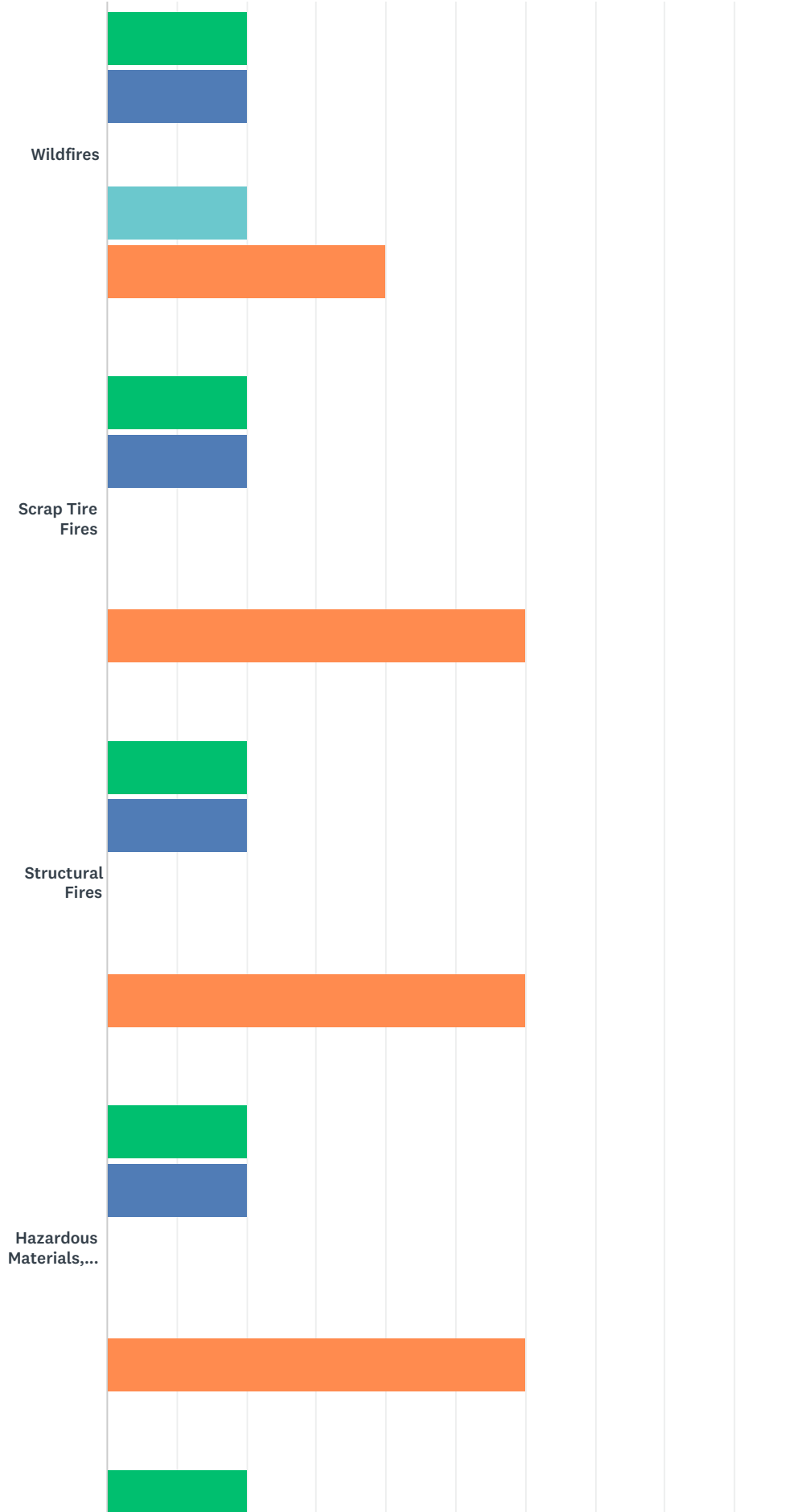


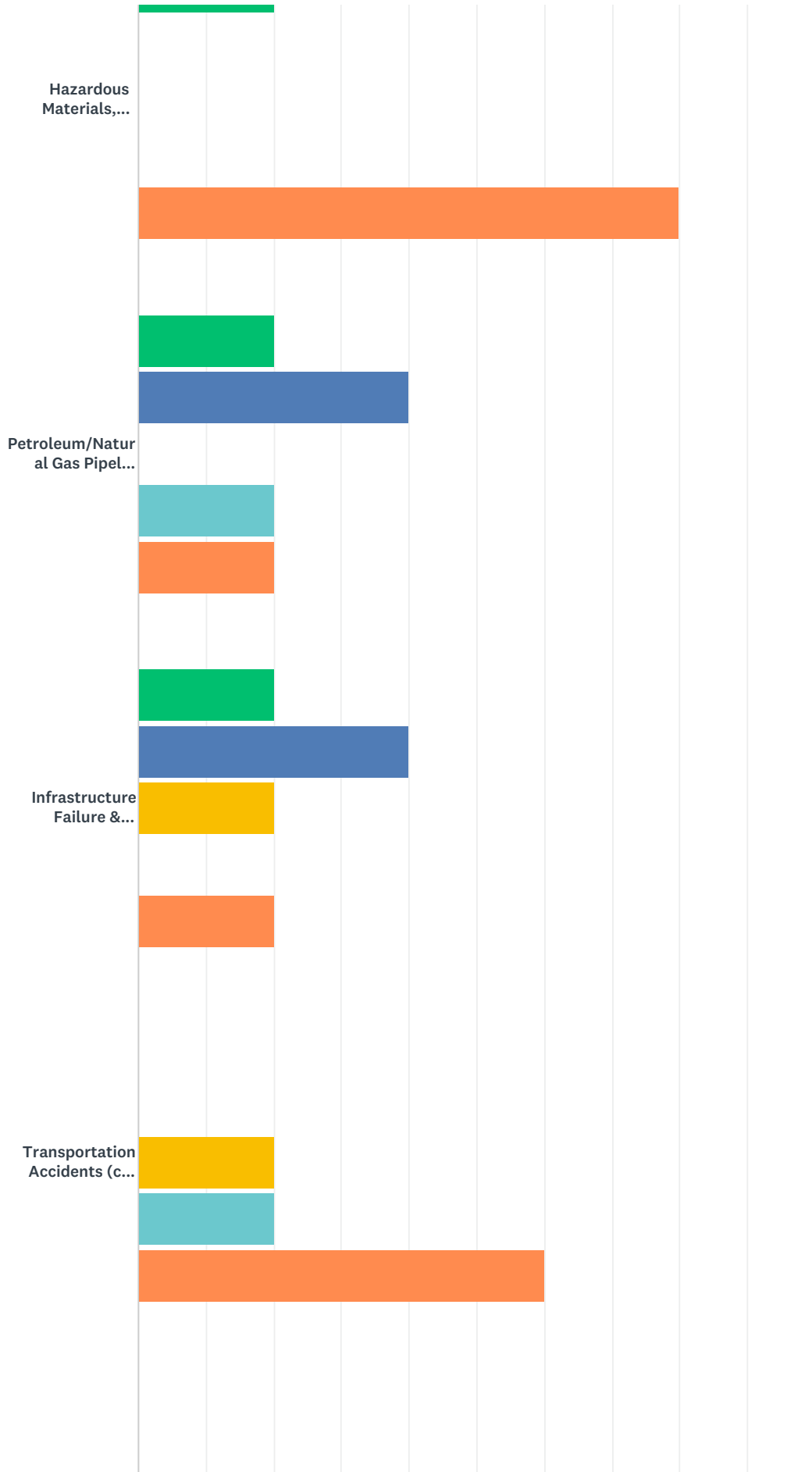


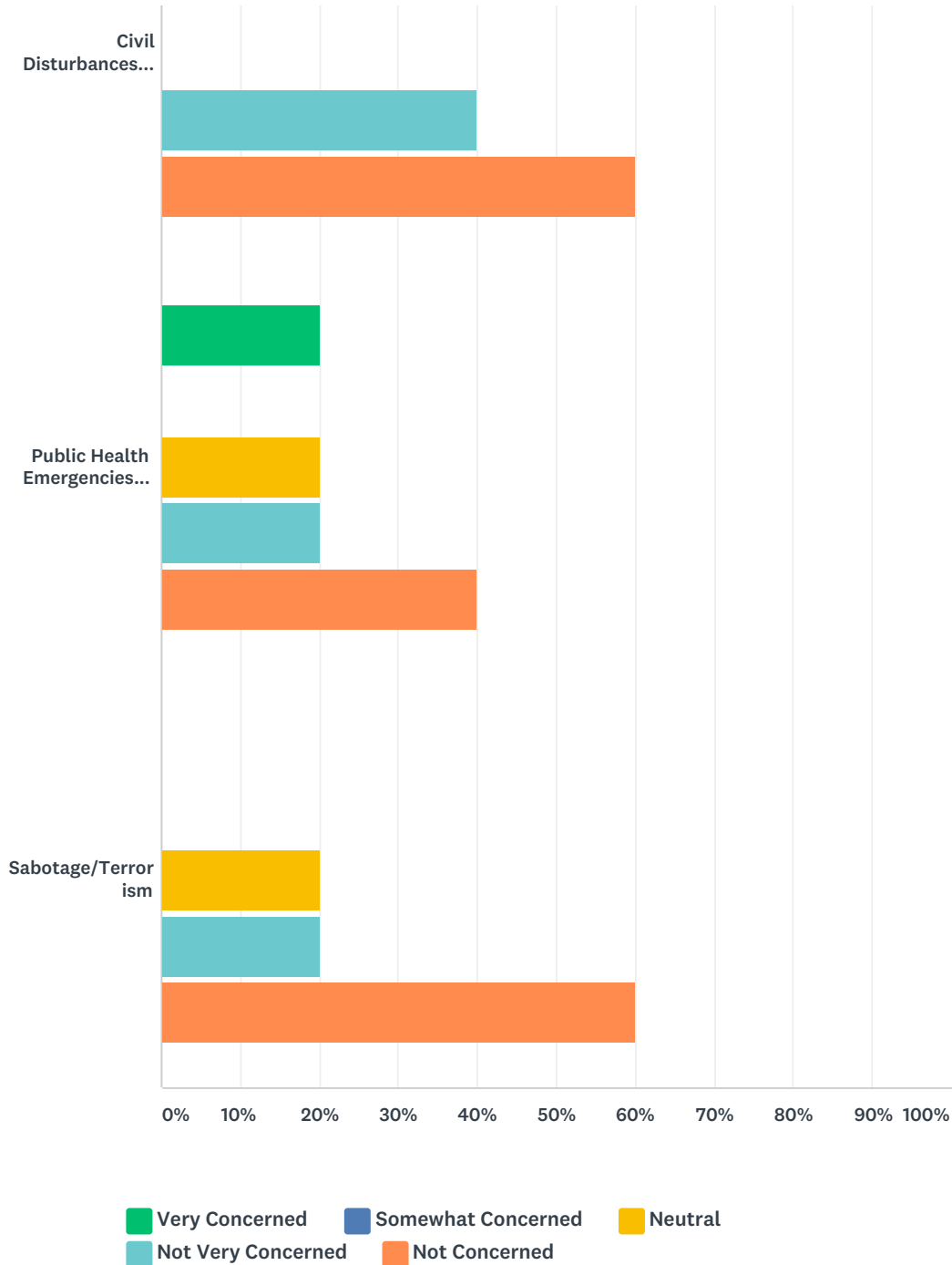












	VERY CONCERNED	SOMEWHAT CONCERNED	NEUTRAL	NOT VERY CONCERNED	NOT CONCERNED	TOTAL
Extreme Weather Temperatures (hot/cold)	20.00% 1	20.00% 1	0.00% 0	40.00% 2	20.00% 1	5
Fog	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 5	5
Hail	0.00% 0	20.00% 1	20.00% 1	20.00% 1	40.00% 2	5
Ice and Sleet Storms	40.00% 2	20.00% 1	20.00% 1	0.00% 0	20.00% 1	5
Lightning	0.00% 0	20.00% 1	0.00% 0	20.00% 1	60.00% 3	5

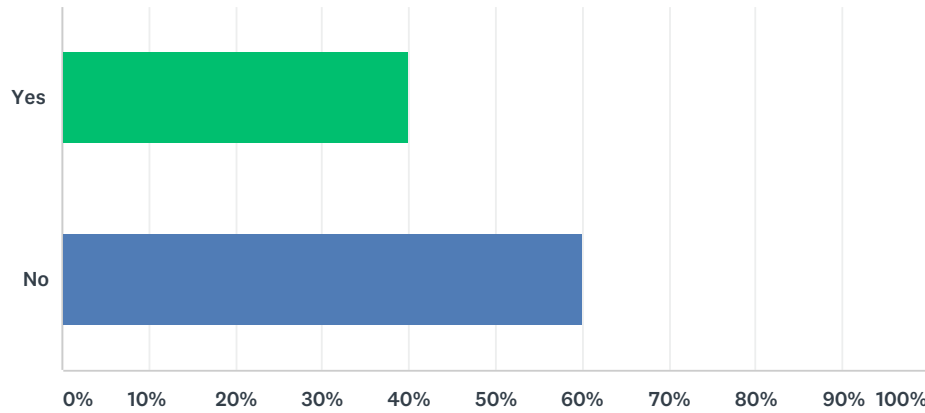
Iron County Hazard Mitigation Public Input Survey

SurveyMonkey

Severe Winds (Windstorms)	20.00% 1	40.00% 2	20.00% 1	0.00% 0	20.00% 1	5
Snowstorms and Blizzards	20.00% 1	20.00% 1	20.00% 1	20.00% 1	20.00% 1	5
Tornadoes	0.00% 0	0.00% 0	0.00% 0	60.00% 3	40.00% 2	5
Earthquakes	0.00% 0	0.00% 0	0.00% 0	20.00% 1	80.00% 4	5
Landslide/Mudslide	0.00% 0	20.00% 1	0.00% 0	0.00% 0	80.00% 4	5
Subsidence (Sink holes or ground collapse, mine-related or not)	20.00% 1	0.00% 0	0.00% 0	0.00% 0	80.00% 4	5
Dam Failure	20.00% 1	0.00% 0	0.00% 0	0.00% 0	80.00% 4	5
Drought	20.00% 1	0.00% 0	0.00% 0	20.00% 1	60.00% 3	5
Flooding due to precipitation event or snowmelt	20.00% 1	20.00% 1	0.00% 0	20.00% 1	40.00% 2	5
Shoreline Flooding and Erosion	0.00% 0	0.00% 0	20.00% 1	40.00% 2	40.00% 2	5
Invasive Species (Emerald Ash Borer/Asian Carp)	0.00% 0	60.00% 3	40.00% 2	0.00% 0	0.00% 0	5
Wildfires	20.00% 1	20.00% 1	0.00% 0	20.00% 1	40.00% 2	5
Scrap Tire Fires	20.00% 1	20.00% 1	0.00% 0	0.00% 0	60.00% 3	5
Structural Fires	20.00% 1	20.00% 1	0.00% 0	0.00% 0	60.00% 3	5
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	20.00% 1	20.00% 1	0.00% 0	0.00% 0	60.00% 3	5
Hazardous Materials, Transportation-related (e.g. waste spill from traffic accident)	20.00% 1	0.00% 0	0.00% 0	0.00% 0	80.00% 4	5
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	20.00% 1	40.00% 2	0.00% 0	20.00% 1	20.00% 1	5
Infrastructure Failure & resulting hazards (e.g. power outage)	20.00% 1	40.00% 2	20.00% 1	0.00% 0	20.00% 1	5
Transportation Accidents (car crashes)	0.00% 0	0.00% 0	20.00% 1	20.00% 1	60.00% 3	5
Civil Disturbances (rioting)	0.00% 0	0.00% 0	0.00% 0	40.00% 2	60.00% 3	5
Public Health Emergencies (disease epidemic)	20.00% 1	0.00% 0	20.00% 1	20.00% 1	40.00% 2	5
Sabotage/Terrorism	0.00% 0	0.00% 0	20.00% 1	20.00% 1	60.00% 3	5

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

Answered: 5 Skipped: 0



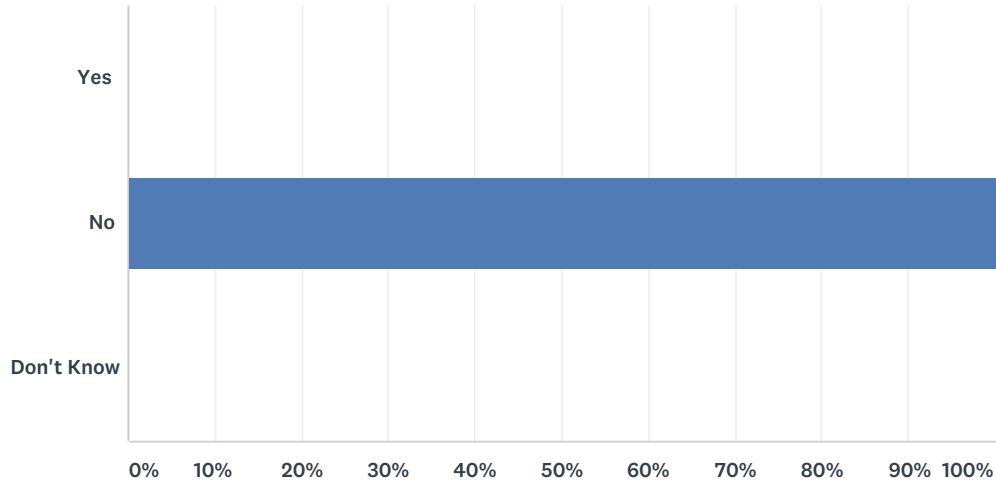
ANSWER CHOICES	RESPONSES	
Yes	40.00%	2
No	60.00%	3
TOTAL		5

## Q6 IF YES, please explain:

Answered: 3 Skipped: 2

### Q7 Is your home located on a floodplain?

Answered: 5 Skipped: 0

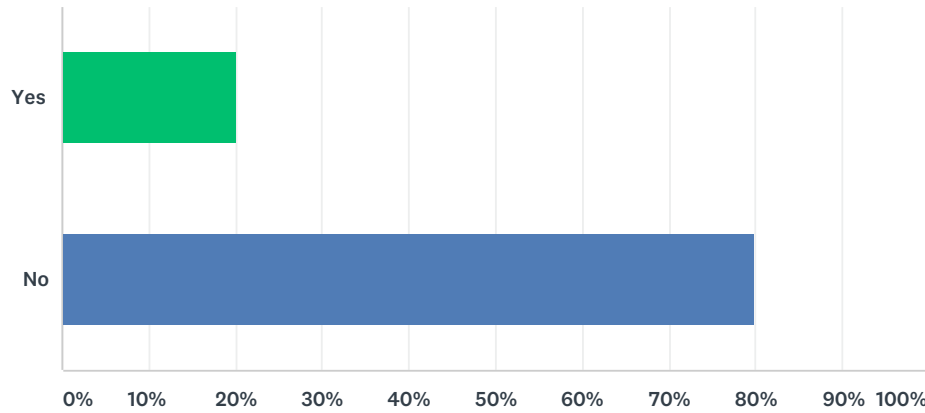


ANSWER CHOICES	RESPONSES	
Yes	0.00%	0
No	100.00%	5
Don't Know	0.00%	0
<b>TOTAL</b>		<b>5</b>



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

Answered: 5 Skipped: 0



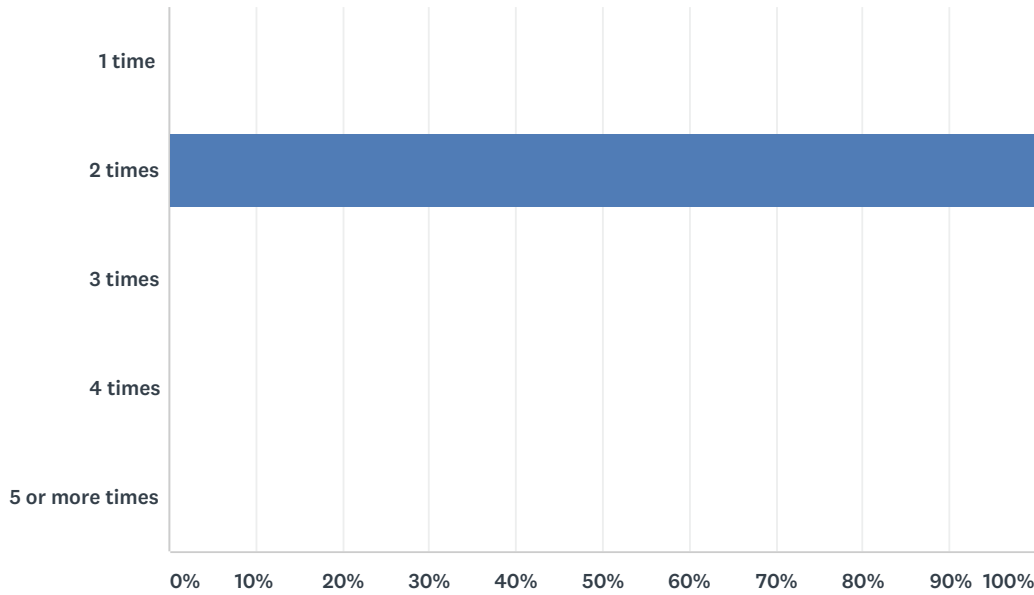
ANSWER CHOICES	RESPONSES	
Yes	20.00%	1
No	80.00%	4
TOTAL		5

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

Answered: 1 Skipped: 4

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

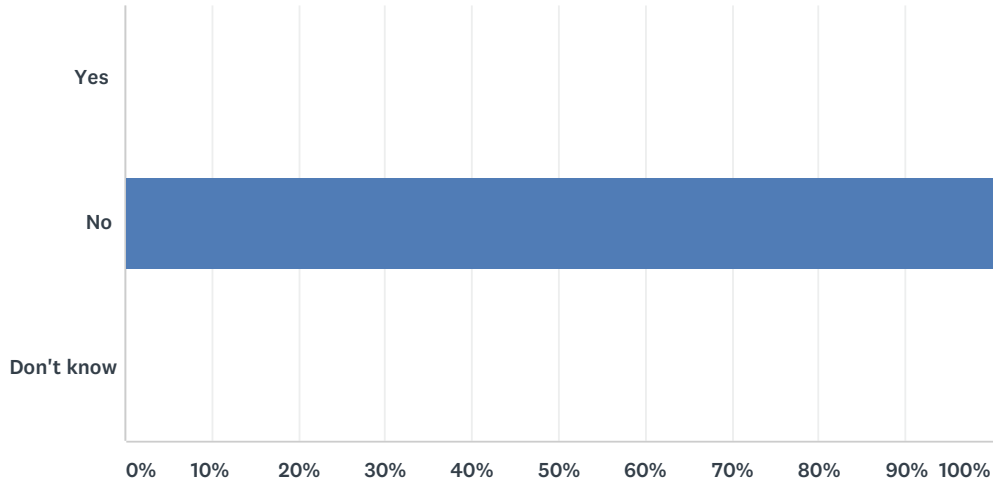
Answered: 1 Skipped: 4



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

### Q11 Do you have flood insurance?

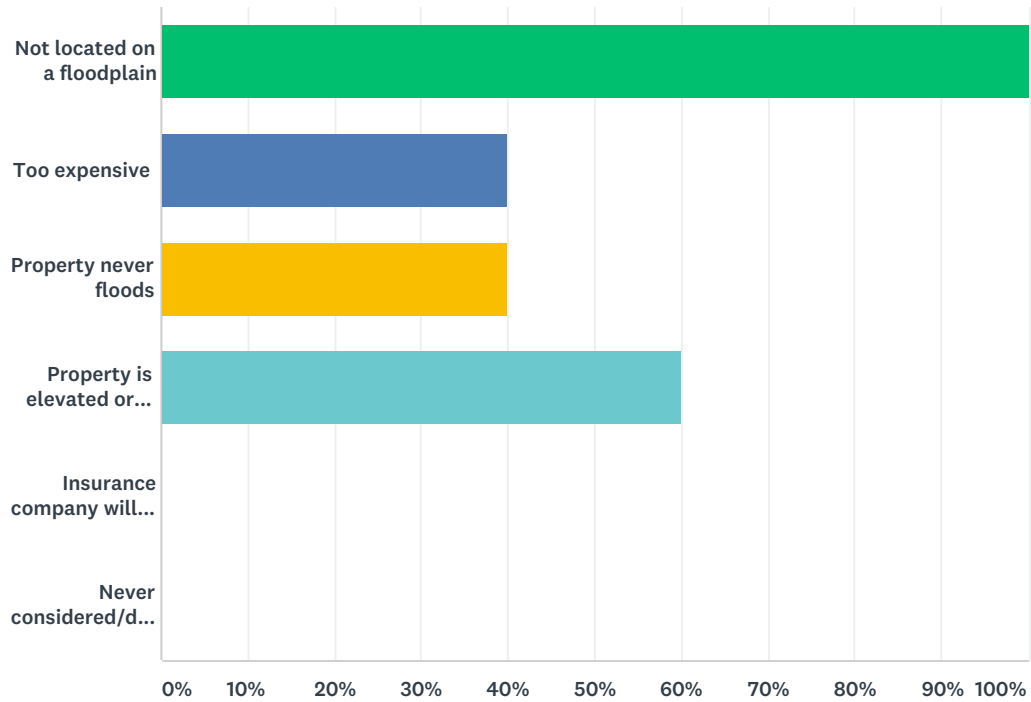
Answered: 4 Skipped: 1



ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	100.00% 4
Don't know	0.00% 0
<b>TOTAL</b>	<b>4</b>

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

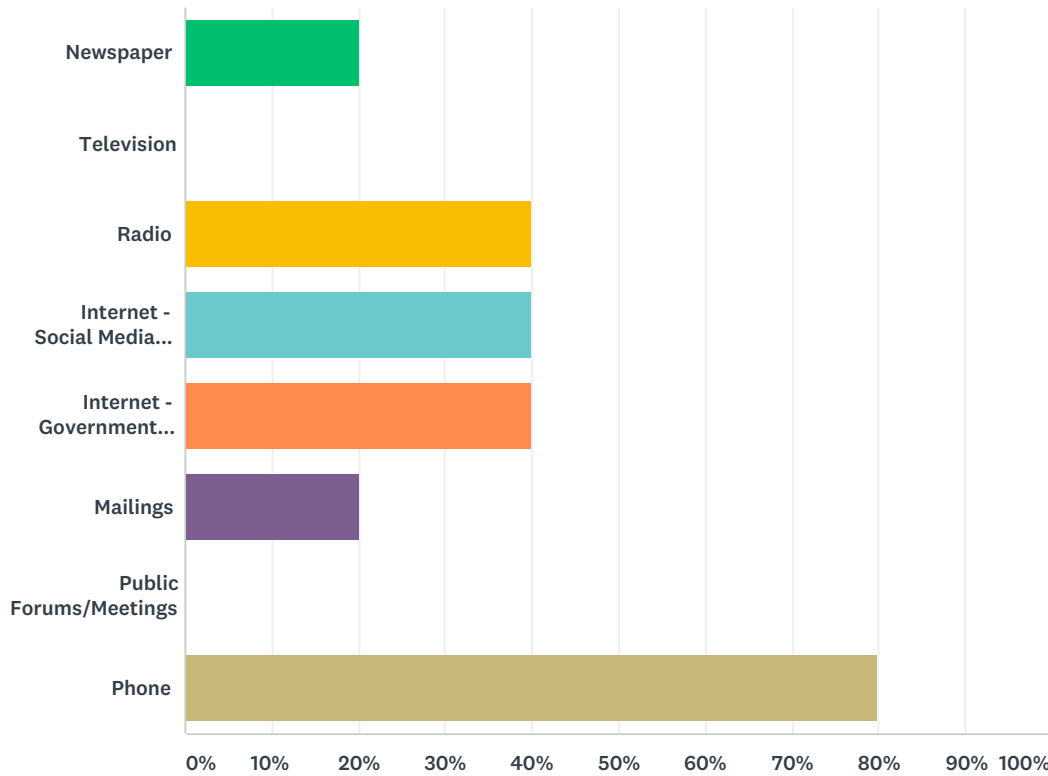
Answered: 5 Skipped: 0



ANSWER CHOICES	RESPONSES	
Not located on a floodplain	100.00%	5
Too expensive	40.00%	2
Property never floods	40.00%	2
Property is elevated or otherwise protected	60.00%	3
Insurance company will not provide	0.00%	0
Never considered/didn't know about it	0.00%	0
Total Respondents: 5		

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

Answered: 5 Skipped: 0



ANSWER CHOICES	RESPONSES	
Newspaper	20.00%	1
Television	0.00%	0
Radio	40.00%	2
Internet - Social Media (Facebook or Twitter)	40.00%	2
Internet - Government Website Postings	40.00%	2
Mailings	20.00%	1
Public Forums/Meetings	0.00%	0
Phone	80.00%	4
Total Respondents: 5		

**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: 1



## Q15 Additional comments:

Answered: 1 Skipped: 4

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

Answered: 2 Skipped: 3

#	RESPONSES	DATE
1	Flooding	6/19/2019 12:50 PM
2	Extreme snow load in drifts on roof, causing cracks in interior walls.	6/18/2019 11:37 AM

## Q6 IF YES, please explain:

Answered: 3 Skipped: 2

#	RESPONSES	DATE
1	Worked with companies, law enforcement regarding safety matters related to Enbridge and TransCanada pipelines.	6/24/2019 11:09 PM
2	Fixed Issues with my home, Work for the conservation district and work daily to prevent erosion, invasive species and help people be prepared. I also have two weeks worth of food water and medicine and a family disaster plan as well.	6/19/2019 12:50 PM
3	Removed a dead spruce which towered over my house. Vow to get roof snow removed earlier.	6/18/2019 11:37 AM

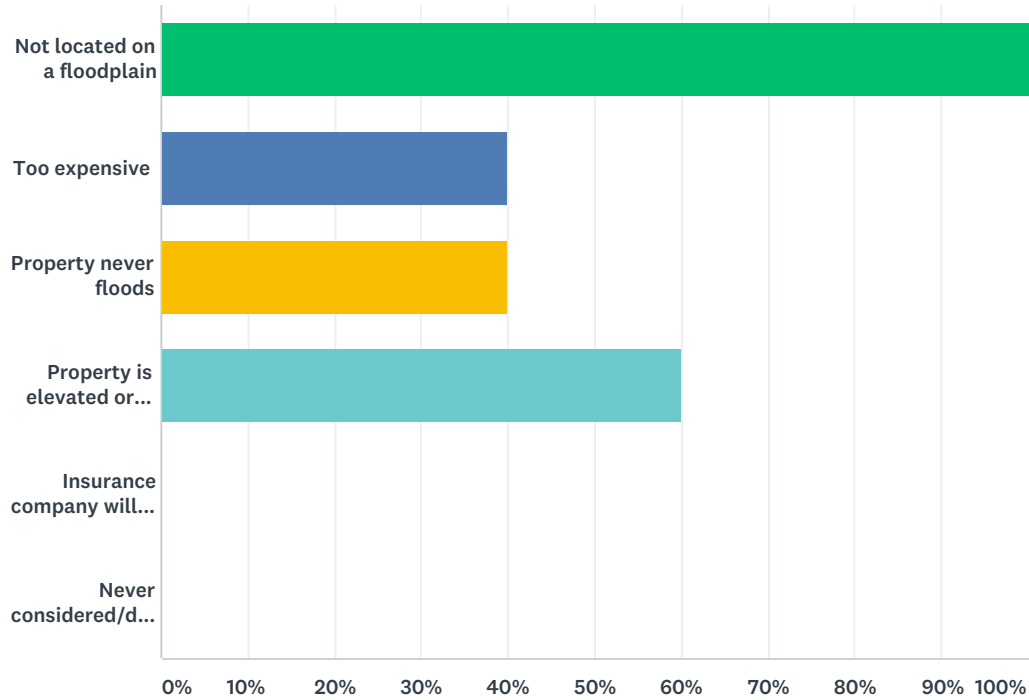
### Q9 IF YES, what are the closest major cross streets to this location?

Answered: 1 Skipped: 4

#	RESPONSES	DATE
1	Maple and Erie	6/19/2019 12:50 PM

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

Answered: 5 Skipped: 0



ANSWER CHOICES	RESPONSES	
Not located on a floodplain	100.00%	5
Too expensive	40.00%	2
Property never floods	40.00%	2
Property is elevated or otherwise protected	60.00%	3
Insurance company will not provide	0.00%	0
Never considered/didn't know about it	0.00%	0
Total Respondents: 5		

#	OTHER REASON (PLEASE SPECIFY)	DATE
1	Only floods basement and I can fix that with a pump.	6/19/2019 12:50 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: 1

#	RESPONSES	DATE
1	The list of "hazards" you listed at the beginning of this survey are not hazards at all but rather weather related events that are quite normal given the area we live in. We have lived with these conditions for decades without significant impacts or need for government intervention. The only real potential problems for this area are failure of the major power grid or a gas or oil pipeline event that would interrupt major transportation routes. As I said, claiming that weather events are hazards is not realistic in this area.	6/24/2019 11:09 PM
2	Hold seminars or meetings about what to do in the City if we lose power for a period of time. Where to go if there is an emergency such as no power during winter or extreme temperatures overall.	6/20/2019 3:39 PM
3	Address building and infrastructure issues that are existing and will be made worse by severe weather. Stockpile food and first aid supplies in case of disaster needs. Emulate the Civil Defense efforts from the 60's but in an all-encompassing fashion.	6/19/2019 12:50 PM
4	City owned power dam should have backup generators to avoid long outages during winter.	6/18/2019 11:37 AM

## 2019 County Hazard Mitigation Local Government/Institutions Survey

The Western Upper Peninsula Planning and Development Region is updating Hazard Mitigation Plans for all six (6) counties in the Western Upper Peninsula. Update and adoption of the plan is **required** by the Federal Emergency Management Agency (FEMA) as a pre-condition for organization and/or local government to apply for federal mitigation grant funding.

The goal of the Hazard Mitigation Plan is to recommend strategies on a pre-disaster basis for the purpose of reducing adverse effects caused by natural, man-made, and technological disasters, including flooding, dam failures, wildfires, severe weather events, public health emergencies, terrorism, and hazardous materials and gas pipeline incidents.

We need your assistance in providing input into the County Hazard Mitigation Plan update through the enclosed survey. FEMA **requires** a certain level of participation of local units of government for the plan to be approved, and this survey will help to meet that requirement. Please fill out the survey as completely as possible and return it. Feel free to attach additional pages if necessary.

Contact [rpressley@wuppd.org](mailto: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
<b>WEATHER HAZARDS</b>					
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"/>
<b>GEOLOGIC HAZARDS</b>					
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"/>
<b>HYDROLOGICAL HAZARDS</b>					
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"/>
<b>ECOLOGICAL HAZARDS</b>					
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"/>
<b>INDUSTIRAL HAZARDS</b>					
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
<b>INFRASTRUCTURE HAZARDS</b>					
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"/>
<b>HUMAN RELATED</b>					
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!**



## Western Upper Peninsula Planning & Development Regional Commission

400 Quincy St., 8<sup>th</sup> Floor, Hancock, MI 49930  
906-482-7205 info@wuppdr.org

News Release

Release Date: May 3, 2021

Media Contact:

Rachael Pressley, Assistant Regional Planner

906.482.7205 ext. 116

[rpressley@wuppdr.org](mailto:rpressley@wuppdr.org)

### **Iron County Hazard Mitigation Plan available for review**

The Western Upper Peninsula Planning and Development Region (WUPPDR) has recently made updates to the Iron 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 county and to become better prepared for them.

The draft of the Iron County 2020-2025 Hazard Mitigation Plan Update will be available through June 3, 2021 for public review and comment prior to plan adoption by all local governments at regular meetings. A formal public hearing will also be held at a County Board meeting to be announced.

Copies of the plan draft will be available at WUPPDR (400 Quincy St.) in Hancock and at the Iron County Clerk's Office (2 S 6<sup>th</sup> St.) in Crystal Falls, and; online at [www.wuppdr.org](http://www.wuppdr.org).

Written comments will be considered by WUPPDR in cooperation with Iron County and local governments, as appropriate. Comments must be received by June 3, 2021 and may be mailed to WUPPDR, 400 Quincy St., 8<sup>th</sup> Floor, Hancock, MI 49930 or emailed to Rachael Pressley, Assistant Regional Planner, at [rpressley@wuppdr.org](mailto:rpressley@wuppdr.org).

###

## 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  
Map Review Exercise  
Government/Institution Survey

**Action:** Submit past/present/future mitigation activities to Project Coordinator  
([rpressley@wuppdr.org](mailto: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](mailto:jwuorenmaa@wuppdr.org)

Project Coordinator – Rachael Pressley, [rpressley@wuppdr.org](mailto:rpressley@wuppdr.org)

Planning Support – Angela Yu, [ayu@wuppdr.org](mailto:ayu@wuppdr.org)

GIS Support – Alanna Mingay, [amingay@wuppdr.org](mailto:amingay@wuppdr.org)

Hazard Mitigation Intern – Celine Carus, [ccarus@wuppdr.org](mailto:ccarus@wuppdr.org)





## 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@wuppdri.org](mailto:rpressley@wuppdri.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.

<b>Hazard</b>	<b>Overall Concern</b>	<b>Comments</b>
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](mailto:rpressley@wuppdr.org))

WUPPDR Hazard Mitigation Team:

Executive Director – Jerald Wuorenmaa, [jwuorenmaa@wuppdr.org](mailto:jwuorenmaa@wuppdr.org)

Project Coordinator – Rachael Pressley, [rpressley@wuppdr.org](mailto:rpressley@wuppdr.org)

Planning Support – Angela Yu, [ayu@wuppdr.org](mailto:ayu@wuppdr.org)

GIS Support – Alanna Mingay, [amingay@wuppdr.org](mailto:amingay@wuppdr.org)

Hazard Mitigation Intern – Celine Carus



## Past Mitigation Activities: Iron County

### 2005 Mitigation Program Action Items

2005 Item	Status
NOAA Radio	Completed
Improved Emergency Response	Ongoing
Update Stormwater Management Plans	Not Completed
Review Plans and Development Regulations	Ongoing
Mine Shaft Safety	Ongoing
Public Information/Education Program	Ongoing
Retrofit Underground Pipes	Ongoing
Insurance	Ongoing
Review Plan and Update Regularly	Ongoing

### 2013 Mitigation Program Action Items

2013 Item	Status
Acquisition of Blighted Buildings/Properties	
Obtain Needed Firefighting Equipment	
Wellhead Protection	
Pipeline Safety/Training Program	Ongoing Annually
Mine Shaft Safety	Ongoing
Improved/Continuing Emergency Response	Ongoing
Update Storm Water Management Plans	
Review Plans and Development Regulations	Ongoing
Public Information/Education Program	Ongoing
Retrofit Underground Pipes	Ongoing
Insurance	Ongoing
Adopt Hazard Mitigation Plan & Update Regularly	Ongoing

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 Iron County. All activities should be consistent with Mitigation Goals.



## **Example Action Item from the 2013 Update:**

### **Action Item: Obtain Needed Firefighting Equipment**

Jurisdictions throughout the county need to attain and maintain physical capacity for fighting both structural fires and wildfires. Currently, Mastodon Township is in need of a tanker truck to fight wildfires.

**Responsible Agency:** Mastodon Township

**Deadline:** 2015

**Cost:** \$250,000

**Potential Funding Sources:** USDA Rural Development and others unknown

**Benefits:** With improved local capacity for fighting wildfires, local jurisdictions will not have to rely on distant responders. This will decrease fire size and speed of growth and will prevent broad, potentially catastrophic, impacts.

## Appendix F: State Document Review

## Appendix G: Plan Adoption