

Missaukee County, Michigan Natural Hazard Mitigation Plan

2023

FEMA LETTER OF APPROVAL

ACKNOWLEDGEMENTS

The Missaukee County Natural Hazard Mitigation Plan is prepared for Missaukee County, Michigan and all the jurisdictions within it. This plan is the culmination of an interdisciplinary and interagency planning effort that required the participation, technical assistance and expertise of individuals within the governmental agencies and organizations listed below. Each of the entities listed are also invited to be continuing participants in the future regular review and updates of the plan.

Participating Entity	Representative	Title
Missaukee County Board of Commissioners	Pam Niebrzydowski	District 3
	Dean Smallegan	District 5, County Planning Commissioner
Missaukee County Planning Commission	Sherry Blaszak	Planning Commissioner, Conservation District Manager
	Stacy Karll-Linder	Planning Commissioner
	Robert Sturdevant	Planning Commissioner (Former)
	Bruce Miller	Planning Commissioner
	Mimi Zwolak	Planning Commissioner
Missaukee County	Liz Vogel	County Administrator
	Linda Hartshorne-Shafer	Planning and Emergency Management Director
	James VanHaitsma	Equalization Director
	Wilbur "Wil" Yancer	Sheriff
	Brad Siddall	Road Commission
	Grace Freese	Parks Manager
	Brian Kanouse	Electrical Inspector
	David Denhouten	County Prosecutor, Prosecutor's Office
	Jessica Nielsen	Clerk
	Julie Stahl	911 Coordinator
City of Lake City	Craig Ardis	Mayor, County Planning Commissioner
	Bob Pickford	City Council Member
	Fred West	Lake City Area Fire Department #600
	Austin Booms	Lake Missaukee Area Fire Dept. #200
City of McBain	Joey Roberts	Mayor
	Jay DeBoer	McBain Fire Department
	Craig Fisher	McBain Fire Department Chief, County Planning Commissioner
Aetna Township	Linda Brown	Clerk
	Daymion Martinez	Clam Union Fire Department
	Jon Ouwinga	Clam Union Fire Department
	Carl Hunt	Merritt Area Fire Department
Bloomfield Township	Tim Bridson	Supervisor
	Cherrie Park	Clerk
	Pat Powell	Treasurer
	Michael Gillette	Trustee
	Justin Stauffer	Trustee
Butterfield Township	Carl Hunt	Merritt Area Fire #100
	Edward Nettle	Merritt Area Fire #100
Caldwell Township	Jim Brown	Lake Missaukee Fire Dept. (Former)
	David LaRoche	Lake Missaukee Fire Dept.
Clam Union Township	Steve Ebels	Clerk
	Daymion Martinez	Clam Union Fire
	Jon Ouwinga	Clam Union Fire
Enterprise Township	Carl Hunt	Merritt Area Fire #100
	Edward Nettle	Merritt Area Fire #100
Forest Township	Margie Phillips	Clerk
	Jim Brown	Lake Missaukee Fire Dept. (Former)
	David LaRoche	Lake Missaukee Fire Dept.
Holland Township	Carl Hunt	Merritt Area Fire Department
	Donna Bode	Clerk
Lake Township	Fred West	Lake City Area Fire Department #600
Norwich Township	Michael Doan	Norwich Township Fire Department
	Jordan Booms	Norwich Township Fire Department
Participating Entity	Representative	Title

Pioneer Township	Jim Brown	Lake Missaukee Fire Dept. (Former)
	David LaRoche	Lake Missaukee Fire Dept.
Reeder Township	Dan Gallop	Supervisor
	Daymion Martinez	Clam Union Fire
	Jon Ouwinga	Clam Union Fire
	Jim Brown	Lake Missaukee Fire Dept. (Former)
	David LaRoche	Lake Missaukee Fire Dept.
Richland Township	Craig Fisher	Fire Chief, County Planning Commissioner
	Jay DeBoer	McBain Fire Dept.
Riverside Township	Craig Fisher	Fire Chief, County Planning Commissioner
	Jay DeBoer	McBain Fire Dept.
West Branch Township	Carl Hunt	Merritt Area Fire
	Michael Doan	Norwich Fire
Missaukee Conservation District / North Country Cooperative Invasive Species Management Area (NCCISMA)	Sherry Blaszak	District Manager, County Planning Commissioner
	Vicki Sawicki	Invasive Species Coordinator / Program Coordinator
Missaukee Conservation District / Missaukee County Farm Bureau	Jodi DeHate	MAEAP Technician/President
Missaukee EMS	Aaron Sogge	Director
Missaukee Commission on Aging	Heather Harris-Bryant	Executive Director
Missaukee District Library	Laura Marion	Director
Missaukee Intermediate School District		Board Trustee
District Health Department #10	Brad Haner	Emergency Preparedness Coordinator
Michigan State Police - EMHSD	Mike Sobocinski	Hazard Mitigation Planning Analyst
Michigan Department of Natural Resources	Amy DeRuiter	Houghton Lake Field Office, Fire Division
	Mike Carroll	Manton Field Office, Fire Division

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I. INTRODUCTION

Hazard mitigation is defined as any action taken before, during, or after a disaster or emergency to permanently eliminate or reduce the long-term risk to human life and property from natural, technological and human-related hazards. Mitigation is an essential element of emergency management, along with preparedness, response and recovery.

Mitigation allows repairs and reconstruction to be completed after an incident occurs in such a way that does not just restore the damaged property as quickly as possible to pre-disaster conditions. It also ensures that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage. When successful, hazard mitigation will lessen the impact of a disaster on people, property, the environment and economy, and continuity of services through the coordination of available resources, programs, initiatives, and authorities.

A *hazard*, in the context of this plan, is an event or physical condition that has potential to cause fatalities; injuries; damage to personal property, infrastructure, or the environment; agricultural product loss; or interruption of business or civic life. The Missaukee County Natural Hazard Mitigation Plan examines impacts related to *natural* hazards such as extreme heat, drought, wildfires, flooding, dam failure, thunderstorm with wind, high winds, hail, extreme winter weather, and invasive species. An exception is that it will also consider the human-related hazard of public illness outbreak. The following natural hazards were not included in the analysis for this Hazard Mitigation Plan: dense fog, Great Lakes shoreline hazards, earthquakes, subsidence, space weather, and meteorites & other impacting objects. According to information presented about these hazards in Michigan State Police's 2019 *Michigan Hazard Analysis*, there is zero to minimal risk of these events occurring in Missaukee County.

The main objective of the Missaukee County Natural Hazard Mitigation Plan is to permanently eliminate or reduce long-term risks to people and property from natural hazards so that county assets such as transportation, infrastructure, commerce, and tourism can be sustained and strengthened. This can be accomplished through collaborative efforts/activities amongst agencies within the county to protect the health, safety, and economic interests of the residents and businesses through planning, awareness, and implementation.

Through this Plan, a broad perspective was taken in examining multiple natural hazard mitigation activities and opportunities in Missaukee County. Each natural hazard was analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigation.

Since the 2015 Plan's adoption period, the county and municipalities have achieved the following key endeavors to address their previously identified mitigation strategies. Refer to Appendix C for the details of mitigation strategies included in the 2015 plan and their current status.

- Progress working with utility companies to bury power lines to reduce the likelihood of power outages
- Continued efforts by the County Building Department to collaborate with utility companies, inspectors, homeowners, and contractors to improve new development
- The City of Lake City and surrounding townships are actively working with FEMA and EGLE study the improvements to the Lake Missaukee Water Control Structure which poses a flooding threat to the community
- The Plan has been integrated into other planning mechanisms:
 - The 2023-2027 Missaukee County Recreation Plan
 - The 2020-2024 City of McBain Master Plan

Section VI of this plan provides a list of hazard mitigation strategies for each natural hazard identified. Strategies were developed based on discussions with local officials and consideration of possible alternatives for mitigation. (Refer to Appendix E for a list of Alternative Strategies that were considered.) Strategies are grouped according to their purpose: Awareness & Preparation, Shelters, Building & Development, Utilities & Technology, and Environment & Natural Resources. The strategies table also includes: a description of each strategy; what natural hazards it addresses; where the strategy applies; who is responsible for implementing the strategy; how the strategy will be implemented (what resources are available to apply the strategy); the estimated timeframe for completion; the level of priority; and what type of strategy it is. Most strategies are intended to be action items completed during the 5-year timeframe in which the plan is active. Some long-term strategies extend beyond the 5-year timeframe due to feasibility or level of difficulty.

Recognizing the importance of reducing community vulnerability to natural hazards, Missaukee County is actively addressing the issue through the development and implementation of this plan. This process will help ensure that Missaukee County remains a vibrant, safe, enjoyable place in which to live, raise a family, continue to conduct business,

and maintain a tourist base. The Plan serves as the foundation for natural hazard mitigation activities and actions within Missaukee County, and will be a resource for building coordination and cooperation within the community for local control of future mitigation and community preparedness around the following:

Natural Hazards Mitigation Planning Goals

Goal 1: Increase local awareness and participation in natural hazard mitigation strategies.

Goal 2: Integrate natural hazard mitigation considerations into the community's comprehensive planning process.

Goal 3: Utilize available resources and apply for additional funding for natural hazards mitigation projects.

Goal 4: Develop and complete natural hazards mitigation projects in a timely manner.

II. PLANNING PROCESS

The Stafford Act, as amended by the Disaster Mitigation Act of 2000, shifted the Federal Emergency Management Agency's (FEMA) scope of work to promoting and supporting prevention, or what is referred to as hazard mitigation planning. FEMA requires government entities to have a natural hazards mitigation plan in place and updated on a 5-year cycle as a condition for applying for grant funding related to natural hazard mitigation and remediation. Missaukee County has a history of mitigation planning and adopted past Natural Hazard Mitigation Plans in 2007 and 2015. The adoption of the 2023 plan will reaffirm the eligibility of the county, as well as those local municipalities who participated in the planning process and adopted the county's plan, for federal pre-disaster mitigation funding.

The update of the County's plan was led by the Natural Hazards Task Force, composed of the Missaukee County's Emergency Management Department's Local Planning Team (LPT), as well as the County Planning Commission. LPT members consist of first responders and local, regional, and state public entities that ensure the readiness of County entities by recommending equipment purchases, training and exercises, and public education on preparedness issues. Meetings were held in-person, at the Missaukee County Annex Building in Lake City, and were open to the public. The schedule of meetings was posted on the Missaukee County Hazard Mitigation Plan project page of Networks Northwest's website.

Representatives of all of the following types of stakeholders were invited to participate in the planning process by various methods: via email invitation, phone calls, meeting attendance/presentation, or mailed letters: local and regional agencies involved in hazard mitigation activities; agencies that have the authority to regulate development; neighboring communities; representatives of businesses, academia, and other private organizations; and representatives of nonprofit organizations, including community-based organizations that work directly with and/or provide support to underserved communities and socially vulnerable populations (such as the Missaukee County Commission on Aging). Please refer to: the Acknowledgements section on pages 3 and 4 for a list of plan participants; Appendix F for a detailed table explaining how and when local government and community organization representatives participated in the planning process; and Appendix G for meeting documentation. All jurisdictions in Missaukee County remain as continuing participants in the 2023 Hazard Mitigation Plan (since the 2015 plan was completed).

The following is an outline of events for the development of the 2023 Missaukee County Natural Hazard Mitigation Plan:

- An online public survey was made available from October 4, 2021 to January 18, 2022 to obtain input on community experience, concerns and priorities regarding natural hazard mitigation in Missaukee County. The survey received 27 responses from representatives of the organizations listed in Table 1. A copy of the survey results are included in Appendix B.

Table 1: Community Survey Participation

Aetna Township

City of McBain

Clam Union Fire Department

Clam Union Township

District Health Dept. #10

Holland Township

McBain Fire Department

Merritt Area Fire Department

Missaukee Conservation District

Missaukee County Board of Commissioners

Missaukee County Clerk

Missaukee County Commission on Aging

Missaukee County Equalization

Missaukee County Farm Bureau

Missaukee County Planning Commission

Missaukee County Sheriff's Office

Missaukee EMS

School Board

- Meetings where the Natural Hazard Mitigation Plan update work was discussed:
 - October 20, 2021 (LPT)
 - January 19, 2022 (LPT)
 - May 25, 2022 (County Planning Commission)
 - September 28, 2022 (County Planning Commission)
 - November 16, 2022 (County Planning Commission)
 - January 18, 2023 (LPT)

Additionally, county and regional agencies that share borders with Missaukee County were invited to participate in the planning meetings and sent a copy of the plan in its draft form and again the approved plan. Those agency staff members are:

- Mike Thompson, Kalkaska County Emergency Management Coordinator
- Mark Watkins, Osceola County Emergency Management Director
- Vanessa Varner, Roscommon County Emergency Management Director
- Randy Boike, Wexford County Emergency Management Coordinator
- Jerry Becker, Clare County Emergency Management Coordinator
- Robert Carson, Regional Director of Community Development, Networks Northwest

During development of the plan, all Missaukee County municipalities and the public were provided the opportunity to participate in the online community survey, community meetings, as well as comment on plan drafts and other related materials. The draft plan materials and meeting times/locations were published on the project page of Networks Northwest's website. All meetings where the plan was discussed were open to the public and other jurisdiction/municipality participation as well.

Other public input received by the Emergency Management Coordinator or Networks Northwest staff during the development of the plan took the form of phone calls, emails and conversations that occurred at various non-mitigation related meetings throughout the county. Specifically, information provided via conversations with Brian Kanouse, Electrical Inspector for the County Building Department, and Brad Siddal, Road Commission Manager, was utilized in the development of the plan, including the hazard mitigation strategies.

The following organizations that serve vulnerable populations (such as the elderly, disabled, or low-income residents) participated in the development of the plan: the Missaukee County Commission on Aging, District Health Department #10, the Wexford-Missaukee Intermediate School District Board of Education, and the Missaukee County Library. Appendix F provides a complete list of how organizations participated in the planning process.

Additionally, the public was notified through a direct mailing (to local government officials) and a published notice in the *Missaukee Sentinel* on March 3, 2023 of the opportunity to provide feedback County's draft Natural Hazard Mitigation Plan at or prior to the public hearing held on March 22, 2023 as part of the Missaukee County Planning Commission meeting. During the public review period for the draft plan, written comments were received from the Forest Township Supervisor which are included in Appendix G (Meeting Documentation). While no public comments were received during the hearing, County Planning Commission staff inquired about possibly including the locations of oil and gas pipelines that are located in the county on the Critical Infrastructure Maps. In consideration of this request, Networks Northwest has included a discussion of pipelines and gas/oil storage fields as vulnerable infrastructure in Section IV of this plan.

Following the public hearing, Planning Commissioners recommended the draft plan be submitted to Michigan State Police and FEMA for their review and approval.

Below is the posting published in *The Missaukee Sentinel* on March 3, 2023 and an image of the available draft plan and notice to the public taken from the Networks Northwest website.

Figure 1: Missaukee County Notice of Draft Plan Availability

B8 The Missaukee Sentinel — Friday, March 3, 2023

The Missaukee Sentinel

Classified

CALL YOUR CLASSIFIED SP

Legals	Legals	Legals
<p>NOTICE - TOWNSHIP OF PIONEER</p> <p>The Pioneer Township Board of Review will meet at Pioneer Township Hall, 2914 West Moorestown Road, on the following dates:</p> <p>Organizational Meeting: Tuesday, March 7, 2023, 3:30 p.m. Appeal(s) Hearing: Monday March 13, 2023, 9:00 a.m. to 3:00 p.m. Appeal(s) Hearing: Tuesday, March 14, 2023, 3:00 p.m. to 9:00 p.m.</p> <p>The Board of Review will meet to hear questions, protests, and to equalize the assessment roll. By Township Board resolution, residents are able to protest by letter, provided protest letter is received prior to March 14, 2023. The tentative ratios and the estimated multipliers for each class of real property and personal property for 2023 are as fol-</p>	<p>ATTENTION CITY OF LAKE CITY RESIDENTS NOTICE OF A PUBLIC TRUTH AND TAXATION HEARING</p> <p>The requisite Public Hearing has been scheduled for Monday, March 13, 2023, at 6:00 P.M. at the City of Lake City Municipal Building, 115 W. John Street, to discuss adoption of the FY Budget. Of note, a copy of the budget will be available at the Special Council Meeting, and further a copy will be available for public inspection in the Clerk's Office at 115 W. John Street.</p> <p>THE PROPERTY TAX MILLAGE RATE PROPOSED TO BE LEVIED TO SUPPORT THE PROPOSED BUDGET WILL BE A SUBJECT OF THIS HEARING.</p>	<p>Notice of availability of Draft Hazard Mitigation Plan and Public Meeting for Input on the Draft Hazard Mitigation Plan.</p> <p>Missaukee County is in the process of updating its Hazard Mitigation Plan in accordance with the Disaster Mitigation Plan of 2000. There will be a public meeting following the public review period on March 22, 2023. The meeting will be at the Missaukee County Annex Building, 105 S. Canal Street, Lake City, MI 49651 at 5:00 PM. Public comments are requested either in person or by representative at the public meeting or at PO Box 506, Traverse City, MI 49685, or by email at jennifer.neal@networksnorthwest.org. The draft plan is available for review on Missaukee County's website and Network Northwest's website.</p>

Source: *The Missaukee Sentinel*, March 3, 2023

Figure 2: Networks Northwest Notice of Draft Plan Availability

MISSAUKEE COUNTY

Notice of Availability of Draft Hazard Mitigation Plan and Public Meeting for Input on the Draft Hazard Mitigation Plan

A public hearing for the plan will be held on March 22, 2023. The meeting will be at the Missaukee County Annex Building, 105 S. Canal Street, Lake City, MI 49651 at 5:00 PM. Upon review of the plan, and incorporation of any public input received at or prior to the public hearing, the County Planning Commission shall recommend it be sent to Michigan State Police (MSP) Homeland Security Division for review and then on to FEMA for their review and approval. Once FEMA has approved the plan, it will be brought before the County Board of Commissioners and all local government boards for adoption.

Public comments are requested either in person or by representative at the public meeting or at PO Box 506, Traverse City MI 49685, or by email at jennifer.neal@networksnorthwest.org.

2023 Missaukee County Hazard Mitigation Plan Drafts for Review

- [Plan Document](#)
- [Strategies Table](#)
- Project Maps (Appendix A)**
 - [Hazard Areas](#)
 - [Vulnerable Populations and Hazard Areas](#)
 - [Environmental Features](#)
 - [Infrastructure](#)
- Community Survey Results (Appendix B)**
 - [Survey Results](#)

Source: Networks Northwest webpage, March 6, 2023

III. COMMUNITY PROFILE

Land Use/ Land Cover

Missaukee County is located in Northwest Lower Michigan, and is bordered by Kalkaska County to the north, Crawford County to the northeast, Roscommon County to the east, Clare County to the southeast, Osceola County to the southwest, Wexford County to the west, and Grand Traverse County to the northwest. Major transportation routes through Missaukee County include M-66, a north-south corridor, traversing the west section of the County and M-55, running east and west, connects to US-127 in Roscommon County near Houghton Lake. Refer to Appendix A for a map of the county's main roads, water bodies and jurisdictions.

Missaukee County consists of 564.79 square miles of land area and is the 49th largest county in Michigan.¹ Land cover in Missaukee County is a combination of wetlands, water bodies including rivers, lakes and streams, forested lands, open agriculture areas, and urban and rural development. The predominant land cover type is "Forested," a combination of deciduous forest, evergreen forest, and mixed forest (Table 2). The second most prevalent land cover type is "Wetlands," a combination of emergent herbaceous wetlands and woody wetlands.

Table 2: Land Cover by Type

Classification	Acres	Percent
Developed (High Intensity)	120.59	0.03
Developed (Med. Intensity)	503.17	0.12
Developed (Low Intensity)	3,914.71	0.96
Developed (Open Space)	14,485.76	3.56
Agriculture	71,146.38	17.48
Forested	166,722.48	40.96
Wetlands	97,194.02	23.88
Grassland, Pasture, Shrub/Scrub	50,382.39	12.38
Barren	636.38	0.16
Open Water	5,175.46	1.27
TOTAL	407,010.74	

Source: Networks Northwest

There are approximately 22 inland lakes and 209 miles of streams covering 4,800 acres of the county. Missaukee County lies within the Upper Manistee River and Muskegon River Watersheds. In total, the Upper Manistee covers 570 square miles while the Muskegon River Watershed covers another 2,700 square miles. Nearly 70% of Missaukee County's area is part of the Muskegon River Watershed, which in turn is within the Lake Michigan Watershed. The third drainage system in the county is that of the Clam River, which is within the Muskegon River Watershed. The Upper Manistee River is the northern branch of the Manistee River, which eventually empties into Lake Michigan. The Upper Manistee River watershed originates near Alba and covers parts of Antrim, Otsego, Crawford, Kalkaska, and Missaukee Counties. The main part of the river is approximately 78 miles long and drops in elevation from 1,250 feet to about 935 feet at the planning boundary of the western edge of Missaukee County.

The main rivers of the county are the Manistee, the Muskegon, and the Clam; the Clam River is a tributary of the Muskegon River and a recognized Blue Ribbon Trout Stream. Parts of the Upper Manistee River and its tributaries are included in the Natural Rivers Act, which provides additional protections to designated rivers. Tributaries of the Upper Manistee found in Missaukee County include Silver Creek, Filer Creek, Ham Creek, Gravy Creek, Hopkins Creek, Cannon Creek and Fisher Creek. Major lakes found in the County include Lake Missaukee, Crooked Lake, and Sapphire Lake. In the summer, these waterways and bodies of water provide excellent fishing, boating, swimming, and water skiing in addition to their undeniable aesthetic appeal. Ice fishing, snowshoeing, cross-country skiing, and snowmobiling are favored winter uses of the lakes. The wetland areas of the county provide excellent waterfowl habitat, which generate hunting and wildlife viewing opportunities for residents and visitors alike. From a recreational planning standpoint, these water bodies should be managed carefully to ensure continued enjoyment of this irreplaceable resource. In addition to these unique and valuable water systems, the Dead Stream Swamp in the northeastern portion of the county is recognized by the National Park Service Department of the Interior as one of twelve National Natural

¹ US Census Bureau, https://data.census.gov/cedsci/profile/Missaukee_County,_Michigan?g=0500000US26113

Landmark sites in Michigan. Contained within the Houghton Lake State Forest and shared between Missaukee and Roscommon counties, this 12,403 acre treasure is an example of a northern white cedar swamp and is considered a climax stage in bog forest development.

Missaukee County is located within the transition zone, between the boreal forests to the north and the mixed deciduous forests to the south. This provides residents and visitors alike the unique potential to view flora and fauna found more commonly in other areas of the region, in addition to the wealth of species typical of this area. The forests of Missaukee County are generally a pine community, composed of jack pine and red pine on the sandy, drier, more sterile soils. White pine, which competes with hardwoods (to include red and white oak, sugar and red maple, and yellow and white birch, among others), is located on more nutrient-rich soils. Black ash, tamarack, and balsam fir are found in swampier areas, with hemlock growing in the drier areas of swamps. Also in the swamps, wetland vegetation patterns are found along with a multitude of shrubs. Most forested areas are second growth, resulting from intensive lumbering which took place during the late 1800's and early 1900's, and altered some of the original forest patterns.

This expanse of forested land, is one of the most prominent features of Missaukee County. Harvesting, processing, and manufacture of timber products remain viable industries in the county. In addition to private enterprise, forest lands are invaluable in terms of quality water, wildlife habitat, recreational areas, and tourist attractions.

According to the 2017 USDA Census of Agriculture, the county had 113,624 acres of land in farms, with a total of 406 farms that had an average size of 280 acres. This represents a 14 percent increase in the acreage and a 22 percent average size of farms since the 2012 USDA Census of Agriculture. There was a 6 percent decrease in the number of farms since the 2012 USDA Census of Agriculture. The total market value of agriculture products (crops and livestock, poultry, and products) is \$148,708,000. 85% of the market value of agricultural products sold in the county is from livestock, poultry, and products, with a 2017 market value of \$126,695,000. Milk from cows, cattle and calves, grains, oilseeds, dry beans, dry peas are the top three agriculture products sold. While a small portion of overall sales at 4,959,000, Missaukee County ranks 1 in the state for cultivated Christmas trees, short rotation woody crops. Overall, Missaukee County ranks 22 out of 83 counties in the State of Michigan for the sale of agricultural products.

The 2015 Missaukee County Hazard Mitigation Plan indicated that 237,900 acres, or 55.1%, of the county was composed of forested lands; compared to current data, there has been a 14% decrease in forested areas. While development in the county has remained fairly steady in the past decade, it has been noted that the type of new development is changing. Commercial development has slowed, but residential development is occurring as quickly. Housing of all types and prices is in demand, but many communities desire smaller units and multiple family units. This type of housing is especially important for the senior population and will likely be in demand for many years. The county is divided into 15 townships, the City of Lake City, and the City of McBain. Developed land cover is found predominantly in and around Caldwell Township, Lake City, Lake Township, McBain, and Richland Township.

Population

Missaukee County is the least most populated county in the ten county region of Northwest Lower Michigan (Table 3) and is the ranked 67 out of 83 counties in the state for population.² The 2019 American Community Survey (ACS) estimated the county population to be 15,028 persons. The estimated 2019 population per square mile (out of a total 564.79 square miles) is approximately 26.6 persons. A comparison of the 2010 and 2019 ACS data indicates a .4% increase in county population from 2010, when the population was an estimated 14,962 persons (Table 4). Figure 3 is a choropleth map indicating the population of the township or city within determined ranges. Darker colors indicate higher population areas.

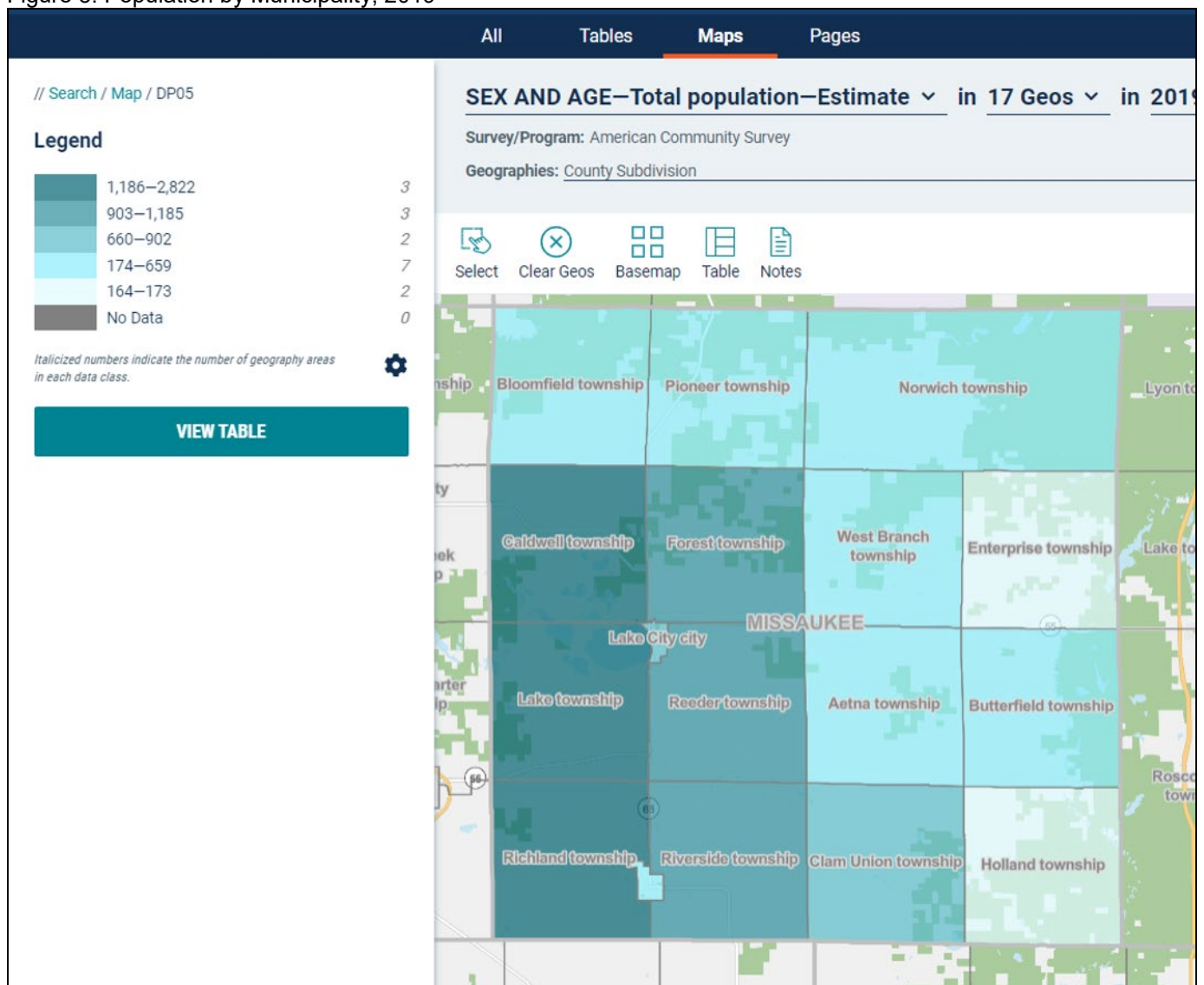
² https://www.michigan-demographics.com/counties_by_population

Table 3: 2019 Estimated Regional Population by County, State

Jurisdiction	Population
Missaukee County	15,028
Kalkaska County	17,585
Antrim County	17,615
Leelanau County	21,652
Antrim County	23,206
Manistee County	24,457
Charlevoix County	26,188
Emmet County	33,104
Wexford County	33,256
Grand Traverse County	92,181
State of Michigan	9,965,265

Source: US Census, 2019 ACS 5-Year Estimates

Figure 3: Population by Municipality, 2019



Source: US Census, 2019 5-Year ACS Estimates

Lake Township remains the most populated municipality in Missaukee County with 2,822 people. Lake City is located west of Lake City, in southwest Missaukee County on the Wexford County border. Municipalities in the eastern portion of the county are the least population with 164 people and 173 people in Enterprise Township and Holland Township, respectively. Missaukee County communities experienced varying degree of population change from 2010 to 2019 (Table 4). The numeric and percent change provide a snapshot of the population growth and decline in the county, but should be considered loosely as small numbers are more greatly impacted by the standard margin of error in estimate data.

Table 4: Population Change by Municipality, 2010 & 2019

Municipality	2010 Estimated Population	2019 Estimated Population	Numeric Change	Percent Change	Jurisdiction Status
Missaukee County	14,962	15,028	66	0.4%	All jurisdictions are continuing participants in the 2023 hazard mitigation plan since the previous 2015 plan.
Aetna Township	432	495	63	14.6%	
Bloomfield Township	338	578	240	71.0%	
Butterfield Township	677	449	-228	-33.7%	
Caldwell Township	1,665	1,439	-226	-13.6%	
Clam Union Township	972	902	-70	-7.2%	
Enterprise Township	224	164	-60	-26.8%	
Forest Township	1,100	1,124	24	2.2%	
Holland Township	157	173	16	10.2%	
City of Lake City	851	771	-80	-9.4%	
Lake Township	2,762	2,822	60	2.2%	
City of McBain	697	659	-38	-5.5%	
Norwich Township	583	621	38	6.5%	
Pioneer Township	375	516	141	37.6%	
Reeder Township	1,124	1,120	-4	-0.4%	
Richland Township	1,462	1,540	78	5.3%	
Riverside Township	1,195	1,185	-10	-0.8%	
West Branch Township	348	470	122	35.1%	

Source: US Census, 2010 and 2019 5-Year ACS Estimates.

Like many northwest Michigan communities, Missaukee County experiences an influx of seasonal residents and tourists during the summer months. However, the decennial Census and the American Community Survey only consistently and comprehensively track the permanent population. The 2022 *Seasonal Population Study for Northwest Lower Michigan*, analyzed the 2020 seasonal population for ten counties in northwest Michigan. The study collected data for permanent and part-time residents and overnight visitors in accommodations and short-term rentals by County. Northwest Lower Michigan's permanent base population is 310,802 and expands to its largest seasonal population of 676,052 in July, 118% increase. Missaukee County increases by as much as 99% in July (15,052 to 29,894) (Table 5). On average, the population grows by 52% or 7,877 people throughout the year. All ten counties in the Networks Northwest service area were included in the study: Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Kalkaska, Leelanau, Manistee, Missaukee, and Wexford.

Table 5: Missaukee County Seasonal Population by Month

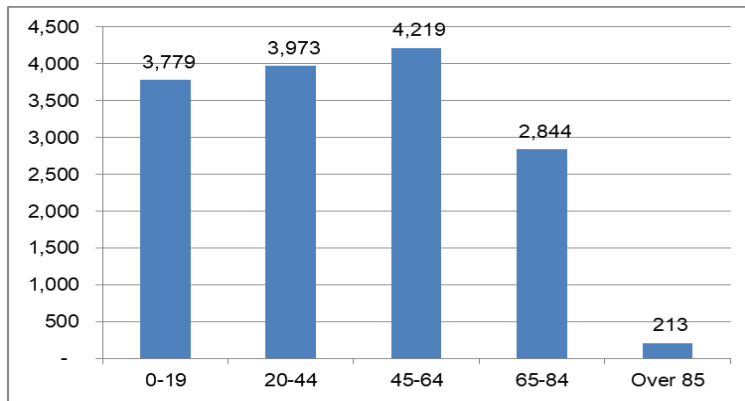
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Permanent Population	15,052	15,052	15,052	15,052	15,052	15,052	15,052	15,052	15,052	15,052	15,052	15,052	
Combined Population	15,926	15,977	16,479	16,481	26,345	29,084	29,894	29,814	26,372	26,503	26,184	16,086	22,929
Difference	874	925	1,427	1,429	11,293	14,032	14,842	14,762	11,320	11,451	11,132	1,034	7,877
Percent Change	6%	6%	9%	9%	75%	93%	99%	98%	75%	76%	74%	7%	52%

Source: Networks Northwest 2022 *Seasonal Population Study for Northwest Lower Michigan*

Age, Race & Disability

Understanding the age distribution and median age of Missaukee County can help identify social, economic, and public service needs in the community. The county's total estimated 2019 population is broken into age cohorts (analyzing which proportions of a municipality's population are in which stages of life). This gives a nuanced view of the makeup of a community. Figure 4 indicates the cohort group with the largest population is the 45 to 64 year old group, followed by those in 20-44 year old group and then by the 0-19 year old group. As shown in Figure 5, the median age (the midpoint where half the population is younger and half the population is older) of Missaukee County is older (43.5 years) than the State (39.7 years). The county, like the State, is aging, but at a faster rate. The youngest community in the county is Richland Township with a median age of 31.8 years, followed closely by Clam Union Twp. at 32.2 years. The oldest community in the county is Holland Township with a median age of 56.3 years (Figure 6).

Figure 4: Missaukee County Population by Age Cohort, 2019



Source: US Census, 2019 ACS 5-yr Estimates

Figure 5: Median Age Trends - 2000, 2010, and 2019

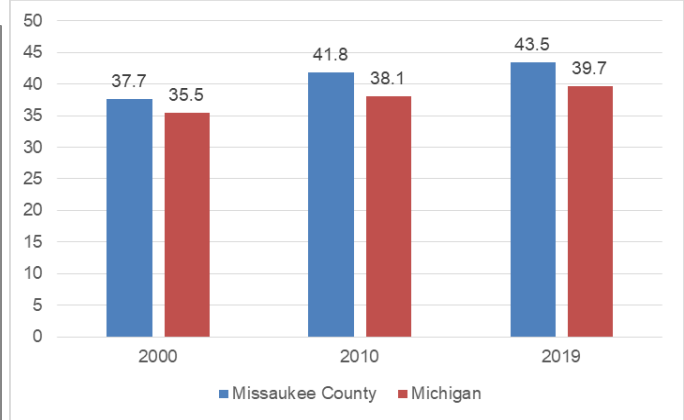
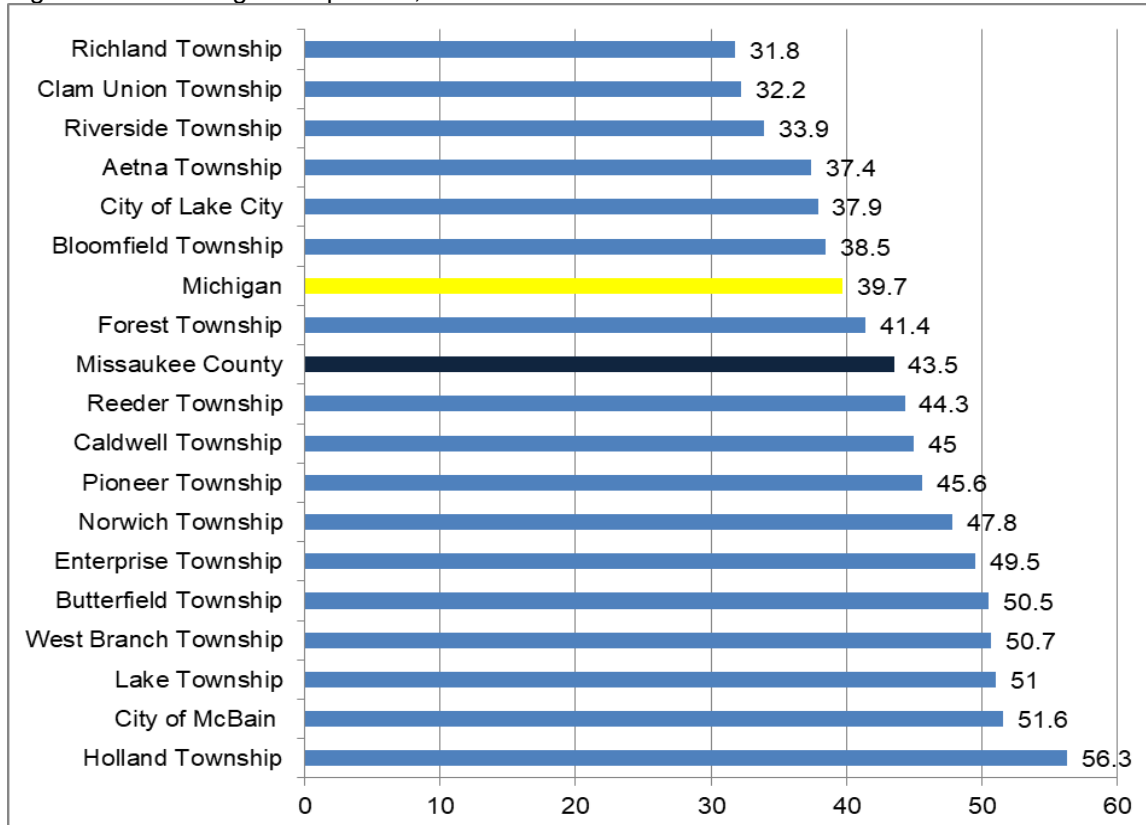


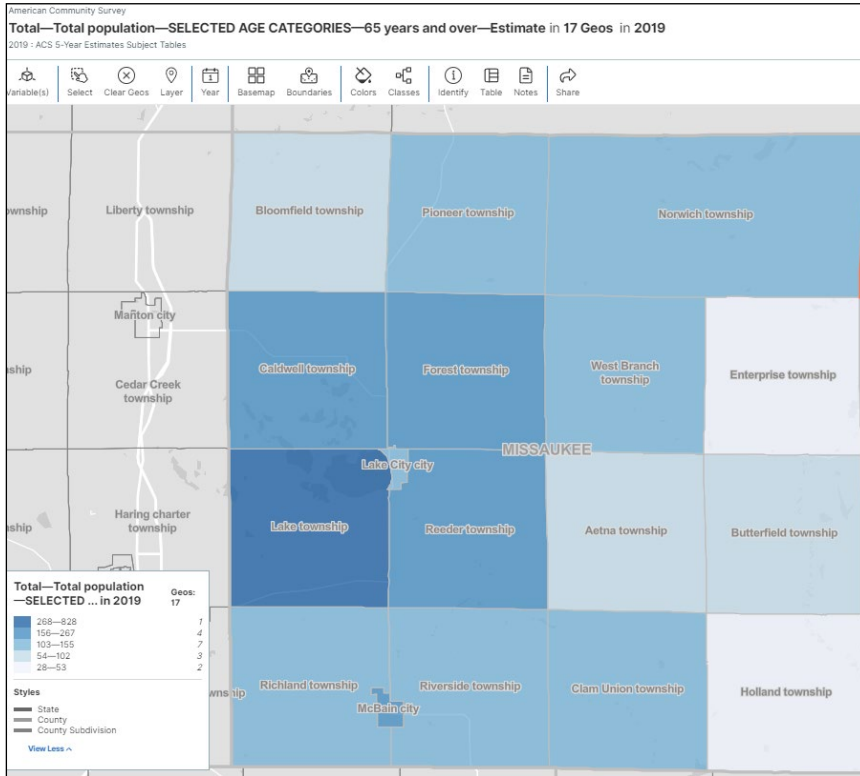
Figure 6: Median Age Comparison, 2019



Source: US Census, 2019 ACS 5-yr Estimates

Persons over the age of 65 are considered a socially vulnerable population group. An estimated 37.5% of persons aged 65 years or older has with one or more type of disability (Table 7). Figure 7 indicates that the greatest concentrations of this cohort are located in Lake Township, the City of McBain, Reeder Township, Forest Township and Caldwell Township. These communities represent areas where a greater focus on services may be needed for senior citizens pertaining to enduring natural hazard events such as extreme temperatures, severe winter weather, high winds, and resulting power outages. Table 6 lists community estimates for persons over age 65, in order from most to least number of persons.

Figure 7: Estimated Number of Residents over Age 65, Missaukee County



Source: US Census Bureau, 2019 ACS 5-Year Estimates

Table 6. Estimated Population over Age 65 by Jurisdiction

Missaukee County Jurisdiction	Est. Population Age 65+
Lake Township	828
Caldwell Township	267
Reeder Township	232
Forest Township	217
City of McBain	210
Riverside Township	155
City of Lake City	143
Norwich Township	140
Richland Township	135
Clam Union Township	131
West Branch Township	126
Pioneer Township	117
Butterfield Township	102
Bloomfield Township	95
Aetna Township	78
Holland Township	53
Enterprise Township	28

Source: US Census Bureau, 2019 ACS 5-Year Estimates

The racial makeup of Missaukee County is predominantly white (94% - Table 6). 2.9% of the population identifies as Hispanic or Latino; this may be representative of residents working in the predominant agricultural industry in the county. 0.6% of the population is Black; 0.2% is Asian; 0.4% is American Indian or Alaskan Native; 1.9% consists of two or more races and 0% are "Native Hawaiian or Other Pacific Islander" or "Some Other Race".

The racial composition estimates of each jurisdiction in the County are also shown in Table 6. The cities of Lake City and McBain appear to have the greatest estimated percentage of minority populations compared to the other communities. Additionally, it is estimated that between 5 percent and 9.5 percent of their populations of Townships of Riverside, Clam Union, West Branch, Holland, and Caldwell identify as being of Hispanic or Latino Origin. These communities represent areas that contain small concentrations of minority populations, which are also considered socially vulnerable populations in the context of natural hazard events. There may be an increased need for public assistance in these communities as this population group may have limited social and financial resources to withstand or recover from a hazard event.

Table 6: Racial Composition in the State of MI, Missaukee County, and Jurisdictions

	White	Black	American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino Origin*
Michigan	75.0%	13.6%	0.5%	3.1%	0.1%	0.1%	2.5%	5.1%
Missaukee County	94.0%	0.6%	0.4%	0.2%	0.0%	0.0%	1.6%	2.9%
City of Lake City	89.0%	4.2%	0.6%	0.4%	0.0%	0.0%	5.8%	2.2%
City of McBain	92.0%	2.6%	0.0%	0.0%	0.0%	0.0%	5.5%	0.0%
West Branch Township	95.1%	0.0%	0.6%	0.4%	0.0%	0.0%	3.8%	6.6%
Norwich Township	95.2%	0.0%	2.6%	0.0%	0.0%	0.0%	2.3%	0.0%
Bloomfield Township	95.5%	0.5%	2.4%	0.0%	0.0%	0.7%	0.9%	2.1%
Aetna Township	95.6%	0.8%	1.6%	0.0%	0.0%	0.0%	2.0%	0.8%
Lake Township	95.7%	0.7%	0.0%	0.4%	0.0%	0.0%	3.2%	0.6%
Holland Township	96.0%	0.0%	0.0%	0.0%	0.0%	0.6%	3.5%	5.2%
Caldwell Township	96.2%	0.6%	0.8%	0.8%	0.0%	0.0%	1.6%	5.1%
Forest Township	97.0%	0.2%	0.6%	0.0%	0.0%	0.9%	1.3%	2.6%
Richland Township	97.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.8%	2.4%
Pioneer Township	97.1%	0.0%	1.4%	0.6%	0.0%	0.0%	1.0%	2.3%
Butterfield Township	98.0%	0.0%	0.0%	0.0%	0.0%	0.2%	1.8%	1.6%
Reeder Township	98.3%	0.7%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%
Riverside Township	99.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.2%	9.5%
Clam Union Township	99.1%	0.0%	0.3%	0.0%	0.0%	0.6%	0.0%	8.5%
Enterprise Township	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: US Census, 2019 ACS 5-yr Estimates *Those identifying as being of Hispanic or Latino Origin can identify as being of any type of race

Table 7 represents the number of persons with one or more disability and also those with a disability by age group. An estimated 2,761 (18.5%) of Missaukee County residents have one or more type of disability. An estimated 37.5% of persons aged 65 years or older has with one or more type of disability.

Table 7: Persons with a Disability, 2019

Total Civilian Noninstitutionalized Population	14,924 persons
With one or more disability	2,761 (18.5%)
Age 0-17 with a disability	173 (5% of that age group)
18 to 64 years with a disability	1,473 (17.4% of that age group)
65 years and over with a disability	1,115 (37.5% of that age group)

Source: US Census, 2019 ACS 5-yr Estimates

Housing Characteristics and Development Trends

The average household size for Missaukee County residents is 2.45 persons, which is slightly lower than the State's average of 2.46. Missaukee County has an estimated 6,055 total households and 9,227 housing units (Table 8). The Census defines a household as all the people who occupy a single housing unit, regardless of their relationship to one another. Lake Township has the largest percentage of housing units of all municipalities in the county (20.8%).

Table 8: Housing Units by Municipality, 2019

Municipality	2019 Housing Units (ACS)	Percent of 2019 Total
Missaukee County	9,227	
Aetna Township	302	3.3%
Bloomfield Township	372	4.0%
Butterfield Township	377	4.1%
Caldwell Township	860	9.3%
Clam Union Township	519	5.6%
Enterprise Township	181	2.0%
Forest Township	757	8.2%
Holland Township	226	2.4%
City of Lake City	431	4.7%
Lake Township	1,920	20.8%
City of McBain	299	3.2%
Norwich Township	507	5.5%
Pioneer Township	331	3.6%
Reeder Township	707	7.7%
Richland Township	596	6.5%
Riverside Township	487	5.3%
West Branch Township	355	3.8%

Source: US Census, 2010 & 2019 ACS 5-Yr Estimates

About 55.2% of residential units were estimated to be built before 1980 (Table 9). Unless recently renovated, these homes likely do not meet modern building code requirements that ensure the structure is properly constructed to withstand impacts from natural hazard events, such as heavy snow, ice, riverine flooding, and high winds. The 2019 ACS also estimates that 78.3% of the county's household units are 1-unit, detached structures (commonly referred to as single-family homes), and 18.6% are mobile homes. Mobile homes are considered to be vulnerable to impacts from high winds, tornadoes, hail, heavy snow and flooding due to their light construction frame and lack of a traditional foundation to anchor the structure to the ground. Areas of mobile homes are identified within the City of McBain, Caldwell Township, and Forest Township on the Hazard Areas and Vulnerable Populations map provided in Appendix A.

Table 9: Year Structure Built, 2019

Year Built	Housing Units	Percentage of Units
Built 2000 or later	1,222	13.2%
Built 1990 to 1999	1,591	17.2%
Built 1980 to 1989	1,322	14.3%
Built 1960 to 1979	2,748	29.8%
Built 1940 to 1959	1,358	14.7%
Built 1939 or earlier	986	10.7%
Total Housing Units	9,227	

Source: US Census, 2019 ACS 5-Year Estimates

Housing Tenure, Table 10, summarizes the status of housing units, whether occupied or vacant, as well as the median housing value of owner-occupied units (\$118,700) and the median gross rent (\$736). Of the 9,227 total housing units, (65.6%) are occupied (indicating physically occupied, principal residence housing units).

Table 10: Housing Tenure, 2019

Total housing units	9,227	%
Occupied housing units	6,055	65.6%
Owner-occupied	4,851	80.1%
Median Value of owner-occ. units	\$118,700	
Renter-occupied	1,204	19.9%
Median Gross Monthly Rent	\$736	
Vacant housing units	3,172	34.4%

Source: US Census, 2019 ACS 5-year Estimates

Economic Profile

The *2021 Comprehensive Economic Development Strategy (CEDS)* prepared by Networks Northwest is the product of a locally-based, regionally-driven economic development planning process to identify strategies for economic prosperity. The plan was prepared for the ten county region of northwest Lower Michigan. Table 11 provides a comparison of annual average wage for each county in the CEDS planning area for 2018. The average is a calculation of the annual average wage by 20 different North American Industry Classification Sectors (NAICS) in Missaukee County. Kalkaska County has the highest average annual wage at \$50,971, followed by Grand Traverse County at \$44,562. Employees in Missaukee County earn \$35,917 on average, annually.

Table 11: Average Annual Wage by County, 2018

County	Average Annual Wage
Antrim	\$33,081
Manistee	\$33,821
Benzie	\$33,908
Missaukee	\$35,917
Leelanau	\$36,833
Emmet	\$40,258
Wexford	\$40,586
Charlevoix	\$44,558
Grand Traverse	\$44,562
Kalkaska	\$50,971

Source: 2021 Comprehensive Economic Development Strategy (CEDS) prepared by Networks Northwest

Table 12 provides the county's industry NAICS Sectors as well as the number of industry establishments, jobs, percent distribution, and annual average wage.

The industry with the largest percent distribution is "**Manufacturing**" at 19.4%, followed by "**Retail Trade**" at 10.3%.

The industry with the highest annual average wage is "**Finance and Insurance**" at \$49,629, followed by "**Wholesale Trade**" at \$46,705. Employees within the "Manufacturing" industry earn the third highest annual average wage with \$45,158.

Table 12: Economic Distribution by Industry, 2018

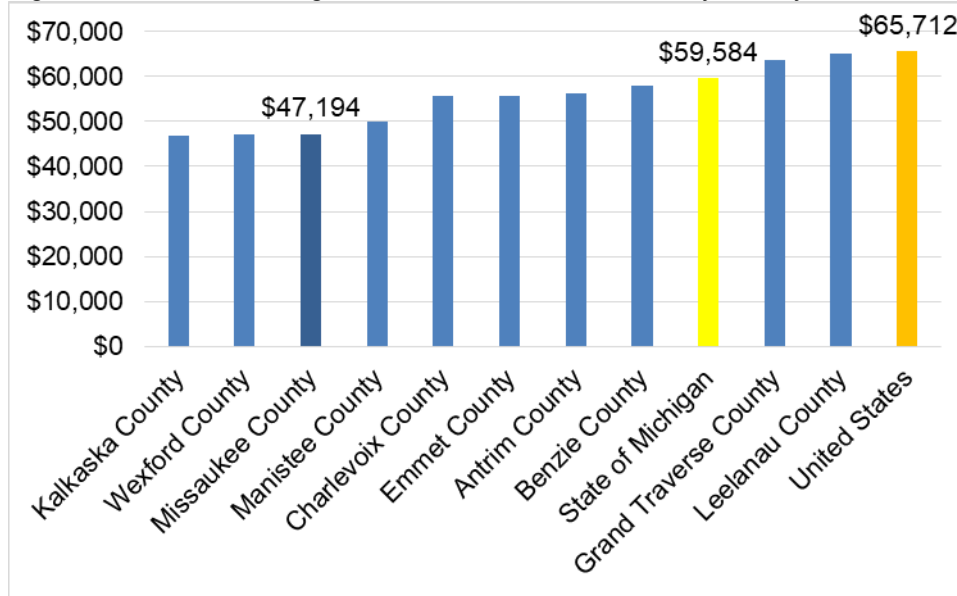
Industry Description	Establishments	Jobs	Percent Distribution	Annual Average Wage
Total Covered Employment	342	3,301	100.00%	\$35,917
Agri., forestry, hunting	46	D	D	D
Mining	2	D	D	D
Construction	56	179	5.40%	\$37,107
Manufacturing	25	642	19.40%	\$45,158
Wholesale trade	9	101	3.10%	\$46,705
Retail trade	30	341	10.30%	\$31,562
Transportation, warehousing	26	245	7.40%	\$42,242
Information	5	7	0.20%	\$24,672
Finance and Insurance	11	107	3.20%	\$49,629
Real Estate, rental, leasing	6	9	0.30%	\$23,409
Professional, technical services	16	65	2.00%	\$38,753
Administrative, waste services	7	20	0.60%	\$19,026
Educational services	5	N/A	N/A	N/A
Health care, social assistance	34	D	D	D
Arts, entertainment, recreation	4	15	0.50%	\$13,908
Accommodation and food services	15	110	3.30%	\$13,518
Other services, exc. public admin.	31	94	2.80%	\$27,678
Public administration	14	151	4.60%	\$31,066
Other Includes (private, utilities, management of business, and unallocated)				

Source: 2021 Comprehensive Economic Development Strategy, Networks Northwest

*D means limited industries of a sector that would disclose confidential information

Figure 8 and Table 13 present a comparison of the median household income (MHI) across the ten county region, the State of Michigan, and local jurisdictions. Missaukee County has a median household income of \$47,194, the third lowest in the region. Richland Township has the highest median household income in the county at \$64,830 (Table 13). As shown in Figure 6: Median Age Comparison, Richland Township's population is also the youngest in the county. Forest Township has the lowest median household income in the county, at \$36,705.

Figure 8: Northwest Michigan Median Household Income by County, State, Nation 2019



Source: US Census, 2019 ACS 5-yr Estimate

Table 13: Median Household Income (MHI) by Local Jurisdiction, 2019

Jurisdiction	MHI
Missaukee County	\$47,194
Forest Township	\$36,705
City of McBain	\$38,491
Butterfield Township	\$41,944
West Branch Township	\$42,500
Enterprise Township	\$43,750
Reeder Township	\$44,886
Pioneer Township	\$45,673
City of Lake City	\$45,714
Caldwell Township	\$46,375
Bloomfield Township	\$47,321
Riverside Township	\$49,917
Clam Union Township	\$50,398
Holland Township	\$50,500
Norwich Township	\$51,500
Lake Township	\$51,528
Aetna Township	\$58,750
Richland Township	\$64,830

Source: US Census, 2019 ACS 5-yr Estimate

Additionally, there is an online interactive tool available from the US Census Bureau allows for viewing of estimated job density within the county: <https://onthemap.ces.census.gov/>. This website may be useful for emergency preparedness planning as related to response and potential impact to local economic activity areas.

The county's economic profile can be further described by considering the cost of housing, transportation, and other goods and services. The budgeting rule of thumb has been that a household should spend no more than 30 percent of its income on housing

costs. Considering the MHI of Missaukee County over twelve months, a household is earning \$3,932.83 per month. The US Census 2019 5-year ACS estimates that the median gross monthly rent is \$736 in Missaukee County, which equates to about 19% of the median household income.

However, according to the 2019 Northwest Michigan Target Market Analysis³ (conducted by LandUseUSA on behalf of Housing North and Networks Northwest), rents are far higher in Missaukee County than what many renters can afford. While the affordable rent for a renter earning the mean wage in the county is \$725, the affordable rent for a full-time minimum wage worker earning \$9.45 an hour is \$491. And anecdotally, the demand for housing is driving prices higher still. Home prices are also increasing where the cost to purchase a home is often as much as \$200/square foot or more.

The following tables describe the population with the lowest incomes. It is estimated, in 2019, that 14.2% of all people in the county lived at or below the poverty level (Table 15). The Census describes poverty thresholds differently based on the size of the family and the number of related children living together, as illustrated in Table 14 below.

Table 14: 2019 Federal Poverty Level Guidelines

Persons in family/household	Poverty guideline
1	\$12,490
2	\$16,910
3	\$21,330
4	\$25,750
5	\$30,170
6	\$34,590
7	\$39,010
8*	\$43,430

*For families/households with more than 8 persons, add \$4,420 for each additional person.

Table 15: Missaukee County Poverty Estimates, 2019

Poverty	Statistics
All families living below the poverty level	14.2%
Persons under age 18, in poverty	20.0% (of that age group)
Persons 18 to 64 years, in poverty	14.4% (of that age group)
Persons 65 years and older, in poverty	7.0% (of that age group)

Source: US Census, 2019 ACS Estimate

Financial hardship is further described in the United Ways of Michigan report entitled *ALICE in Michigan: A Financial Hardship Study*. ALICE, which is an acronym for Asset Limited, Income Constrained, Employed, are those households with income above the Federal Poverty Level, but below the basic cost of modern living, such as housing, child care, food, health care, technology and transportation. The ALICE threshold is described as, “the average income that a household needs to afford the basic necessities... for each county in Michigan. Households earning below the ALICE Threshold include both ALICE and poverty-level households” (ALICE, 2019). Table 16 identifies the number of ALICE and poverty households for the county and each municipality. These households likely would not have reserve savings to cover an emergency, such as impacts to their personal property from a natural hazard event.

Every community in Missaukee County contains low-income households, which are considered socially vulnerable populations. These households may likely have more of a need for social services/public services in the aftermath of a hazard event, such as assistance with transportation, food, water, and shelter. The estimated number of these households are shown in Table 16, with Lake Township containing the most and Aetna Township containing the least.

³ <https://www.housingnorth.org/target-market-analysis>

Table 16: ALICE Report Findings, 2019⁴

Jurisdiction	Total Households	% of Total HH that are in Poverty and ALICE	# of Total HH that are in Poverty and ALICE
Holland Township*	55*	7.3%	4*
Enterprise Township*	57*	19.3%*	11*
Aetna Township	200	39%	78
Pioneer Township	191	44%	84
Clam Union Township	351	26%	91
Butterfield Township	200	47%	94
Bloomfield Township	229	42%	96
West Branch Township	214	49%	105
Norwich Township	254	42%	107
City of Lake City	278	42%	117
Riverside Township	417	32%	133
Richland Township	517	27%	140
City of McBain	273	56%	153
Reeder Township	475	46%	219
Caldwell Township	565	42%	237
Forest Township	489	54%	264
Lake Township	1,251	35%	438
Missaukee County		27% (State Avg. is 25%)	

* There is no ALICE data for Enterprise Township or Holland Township. The data shown from these communities is from 2019 ACS estimates for the number of families (a household with at least two people in it) and poverty level estimates for those families.

⁴ Michigan Association of United Ways. *ALICE in Michigan: A Financial Hardship Study*. 2021. <https://www.unitedforalice.org/county-profiles/michigan>

IV. Hazard Identification and Assessments

Vulnerability Assessment

Natural hazard impact on the community can be understood by evaluating vulnerabilities for commonly agreed upon assets. A community's assets are defined broadly to include anything that is important to the character and function of a community and can be described very generally in the following categories:

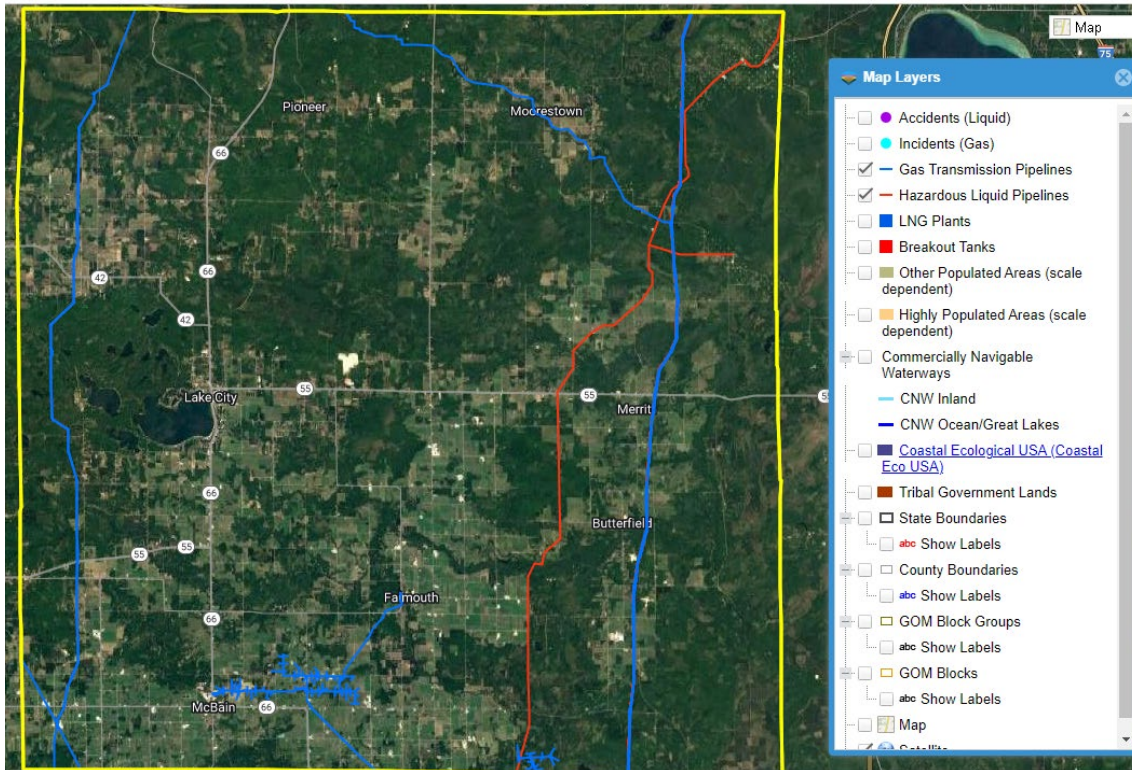
- People
- Economy
- Built environment
- Natural environment

Vulnerable populations include the economically disadvantaged, minority populations, elderly, homeless, and persons with a disability. Those that live unsheltered or in homeless encampments, assisted living facilities, mobile home parks, or isolated subdivisions are more susceptible to hazardous events. The demographic characteristics of these vulnerable populations, including the estimated representation of the population by geography and specific location (if available) within Missaukee County, was discussed previously in the Community Profile (Section III) of this Plan. Vulnerable populations are represented on the *Vulnerable Populations and Hazard Areas Map* in Appendix A. Those locations included on the map were specifically discussed during public input sessions. There may be additional locations of vulnerable populations that are not listed.

The economic center of activity is primarily focused on the western half of the county. Townships in the southwest, located on the border with Wexford County, are the most populated and have the most developed land. This is largely in part because of their proximity to the City of Cadillac, an employment center for this part of the region. This area accommodates growth and investment and has an operational municipal water and sewer system and broadband service.

In addition to water and sanitary utilities infrastructure, pipelines and gas/oil storage fields are also vulnerable infrastructure in the county. Pipelines and gas/oil storage fields are located throughout the county. The National Pipeline Mapping System (NPMS) Public Viewer (<https://pvnpm.s.phmsa.dot.gov/PublicViewer/>) enables users to view NPMS pipeline, liquefied natural gas (LNG) plant and breakout tank data one county or offshore area at a time, including attributes and pipeline operator contact information. Figure 9 below represents the gas transmission pipelines (blue) and the hazardous liquid pipelines (red).

Figure 9: Gas Transmission Pipelines and Hazardous Liquid Pipelines Aerial Image



Source: National Pipeline Mapping System (NPMS) Public Viewer, April 27, 2023

The natural environment and large parts of the economy are intertwined between recreation, sport, and food sources involving the county's natural resources. Hunters are attracted to the area by the abundance of white-tailed deer, wild turkeys, and ruffed grouse, as well as a wealth of small game species to include squirrels and rabbits. Lakes, ponds, and wetland areas throughout the county yield prime waterfowl habitat. During the spring and fall migrations, these areas are stopping points for numerous waterfowl; wintering populations of species to include the Common Goldeneye, Bufflehead, American Black Duck, Mallard, and Common and Hooded Mergansers are common to rivers which may remain open throughout the season. Outdoor enthusiasts have the opportunity to view and observe a wide variety of wildlife in various habitats throughout the county. In addition to the more common avian species, such as the Great Blue Heron, Red-Tailed Hawk, and Blue Jay, mammals such as rabbits, raccoons, several species of squirrels, and North America's only marsupial, the Virginia Opossum, and many other species may be observed.

Missaukee County may also be home to a variety of Endangered, Threatened, or Species of Special Concern, to include mollusks and snails, birds, insects, reptiles, and mammals, according to the Michigan Natural Features Inventory. Within the many forms of the local flora and fauna normally observed, there are some species which are not typically readily visible, such as the Black Bear or Pileated Woodpecker. For certain species, this may be due to their preference for isolation and solitude; for others, it may be the result of factors including the rarity of the species or requirements for areas of undisturbed habitat. The Michigan Department of Natural Resources and Environment, Wildlife Division has provided a listing of several species of wildlife shown as endangered, threatened, or special concern under federal and or state law that have been identified as having occurred within portions of Missaukee County. These include various plants, birds, reptiles, insects, and fish species. The federally enacted Endangered Species Act of 1973, along with Part 365, Endangered Species Protection of the Michigan Natural Resources and Environmental Protection Act, Public Act 451 of 1994, as amended, provides protection for these important special resources. A success story is found in Bald Eagle, which has become more common in Missaukee County and elsewhere in the region and country due to the ban of chemicals such as DDT in the 1970's, as well as the habitat protections offered by the Endangered Species Act. Although once forced nearly to extinction, Bald Eagle populations have recovered to the point that they were delisted from the Endangered Species Act August of 2007; however, protection to these birds is still offered through the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. This majestic species is often spotted soaring over the many lakes and rivers in the area. The vast diversity of the natural resources found within Missaukee County provides endless potential for education and recreation, as well as opportunities to appreciate the natural world, both for those who reside in this beautiful and unique area and for those who visit. The blend of forest and wetland habitats within the county and the wealth of species which inhabit them are a resource which would be a valuable asset to any community. The recreational use of these resources encompasses a wide variety of activities, to include sightseeing, picnicking, camping, and bird watching, as well as fishing and hunting. Multiple uses may require employment of a variety of management strategies; strategies must be carefully planned to ensure conscientious stewardship of resources. Wildlife and forests within parks can be successfully managed to satisfy the requirements of recreation and other uses, while also promoting good wildlife and forest management practices.

Additionally, countywide critical infrastructure is represented on the Critical Infrastructure Map, shown below. Task Force members and community stakeholders identified the critical facilities and infrastructure on the base map and provided updated GIS shape files for mapping purposes. The Critical Infrastructure Points Map is in Appendix A. Table 17 is a summary of critical infrastructure points in Missaukee County.

Table 17: Critical Facilities and Infrastructure

Total # of Facilities	Facility Type
35	Agriculture <ul style="list-style-type: none"> • Dairy Farms • Ranches
6	Commercial <ul style="list-style-type: none"> • Banking • Food and retail
27	Communications <ul style="list-style-type: none"> • Communications towers • Wireless infrastructure
11	Emergency Services <ul style="list-style-type: none"> • Emergency Management • Emergency Medical Services (EMS) • Fire and Emergency Services • Law Enforcement
13	Energy <ul style="list-style-type: none"> • Provider pumping and storage
33	Government Facilities <ul style="list-style-type: none"> • Dams • Municipal Facilities • Service-Oriented Government Facility – USPS Service Centers • Treated Water Distribution Control Center • Wastewater Facility
5	Healthcare <ul style="list-style-type: none"> • Extended Care Facility • Healthcare and Public Health
8	Industry <ul style="list-style-type: none"> • Chemical storage • Manufacturing
21	Transportation <ul style="list-style-type: none"> • Aviation • Bridges • Road and highways

Source: Missaukee County Emergency Services

Historical Analysis

The Historical Analysis of Missaukee County hazards uses information on impacts and losses from previous hazard events to predict potential impacts and losses during a similar event. Because of the frequency of these events, communities are more likely to have experience with and data on impacts and losses. Additionally, there have been seven (7) federal-or state-declared disaster incidents that have involved Missaukee County (Table 18). These are included in the hazard analysis for individual event types.

Table 18: Presidential and Governor Declared Disasters for Missaukee County

Date of Declaration	Type of Incident	Affected Area	Type of Declaration/Federal ID #
March 2020	COVID-19; COVID-19 Pandemic	Statewide & National	State of Emergency; National Emergency (3455); Governor and Presidential Declared Major Disaster (4494)
1/29/2019	Extreme Cold	Statewide	Governor Declared Emergency
5/7/2014	Severe weather, flooding, wind damage from April - May 2014	Newaygo, Osceola, Isabella, Mecosta, Missaukee , Muskegon, Roscommon and Wexford Counties	Governor Declared Disaster
6/6/2008 – 7/13/2008	Severe Storms, Tornadoes and Flooding	Allegan, Barry, Eaton, Ingham, Lake, Manistee, Mason, Missaukee , Osceola, Ottawa, and Wexford Counties	Governor Declared Major Disaster and Presidential Declared Major Disaster (1777)
9/4/2005 and 9/7/2005	Hurricane (Katrina) Evacuation	Statewide - Declared due to the emergency conditions in MI, resulting from the influx of evacuees from states impacted by Hurricane Katrina beginning on August 29, 2005.	Governor Declared Disaster and Presidential Declared Emergency (3225)
1/26-27/1978	Blizzard, Snowstorm	Statewide	Presidential Declared Emergency (3057); Governor Declared Disaster
3/2/1977	Drought	44 Counties, including Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Kalkaska, Leelanau, Manistee, Missaukee , Otsego, Roscommon and Wexford.	Presidential Declared Emergency (3035)

Sources: FEMA <https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties> and Michigan State Police 2019 Michigan Hazard Analysis (MHA) pub. 103

Hazard Descriptions

Missaukee County is vulnerable to a wide range of natural hazards. Hazard events have the potential to impact community residents and visitors; economic drivers in the community; critical infrastructure and the built environment; and the natural environment. Missaukee County Emergency Management is challenged with managing these threats to protect life and property. This plan includes a profile for each natural hazard event Missaukee County is likely to face. Each profile includes the location, extent, previous occurrences, probability of future events, and a vulnerability assessment.

- **Location** is the geographic areas within the planning area that are affected by the hazard, such as a floodplain. The entire planning area may be uniformly affected by some hazards, such as drought or winter storm. Location may be described in narrative and or through map illustrations.
- **Extent** is the strength or magnitude of the hazard. Extent can be described in a combination of ways depending on the hazard.
- **Previous occurrences** describe the history of previous hazard events within the county. This information helps to estimate the likelihood of future events and predict potential impacts. The extent of historic events may be included when the data is available. Data is primarily collected from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) Storm Events Database.
- **Probability of future events** is the likelihood of the hazard occurring in the future based on previous event occurrences and any trends that may appear. Probability may be defined using historical frequencies or statistical probabilities.
- **Vulnerability assessment** accounts for the types and numbers and values of assets such as populations, existing and future buildings, infrastructure, critical facilities, recreation and environmental features located in the identified hazard areas and estimates of the potential impact to those vulnerable assets identified.

Data for natural hazard events in Missaukee County was compiled from several different sources. Weather event data was collected primarily from the National Centers for Environmental Information through the National Oceanic and Atmospheric Administration's (NOAA) website utilizing the following sections:

- **Climate** <https://www.weather.gov/wrh/Climate?wfo=apx> – Historical local observed weather data; Climate prediction and variability; local high impact event summaries.
- **NOAA Storm Event Database** <https://www.ncdc.noaa.gov/stormevents/> - Data available to search beginning in 1950 to within 3 months from present day; however, information for various events is limited and non-contiguous. The database provides local storm reports, damage reports, and recorded event descriptions. The event types⁵ researched for Missaukee County include: Drought (Drought); Flooding (Flash Flood, Flood); Hail (Hail); Extreme Winter Weather (Blizzard, Extreme Cold/Wind Chill, Freezing Fog, Frost/Freeze, Heavy Snow, Ice Storm, Lake-effect Snow, Sleet, Winter Storm, Winter Weather); Tornado (Tornado, Funnel Cloud); Thunderstorm and High Wind (Heavy Rain, High Wind, Lightning, Strong Wind, Thunderstorm Wind); and Wildfire (Wildfire).

Historical local observed drought data was obtained from the [US Drought Monitor](#).

The 2019 [Michigan Hazard Analysis](#) report by the Michigan Department of State Police was referenced to obtain data on wildfires that occurred on State of Michigan owned land between 1981 and 2018.

The websites for the [National Inventory of Dams](#) and [MI-EGLE's Michigan Dam Inventory](#), along with MDNR staff input provided at meetings during the planning process, provided current information on regulated dams in the county.

⁵ Names of events as presented in the Storm Event Database are shown in parentheses.

The NOAA NCEI Storm Event Database is updated on a rolling basis, and thus is always being added to. The most up to date information was added to Table 19, but as events occur the database will change. Thus, additional events will be added in subsequent years. The database was searched for any events in Missaukee County between 01/01/1950 and 7/31/2022 (26,510 days), which returned a result of 170 reported events; a total of 149 days with an event; 0 days with event and death; 1 day with an event and death or injury; 28 days with an event and property damage; and 1 day with event and crop damage. It is important to note when viewing the data that most of the events were recorded after the mid-1990's, even though the search range went back to 1950.

Those events as well as the emergency declaration events are included in the hazard analysis. The hazard analysis groups the events into the following categories:

Table 19: Number of Events by Type, Location, and Year

Type of Event	# of Events	Event Location	Years Event Recorded
Extreme Winter Weather	81	Statewide; Region	1978*, 1996-2013, 2015-2016, 2018-2021
Thunderstorm/Wind and High Winds	38	County and Region	1981, 1983 1991, 1993-1999, 2002, 2004-2008, 2010-2012, 2015, 2017, 2018, 2020, 2021
Hail	32	Countywide	1984, 1993-1996, 2000, 2003, 2004, 2006-2008, 2011, 2014-2018
Tornadoes	7	Countywide	1955, 1964, 1980, 1983, 1994, 1994, 1998
Extreme Temperatures (Heat / Cold)	2 / 4	Region; Statewide	2001, 2018 / 2007, 2014, 2015, 2019*
Drought	2	Countywide and Region	1977*, 2001
Flash Flood / Flooding	4	Countywide and Region	2004, 2008*, 2012, 2014*
Lightning	3	County/Region	2000, 2003, 2005
Wildfire	406	MDNR Lands	1981-2018
Public Health Emergency (COVID-19 Pandemic)	1	Statewide/National	2020*
Invasive Species	-	County/Region	Ongoing

Sources: [NOAA National Centers for Environmental Information Storm Events Database](#); [Michigan State Police-Dept. of Homeland Security 2020 MI Hazard Analysis](#); [FEMA Disaster Declarations for States and Counties](#)

Note: * indicates a state or federal event designation

Economic Impact Analysis

The NOAA National Centers for Environmental Information identify seven (7) billion-dollar disasters. Every year since 1980 drought, floods, freezing temperatures, severe storms, tropical cyclones, wildfires, and winter storms have claimed countless lives and caused billions of dollars in damages in the United States. Every state in the country, as well as Puerto Rico and the Virgin Islands, have been impacted by at least one billion-dollar disaster since 1980. In total, the Central, South, and Southeast regions typically experience a higher frequency of billion-dollar disasters than other regions.

The estimated economic impact of the previously described Missaukee County natural hazard events that were *reported* to NOAA is \$1,145,750 in property damages and \$500,000 in crop damages (Table 20). It should be noted that many events likely cause numerous small amounts in property damage, such as hailstorms, but this often goes unreported. The impact to human life included 0 deaths and 2 directly related injuries, both received from lightning. The total reported Damaging Events' Costs recorded with NOAA for Missaukee County are as follows:

Table 20: Damage Estimates by Event Type

Event	Property Damage Estimate	Crop Damage Estimate	Directly Related Death	Directly Related Injury or Illness
Winter Weather	\$185,000			
T-Storm with Wind	\$537,000			
Hail	\$0	\$500,000		
Tornado	\$262,750			
Extreme Temperatures	\$0			
Drought	\$0			
Flood/Flash Flood	\$160,000			
Lightning	\$1,000			2
Wildfire	\$0			
Public Health Emergency (COVID-19)	N/A		68*	3,475*
Invasive Species	N/A	N/A		
TOTAL	\$1,145,750	\$500,000	68	3,477

Source: NOAA's National Centers for Environmental Information; *State of Michigan, results as of November 29, 2022.

Table 21 provides an overview of each potential hazard's impact on the permanent population and the estimated impact on the State Equalized Values (SEV) for real and personal property (residential and commercial). By law, SEV is equal to approximately one-half of the property's true market value. Population data is collected from the US Census, 2019 ACS data. According to the *2022 Seasonal Population Study for Northwest Lower Michigan*, apply a 99% increase to account for the highest estimated annual seasonal population within the county (which occurs in July).

Table 21: Geographic Economic Impact by Event

Potential Hazard Event	Geography	Population Estimates	State Equalized Value
Extreme Winter Weather, Thunderstorm, Wind, Hail, Lightning, Tornado, Extreme Temperatures, Drought, Public Health Emergency	Missaukee County	15,028	\$925,145,000.00
Flooding	Caldwell, Lake, Reeder, and Clam Union Townships, and the City of Lake City	7,054	\$59,401,359.00
Wildfire	Pine Forest Areas Countywide (White, Red, and Jack Pine)	15,028	\$51,625,632.00
Wildfire	Fire Prone Areas: Caldwell, Lake, Richland, Norwich, Enterprise, Butterfield, and Holland Townships	7,208	\$80,884,155.00
Wildfire	Tree farm locations		\$6,399,750.00

Sources: 2019 ACS Estimates from the U.S. Census Bureau; Missaukee County Equalization

Extreme Winter Weather

National Weather Service defined as: *phenomenon (such as snow, sleet, ice, wind chill) that impacts public safety, transportation, and/or commerce.* The Extreme Winter Weather category includes the following subcategories: winter weather, winter storm, ice storm, heavy snow, blizzard, frost/freeze, and lake effect snow. Blizzards are the most perilous snowstorms and are characterized by low temperatures, strong winds, and enormous amounts of fine, powdery snow. Snowstorms have the potential to reduce visibility, cause property damage, and loss of life.

According to the 2019 Michigan Hazard Analysis, Michigan has 360 snowstorms with 0.1 average annual deaths, 0.1 average annual injuries, and \$1.9 million in average annual property and crop damage. Michigan experiences large differences in snowfall over short distances due to the Great Lakes. The average annual snowfall accumulation ranges from 30 to 200 inches with the highest accumulations in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan. For example, the average snowfall ranges from 141 inches in the Gaylord area to 101 inches in Traverse City in the northwest region of the Lower Peninsula.

Ice and Sleet Storms are storms that generate sufficient quantities of ice or sleet that result in hazardous conditions and/or property damage. Ice storms occur when cold rain freezes on contact with the surface and coats the ground, trees, buildings, and overhead wires with ice. Often times, ice storms are accompanied by snowfall, which sometimes causes extensive damage, treacherous conditions, and power loss. On the other hand, sleet storms are small ice pellets that bounce when hitting the ground or other objects. It does not stick to trees or wires, but can cause hazardous driving conditions. When electric lines are down, households are inconvenienced, and communities experience economic loss and the disruption of essential services.

According to the 2019 Michigan Hazard Mitigation Plan, Michigan has 16 average annual ice and sleet storm events with 0.2 average annual deaths, 0.5 average annual injuries, and \$11.4 million in average annual property and crop damage.

Location

Extreme winter weather events are regional events that are not confined to geographic boundaries and can affect several areas at one time with varying severity depending on factors such as elevation and wind patterns. All of Missaukee County is at risk from the occurrence and impacts from extreme winter weather.

Extent

Snowstorms can be measured based on snowfall accumulations or damages. The average annual snowfall in Missaukee County is 75.4 inches. On March 2, 2012 Missaukee County had \$150,000 in property damages caused by heavy snow. Extreme winter weather events in total caused \$290,000 in property damages between 1996 and 2022.

Previous Occurrences

Since 1996, there have been 80 extreme winter weather events in addition to the Presidential Emergency Declaration in 1978 for a blizzard snowstorm. The category extreme winter weather includes heavy snowstorms, ice storms, frost/freeze, blizzards, winter weather, and winter storms reported in Missaukee County, Table 22. Winter storm events with moderate snowfall of 5-10 inches are the most common event type in Missaukee County. Heavy snow and blizzards have been less common, and there were no frost freeze events. Heavy snow is the most costly extreme winter weather event.

The March 2, 2012 event narrative is as follows:

One of the highest-impact snowstorms in recent memory pounded Northern Michigan on the night of March 2, 2012. Low pressure tracked from Missouri, to southern Lower Michigan, and on to eastern Canada, while rapidly strengthening. Precipitation surged northward into the region on the evening of the 2nd. This was primarily snow, except in parts of east central Lower Michigan (especially near Lake Huron), where temperatures were mild enough for rain. Snow wound down on the morning of the 3rd, and though somewhat blustery winds occurred behind the system on the 3rd, blowing snow was limited because the snowfall was so wet. Snow totals ranged from 6 to 14 inches across most of Northern Michigan. Higher amounts fell near and west of Grand Traverse Bay, with a maximum amount of 20 inches near Lake Ann. With relatively warm temperatures, the snow was very wet; Traverse City saw around a foot of snow during the night, with a low temperature of 33 degrees. The snow stuck to everything, with the weight of the snow downing many, many trees and power lines. Power outages were widespread, with an outright majority of Northern Michigan residents losing power at some time during or after the storm. In Benzie County, 95 percent of residents lost power. Outages lasted up to a week in some spots. Great Lakes Energy described it as the worst snowstorm (in regards to power outages) in 30 years. A number of counties and communities opened shelters to aid those without power or heat.

This event caused the 2nd highest amount in property damages of any event in Missaukee County. It is tied with the flash flood event on June 13, 2008. The single event that caused the most amount of property damages is the tornado that occurred on September 3, 1964 that caused \$250,000 in property damages.

Table 22: Extreme Winter Weather Events

Event Type	Total Events	Property Damage	Crop Damage	Event Years
Winter Weather	1	\$10,000		2006
Winter Storm	42	\$25,000	-	1997-2000, 2002-2012, 2015, 2016, 2018-2021
Heavy Snow	27	\$150,000	-	1996, 1999-2009, 2011-2013
Ice Storm	2	-	-	2001, 2002
Lake-Effect Snow	4	-	-	2006, 2010, 2013, 2016
Blizzard	5	-	-	1978*, 1997-1999, 2019
Frost/Freeze	0	-		
TOTAL	81	\$290,000	0	-

Source: NOAA: National Centers for Environmental Information and FEMA Disaster Declarations for States and Counties

Probability of Future Events and Vulnerability Assessment

Since 1996, Missaukee County has had 80 extreme winter weather events. Over the last 27 years, there have been 2.96 extreme winter weather events every year. The probability of an extreme winter weather event occurring in future years is 100% percent. Heavy snow events have the potential of shutting down towns and businesses for a significant period of time. Blowing and drifting snow with blizzard conditions cause driving hazards. Ice damage may occur when high winds push lake water and ice past the shoreline, causing damage to public infrastructure and residential property. Northwest Michigan was hit by a killing freeze in April 2012. While this event did not occur in Missaukee County, an event of this type could occur in the future. Areas where this did occur reported millions of dollars in crop damages. If this event occurred in Missaukee County, the agriculture economy would be devastated.

During the winter months, the population is largely made up of the base permanent residents. However, there is increasing demand from seasonal residents to purchase property and retire or work remotely northern Michigan. New residents, especially those locating in remote areas, increase the chance of risk to life and property during severe weather events. Long-time permanent residents rely on their network of family, friends, and neighbors to lend a hand when it's needed. New residents may not have a ready-made network are more vulnerable if they need assistance.

Winter-related events cause difficult driving conditions and in the event of an emergency, can make travel increasingly difficult for emergency personnel who may be more frequently dispatched to rural areas. Much of the Missaukee County population, like much of northern Michigan, is located in remote, rural areas. Townships located in northern and eastern portions of the county are sparsely populated, but older and also remote from major services in the southwest portion of the county. Holland Township, West Branch Township, and Butterfield Township are also some of the oldest (Holland Township is the oldest) communities in Missaukee County. Elderly residents are the most likely persons to have a disability, and therefore, are the most vulnerable to extreme winter weather events.

Thunderstorms and Severe Winds

Severe thunderstorms are weather systems accompanied by strong winds (at least 50 knots, or 58 mph), lightning, heavy rain (that could cause flash flooding), hail (at least 3/4" diameter), or tornadoes. Severe thunderstorms can occur at any time in Michigan, although they are most frequent during the warm spring and summer months from May through September.

High wind events are included in this category. Long-lived wind events associated with fast-moving severe thunderstorms are known as a *derecho* (pronounced similar to "deh-REY-cho"). According to the National Weather Service, a derecho is a widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. Although a derecho can produce destruction similar to the strength of tornadoes, the damage typically is directed in one direction along a relatively straight swath. As a result, the term "*straight-line wind damage*" sometimes is used to describe derecho damage. By definition, if the wind damage swath extends more than 240 miles (about 400 kilometers) and includes wind gusts of at least 58 mph (93 km/h) or greater along most of its length, then the event may be classified as a derecho. A derecho often occurs during the spring or summer; however, it can occur any time of the year.

Severe windstorms can cause damage to homes and businesses, power lines, trees and agricultural crops, and may require temporary sheltering of individuals without power for extended periods of time.

Location

Thunderstorms and severe wind are regional events that are not confined to geographic boundaries and can affect several areas at one time with varying severity depending on factors such as elevation and wind patterns. All of Missaukee County is at risk from the occurrence and impacts from thunderstorms and severe winds.

Extent

Thunderstorms can be measured based on wind speed or damages. The average wind speed for events in Missaukee is 56 knots. Missaukee County had a reported \$537,000 in property damages caused by thunderstorms and severe winds since 1955. Thunderstorms and severe wind events have caused the most amount of property damages of any hazard event type.

Previous Occurrences

Since 1955, there have been a total of 38 thunderstorm/wind and high wind events reported in Missaukee County (Table 23). This is the second-most frequently occurring type of severe weather event in the county.

Table 23: Thunderstorm and Wind Events

Event Type	Number of Events	Property Damage	Crop Damage	Event Year(s)
Thunderstorm Wind	34	\$ 480,000	\$ -	1981, 1983, 1991, 1993-1999, 2002, 2004, 2006-2008, 2011, 2012, 2015, 2017, 2018, 2020
High Wind	4	\$ 57,000	\$ -	1998, 2005, 2010, 2021
TOTAL	38	\$537,000	\$ -	

Source: NOAA: National Centers for Environmental Information

The August 28, 2018 event narrative is as follows:

Another line of thunderstorms crossed northern Michigan in the evening of the 28th. This line produced considerable wind damage, along with a handful of tornadoes. Power poles were snapped and many trees were downed, laying across roads near Lake Missaukee. Windows were damaged on some nearby businesses.

This single event caused \$140,000 in property damages; it caused the 4th highest amount in property damages of any single event in Missaukee County. The event that caused the most amount of property damages is the tornado that occurred on September 3, 1964 that caused \$250,000 in property damages.

The thunderstorm event on June 8, 2007 was a substantial event that caused \$110,000 in property damages. The event narrative is as follows:

A potent line of thunderstorms developed over Lake Michigan, and moved across Northern Lower Michigan in the early overnight hours. These storms produced a considerable amount of wind damage, especially in Northwest Lower Michigan. There were a

number of power outages, most widespread in the Cadillac area. Many large trees were downed in northern Missaukee County. Several structures and trailers were damaged by falling trees, especially in and just west of Moorestown.

Probability of Future Events and Vulnerability Assessment

Since 1955, Missaukee County has had 38 thunderstorm/wind and high wind events. This averages to .57 events every year. The probability of an event occurring in future years is 57 percent. Damage from straight line winds usually affects multiple counties through the loss of electricity from trees/tree limbs downing power lines; causing widespread property damage; and potentially exposing the public to severe injury or fatality due to flying debris. The magnitude and severity depend on the county population, seasonal activity, and the spread of development. During the warm or summer months, the base population expands by an estimated 27% to include both the seasonal short-term population. Residents and visitors are attracted to both rural areas and city centers. Mobile home parks, campgrounds, institutions (schools, places of worship, etc.), and annual events such as the Greatest 4th in the North and the Missaukee Agriculture Youth Show that draw a large number of visitors to outdoor recreation areas were identified as specific areas of concern. Cities and townships that host major events and see a large increase in summer population are City of Lake City, City of McBain, Lake Township, Caldwell Township, Forest Township, Reeder Township, Richland Township, Riverside Township, and Clam Union Township.

Hail

Hailstorms occur when a severe thunderstorm produces hail that falls to the ground. Hail is formed when the updrafts of the storm carries water droplets above the freezing level, where they form into rounded or irregular lumps of ice that range from the size of a pea to the size of a grapefruit. When the weight of the hail is no longer supported by the air, it falls to the ground and has the potential to batter crops, dent automobiles, and injure people and wildlife. Sometimes, large hail appears before a tornado since it is formed in the area of a thunderstorm that tornadoes are most likely to form.

According to the *2019 Michigan Hazard Mitigation Plan*, Michigan has on average 191 hail storms, an expected annual statewide loss of about \$16.6 million, no deaths, and approximately 1 injury per year. Despite damaging hail occurring in every part of Michigan, the areas of the state most prone to severe thunderstorms (e.g. the Southern half of the Lower Peninsula) are also most prone to large and damaging hail. The majority of the hailstorms occur during the growing season from May through August when crops have the greatest potential to be damaged by hail.

The National Weather Service issues forecasts for severe thunderstorms with sufficient warning time to allow residents to take appropriate action to reduce the effects of hail damage to vehicles and some property. However, little can be done to prevent damage to crops. For example, during September 26-27, 1998, a line of severe thunderstorms moved across northern Lower Michigan producing hail up to 2" in diameter in Manistee County and destroying an estimated 30,000-35,000 bushels of apples at area farms, and damaging several homes and vehicles.

Location

Hailstorms are regional events that frequently accompany thunderstorms, and are not confined to geographic boundaries. The severity of hailstorms may range across the affected areas. All of Missaukee County is at risk from the occurrence and impacts from hailstorms. According to the National Weather Service, Missaukee County is in an area of the United States that has on average two days of hailstorm events per year.

Extent

Hailstorms are categorized using the TORRO Hailstorm Intensity Scale, which ranges from H0 (Hard Hail) to H10 (Super Hailstorms) (Table 24). According to the NOAA National Centers for Environmental Information, the approximate size of hail is described below. If a thunderstorm produces hail that is 1 inch in diameter (quarter size) or larger, it is considered to be a severe thunderstorm.

Table 24: NOAA Hail Size Description

Appearance	Approximate Size in Inches
Pea	0.25-0.5 inch
Penny	0.75 inch
Nickel	0.88 inch
Quarter	1.00 inch
Walnut/Ping Pong	1.50 inch
Golf Ball	1.75 inch
Hen Egg	2.00 inch
Tennis Ball	2.50 inch
Baseball	2.75 inch
Tea Cup	3.00 inch
Grapefruit	4.00 inch
Softball	4.50 inch

The greatest size of hail reported in Missaukee County has been 1.75 inches. According to the scale, hailstones of this size are slightly larger than a golf ball.

Previous Occurrences

Since 1984, Missaukee County had 32 hailstorms reported to NOAA (Table 25). There are no reported property damages; there is one instance of reported crop damages, and no injuries or deaths attributed to hail. \$500,000 of crop damages was reported during one particularly strong event on July 25, 1994, hail damage was significant within Missaukee County. Hail during this event was recorded at 1.75 inches. Hail of this magnitude was reported during three subsequent events, the first was August 28, 1984, the second on October 2, 2006, and the third was August 2, 2015. There were no reported damages during these events.

Table 25: Hail Events, 1984-2022

Missaukee Co.	8/28/1984	1.75
Lake City	4/24/1993	0.75
Moorestown	4/24/1993	1
Stittsville	8/3/1993	0.75
Vogel Center	7/25/1994	1.75
Missaukee Co.	4/18/1995	1.5
E MISSAUKEE COUNTY	5/18/1996	0.75
LUCAS	6/10/1996	0.88
LAKE CITY	5/12/2000	0.75
MC BAIN	6/8/2003	0.75
FALMOUTH	7/13/2003	1
MC BAIN	8/3/2003	1
LAKE CITY	7/13/2004	1
LAKE CITY	6/27/2006	0.75
MERRITT	6/28/2006	0.75
MERRITT	10/2/2006	0.75
MC BAIN	10/2/2006	1.75
MC BAIN	10/18/2007	1
STITTSVILLE	6/15/2008	0.88
MOORESTOWN	6/15/2008	0.75
MISSAUKEE PARK	7/16/2008	0.75
PIONEER	5/12/2011	0.88
MOORESTOWN	5/8/2014	0.75
MOORESTOWN	8/2/2015	1
Moorestown	8/2/2015	1.75
MOREY	10/15/2015	1
LAKE CITY	7/8/2016	1
MC BAIN	2/24/2017	1.5
LUCAS	2/24/2017	0.75
MC BAIN	2/24/2017	0.88
MISSAUKEE PARK	5/26/2018	1
Moorestown	5/11/2022	1

Source: NOAA: National Centers for Environmental Information

The July 25, 1994 event narrative is as follows:

Major crop damage occurred on a 5,000 acre area south and west of Vogel Center along the southern edge of the county. Hail size ranged from 1.25 to 1.75 inches. The entire episode was over in about seven minutes. Department of Agriculture specialists estimated the total damage at \$200,000.

Probability of Future Events and Vulnerability Assessment

With 32 events reported in the past 39 years, Missaukee County has an 82% chance of a major hailstorm every year. All existing and future buildings, exposed infrastructure, and populations are at risk from hailstorms since hail causes damage to roofs, brick walls, glass, landscaping, crops, and cars. Manufactured homes and campground populations located throughout the county and are more susceptible to hail damage. Hail can also damage roads, sidewalks, bridges, and above ground utilities. Hail has the potential to cause injury and death, and populations are advised to take shelter when an event occurs.

Riverine and Urban Flooding

Fluvial, or Riverine flooding occurs when rivers, streams, and lakes overflow into adjacent floodplains due to prolonged, intense rainfall, rapid snowmelt or ice jams. Flooding can damage or destroy property, disable utilities, destroy crops and agricultural lands, make roads and bridges impassable, and cause public health and safety concerns. Floods occur in the early spring, but also occur in the winter due to ice jams, and during the summer or fall from severe thunderstorms. Flooding caused by severe thunderstorms has a greater impact on watercourses with smaller drainage areas.

Pluvial, or Urban flooding occurs when water flows into low-lying areas because it does not have a place to go, due to impervious surface coverage. This flooding occurs from a combination of excessive rainfall, snowmelt, saturated ground, and inadequate drainage, and is becoming more common in Michigan. Since development is occurring in floodplains, the natural landscape is unable to properly disperse the water. Urban flooding also has the potential to overflow onto docks or other structures with electricity running to them, which increases the risk for an electric shock drowning. Additionally, storm and sanitary sewers are unable to handle the water flows associated with storm events, which can result in sewer overflows and affect the water quality of nearby lakes and rivers, as well as structures with basements or shallow groundwater tables.

Dam failure is also a potential source of flooding. Infrastructure in the state is aging and costly to maintain. FEMA provides Federal Guidelines for Dam Safety. These guidelines encourage strict safety standards in the practices and procedures employed by federal agencies or required of dam owners regulated by the federal agencies (2004). The National Inventory of Dams provides a catalogue of dams in the nation with a profile of each. Each profile lists the Hazard Potential Classification. This is a system that categorizes dams according to the degree of adverse incremental consequences of a failure or misoperation of a dam. The hazard potential classification does not reflect in any way on the current condition of the dam.

According to the Michigan Dam Inventory, of the 17 dams located in Missaukee County, only one of them is indicated as having a “significant” hazard potential – the Reedsburg Dam in Enterprise Township, near the eastern central border of the county.

According to the 2019 Michigan Hazard Analysis, the most damaging hazard in Michigan, based upon estimated physical damages and known response/recovery costs, appears to be floods. The MSP reports that flooding events have a statewide expected annual loss estimated at more than \$100 million (\$25.69 million had previously been estimated in the 2014 Michigan Hazard Mitigation Plan, but Federal Disaster 4195 confirmed a higher magnitude more in line with earlier MDEQ estimates, as that Metro Detroit flood event was quite similar to Federal Disaster 1346 during the previous decade). MSP’s 2019 Michigan Hazard Analysis indicates that the Northern Lower Peninsula averages 0.3 annual flooding events, with average annual property and crop damages of \$2,591,244 due to flooding.

Location

Missaukee County is likely to be impacted by both fluvial and pluvial flooding. Fluvial flooding may be due in part to Lake Missaukee and other smaller lakes, in addition to the Muskegon River, the Manistee River, and the Clam River (a tributary of the Muskegon River) traversing the county. The Muskegon River and much of its tributaries are located in the east-central and south-central portions of the county. The Manistee River starts in Antrim County to the northwest, travels through Otsego County, Crawford County, Kalkaska County, Missaukee County, Wexford County, and enters Manistee County. Northwest Missaukee County is likely to experience riverine flooding from the Manistee River and its tributaries. Riverine flooding has occurred when spring snowmelt coincides with prolonged, intense rains.

Pluvial flooding may occur from excessive rainfall in developed areas in southwest portions of the county near the City of Lake City, Caldwell Township, Lake Township, and Richland Township. Other flooding may involve low-lying areas that collect runoff waters; flaws or shortcomings in existing sewer infrastructure; undersized or poorly designed storm water control practices; collective effects of land use and development trends; illegal diversion of water, or actions that interfere with system function.

According to the National Inventory of Dams, Missaukee County has five major dams listed including: Cannon Creek Dam #1 and #2, Falmouth Dam, Horseshoe Lake Dam, and Reedsburg Dam (Table 26). All except the Reedsburg Dam, located in Enterprise Township, have a Hazard Potential Classification of “Low”. Low hazard potential dams are not required to have an Emergency Action Plan (EAP) on file with the State of MI/ Missaukee County Emergency Management. Additionally, there is no expected loss of human life or impact to lifeline interests if the dam were to fail, and economic losses and environmental damages would be low and generally limited to that of the dam owner.

The Reedsburg Dam is listed as having a “Significant” hazard potential classification. This means that if the dam were to fail, there would be economic losses, environmental damages, and impacts to lifeline interests, but no expected loss of human life. The owner/operator of the Reedsburg Dam is the MDNR – Wildlife Division. According to the Michigan Dam Inventory, it was last

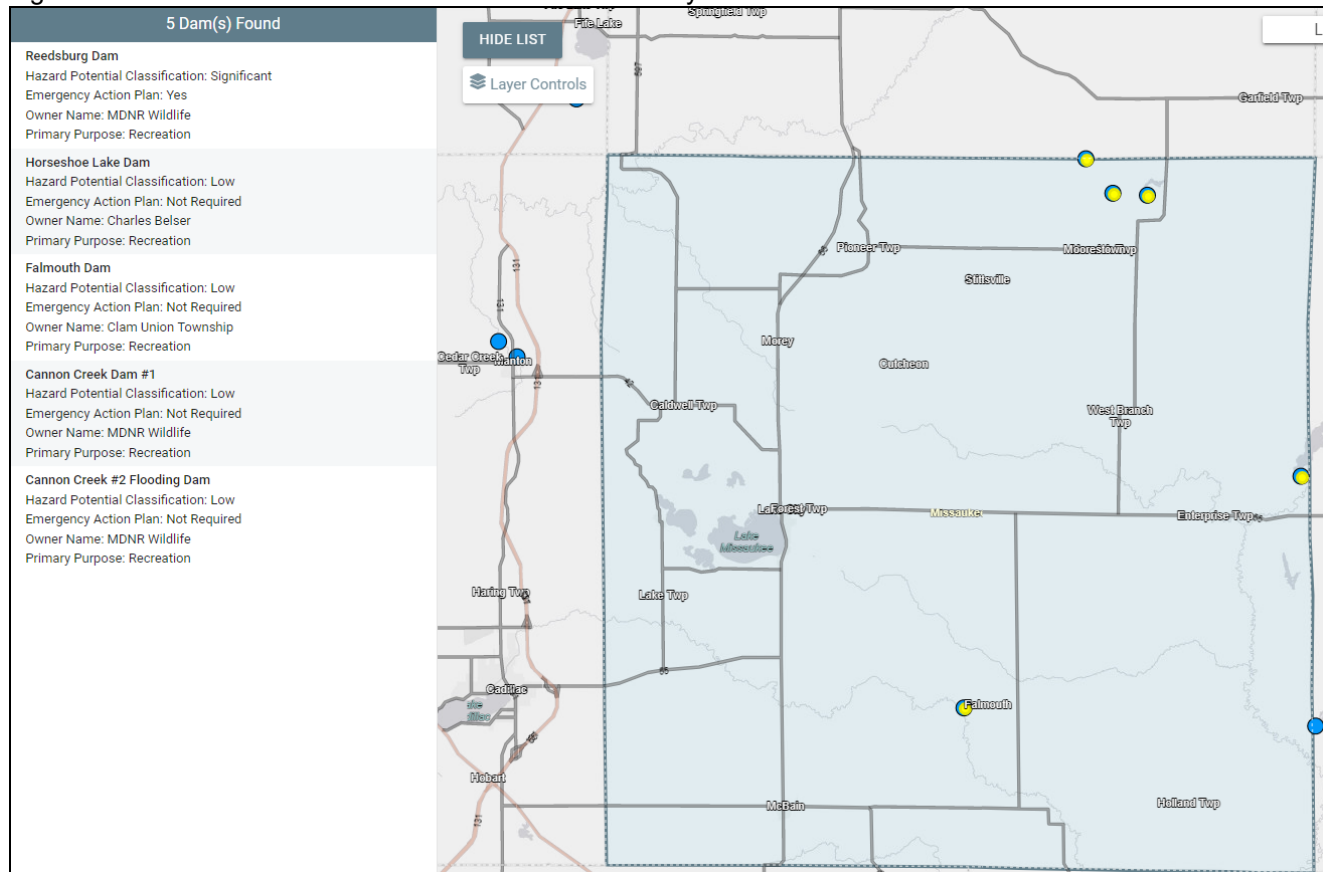
inspected June 20, 2017, receiving a “Satisfactory” condition rating, and is due for inspection again by December 30, 2023. It is listed as having an Emergency Action Plan on file as of December 10, 2009. According to MDNR staff, the Reedsburg Dam was rebuilt in 2021.

Table 26: Regulated Dams in Missaukee County

Name	Cannon Creek Dam #1	Cannon Creek Dam #2	Falmouth Dam	Horseshoe Lake Dam	Reedsburg Dam
Height (Ft)	9.2	6.5	15	16	15.5
Storage (Acre Ft)	860	70	275	290	3,450
Water Body	Big Cannon Creek	Big Cannon Creek	Clam River	Big Cannon Creek	Muskegon River
Location	Norwich Township	Norwich Township	Clam Union Township	Norwich Township	Enterprise Township
Owner	MDNR	MDNR	Clam Union Township	Charles Belser	MDNR
Year Completed	1953	1964	1930	1940	1941
Hazard Potential	Low	Low	Low	Low	Significant
Last Inspected	7/10/2013	12/14/2014	8/5/2019	11/23/2021	6/20/2017
Condition Assessment	Fair	Removed	Satisfactory	Fair	Satisfactory
Next Inspection Due	12/30/2021	N/A	12/30/2024	12/30/2026	12/30/2023
EAP Required?	No	No	No	No	Yes

Source: National Inventory of Dams; EGLE Michigan Dam Inventory

Figure 10: Locations of Public Dams in Missaukee County



Source: National Inventory of Dams

Extent

Flood extent can be measured by the amount of property damage and accumulation of rainfall. In total, flood and flash flood events have caused \$160,000 in property damages, no crop damages, and no deaths or injuries. Since 1950, the average annual precipitation is 31.14 inches. September is historically the wettest month with an average of 3.37 inches.

Previous Occurrences

Two flood events have occurred since 1996 in addition to the Presidential Declared Major Disaster and Governor Declared Disaster in June/July 2008 and the Governor Declared Disaster on May 7, 2014 (Table 27).

The first occurrence occurred on May 9, 2004. The event narrative is as follows: *A warm front was moving slowly north into Lower Michigan. Thunderstorms developed repeatedly north of the warm front, dropping up to 2 inches of rain in less than an hour in spots. Isolated flooding and flash flooding resulted, with more widespread flooding in southern Gladwin County. The intersections of Falmouth and Thirteen Mile Roads, and Prosper and Eight Mile Roads, were inundated.*

The second occurrence on June 13, 2008, a Presidential Declared Major Disaster and Governor Declared Disaster, caused the most damage of the reported flood events with \$150,000 in property damages. This event caused the 2nd highest amount in property damages of any event in Missaukee County. The amount of damages is tied with the heavy snow event on March 2, 2012. The single event that caused the most amount of property damages is the tornado that occurred on September 3, 1964 that caused \$250,000 in property damages. The flood event narrative is as follows: *A large area of thunderstorms developed over Lake Michigan late in the evening on the 12th, as very moist air surged into the region. These storms were severe as they moved onshore, producing damaging winds, large hail, and a brief tornado. However, the biggest impact was from excessive rainfall, which produced unusually severe flooding in West Central Lower Michigan. The Governor of Michigan declared a state of emergency for Manistee and Wexford Counties, along with other counties downstate. Three to six inches of rain fell in southwest and central Missaukee County, in the very early morning hours of the 13th. This resulted in flash flooding, with several roads washing out.*

The third occurrence occurred on July 25, 2012 and caused \$10,000 in property damages. The event narrative is as follows: *Thunderstorms developed ahead of low pressure in Wisconsin. Some storms became severe, producing large hail, damaging winds, and heavy rain. Flooding occurred near the M-66 corridor in western Missaukee County. Rain fall amounts of 2 to 3 inches in just two hours were common in these areas. Roads were closed near Dickerson and Stoney Corners west of McBain, and at M-66 and Kalkaska Street in Lake City.*

The fourth occurrence occurred on May 7, 2014, and was a Governor Declared Disaster, but was not an event recorded in the NOAA Storm Events Database.

Table 27: Fluvial and Pluvial Flood Events

Location	Event Type	Property Damage	Crop Damage	Event Year(s)
Countywide/Region	Flash Flood	\$ 160,000	-	2004, 2008*, 2012
Countywide/Region	Flooding		-	2014**
TOTAL		\$ 160,000		

Source: NOAA: National Centers for Environmental Information

* June/July 2008 Presidential declared disaster and Governor declared emergency

** May 7, 2014 Governor declared emergency

Probability of Future Events and Vulnerability Assessment

Between 1996 and 2021, Missaukee County has had four major flooding events. The annual probability that a major flood event will occur in the future is 15%. Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption 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 collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

The seasonal nature of flooding will continue to occur. Years with exceptional snowfall levels will likely result in flooding events from snowmelt. Lake Michigan water temperatures will create more active storm systems and heavier rainfalls. Lake Michigan water levels will also increase flooding events inland as the water table rises. Furthermore, increased development, reduction in

green space, and subsequent soil erosion cause sedimentation to accumulate in river and lake beds reduce the amount of water flow. Rivers and lakes with sedimentation buildup will experience water backups and flooding events unless mitigated. Due to major rivers and lakes that flow throughout the county, every city and township has a likelihood of flooding.

Specific flood hazard area concerns were identified during public input meetings and are labeled on the Hazard Areas Map provided in Appendix A.

Public input provided during plan development included a concern for the aging Falmouth Dam in Clam Union Township. It was expressed that this dam may require extensive repair and/or maintenance at some point in the future, and may contain sediment that harbors contaminants accumulated from previous industrial activities around the dam. The Falmouth Dam was last inspected in 2019 and was given a “satisfactory” rating, indicating that it “meets applicable hydrologic and seismic regulatory criteria”.

The Falmouth Dam is due for its next inspection before the end of 2024. While an EAP is not required for this dam and it has a “low” hazard rating, it is recommended that the County Emergency Management Coordinator maintain communication with the State of Michigan and the dam owner regarding the condition of the dam upon the next State-required inspection.

Additionally, the City of Lake City has expressed interest in removing the Lake Missaukee Water Control Structure, which is considered a dam. The technology used when it was built over 50 years ago is now obsolete and prevents sufficient streamflow to the Mosquito Creek, located east of M-66. The diameter of the outflow pipe is only 36 inches and does not effectively manage the Missaukee Lake water levels, resulting in high lake water levels, sand deposits on one side of the pier and erosion on the other. This future potential infrastructure project would also likely incorporate the reconstruction of M-66 by MDOT and remediating storm sewers that currently flow directly into Lake Missaukee. The City is also collaborating with professional engineers to evaluate alternative instruments for removing the lake level control structure.

NFIP Participation Status

Currently no part of Missaukee County falls within a federally-identified flood plain, and therefore does not participate in the National Flood Insurance Program (NFIP). In light of the changing flood potential in surrounding counties and Missaukee County, the City of Lake City, Caldwell Township, Lake Township, and Reeder Township are collaborating with FEMA, EGLE, and Missaukee County on developing a new FEMA floodplain study for properties around Lake Missaukee (expected completion in 2024 or 2025.)

FEMA defines a “repetitive loss property” as any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period since 1978 (the year at which consistent claims data collection began). County officials have not identified any property(ies) that are defined by the National Flood Insurance Program as having suffered repetitive flood losses. FEMA officials were contacted in July 2022, with a request to provide documentation of NFIP data. The documentation was not provided prior to the completion of this plan.

Any other floodplains in the county are regulated by the Michigan Department of Environment, Great Lakes, and Energy under the Floodplain Regulatory Authority, found in Part 31, Water Resources Protection of the Natural Resources and Environmental Protection Act (Part 31). This states that any filling, grading, or constructing within a 100 year floodplain requires a permit from EGLE before initiation of the work. Furthermore, floodplains are regulated at the local level through State Building Codes, which are enforced by the local building department. State building code requirements are more restrictive than FEMA’s through the NFIP. Therefore, Missaukee County meets the eligibility requirements for NFIP by virtue of compliance with state building codes. Soil Erosion and Sedimentation Control (PA 451 Part 91) Permits that are issued through the Conservation District for proposed construction that will take place within 500 feet of a water body or for the disturbance of one or more acre of land regardless of distance from water source (if more than one acre of land will be disturbed) offer significant, additional protections of water resources.

Lightning

Lightning is a random and unpredictable discharge of electricity in the atmosphere between the clouds, air, or ground to equalize the charged regions in the atmosphere. It is still being debated how the electrical charges build up in the clouds. Lightning generally occurs during thunderstorms; however, it can occur without a thunderstorm, such as during intense forest fires and heavy snowstorms. Lightning that occurs without nearby rain is most likely to cause forest fires.

Location

Lightning is not confined to geographic boundaries and is a regional event. Since lightning occurs randomly, it is impossible to predict where lightning will occur and how severe it will be. All of Missaukee County is at risk from the occurrence and impacts from lightning.

Extent

Three lightning events have been reported to NOAA for Missaukee County. In total, lightning has caused two injuries and \$1,000 in property damages.

Previous Occurrences

There have been three lightning events reported to NOAA for Missaukee County since 1996 (Table 28). The first event on September 1, 2000 resulted in no harm to human life or property.

The second event occurred on July 17, 2003 and has two injuries associated with it. In this event: *Two men were walking along a puddled trail in Bloomfield Township when lightning struck in the immediate vicinity. The two were knocked to the ground, and were treated at the scene by an EMS crew for cuts and scrapes.*

The third event occurred on July 24, 2005 \$1,000 in property damages associated with it. In this event: *A band of showers and thunderstorms moved across northern Lower Michigan during the early morning hours. These storms brought isolated severe weather and very heavy rainfall to the region. In many places the rain was welcome, as the first half of July had been quite dry. However, excessive rain occurred in Manistee. Lightning struck a utility pole outside of a residence, blasting a crossbeam to the ground. Part of the surge entered the home, destroying a television.*

Table 28: Lightning Events

Location	Date	Deaths	Injuries	Property Damage
Countywide/Region	9/1/2000			
Countywide/Region	7/17/2003		2	
Countywide/Region	7/24/2005			\$ 1,000
TOTAL		0	2	\$ 1,000

Source: NOAA: National Centers for Environmental Information

Probability of Future Events and Vulnerability Assessment

Since there have been three lightning events reported in the last 27 years, this indicates an 11% chance an impactful lightning event would occur every year. However, not all lightning events been reported to NOAA, since events with injuries, deaths, and extensive damages/disruptions tend to be the only ones reported. Therefore, the number of lightning events and damages may be higher.

All existing and future buildings, exposed infrastructure, and populations are at risk from lightning events since it may cause structural and wildland fires, loss of electrical and telecommunications equipment, and damage to buildings or vehicles from falling trees struck by lightning. People that work outside or participate in outdoor recreation activities are at a higher risk to be struck by lightning. Mobile home parks, campgrounds, and outdoor annual events such as the Greatest 4th in the North and the Missaukee Agriculture Youth Show that draw a large number of visitors to outdoor recreation areas were identified as specific areas of concern. Cities and townships that host major events and see a large increase in summer population are City of Lake City, City of McBain, Lake Township, Caldwell Township, Forest Township, Reeder Township, Richland Township, Riverside Township, and Clam Union Township.

Tornado

Tornadoes are rapidly rotating columns of air that impact the ground after forming from some of the severe thunderstorms that occur during Michigan's warm months. Tornadoes can cause catastrophic damage to either a limited or an extensive area. A tornado can have winds exceeding 200 miles per hour and can have widths over one mile. These storms are the most violent of the atmospheric storms since they have the potential to destroy buildings, uproot trees, hurl objects, and cause loss of life.

According to the National Oceanic and Atmospheric Administration/National Weather Service's Storm Prediction Center, tornadoes cause approximately 60 deaths and hundreds of millions of dollars in property damage each year. The Michigan State Police's *2019 Michigan Hazards Analysis*, Michigan is located on the northern fringe of the nation's tornado belt, and since 1996 has averaged about 18 tornadoes per year. The longer term annual average (since 1950) is 8 injuries and one death per year, and over \$17 million in property damages statewide.

Between 1996 and 2017, Michigan has had 382 reported tornado events. Approximately 67% of all Michigan tornadoes have been weak tornadoes (EF0 or EF1 intensity), while 29% have been strong tornadoes (EF2 or EF3 intensity) and 4% have been classified as violent tornadoes (EF4 or EF5 intensity). However, those few violent tornadoes have been responsible for 88% of Michigan's tornado-related deaths. Strong tornadoes (EF2 or EF3 intensity) have accounted for approximately 11% of the deaths, while weak tornadoes (EF0 or EF1 intensity) have caused only 1% of all tornado-related deaths.

In Michigan, Tornadoes are most likely to occur in the summer months, although some have occurred in the spring and fall.

Location

Tornadoes are a regional event that are not confined to geographic boundaries and can affect several areas at one time. Also, the magnitude of tornadoes may range across the affected areas. All of Missaukee County is at risk from the occurrence and impacts from tornadoes. It is impossible to predict where and with what magnitude a tornado will touch down.

Extent

The Fujita Scale (Table 29) categorizes tornado severity based on observed damage. The six-step scale ranges from F0 (light damage) to F5 (incredible damage). As of February 2007, the National Weather Service uses the Enhanced Fujita Scale (EF Scale). This new scale ranges from EF0 to EF5. Based on the Fujita Scale, Missaukee County's most damaging tornado occurred on September 3, 1964 and was measured to be an EF2 with winds ranging from 110-137 mph.

Table 29: Fujita and Enhanced Fujita Scale Comparison

Fujita Scale (Old)		EF Scale (Current)	
Fujita Scale	3-Second Gust Speed (mph)	EF Scale	3-Second Gust Speed (mph)
F0	45-78	EF0	65-85
F1	79-117	EF1	86-109
F2	118-161	EF2	110-137
F3	162-209	EF3	138-167
F4	210-261	EF4	168-199
F5	262-317	EF5	200-234

Source: FEMA

Previous Occurrences

Between 1950 and 2022, Missaukee County has had seven (7) reported tornadoes touched down, causing \$262,750 in property damage (Table 30). The most destructive tornado occurred in 1964; it was a category EF2, causing no deaths or injuries, and \$250,000 in property damage. This event had the most property damages associated with any single event in Missaukee County. The remaining six tornadoes were category EF-0 or EF-1 tornadoes.

Table 30: Tornado Events, 1950-2022

Date	Location	Trajectory	Magnitude	Deaths	Injuries	Property Damages
8/20/1955	West Branch Twp. (close to the border with Norwich Twp.), Norwich Twp.	SW to NE	F0	0	0	\$ 2,500.00
9/3/1964	City of Lake City, Reeder Twp.	NW to SE	F2	0	0	\$ 250,000.00
7/7/1980	Richland Twp.	NW to SE	F0	0	0	\$ 0.00
7/21/1983	Lake Twp., Reeder Twp., Clam Union Twp.	NW to SE	F1	0	0	\$ 250.00
6/17/1994	Caldwell Twp.	NW to SE	F0	0	0	\$ 5,000.00
7/17/1994	Butterfield Twp.	SE to NE	F0	0	0	\$ 5,000.00
5/31/1998	Reeder Twp.	NW to SE	F0	1	1	\$ 0.00
TOTAL						\$ 262,750.00

Source: NOAA: National Centers for Environmental Information

Probability of Future Events and Vulnerability Assessment

Since there have been seven tornadoes events reported in the last 72 years, the data shows that there is a 9.9% chance a tornado would occur every year. While the chance for a tornado is low, if an event occurs, there is potential for a high magnitude tornado to touch down. Many of the reported historic events have caused property damage.

There is an operational, manual tornado/severe weather siren in the City of McBain.

Similar to thunderstorms and severe wind events, populations without access to permanent, sturdy shelter are most vulnerable to tornado events. This includes mobile home parks, campgrounds, recreation areas, and large outdoor gatherings. Cities and townships that host major events and see a large increase in summer population are City of Lake City, City of McBain, Lake Township, Caldwell Township, Forest Township, Reeder Township, Richland Township, Riverside Township, and Clam Union Township. Appendix A provides maps of the vulnerable populations in Missaukee County.

Persons with a disability or elderly persons are also more vulnerable. Tornadoes can occur suddenly with very little warning, and it may be difficult for these populations to find adequate shelter in time.

While past tornado events have occurred in the townships of West Branch, Norwich, Reeder, Lake, Clam Union, Caldwell and Butterfield, as well as the City of Lake City, all communities in Missaukee County are at risk from damage by tornadoes. It is impossible to predict where and with what magnitude a tornado will touch down.

Extreme Temperatures

Prolonged periods of very high or very low temperatures are often accompanied by other extreme meteorological conditions, such as high humidity, drought, heavy snowfall, or high winds. Extreme heat or extreme cold primarily affect the most vulnerable segments of the population, such as the elderly, children, impoverished individuals, and people in poor health.

Nationwide, there have been approximately 175 deaths per year that are attributable to extreme heat according to the 2019 Michigan Hazard Analysis. The threats from extreme heat are heatstroke, sunstroke, muscle cramps, heat exhaustion, and fatigue. It is hazardous to livestock and agricultural crops, causes water shortages, exacerbates fire hazards, exacerbates respiratory problems, prompts excessive electrical energy demands, and causes infrastructure failures. Urban areas experience the most serious extreme heat with the combined high temperatures and high humidity that produce a heat-island effect.

According to the 2019 Michigan Hazard Mitigation Plan, Michigan has 11 average annual extreme heat events with 0.4 average annual deaths and 41 average annual injuries.

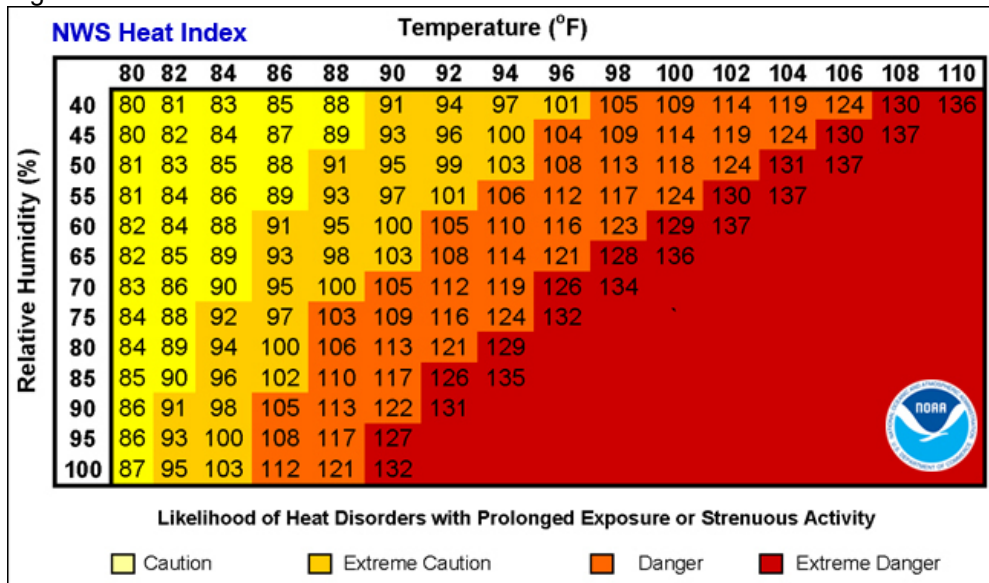
In the United States, approximately 700 people die each year as a result of severe cold temperature-related causes according to the 2019 Michigan Hazard Analysis, with a significant number of deaths occurring due to illnesses or disease that are negatively impacted by severe cold weather, such as stroke, heart disease, and pneumonia. Exposure to extreme cold temperatures can be life threatening and can cause hypothermia and frostbite. According to the 2019 Michigan Hazard Mitigation Plan, Michigan has 35 average annual extreme cold events with 1 death, 9.4 average annual injuries, and \$6.4 million in average annual property and crop damage. Extreme cold affects transportation modes and power utilities, resulting in dead vehicle batteries and loss of power/heat.

Location and Extent

Extreme temperatures are a regional event that are not confined to geographic boundaries and range in severity across the affected areas. All of Missaukee County is at risk from the occurrence and impacts from extreme temperatures.

Extreme heat is measured with the National Weather Service's Heat Index Chart (Figure 11). The chart uses relative humidity and air temperature to determine the likelihood of heat disorders with prolonged exposure or strenuous activity. Individuals are unable to shed excess heat from their bodies when they experience prolonged exposure to hot temperatures, which results in heat disorders.

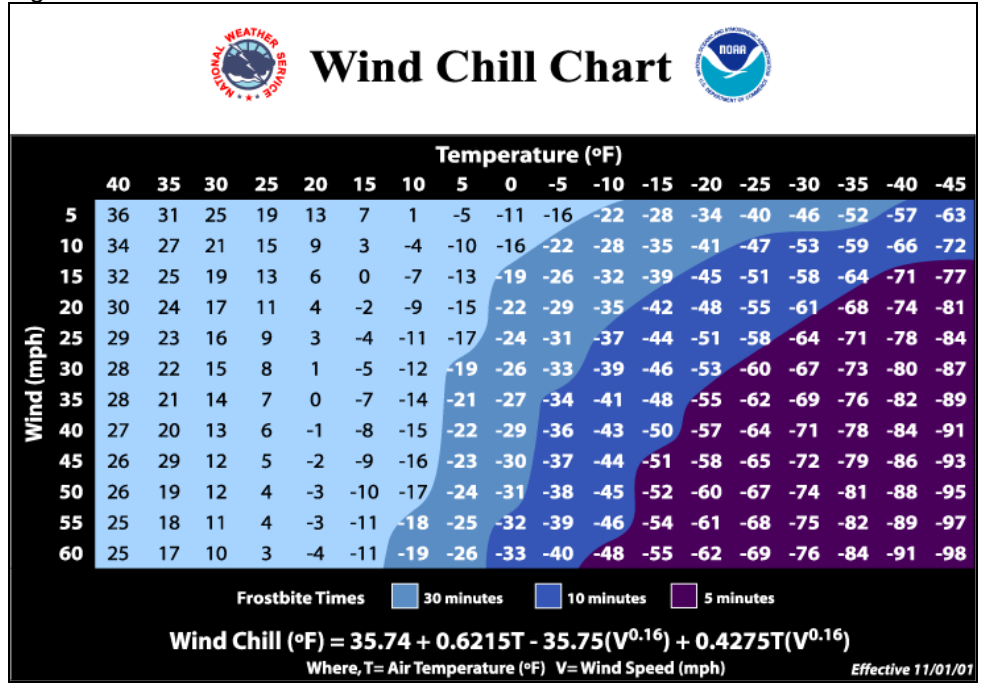
Figure 11: National Weather Service Heat Index



Source: National Weather Service

Extreme cold is measured with the wind chill index, which is a measure of the rate of heat loss from exposed skin caused by the combined effects of wind and cold. As the wind increases, heat is carried away from the body and reduces the external and internal body temperatures. Figure 12 shows the NOAA Wind Chill Chart as it corresponds to various temperatures and wind speeds.

Figure 12: National Weather Service Wind Chill Chart

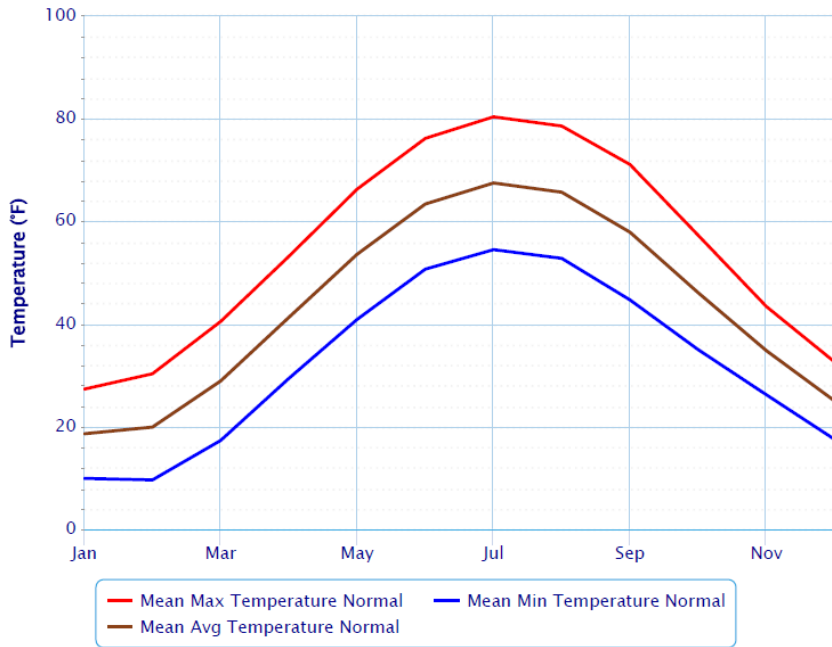


Source: National Weather Service

Figure 13 illustrates the average expected minimum, maximum, and average temperatures by month for Lake City in Missaukee County (based on the latest 30-year climatological data period, from 1991-2020). The highest mean maximum temperature occurs in July, at 80.4 degrees. The coldest mean minimum temperature occurs in February, at 9.6 degrees.

Monthly Climate Normals (1991–2020) – LAKE CITY EXP FARM, MI

Click and drag to zoom to a shorter time interval



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Month	Mean Max Temperature Normal (°F)	Mean Min Temperature Normal (°F)	Mean Avg Temperature Normal (°F)
January	27.3	9.9	18.6
February	30.3	9.6	19.9
March	40.5	17.3	28.9
April	53.2	29.4	41.3
May	66.3	40.9	53.6
June	76.2	50.7	63.4
July	80.4	54.5	67.5
August	78.6	52.8	65.7
September	71.1	44.7	57.9
October	57.3	35.0	46.1
November	43.4	26.2	34.8
December	32.6	17.5	25.0
Annual	54.8	32.4	43.6

Source: NOAA Climate Data Online

Previous Occurrences

There have been two reported events of extreme heat and four reported events of extreme cold/wind chill (Table 31). One of the extreme cold events was also a Governor Declared Disaster on January 29, 2019. No direct harm has occurred to human life and no damages to property or crops have been reported.

Table 31: Extreme Heat and Cold Related Events

LOCATION	DATE	EVENT	DEATHS	INJURIES	PROPERTY DAMAGES	CROP DAMAGES
MISSAUKEE (ZONE)	8/1/2001	Heat	0	0	0	0
MISSAUKEE (ZONE)	6/30/2018	Excessive Heat	0	0	0	0
MISSAUKEE (ZONE)	2/4/2007	Extreme Cold/Wind Chill	0	0	0	0
MISSAUKEE (ZONE)	1/6/2014	Extreme Cold/Wind Chill	0	0	0	0
MISSAUKEE (ZONE)	2/19/2015	Extreme Cold/Wind Chill	0	0	0	0
MISSAUKEE (ZONE)	1/30/2019	Extreme Cold/Wind Chill	0	0	0	0
TOTAL			0	0	\$0.00	\$0.00

Sources: NOAA: National Centers for Environmental Information; MSP 2019 Michigan Hazard Mitigation Plan

The Governor Declared Disaster on January 29, 2019 event narrative is as follows: *Another blast of arctic air impacted northern Michigan, behind a departing area of low pressure. Lake effect snow, gusty winds, blowing and drifting snow, and very low wind chills, combined to produce an abundance of winter weather hazards in northern Michigan. Wind chills bottomed out at 25 to 35 below zero in most of northern Michigan. Snowfall amounts of 5 to 7 inches were reported from Good Hart, Brethren, Boyne City, and Indian River.*

Probability of Future Events and Vulnerability Assessment

There is an 8.3% chance an extreme heat event would occur every year. Similarly, there is an 18.2% chance an extreme cold event would occur every year.

Extreme heat and cold events are more likely to impact unsheltered populations. The county’s homeless population is especially vulnerable. Seasonal emergency shelters are essential services for the community. The *Northwest Lower Michigan Coastal Resilience Atlas* written by the Land Information Access Association completed a Heat Vulnerability Assessment⁶ of coastal communities. A community’s vulnerability is their exposure to the hazard (determined by tree canopy and impervious surface coverage) + their sensitivity. Sensitivity is determined by the following factors:

- Persons > 65 years
- Persons living alone
- Minority (non-white) persons
- Persons living below the poverty threshold
- People > age 25 with less than a high school education
- Disability status (i.e., ambulatory difficulty, mental disability)

As mentioned before, townships located in northern and eastern portions of the county are sparsely populated, but older and also remote from major services in the southwest portion of the county. Holland Township, West Branch Township, and Butterfield Township are also some of the oldest (Holland Township is the oldest) communities in Missaukee County. Elderly residents are the most likely persons to have a disability, and therefore, are the most vulnerable to extreme temperature events.

⁶ Land Information Access Association. (2019). *Northwest Lower Michigan Coastal Resilience Atlas*. http://www.resilientmichigan.org/nw_atlas.asp

Drought

Drought is a normal part of the climate cycle. It is a slow-moving hazard, which causes people to underestimate the damage it can do, but losses from drought are as substantial as those from hurricanes, tornadoes and other faster-moving disasters. Drought causes losses to agriculture; affects domestic water supply, energy production, public health, and wildlife; and contributes to wildfire, to name a few of its effects.

Location

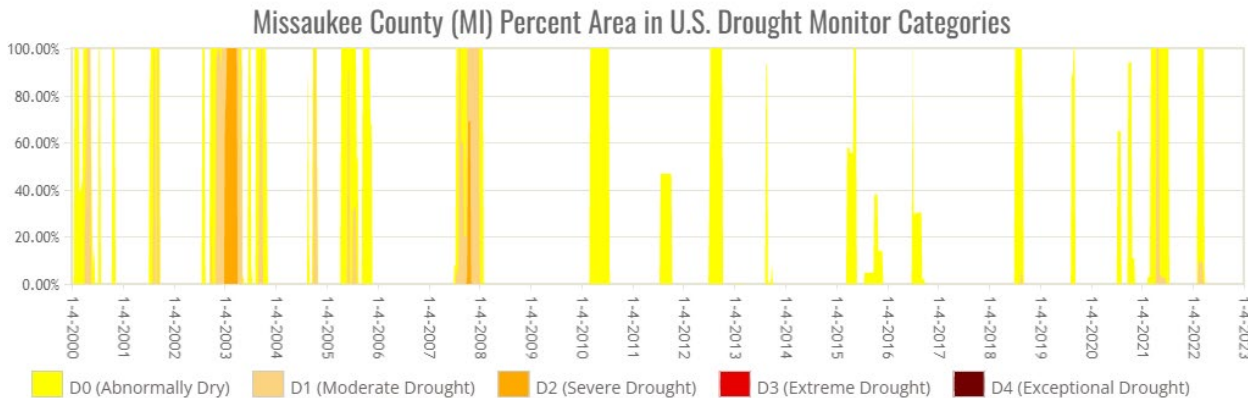
Drought is a regional event that is not confined to geographic boundaries and range in severity across the affected areas. All of Missaukee County is at risk from the occurrence and impacts from drought.

Extent

The Palmer Drought Severity Index (PDSI) uses readily available temperature and precipitation data to estimate relative dryness. It is a standardized index that generally spans -10 (dry) to +10 (wet). Maps of operational agencies like NOAA typically show a range of -4 to +4, but more extreme values are possible. The PDSI has been reasonably successful at quantifying long-term drought.

The U.S. Drought Monitor combines several input sources including the PDSI and the Standardized Precipitation Index to prepare a weekly map showing parts of the U.S. that are in drought. The map uses five classifications: abnormally dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought: moderate (D1), severe (D2), extreme (D3) and exceptional (D4) (Figures 14 & 15).

Figure 14: Missaukee County Historical Drought Levels



Source: US Drought Monitor

Figure 15: U.S. Drought Categories and Historically Observed Impacts

Michigan

Category	Historically observed impacts
D0	Grass fires increase
	Lawns are brown; landscape and gardens are watered more frequently
D1	Most crops and vegetation are stressed; farmed Christmas trees are stressed
	Well levels decline
D2	Corn and soybean yields are low
	Mature trees are stressed
	Streamflow is extremely low, potentially too low to irrigate

Source: US Drought Monitor

Previous Occurrences

There have been two recorded incidents of drought in Missaukee County. The first occurred in March 1977; there was a Presidential Declared Emergency for drought problems plaguing counties in the Upper Peninsula and Northern Lower Peninsula, which included Missaukee County. This event was part of the 1976-77 drought in the Great Plains, Upper Midwest, and West of the United State. At a statewide level, the drought lasted for 11 consecutive months, from September 1976 to July 1977, and reached a low point in January 1977, with a Palmer Index value of -5.29 (within the D4 exceptional drought classification) (2019 Michigan Hazard Analysis).

The second occurrence of drought occurred on August 1, 2001 and ended August 9, 2001. There were no deaths, injuries, property damages, or crop damages associated with this event. The episode narrative is as follows: *After a cool beginning, the last half of July 2001 was characterized by warmer than normal and drier than normal weather. Less than an inch of rainfall was recorded in some areas for the month of July. This lack of rain and warm conditions became serious during the first two weeks of August when little if any rain fell and temperatures jumped into the 90s. The stress on the crops was most noted in northern Michigan corn, but also hit hay crops to a lesser extent. As a result of the drought, the U.S.D.A. declared several counties disaster areas and granted farmers in counties where the crop losses were 30% or greater, special low interest loans.*

Probability of Future Events and Vulnerability Assessment

There is a 9.5% annual chance for a drought event in Missaukee County. In Northern Michigan's forested regions, drought can adversely impact timber production and some tourism and recreational enterprises. This can also cause a drop in income, which impacts other economic sectors. Additionally, drought directly increases the threat of wildfire. Eastern portions of Missaukee County are heavily forested and are therefore highly vulnerable to drought-related wildfire threats. The threat to water sources, including those dependent on well water should also be considered. Many county residents rely on ground water wells for drinking water. Even drought events in category D1 experience water well level decline. Drought events combined with excessive heat can have severe impacts on elderly and low income people. Lastly, D1, Moderate Drought events cause stress for crops and vegetation; farmed Christmas trees are stressed. The largest impact would be on the \$4,959,000 cultivated Christmas tree and short rotation woody crop agriculture product sales.

Wildfire

A wildfire is an unplanned, uncontrolled fire in grassland, brushland, or forested areas. Wildfires can occur in any forest or grassland type under dry conditions; however, some forest types are more susceptible to wildland fires. For example, jack and red pine forest stands have a high risk for wildfires, as they depend on fire to provide all the right conditions for regeneration, while aspen and white pine forest stands have a moderate risk. The primary cause of wildfires is from human activities, specifically burning outdoor debris. Wildfires cause destruction to property and timber resources, and injuries or loss of life to wildlife and persons living or recreating in wildfire prone areas. Long-term effects include scorched and barren land, soil erosion, landslides/mudflows, water sedimentation, and loss of recreational opportunities.

Approximately 55% (20.4 million acres) of Michigan's total land area is forest cover. The vast forests provide Michigan with the largest state-owned forest system in the United States. In addition, Michigan has the fifth largest quantity of timberland acreage, with 19.3 million acres (including hardwoods and softwoods). That vast forest cover is a boon for both industry and recreation, and these areas have been gradually increasing in recent years. However, it also means that many areas of Michigan are vulnerable to wildfires.

Michigan's fire season starts in early spring, when leaves and grasses remain dry from fall and winter and trees are not yet green. Wildfires are often accompanied by drought where dry conditions increase the potential to burn. Often a thunderstorm will roll through and lightning will strike causing sparking of dry leaves and dead wood. High winds can then spread wildfire. Wildfires can become unpredictable in windy conditions or when the wind changes direction suddenly. Cooler nighttime temperatures often help suppress wildfires and the potential for wildfire; however Michigan has had several major fire events.

According to MDNR and U.S. Forest Service records, between 1910 and 1949, over 5.8 million acres of forest were burned in Michigan, an average of 145,000 acres per year. By comparison, it was reported that between 1950 and 1996, the MDNR and U.S. Forest Service were involved in suppressing over 46,100 wildfires that burned 390,000 acres of forest, which averages only 8,300 acres burned per year. This drastic reduction in the acres of timber burned was largely the result of increased use of specialized equipment to suppress the fires, and intensified efforts toward fire prevention.

However, lightning strikes are not the primary cause of wildfires in Michigan. Recently, only about 4% of all wildfire in Michigan were caused by lightning strikes, and most other causes have been attributed to human activity. Outdoor debris burning is the leading cause of wildfires in Michigan. Most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from wildfires is the destruction of property, timber, wildlife, and injury or loss of life of persons who live in or are using recreational facilities in the area.

Location

All of the county's communities and developed areas are vulnerable to wildfires since the community centers and rural residential developments interface with the high risk forest types (e.g. Red Pine, Eastern White Pine, and Jack Pine). Approximately 166,722.48 acres or 40.96% of Missaukee County is forested. Collectively, pine forests areas make up 23,602.28 acres of forested land. As shown on the Environmental Features Map in Appendix A, pine forests are located countywide. Public lands are commonly forested and also located throughout the county.

Extent and Previous Occurrences

Extent can be measured by the number of acres burned and the cost of property damage. Between 1996 and 2017 there were no wildfires reported outside of MDNR lands in Missaukee County. Between 1981 and 2018 there were 406 reported fires on lands under MDNR jurisdiction. This resulted in 1,884.9 acres burned and 49.6 acres burned per year. No property damages were recorded.

Probability of Future Events and Vulnerability Assessment

There is a 100% chance there will be a wildfire on MDNR lands, and a small chance there will be a wildfire on lands outside of MDNR jurisdiction. Forest types (Red Pine, Eastern White Pine, and Jack Pine) and grasslands within Missaukee County are susceptible to wildfires. Wildfire prone areas were identified in Caldwell, Lake, Richland, Norwich, Enterprise, Butterfield, and Holland Townships. The largest areas of concern are in the Norwich Township in the northeast and Holland Township in the southeast. Christmas tree farms and public lands are more vulnerable to wildfires and have been identified on the Hazard Areas Map (Appendix A).

Additional factors that increase fire risk include dead or dying trees as a result of disease, invasive Phragmites, lightning strikes, and human factors such as the number of persons residing, camping, or traveling through the County. Historically, Michigan's landscape has been shaped by wildfire; however, over the last several decades, the current landscape has transformed from wildland to residential development. With the increase in residential development in and around rural areas prone to wildfires, there is an increase in the potential for loss of life and property damage. Unfortunately, rural areas do not have enough fire suppression forces available to protect every structure from wildfires. Residential development in rural Missaukee County is often isolated from town centers and emergency services. Those subdivisions that are located in rural areas near Jack Pine forests or sand dunes/grasslands are identified on the Vulnerable Populations and Hazard Areas Map in Appendix A.

Public Health Emergency (Infectious Disease)

Public health emergencies occur when there is a widespread and/or severe epidemic, contamination incident, bioterrorist attacks, or other situation that negatively impacts the health and welfare of the public. These emergencies include disease epidemics, large-scale food or water contamination incidents, extended periods without adequate water and sewer services, harmful exposure to chemical, radiological or biological agents, and large-scale infestations of disease-carrying insects or rodents. A common characteristic of public health emergencies is that they impact or have the potential to impact a large number of people either statewide, regionally, or locally in scope and magnitude. These health emergencies can occur as primary events or as secondary events from another hazard or emergency (e.g. flood, tornado, or hazardous material incident).

Also included in this discussion is the impact of certain animal viruses on domestic and wildlife species. Avian influenza was specifically mentioned as a concern. There are four types of influenza (flu) viruses: A, B, C and D. Wild aquatic birds, including gulls, terns, and shorebirds, and wild waterfowl, such as ducks, geese and swans are considered reservoirs (hosts) for avian influenza A viruses. Past outbreaks of avian influenza A have occurred in North America and around the world.

Location

Public Health Emergency can be a worldwide, national, state or regional event that is not confined to geographic boundaries and range in severity across the affected areas. All of Missaukee County is at risk from the occurrence and impacts from an infectious disease. Depending on the type of disease, different populations are more susceptible. This is also true of avian influenza A. Avian influenza A occurs naturally among wild aquatic birds worldwide and can infect domestic poultry and other bird and animal species.

Extent

The extent of a public health emergency can be determined by the number of cases and deaths, and the amount of money spent to prepare for and respond to public health threats. In Missaukee County, the District Health Department 10 works with local, state, and federal agencies to prepare for and respond to public health threats. It developed a comprehensive emergency preparedness program capable of responding to a variety of emergency situations with funds from the Centers for Disease Control. The State of Michigan reports, as of November 29, 2022, there are 3,475 cumulative cases of COVID-19 and 68 deaths in the county. Those in the 60-69 year age group and older have the most deaths of any age range.

The extent of an avian influenza outbreak can also be determined by the number of infected cases. Most avian influenza A viruses are low pathogenic and cause few signs of disease in infected wild birds. In poultry, some low-pathogenic viruses can mutate into highly pathogenic avian influenza viruses. Highly pathogenic avian influenza viruses cause severe disease and high mortality in infected poultry. Only some avian influenza A(H5) and A(H7) viruses are classified as HPAI A viruses, while most A(H5) and A(H7) viruses circulating among birds are LPAI A viruses. HPAI A(H5) or A(H7) virus infections can cause disease that affects multiple internal organs with mortality up to 90% to 100% in chickens, often within 48 hours. However, ducks can be infected without any signs of illness. HPAI A(H5) and A(H7) virus infections in poultry also can spill back into wild birds, resulting in further geographic spread of the virus as those birds migrate. While some wild bird species can be infected with some HPAI A(H5) or A(H7) virus subtypes without appearing sick, other HPAI A(H5) and A(H7) virus subtypes can cause severe disease and mortality in some infected wild birds as well as in infected poultry.

Previous Occurrences

Throughout the years, there have been many pandemics. For example, there was an outbreak of severe acute respiratory syndrome (SARS) in 2003. This virus was a new coronavirus that resulted in over 8,000 illnesses worldwide. Of these, 774 died. Since 2012, Middle East respiratory syndrome (MERS), a coronavirus, has been reported in 27 countries where there have been approximately 2,494 people infected and 858 deaths. In 2017, the World Health Organization (WHO) put SARS and MERS on its priority pathogen list to spur further research into coronaviruses. More recently in 2020, a Presidential and Governor Emergency was declared for COVID-19 Pandemic in Michigan.

Avian influenza A outbreaks have occurred in the United States and around the world. Outbreaks of some avian influenza A viruses in poultry have been associated with illness and death in people in Asia, Africa, Europe, the Pacific, and the Near East. While very rare, some avian influenza A viruses have also caused illness in people in North America. There have been three major outbreaks in the United States. In July 2015, 164 human exposures were reported with avian influenza A viruses. A second outbreak in 2016 reported no human infections. A third outbreak in 2016 impacted cats in an animal shelter in New York City, and one human infection was reported.

Probability of Future Events and Vulnerability Assessment

Naturally occurring pandemics may result in widespread precautions around the world. The District Health Department 10 created a pandemic plan that serves as a template for responding to a large-scale outbreak of influenza and other highly infectious

respiratory diseases. That plan is being tested currently since COVID-19 appeared in January 2020. The response is ongoing to this pandemic. The elderly, immune-compromised, and low income populations are most vulnerable to public health emergencies.

All wild aquatic birds and domestic poultry are vulnerable to in avian influenza A viruses. Although it is possible for domestic poultry to become infected with avian influenza from direct contact with wild birds, it is more likely that avian influenza viruses are spread indirectly to poultry on contaminated feed, clothing, and equipment. Agricultural agencies encourage producers to prevent wild birds and other wildlife from coming into direct contact with their poultry, and to avoid transporting wild bird fecal material and secretions to poultry via boots, equipment, and feed. Avian influenza A viruses impact recreation such as hunting and bird watching as well as agriculture products in the county.

Invasive Species

The National Invasive Species Council defines an invasive species as, “A species that is not native and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.” The Council was formed under Presidential Executive Orders 13112 and 13751 to prevent the introduction and spread of invasive species, and to support efforts to eradicate and control invasive species that are established throughout the United States. NOAA’s National Ocean Service identifies invasive species as “capable of causing extinctions of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats.” There are a wide variety of species considered invasive. Known and monitored species include:

- Mammals
- Birds
- Insects
- Fish
- Crustaceans
- Mollusks
- Worms
- Plants
- Diseases

Invasive species harmful to Michigan and Missaukee County may be either terrestrial invasive species (TIS) or aquatic invasive species (AIS). Terrestrial invasive include non-native, land-based plants, insects, animals and diseases that harm Michigan’s environment, economy, and human health. Aquatic invasive include non-native, water-dwelling plants, animals, and other organisms that have evolved to live primarily in water (aquatic habitats) rather than on land. Aquatic habitats are habitats that are covered with water all or part of every year. Michigan State Departments cooperated to prepare the Terrestrial Invasive Species State Management Plan and the 2013 Aquatic Invasive Species State Management Plan Update: *Prevention, Detection, and Management in Michigan Waters*. Each plan outlines a statewide strategy to reduce the environmental and economic damages caused by either TIS or AIS.

Non-native terrestrial and aquatic species are introduced to Michigan and the Great Lakes both intentionally and unintentionally. Aquatic invasive species are the result of unwanted fish and aquatic plants released from home aquariums, travelled across the ocean in ballast water carried by freighters, or entered from the ocean through human-built channels such as the Welland Canal. There are 32 AIS specifically listed in the State Management Plan. The State TIS Management Plan lists fourteen species including insects, mollusks, plants, mammals, a shrub, and a bird.

The Midwest Invasive Species Network (MISIN) is a regional effort to develop and provide early detection and response resources for invasive species. Among many tools and resources, the website (misin.msu.edu) provides a catalog of species information and a report of occurrences submitted within each state. Animals, plants, and diseases are included in the catalog. The top five reported species in Michigan are: phragmites (invasive) with 63,018, garlic mustard with 18,368, autumn olive with 16,042, spotted knapweed with 15,436, and brown marmorated stink bug with 13,351.

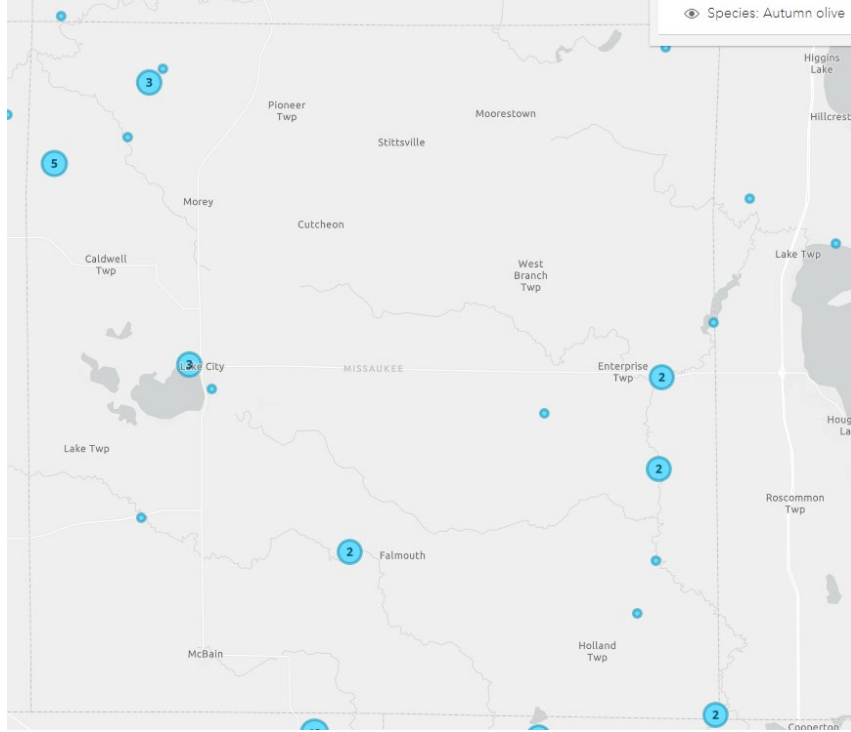
Location

The vast diversity of the natural resources found within Missaukee County provides endless potential for education and recreation, as well as opportunities to appreciate the natural world, both for those who reside in this beautiful and unique area and for those who visit. The blend of forest and wetland habitats within the county and the wealth of species which inhabit them are a resource which would be a valuable asset to any community. The recreational use of these resources encompasses a wide variety of activities, to include sightseeing, picnicking, camping, and bird watching, as well as fishing and hunting.

Invasive species threaten those sensitive ecosystems and may be present in all Missaukee County forest, wetland, farmland, grassland, aquatic, and urban environments. TIS and AIS designation generally applies, however, several upland species appear to be spreading to wetland and aquatic areas. Regular monitoring and reporting introductions detected is the only way to know where an invasive species has infested. The MISIN Species Observations shares reported detections by species name (common and scientific) and family type. Figure 16 identifies reported Autumn Olive cases throughout the county. Reported cases are located throughout the county, especially in the northwest (Bloomfield Township), near Lake Missaukee (Caldwell Township and the City of Lake City), and to the east along the Muskegon River (Butterfield Township and Holland Township).

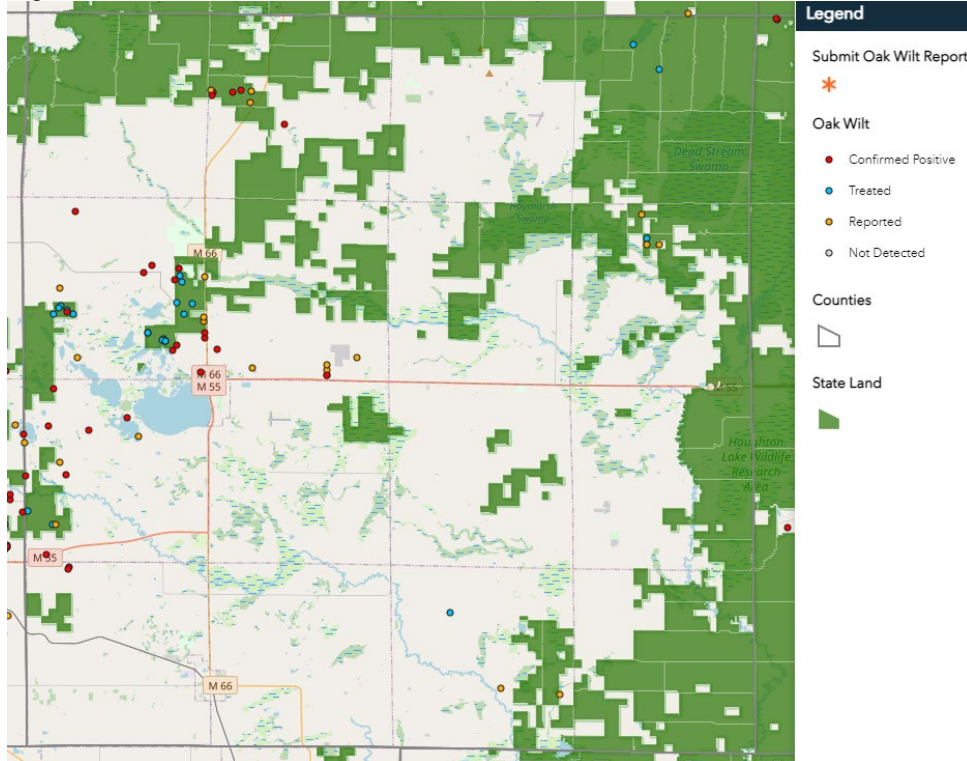
Figure 17 presents the MDNR interactive mapping resource Look For Oak Wilt, which allows users to submit and Oak Wilt Report throughout Michigan. A number of Oak Wilt cases have been reported in Missaukee County. These include trees confirmed positive for the disease, trees that have been treated, and reported cases. The reports of Oak Wilt disease are largely found in heavily forested areas and public lands in the north and west areas of the county. A large number of confirmed cases and treated trees are also located in Caldwell Township.

Figure 16: Autumn Olive Reported Cases



Source: MISIN Species Observations

Figure 17: Oak Wilt Cases



Source: Michigan Department of Natural Resources, Look For Oak Wilt

Extent

Invasive species impact on the county can be measured by its damaging effects. TIS cause billions of dollars in damage annually, are extremely costly to control, and often have irreversible ecological effects. Native habitats, agriculture lands and livestock, and the outdoor recreation economy are threatened or damaged by invasive species. *Michigan's Terrestrial Invasive Species State Management Plan* lists these state impacts:

- The State of Michigan estimates that 42% of threatened or endangered species are at risk due to non-native species.
- Visitors spent over \$22 billion dollars in Michigan in 2014, supporting nearly 327,000 jobs (Tourism Economics 2014). Invasive species impact the use and beauty of Michigan's shorelines, trails and parks, which may result in a reduction in visitor spending and citizen enjoyment
- Michigan's Forest Products Industry supports 96,000 jobs and contributes more than \$20 billion to the state's economy each year (Michigan DNR 2015). Invasive forest pests including emerald ash borer, oak wilt and beech bark disease kill trees and significantly impact the value of urban properties, forests and timber resources. The estimated cost of treating or removing dead ash within developed land in Michigan's communities due to emerald ash borer was \$230 million in 2009⁷.

Previous Occurrences

The Department of Environment, Great Lakes, and Energy oversees invasive species programs for the State. The State has produced prohibited and restricted species lists, watch lists, and state management plans for terrestrial and aquatic species. Many of the species listed in this plan are also listed as a prohibited or restricted species: it is unlawful to possess, introduce, import, sell, or offer that species for sale as a live organism, except under certain circumstances. A full list of prohibited and restricted species can be found at Michigan.gov/invasives.

The Cooperative Invasive Species Management Area serving Lake, Mason, Mecosta, Missaukee, Osceola, and Wexford counties (NCCISMA) and Missaukee Conservation District are focused on habitat-specific management and education to property owners to manage private land. Habitat-specific management is: planning to manage for the resource (aka that natural area) and restoration therefore will remove and control anything that is not supposed to be there. Natural areas for consideration are high-quality natural areas in the service area such as waterways, riparian areas, and significant recreation areas.

The following terrestrial species are causing significant harm:

- Japanese Knotweed, Giant knotweed and Bohemian knotweed, *Polygonaceae*, can be a concern to homeowners, and municipalities because of these plants' ability to grow into a structure's foundation, through sidewalks and road surfaces. These plants can also be spread by root fragments and stem sections. It can create monocultures that shade out desirable vegetation, creating poor habitats for native species. This is of particular concern along water bodies and has been shown to be extremely detrimental to waterways in the Eastern US.
- (Invasive) Phragmites is a large-scale clonal grass that rapidly colonizes wetlands. Phragmites crowds out native plants and alters habitat for native fauna. In doing so, Phragmites also alters human access to water resources and has adverse economic effects, including decreasing property value, inhibiting recreational use, and limiting populations of game species. It can become a fire hazard when it dries down
- Cypress Spurge is an erect, herbaceous to semi-woody perennial with bright yellow-green flowers that turn to purple-red as they mature. Cypress Spurge is toxic to horses and cows.
- Black Swallow Wort is a rapidly growing, herbaceous perennial in the Milkweed family. However, Black Swallow Wort is toxic to animals and the monarch butterfly.
- Oriental Bittersweet is a vine plant that can strangle a tree and causes tree mortality. This impacts ecosystem health and economic health that is associated with trees' health.
- Autumn olive is very widespread in Michigan. It is spread by birds and is recolonizing old farm fields. Its value to wildlife is relatively low (low in protein and other nutrients compared to our natives). It also is known for its nitrogen-fixing abilities.
- Oak wilt is an infectious vascular disease which affects all species of oak. Red oaks get the disease more frequently and succumb more readily than white oak. The disease is spread via root grafts and by sap-feeding beetles.
- Beech bark disease is caused by the combination of the *Neonectria* fungus and beech scale. Beech scales are yellow, soft-bodied insects that are 0.5 to 1.0 mm long as adults. The insects, found on the tree trunk and branches, feed on sap in the inner bark. The minute wounds caused by the scale insects eventually enable the Nectria fungus to enter the tree. The Nectria kills areas of woody tissue.

⁷ Kovacs, K.F., R.G. Haight, D.G. McCullough, R.J. Mercader, N.W. Siegert and A.M. Liebhold. 2010. Cost of potential emerald ash borer damage in U.S. communities, 2009–2019. *Ecological Economics* 69: 569-578.

The following aquatic species are causing significant harm:

- Didymo or “rock snot” is an aquatic diatom that is brown, tan, or yellow in color. Unlike most algae, it feels like wet cotton and is not slimy. Grows in rivers, streams, and lakes. It occurs particularly in cool, oligotrophic, clear water
- Purple loosestrife is an herbaceous wetland perennial reaching 5 feet with reddish-purple flowers with five to seven petals are held in dense terminal cluster. Grows in moist soils, in wet meadows and prairies, shallow marsh, ditches, waste areas, and along lakes, ponds, streams, and rivers.
- Garlic mustard is an aquatic, herbaceous biennial, up to 4 feet in height. Forms round basal rosette the first year, flowers the second year and dies. Grows in forests, particularly floodplain forest, open wetlands, parking lots, campgrounds, paths, and roadsides.
- Eurasian water-milfoil is a submergent, aquatic perennial that reached 3-10 feet or more in length. Grows in ponds, lakes, and low-energy zones in rivers and streams.
- New Zealand mudsnail is an aquatic mollusk with an elongated shell 1/8 inch long with 7-8 whorls. Shell color varies from gray and dark brown to light brown. Grows in flowing freshwater with silt/sand to very brackish rivers; lives in water as deep as 60 feet in lakes or reservoirs.
- Red swamp crayfish is an aquatic crustacean with a dark red body and claws with spiky, bright red bumps, and black wedge-shaped stripe on underside. Grows in flowing to non-flowing freshwater or salt water; permanent ponds; areas of streams and ditches with organic debris; agricultural areas; wetlands.
- Zebra mussel is an aquatic mollusk with striped shells or dark or light shells with no stripes. Attach to objects (pipe, boats, etc.) causing major damage as colonies can block pipes, affecting power plants and water-treatment facilities.

Many of the species listed here are monitored and managed by NCCISMA. However, the list of invasive species impacting the county is extensive and many established species are treated on a case-by-case basis. Other species of concern include:

- Honeysuckle (non-native)
- Glossy buckthorn
- Common buckthorn
- Wild parsnip
- Multiflora rose
- Periwinkle

Probability of Future Events and Vulnerability Assessment

The State TIS Management Plan provides a list of eleven terrestrial species on the watch list. The invasive species included on the watch list are priority species that have been identified as posing an immediate and significant threat to Michigan’s natural resources. These species have either not been confirmed in Michigan, have very limited distribution or are localized. Early detection and timely reporting of occurrences of these species is crucial for increasing the likelihood of stopping an invasion and limiting negative ecological and economic impacts. This list is reviewed and updated periodically, and the most current list is available at www.michigan.gov/invasives.

Common Name Scientific Name Category

1. Asian longhorned beetle *Anoplophora glabripenni* Insect
2. Asiatic sand sedge *Carex kobomugi* Plant
3. Balsam woolly adelgid *Adelges piceae* Insect
4. Chinese yam* *Dioscorea oppositifolia* Plant
5. Hemlock woolly adelgid* *Adelges tsugae* Insect
6. Himalayan balsam* *Impatiens glandulifera* Plant
7. Japanese stiltgrass* *Microstegium vimineum* Plant
8. Kudzu* *Pueraria montana* Plant
9. Mile-a-minute weed *Persicaria perfoliata* Plant
10. Nutria *Myocastor coypus* Mammal
11. Thousand Cankers Disease *Geosmithia morbida Pityophthorus juglandis* Tree Disease

The [Michigan Watch List: Aquatic Invasive Plants](#) and NCCISMA are also monitoring for additional species:

- Spotted lantern fly which impacts fruit and winery production. Winery and fruit production issues can impact agri-tourism.
- Hydrilla is an aquatic, perennial plant that forms dense mats in slow-moving water of lakes, ponds, stream, and rivers.
- European frog-bit is an aquatic, floating, herbaceous annual that forms large colonies, creating dense mats. Grows in open, still waters.

- Parrot feather water-milfoil is an aquatic, herbaceous perennial that can grow 6.5-16.5 feet in length and forms monotypic stands. Grows in lakes, ponds, slow streams, and mudflats, where the emergent form is found.
- Starry stonewort is an aquatic microalga which forms dense mats that cover lake bottoms. Grows in still or slow moving waters.
- Asian Carp (bighead, black, grass, and silver carp) are in direct competition with native aquatic species for food and habitat. Their rapid population increase is disrupting the ecology and food web of the large rivers of the Midwest.
- Beech leaf disease causes dark stripes or banding between leaf veins. A nematode (microscopic worm) is associated with symptoms. Ongoing research is investigating the possibility of other contributing microorganisms.

Missaukee Conservation District, NCCISMA, and other partners protect, enhance, and promote Northwest Michigan's natural communities through terrestrial invasive plant management, education, and outreach. Missaukee County's natural resources are highly vulnerable to invasive animals, plants, and diseases. Significant natural features include forested areas and water bodies such as Lake Missaukee and Crooked Lake and the Manistee River. The impact the species listed on watch lists could be catastrophic for Missaukee County's natural resources, agriculture, recreation, tourism, and economy.

Impacts from Climate Change

Climate describes the average weather conditions for a particular location and over a long period of time. The changing climate impacts society and ecosystems in a broad variety of ways. For example, climate change can alter rainfall, influence crop yields, affect human health, cause changes to forests and other ecosystems, and even impact our energy supply. Climate-related impacts are occurring across the country by increasing the severity of storms and weather-related events. Natural disasters then have a direct impact on our economy.

According to a new comprehensive report from the World Meteorological Organization (WMO), “A disaster related to a weather, climate or water hazard occurred every day on average over the past 50 years – killing 115 people and causing \$202 million (US \$) in losses daily. The number of disasters has increased by a factor of five over the 50-year period, driven by climate change, more extreme weather and improved reporting. But, thanks to improved early warnings and disaster management, the number of deaths decreased almost three-fold⁸” (World Meteorological Organization, 2021).

The impacts of climate change already are, and continue to be, deep and widespread in the Great Lakes Region and Michigan as a whole. The National Climate Assessment (NCA) assesses the science of climate change and variability and its impacts across the United States, now and throughout this century. Chapter 21 of the NCA *Fourth National Climate Assessment Volume II: Impacts, Risks, and Adaptation in the United States* reports, the Great Lakes influence regional weather and climate conditions and impact climate variability and change across the region. The lakes influence daily weather by:

- 1) Moderating maximum and minimum temperatures of the region in all seasons,
- 2) Increasing cloud cover and precipitation over and just downwind of the lakes during winter, and
- 3) Decreasing summertime convective clouds and rainfall over the lakes.

The Great Lakes Integrated Sciences and Assessments (GLISA) is one of 11 NOAA Regional Integrated Sciences and Assessments teams that focus on helping the nation prepare for and adapt to climate variability and change. A summary of findings from NCA and the GLISA report, *Climate Change in the Great Lakes Region*⁹, are provided to show the impacts of climate change throughout the state of Michigan.

Temperature

Warm-season temperatures are projected to increase more in the Midwest than any other region of the United States.¹⁰ Since 1951, annual average air temperatures have increased by 2.3°F (1.3°C) in the U.S., Great Lakes region. By mid-century (2050), average air temperatures are projected to increase by 3°F to 6°F (1.7°C to 3.3°C). By end of century (2100), average air temperatures are projected to increase by 6°F to 11°F (3.3°C to 6.1°C).

The frost-free season is projected to increase 10 days by early this century (2016–2045), 20 days by mid-century (2036–2065), and possibly a month by late century (2070–2099) compared to the period 1976–2005 according to the higher scenario (RCP8.5).¹¹

Precipitation

Since 1951, total annual precipitation has increased by 14% in the U.S., Great Lakes Region. Future projections suggest more precipitation on average, but not necessarily during all seasons (summer to be drier) and not for all locations depending on which model is used. Reduced lake ice cover and enhanced evaporation may lead to increased lake-effect snowfall in the near-term, but rising temperatures will cause more winter precipitation to fall as rain as opposed to snow across the region by late century.

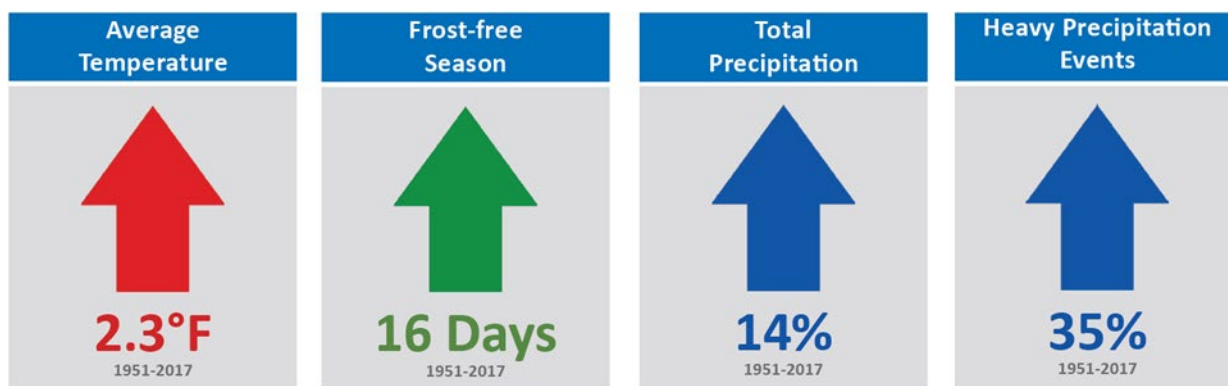
⁸ World Meteorological Organization. (2021, August 31). Retrieved from Weather-related disasters increase over past 50 years, causing more damage but fewer deaths: <https://public.wmo.int/en/media/press-release/weather-related-disasters-increase-over-past-50-years-causing-more-damage-fewer>

⁹ (2019, February 14). Retrieved from Climate Change in the Great Lakes Region: <https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Page.pdf>

¹⁰ Vose, R. S., D. R. Easterling, K. E. Kunkel, A. N. LeGrande, and M. F. Wehner, 2017: Temperature Changes in the United States. *Climate Science Special Report: Fourth National Climate Assessment, Volume I*. Wuebbles, D. J., D. W. Fahey, K. A. Hibbard, D. J. Dokken, B. C. Stewart, and T. K. Maycock, Eds., U.S. Global Change Research Program, Washington, DC, USA, 185–206. doi:[10.7930/J0N29V45](https://doi.org/10.7930/J0N29V45).

¹¹ Hibbard, K. A., F. M. Hoffman, D. Huntzinger, and T. O. West, 2017: Changes in Land Cover and Terrestrial Biogeochemistry. *Climate Science Special Report: Fourth National Climate Assessment, Volume I*. Wuebbles, D. J., D. W. Fahey, K. A. Hibbard, D. J. Dokken, B. C. Stewart, and T. K. Maycock, Eds., U.S. Global Change Research Program, Washington, DC, USA, 277–302. doi:[10.7930/J0416V6X](https://doi.org/10.7930/J0416V6X).

From 1951-2017, the United States, Great Lakes Region, overall, has seen increases in average temperature, frost-free season, total precipitation, and heavy precipitation events.



Snow, Ice Cover and Lake Temperature

Summer lake surface temperatures have been increasing faster than the surrounding air temperatures, with Lake Superior increasing by 4.5°F between 1979 and 2006. Annual average ice cover on the Great Lakes shifted from higher amounts prior to the 1990s to lower amounts in recent decades. There remains strong year-to-year variability, and high ice years are still possible. Lake-effect snowfall has increased in northern areas and may continue to increase through mid-century.

Extreme Weather

The frequency and intensity of severe storms has increased. This trend will likely continue as the effects of climate change become more pronounced. The amount of precipitation falling in the heaviest 1% of storms increased by 35% in the U.S. Great Lakes region from 1951 through 2017. More severe storms may have a negative economic impact due to resulting damages and increased costs of preparation, clean up, and business disruption.

The *NCA Fourth National Climate Assessment Volume II: Impacts Risks, and Adaptation in the United States* reports, “Climate change is transforming where and how we live and presents growing challenges to human health and quality of life, the economy, and the natural systems that support us. Risks posed by climate variability and change vary by region and sector and by the vulnerability of people experiencing impacts. Social, economic, and geographic factors shape the exposure of people and communities to climate-related impacts and their capacity to respond. Risks are often highest for those that are already vulnerable, including low-income communities, some communities of color, children, and the elderly” (*Ch. 14: Human Health, KM 2; Ch. 15: Tribes, KM 1–3; Ch. 28: Adaptation, Introduction*).

A vulnerability assessment can be found in the two-page report: *Climate Change in the Great Lakes Region* by GLISA at <https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Page.pdf>. The report identifies key challenges from climate change such as:

- **Public Health**
 - Increased risk of heat waves and increased humidity may amplify the number of heat-related deaths and illnesses.
 - More storm activity and flooding, resulting in increased point- and non-point source pollution, will likely increase watershed contamination and water-borne illnesses, while warmer surface waters amplify the risk of toxic algal blooms and fish contamination.
- **Tourism and Recreation**
 - *Winter recreation/tourism are likely to suffer* due to reduced snow cover and shorter winters. Reduced lake ice cover and enhanced evaporation may lead to increased lake-effect snowfall in the near-term, but rising temperatures will cause more winter precipitation to fall as rain as opposed to snow across the region by late century.
 - Increasing temperatures and a longer summer season may *increase the demand for lake and beach use*.
 - Overall, *summer tourism may grow before temperature rise becomes unfavorable* for outdoor recreation.
 - *The fishing industry* (commercial and recreation) is likely to be impacted by the *decline of coldwater species of fish, such as lake trout and whitefish*.

- **Natural Environment**

- Despite increasing precipitation, land surfaces in the region are expected to become drier overall due to increasing temperatures and evaporation rates.
- More frequent summer droughts could affect soil moisture, surface water, and groundwater supply.
- Increased evaporation rates and sustained levels of high or low water levels may change wetland areas in the region.
- The rate of warming may *outpace the rate at which ecosystems are able to migrate and adapt*.
- *Wildlife populations better adapted to cold temperatures will continue to decline* as competing species migrate into the region with rising air and surface water temperatures.
- *Forest productivity will likely increase in the short term*, until other impacts of climate change such as increased drought, fire and invasive species present additional stressors to forests.

Comprehensive Vulnerability Analysis

Table 32 summarizes the information presented regarding the analysis and assessment of each hazard throughout Section IV of this plan for each community in Missaukee County. While almost all types of hazards evaluated in this plan could affect every jurisdiction in the County, certain characteristics of people, property, the economy, and the environment were considered to evaluate each community's unique vulnerability to hazard events. For reference, many of these characteristics (i.e., public lands, pine forest area, campgrounds) are illustrated in the maps provided in Appendix A.

Table 32. Community Vulnerability Analysis

Vulnerability Considerations	Townships															Cities	
	Aetna	Bloomfield	Butterfield	Caldwell	Clam Union	Enterprise	Forest	Holland	Lake	Norwich	Pioneer	Reeder	Richland	Riverside	West Branch	Lake City	McBain
Thunderstorm, High Winds, Hail, Tornado																	
Mobile Home Neighborhoods				X			X										X
Campgrounds		X															
Public Recreation Lands	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Previous Tornado Occurance			X	X	X				X	X		X	X		X	X	
Minority Populations														4.9% of pop. is of a minority race	11% of pop. is of a minority race	8% of pop. is of a minority race	
Lower Income Households (numbered from 1 to 17; 1 having the greatest number of lower income households and 17 having the fewest number; based on ALICE study data and poverty estimates from the US Census Bureau)	15	11	12	3	13	16	2	17	1	9	14	4	6	7	10	8	5
Lightning																	
Campgrounds		X															
Communications Critical Infrastructure (Towers)	X			X		X			X			X	X	X		X	
Energy Critical Infrastructure (Wind Farm)																	X
Agriculture Critical Infrastructure (Farms and Ranches)					X								X	X			X
Petroleum and Natural Gas Pipelines	X	X	X	X	X	X		X	X	X	X		X	X	X		X
Public Recreation Lands	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Flooding																	
Previous flood incident areas				X	X				X							X	
Potential Dam Failure			X		X	X		X		X							
Minority Populations														4.9% of pop. is of a minority race	11% of pop. is of a minority race	8% of pop. is of a minority race	
Lower Income Households	15	11	12	3	13	16	2	17	1	9	14	4	6	7	10	8	5
Wildfire																	
Pine Forest	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Campgrounds		X															
Tree Farm				X					X	X	X	X					
Previous Fire Incident History			X	X		X		X	X	X			X				
Minority Populations														4.9% of pop. is of a minority race	11% of pop. is of a minority race	8% of pop. is of a minority race	
Lower Income Households	15	11	12	3	13	16	2	17	1	9	14	4	6	7	10	8	5
Drought																	
Tree Farm				X					X	X	X	X					
Agriculture Critical Infrastructure (Farms and Ranches)					X								X	X			X
Public Recreation Lands	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Extreme Temperatures																	
Agriculture Critical Infrastructure (Farms and Ranches)					X								X	X			X
Petroleum and Natural Gas Pipelines	X	X	X	X	X	X		X	X	X	X		X	X	X		X
Communities with people over age 65 (numbered from 1 to 17; 1 having the greatest number of people over age 65 and 17 having the fewest number; based on estimates from the US Census Bureau)	15	14	13	2	10	17	4	16	1	8	12	3	9	6	11	7	5
Minority Populations														4.9% of pop. is of a minority race	11% of pop. is of a minority race	8% of pop. is of a minority race	
Lower Income Households	15	11	12	3	13	16	2	17	1	9	14	4	6	7	10	8	5
Invasive Species																	
Areas mapped as a locations of concern				X	X				X				X	X		X	
Agriculture Critical Infrastructure (Farms and Ranches)					X								X	X			X
Tree Farm				X					X	X	X	X					
Public Health Emergency																	
Health Care Facility				X					X								X
Assisted Living Facility																	X
Communities with people over age 65	15	14	13	2	10	17	4	16	1	8	12	3	9	6	11	7	5
Minority Populations														4.9% of pop. is of a minority race	11% of pop. is of a minority race	8% of pop. is of a minority race	
Lower Income Households	15	11	12	3	13	16	2	17	1	9	14	4	6	7	10	8	5

V. Goals and Objectives

The mission of the Missaukee County Natural Hazards Mitigation Plan is to protect the health and safety of the public and property in the County which includes prevention of injury, loss of life, property damage, breakdown in vital services like transportation and infrastructure, economic slumps, maintain tourist base, and liability issues. This is done by taking action to permanently eliminate or reduce the long-term risks from natural hazards.

Specific goals and objectives have been established based upon the community's natural hazards analysis, as well as input from the Task Force participants and the public through meetings, request for comments on the draft plan, and the presentation of the plan to the Local Emergency Planning Team.

Goal 1: Increase local awareness and participation in natural hazards mitigation strategies:

- Encourage cooperation and communication between planning and emergency management officials
- Encourage additional local governmental agencies to participate in the natural hazards mitigation process
- Encourage public and private organizations to participate, such as Timber Wolf Lake Campground and LaFarge Inc., as well as other organizations who advocate for individuals with functional or access needs

Goal 2: Integrate natural hazards mitigation considerations into the community's comprehensive planning process:

- Enforce and/or incorporate natural hazards mitigation provisions in building code standards, ordinances, and procedures
- Create or update ordinances to reflect building codes, shoreline protection rules, etc.
- Incorporate natural hazards mitigation into basic land use regulation mechanisms
- Develop community education programs and public warning systems
- Strengthen the role of the Local Emergency Planning Committee in the land development process
- Integrate natural hazards mitigation into the capital improvement planning process so that public infrastructure does not lead to development in natural hazards areas
- Encourage county agencies to assess local roads, bridges, dams, and related transportation infrastructure for natural hazards vulnerability

Goal 3: Utilize available resources and apply for additional funding for natural hazards mitigation projects:

- Provide a list of desired community mitigation measures to the State
- Encourage the application for project funding from diverse entities

Goal 4: Develop and complete natural hazards mitigation projects in a timely manner:

- Encourage public and business involvement in natural hazards mitigation projects

VI. Mitigation Strategies and Priorities

Types of Mitigation Actions

The mitigation planning regulations requires that each participating jurisdiction identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the impacts of the hazards identified in the risk assessment. The emphasis is on mitigating the impacts or vulnerabilities identified in the risk assessment, not on the hazards themselves. The types of mitigation actions can be classified into the following types:

- Local Plans and Regulations
- Structure and Infrastructure Projects
- Natural Systems Protection
- Education and Awareness Programs

Furthermore, a set of evaluation criteria was developed to determine which mitigation strategies were best suited to address the identified problems in Missaukee County.

- The measure must be technically feasible.
- The measure must be financially feasible.
- The measure must be environmentally sound and not cause any permanent, significant environmental concerns.
- The measure must be acceptable to those participating in the strategy and/or primarily affected by the strategy.

By anticipating future problems, the County can reduce potential injury, structure losses, loss of power, such as electric and gas, and prevent wasteful public and private expenditures. The County Infrastructure, Vulnerability, and Hazard Areas Maps in Appendix A can assist with the determining future problem areas.

Emergency Warning System Coverage

Phone and TV warning systems: IPAWS¹², social media, local news sources.

Radio Warning Systems: WTCM 103.5 / 93.5 FM / 580 AM - in the event of a major emergency, important information will be broadcast on these stations. IPAWS, NOAA Weather Radio.

Tornado/Severe Weather Systems: City of McBain tornado siren.

Flood warning system: Local police patrol cars, fire truck PA, door to door in-person notifications, or phone/TV/radio warning systems indicated above.

¹² The Integrated Public Alert & Warning System (IPAWS) is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts, to radio and television via the Emergency Alert System, and on the National Oceanic and Atmospheric Administration's Weather Radio.

Missaukee County Emergency Management Department maintains contracts with many local fire stations, township halls, and community facilities in the county so that they may be utilized as temporary shelters in the event of an emergency. Those are:

Table 33: Shelter Locations

Emergency Shelter Site Name	Generator (Y/N)	Overnight Accommodations (Y/N)	Street Address	City	ZIP
Lake City High School (American Red Cross accredited)	Yes	Yes	251 Russell Rd	Lake City	49651
Lake City Christian Reformed Church	No	No	1657 S Morey Rd	Lake City	49651
Lake City United Methodist Church	No	No	301 John St.	Lake City	49651
Missaukee District Library	No	No	210 S Canal St	Lake City	49651
Lake Missaukee Area Fire Dept.	Yes	No	702 1st St	Lake City	49651
Lake Township Rescue Building	Yes	No	1901 S Green Rd	Lake City	49651
McBain Fire Station	Yes	No	110 W Euclid Ave	McBain	49657
Merritt Area Fire Department	Yes	No	7721 E Houghton Lake Rd	Merritt	49667
Aetna Township Hall	No	No	2950 East Kelly Rd	Falmouth	49632
Bloomfield Township Hall	No	No	9592 West Arnold Rd	Manton	49663
Butterfield Township Hall	No	No	3920 South 13 Mile Rd	Merritt	49667
Caldwell Township Hall	No	No	9510 West Walker Rd	Manton	49663
Clam Union Township Hall	No	No	766 East Proper	Falmouth	49632
Enterprise Township Hall	No	No	9022 Burns Rd	Merritt	49667
Forest Township Hall	No	No	1181 North Decker Rd	Lake City	49651
Holland Township Hall	No	No	7000 East Finkle Rd	Falmouth	49632
Lake Township Hall	No	No	8105 West Kelly Rd	Lake City	49651
Norwich Township Hall	No	No	4551 East Moorestown Rd	Moorestown	49651
Pioneer Township Hall	No	No	2914 West Moorestown Rd	Lake City	49651
Reeder Township Hall	No	No	2970 West Kelly Rd	Lake City	49651
Richland Township Hall	No	No	8299 South Lucas Rd	McBain	49657
Riverside Township Hall	No	No	2900 West Geers Rd	McBain	49657
West Branch Township Hall	No	No	2860 East Walker Rd	Lake City	49651
McBain City Hall	Yes	No	9478 S Morey Rd	McBain	49657

Mitigation Strategies and Implementation

Strategies were developed based on discussions with local officials and a review of best practices (alternatives) for hazard mitigation. The strategies table is grouped according to purpose. Purpose types include: Awareness & Preparation, Shelters, Building & Development, Utilities & Technology, and Environment & Natural Resources. The table also includes: a description of each strategy; what natural hazards they address; where the strategy applies; who is responsible for implementing the strategy; how the strategy will be implemented (what resources are available to apply the strategy); the timeframe for completing the strategy; the level of priority; and what type of strategy it is. Strategies are intended to be action items completed during the 5-year timeframe in which the plan is active. Some long-term strategies may extend beyond the 5-year timeframe due to feasibility or level of difficulty.

Appendix C provides a review of mitigation strategies included in the 2015 plan, their current status, and how they have or have not been incorporated into the 2023 plan. The 2015 mitigation strategies were not given a priority level of “high”, “medium”, or “low”, as they are in the 2023 plan; they were simply listed as the following natural hazards “priority areas”:

- Priority Area 1: Thunderstorms, high winds, tornados and winter storms (Countywide)
- Priority Area 2: Wildfire/Urban Interface Areas (Bloomfield, Holland, Reeder, and Norwich Townships)
- Priority Area 3: Flooding from potential dam failure (in Norwich, Enterprise and Clam Union Townships)

The three priority areas from the 2015 plan remain incorporated into various strategies in the 2023 plan, as indicated in the far right column of the table in Appendix C. However, the wildfire mitigation strategies in the 2023 plan do not specifically focus on Bloomfield, Holland, Reeder, and Norwich Townships. They apply communities in the county that contain areas of pine forest, which is particularly susceptible to fire. Pine forest areas are located in all jurisdictions except for the cities of McBain and Lake City.

A list of potential entities and programs is also provided that can assist with funding and implementation of the proposed hazard mitigation strategies. Each potential resource is assigned a letter code, and the appropriate letter(s) are listed in the “Resources” column of the strategies table. The resources table for how the strategies may be implemented is provided on the following pages. The resources table for how the strategies may be implemented is provided on the following pages as Table 34.

Table 34. Resources Table for Mitigation Strategies

ID	Resource	Description	Hazard Type	Website
A	Missaukee County staff	Missaukee County staff as appropriate	All hazards	https://www.missaukee.org/
B	Local government staff	All local units of government	All hazards	https://www.missaukee.org/government/local_governments/index.php
C	Local Emergency Services and Fire Departments	Lake City Area Fire Dept. (Lake City); Lake Missaukee Area Fire Dept. (Lake City), Lake Township Rescue Building (Lake City), McBain Fire Station (McBain), Merritt Area Fire Dept. (Enterprise Twp.), Missaukee County Ambulance Services (Lake City)	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Wildfire; Flooding; Extreme Temperatures; Public Health Emergency	
D	Missaukee County Commission on Aging	The Missaukee County Commission on Aging helps seniors and their families by answering questions, finding specific products and services, and by providing guidance on how to access a variety of programs and agencies available. Services include: In-Home Services (homemaking, personal care, respite care, foot care, medication set-up and home cleaning chores); Support Services (transportation for medical appointments, Medicare & Medicaid assistance, and other Information and Assistance); and Seasonal Services (snow removal Dec 1-March 31; 911 Address signs.) The COA RN Supervisor also calls to check in with clients on a regular basis.	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency	https://www.missaukeecoa.org/
E	District Health Department #10	DHD #10 serves 10 counties in Michigan; those in the NW MI region include Kalkaska, Manistee, Missaukee, and Wexford counties. Their mission is to promote and enhance the health of our communities and environment through protection, prevention, and intervention. DHD #10 provides programs and services such as: immunizations; communicable disease reporting; issuing public health notifications; school health services; permitting processes for proper location and installation of water wells and septic systems; education about cleaning, monitoring and maintaining septic systems; septic or well repair financial assistance, and the inspection and licensing of food service establishments.	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency	https://www.dhd10.org/
F	Northern Michigan Community Action Association (NMCAA)	NMCAA serves the counties of Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Kalkaska, Leelanau, Missaukee, Roscommon and Wexford. They provide the Weatherization Assistance Program and Emergency Home Repair Program for low- to moderate- income households. They also provide food distribution via the following USDA programs: monthly food package to low-income senior citizens via the Commodity Supplemental Food Program (CSFP), and The Emergency Food Assistance Program (TEFAP) to low-income persons through a quarterly distribution.	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency	https://www.nmcaa.net
G	"MI HOPE" Grants (Michigan Housing Opportunities Promoting Energy Efficiency)	Program for up to \$25K to repair or replace roofs, doors, windows, insulation, heating/cooling systems, water heaters, security lighting, Energy Star appliances and electrical systems for eligible low-income residents.	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency	www.michigan.gov/mi-hope
H	Missaukee Area Community Foundation	The Missaukee Area Community Foundation was developed as a Geographic Component Fund of the Cadillac Area Community Foundation in 1999. This allows the MACF to enjoy the advantages of reduced operational expenses while having access to the same professional staff, fund managers, and investment managers as the Cadillac Area Community Foundation. The primary purpose of the MACF is to develop a community-wide vehicle for permanent endowments to enhance the quality of life in the County of Missaukee, Michigan.	All hazards	https://missaukeefoundation.org/
I	Cadillac Area Community Foundation	The primary mission of the Cadillac Area Community Foundation is to develop a community-wide vehicle for permanent endowments to enhance the quality of life in the area and to establish and manage worthwhile endowed funds for the benefit of our community. The CACF houses the Missaukee Area Community Foundation, a geographic component fund.	All hazards	https://cadillacfoundation.org/
J	Groundwork Center for Resilient Communities	With roots firmly embedded in the pro-health, pro-environment, and pro-economy principles of a local food system, the Groundwork Food and Farming team creates markets for local farmers, and helps connect locally grown food to school children, food pantry clients and families across the state.	Public Health Emergency	https://www.groundworkcenter.org/food-farming/

K	Midwest Agriculture Climate Team	MAC-T members are Extension specialists and state climatologists from many of the states represented in the Midwest Climate Hub, and NOAA NWS climate and weather specialists. The goal of this team is to share expertise regionally, discuss impacts and opportunities as it relates to agriculture and outlooks, and maintain an open line of communication so when weather/climate events do occur, the Midwest agriculture community is set to respond. The team meets monthly during the growing season regularly, and as needed during the winter season.	Drought, Extreme Temperatures, Flooding, Severe Winter Weather, High Winds, Hail	https://www.climatehubs.usda.gov/hubs/midwest/topic/midwest-agriculture-climate-team-mac-t
L	NWS Climate Prediction Center	The U.S. Drought Monitor is a map released every Thursday, showing parts of the U.S. that are in drought. The map uses five classifications: abnormally dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought: moderate (D1), severe (D2), extreme (D3) and exceptional (D4).	Drought	https://www.cpc.ncep.noaa.gov/products/Drought/
M	National Fire Protection Association Firewise USA Program	Firewise USA Program: Each applicant must create a board/committee, complete a community wildfire risk assessment with a 3-year action plan to reduce ignition risk to homes, and complete annual educational and risk reduction actions identified in the plan.	Wildfire, Drought	https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA
N	NFPA Community Wildfire Defense Grants	Communities can use these grants from the USFS in a variety of ways to reduce the wildfire risk to people and property. One key use is capacity building for wildfire mitigation. For example, communities can use the grants to support the implementation and enforcement of wildfire-related codes and standards; to train people to assess wildfire risk and implement effective mitigation measures; and to perform outreach to community members through programs like Firewise USA®. Communities that build these fundamentals—sound land use and building practices, a skilled workforce, and an educated public—will be better prepared for sustained and effective risk reduction and better equipped to take advantage of future federal grants that prioritize communities with codes in place.	Wildfire, Drought	https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire
O	Consumer's Energy Utility Services	Consumers Energy provides electrical and natural gas utility services. Energy through renewable energy sources is available. A power outage map is available to track outage locations.	All hazards.	https://www.consumersenergy.com/outagemap
P	Great Lakes Energy Utility Services	GLE provides electric and high-speed fiber internet and voice services. GLE provides an online power outage map to track outage locations. Also, Truestream's Status Map indicates where fiber internet is available or is being explored in the region.	All hazards.	https://www.gtlakes.com/power-outages/ https://www.truestreamfiber.com/status-map/
Q	Connected Nation Michigan	Connected Nation develops and provides the tools, resources, and methods that help states and communities create and implement solutions to their broadband and digital technology gaps. They assess and plan for the expansion of broadband access, adoption, and use. They empower people with technology skills and resources to improve their quality of life, and we develop public-private partnerships to bring technology access to targeted geographies and population.	All hazards.	https://connectednation.org/michigan/
R	EGLE's Michigan Oil, and Gas and Minerals Division Data Explorer	Interactive mapping tool to search for oil and gas well facilities and associated records throughout Michigan; list of oil and gas well types and status codes.	Flooding, Lightning, Tornado, Severe Winter Weather, High Winds	https://www.egle.state.mi.us/dataminer/ https://www.michigan.gov/egle/about/organization/oil-gas-and-minerals/oil-and-gas/oil-and-gas-well-type-and-status
S	National Pipeline Mapping System - Public Map Viewer	The National Pipeline Mapping System (NPMS) Public Map Viewer is a web-based mapping application designed to assist the general public with displaying and querying data related to: gas transmission and hazardous liquid pipelines, liquefied natural gas plants, and breakout tanks under Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) jurisdiction. This application does not contain distribution or gas gathering pipelines. Basic information about gas or hazardous liquid pipeline incidents is also available.	Extreme temperatures, flooding, and soil erosion.	https://www.npms.phmsa.dot.gov/
T	EGLE's Wetlands Map Viewer	The WMV application was created for the Department of Environment, Great Lakes, and Energy to provide the public with quick and easy access to wetland spatial data.	Flooding, Drought, Extreme Temperatures	https://www.mcqi.state.mi.us/wetlands/mcqiMap.html
U	FEMA Floodplain Management Resources for Local Government Officials	How to participate with the NFIP and tools and resources to provide higher standards for floodplain management.	Flooding	https://www.fema.gov/floodplain-management/management-risk/local

V	FEMA Flood Mitigation Assistance (FMA) Grant Program	FMA is a non-disaster, competitive grant program that provides funding to states, local communities, federally recognized tribes. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. <ul style="list-style-type: none"> • \$800 million available in funding for FY22 • Application Period: September 30, 2022, to January 27, 2023 • Period of Performance: 3 Years • Cost-share: 25% non-federal • Severe Repetitive Loss (up to 100% federal) • Repetitive Loss (up to 90% federal) • Priorities are set each fiscal year 	Flooding	https://www.fema.gov/grants/mitigation/floods
W	FEMA Building Resilient Infrastructure and Communities (BRIC) Grant Program	BRIC is a non-disaster grant program, which provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. Funding has doubled for BRIC to \$2.295 billion for FY21. <ul style="list-style-type: none"> • Caps: States/Territories Allocation and Activities: \$2 million; Tribal set-aside: \$2 million; • National Competition: \$2.133 billion • Application Period: September 30, 2022 to January 27, 2023 • Period of Performance: 3 year from start date on Recipient's federal award • Cost-share: 25% non-federal • Economically disadvantaged rural communities are eligible for 10% non-federal • Priorities are set each fiscal year 	All hazards	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
X	FEMA Hazard Mitigation Grant Program (HGMP)	HMGP is a post-disaster grant program, where funding is only made available under a Presidential major disaster declaration, in the areas of the State requested by the Governor. Federally-recognized tribes may also submit a request for a Presidential major disaster declaration within their impacted areas.	All hazards	https://www.fema.gov/grants/mitigation/hazard-mitigation
Y	State of MI: Resources and Best Practices to prevent and manage invasive species	Prevention tips and action steps to control or remove invasive species.	Invasive Species	https://www.michigan.gov/invasives/take-action
Z	Michigan Invasive Species Grant Program	The Departments of Natural Resources, Environmental Quality and Agriculture and Rural Development work together to address strategic issues of prevention, detection, eradication, and control for both terrestrial and aquatic invasive species in Michigan. This program is designed to address strategic issues of prevention, detection, eradication and control for both terrestrial invasive species (TIS) and aquatic invasive species (AIS) in Michigan.	Invasive Species	www.michigan.gov/invasives/grants/misgp
AA	EGLE's "NotMISpecies" webinar series	This webinar series explores how agencies, universities and locally led organizations are working together to protect Michigan's natural resources through the Michigan Invasive Species Program. If you are concerned about the impacts of invasive species or interested in the techniques used to control them, join us as we examine species-specific actions, innovations in research and technology, and programs designed to help communities prevent and manage harmful invasive species.	Invasive Species	https://www.michigan.gov/invasives/take-action
BB	Clean Boats, Clean Waters Program	Funding from the Michigan Department of Environment, Great Lakes, and Energy and the Great Lakes Restoration Initiative has enabled Clean Boats, Clean Waters to grow into a comprehensive aquatic invasive species boater outreach program. The program's mission is to prevent new aquatic invasive species introductions and limit their dispersal from water recreation activities through outreach and engagement. The program promotes understanding of boat cleaning practices and regulations through the distribution of educational materials, an online resource library, boat washing demonstrations, grants and partnerships.	Invasive Species	www.canr.msu.edu/clean_boat_s_clean_waters/index
CC	Michigan State University Extension (MSUE)	Resources available for: training elected and appointed officials, agriculture and food support programs, and natural resources protections.	All hazards	https://www.canr.msu.edu/outreach/
DD	USDA Natural Resources Conservation Service (NRCS)	The NRCS helps America's farmers, ranchers, and landowners conserve our nation's resources through voluntary programs and science-based solutions.	Drought; Extreme Temperatures; Invasive Species; Public Health Emergency	https://www.nrcs.usda.gov/

EE	Missaukee Conservation District	Our mission is to provide leadership in the promotion and protection of our county soil, water, and other natural resources through education and technical assistance. Our current programs include agricultural assistance, forestry assistance, soil erosion control, invasive species management, stream monitoring, educational services, and the 1.5 mile Missaukee Nature Trail. Our partners include: Michigan Agriculture Environmental Assurance Program (MAEAP), North Country Cooperative Invasive Species Management Area, USDA-NRCS, MI Clean Water Corps, and several local recreation advocacy groups.	Flooding & Erosion; Invasive Species; Wildfire; Drought; Extreme Temperatures; Public Health Emergency	https://www.missaukeecd.org/
FF	North Country Cooperative Invasive Species Management Association (NC-CISMA)	North Country Cooperative Invasive Species Management Area (NCCISMA) acts as an umbrella organization, bringing together a diverse group of partners to collaborate on programs and projects designed to combat invasive species. The organization serves in the counties of Missaukee, Wexford, Lake, Mason, Mecosta, and Osceola. NCCISMA empowers people to address invasive species on their own property through:- Assistance in identifying invasive species- Guidance on treating invasive species and buying herbicides- Invasive species treatment demonstrations- Strike Team for hire to control high priority invasive species on private property- Outreach and educational events	Invasive Species; Flooding and Erosion	https://www.northcountryinvasives.org/
GG	Conservation Resource Alliance	Current projects include: Wild Roots, a cost-share program offering native plants to property owners at a greatly reduced rate; and The River Care Program, which ensures that natural resource professionals maintain a consistent and prioritized action plan for each river in the organization's region. River Care professionals not only find and repair physical problems before they become worse, they also team with local agencies, residents, and interest group representatives for fact-based conversations. These cross-functional teams can speak openly and affect change in an agile, efficient and transparent way. CRA works in the 10-county northwest MI region, along with the southerly adjoining counties of Mason, Lake, Osceola, Oceana and Newaygo.	Flooding & Erosion; Invasive Species; Drought; Extreme Heat; Public Health Emergency	https://www.rivercare.org/
HH	Muskegon River Watershed Assembly	The Muskegon River Watershed Assembly is dedicated to the preservation, protection, restoration, and sustainable use of the Muskegon River, the land it drains, and the life it supports, through educational, scientific and conservation initiatives. Projects have included watershed clean-up events; lake and river evaluation, monitoring and restoration; rain gardens; shoring workshops; and habitat improvement.	Flooding & Erosion; Invasive Species, Public Health Emergency, Drought, Extreme Heat	https://mrwa.org/
II	Upper Manistee River Association	The purpose of this Association is to preserve and protect for future generations the Upper Manistee River system and its drainage as a world class natural resource. MRA consists largely, but not exclusively, of riparian property owners who share river related interests on that part of the Manistee River system, reaching from its head waters in southern Antrim and Otsego Counties downstream, 147 river miles, through Crawford, Kalkaska and Missaukee counties to highway US-131 in Wexford County.	Flooding & Erosion; Extreme Heat; Invasive Species, Public Health Emergency, Drought	http://www.umrasite.org/
JJ	MSUE's Michigan Inland Lakes Partnership	The purpose of the Michigan Inland Lakes Partnership (Partnership) is to engage state and local agencies, Native American Nations, outreach institutions (universities and other educational institutions), non-governmental organizations (NGOs), businesses, industries and citizens in a collaborative effort to ensure the quality, sustainability and ecological diversity of lakes, while considering society's needs. The Partnership will promote communication and cooperation between partners, communities and citizens interested in the management of Michigan's inland lakes, educating leaders, and strengthening stewardship efforts.	Inland flooding, shoreline erosion; Invasive Species	https://www.canr.msu.edu/michiganlakes/convention/
KK	Missaukee Lake Association	The Missaukee Lake Association (MLA) was formed in the fall of 1997. We are a nonprofit voluntary dues organization incorporated under the laws of the State of Michigan. Membership comes from property owners and other interested parties surrounding the lake. The purpose of the MLA is to promote and protect the environmental integrity of the lake through education, safety promotion, quality initiatives and public awareness. The focus of MLA is on the global issues impacting the lake: water quality, wetland protection, weed control, environmental protection and safety. MLA has been doing water quality testing on the lake since the spring of 2001. And since 2009, the Missaukee County Road Commission has monitored the lake levels in the spring and fall of each year.	Flooding & Erosion; Extreme Heat; Invasive Species, Public Health Emergency, Drought	http://lakemissaukee.org/
LL	Missaukee Lake Improvement Board	The Lake Missaukee Improvement Board (LMIB) was formed at the end of 2004 at the urging of the Missaukee Lakes Association (MLA), when MLA was informed that the Eurasian Milfoil that was being treated in the county boat launch had spread to the main body of the lake. MLA had been paying for the treatment in the boat launch area for several years but the scope of the problem was now beyond the authority and resources of MLA.	Flooding, Invasive Species	http://lakemissaukee.org/improvement_board.html

MM	Cadillac Area Land Conservancy	<p>The Cadillac Area Land Conservancy protects significant natural, scenic, and farm lands for current and future generations and fosters an appreciation for the environment in Missaukee, Osceola, Wexford, and northern Lake and Mason counties. Efforts include:</p> <ul style="list-style-type: none"> - Working with property owners to protect natural, scenic and farm lands through conservation easements so they remain undeveloped forever. - Conducting annual monitoring and stewardship of easements - Building coalitions with state and federal agencies to identify priority "wildlife corridors" for establishing future easements. - Conducting community outreach for education and advancing land stewardship now and for future generations. 	<p>Flooding & Erosion; Invasive Species; Public Health Emergency; Wildfire; Drought; Extreme Heat</p>	<p>https://calc-landtrust.org/</p>
NN	Great Lakes Stream Crossing Inventory	<p>Previously, individual inventories were conducted by partnership agencies, watershed organizations, and road agencies but were not readily accessible to stakeholders and did not contain comparable information. The newly developed protocol and datasheet are intended to promote consistent data collection, selection criteria for improvement projects, and selection of appropriate Best Management Practices for each project to benefit all stakeholders. Information gathered on the datasheet can and has been used to prioritize structure replacement and successfully seek funding.</p>	<p>Flooding & Erosion</p>	<p>https://great-lakes-stream-crossing-inventory-michigan.hub.arcgis.com/</p>
OO	EGLE's Michigan Dam Inventory	<p>This open data layer contains dams that are regulated by the State of Michigan. This data is updated automatically by the Dam Safety Program as information changes. EGLE's Dam Safety Program is responsible for ensuring the safety of Michigan's state regulated dams. The program focuses on ensuring that dams are properly constructed, inspected and maintained, and that the owners have adequately prepared for potential emergencies.</p>	<p>Flooding & Erosion; Public Health Emergency</p>	<p>https://gis-michigan.opendata.arcgis.com/datasets/egle::michigan-dam-inventory/about</p>

The Emergency Manager and Task Force considered factors like level of need, economic impact, ease of execution/level of effort, cost, and range of benefit (short term, long-term, small group/area, large group/area) when determining the level of priority for each strategy. In general, strategies that addressed a community need and provided a direct benefit to the community were prioritized as high priority strategies. Strategies that provided a direct benefit to property and natural resources were also categorized as either high or medium priority strategies. Strategies with minimal direct benefit to the community or natural resources were marked as low priority. The cost of the strategy was considered, but not above the strategies potential benefit to the community.

Details on the rationale behind prioritizing for each individual strategy is provided in Appendix D.

PRIORITY

HIGH
MEDIUM
LOW

The key for the strategy types in the far right columns are as follows:

STRATEGY TYPES

1	Local Planning & Regulations
2	Building & Infrastructure Projects
3	Natural Systems Protection
4	Education & Awareness Efforts

The hazard mitigation strategies for Missaukee County are provided on the following pages.

	MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE								WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE				
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species	Public Health Emergency						1	2	3	4	
Preparation and Awareness	1	Incorporate the County Hazard Mitigation Plan's strategies into elements of County and City master plans.	X	X	X	X	X	X	X	X	Missaukee County, City of Lake City, City of McBain	Missaukee County, City of Lake City, City of McBain	A,B	Ongoing	High	X	X	X	X
	2	Continue to pursue interdepartmental cooperation and coordination of police, fire, rescue and EMS services to achieve Community-wide coverage availability.	X	X	X	X	X	X	X	Countywide	Countywide	County Sheriff and EM; local fire/EMS	A, B, C	Ongoing	High	X			
	3	Investigate the feasibility of participating in an emergency mass notification system, such as CodeRED or RAVE.	X	X	X	X	X	X	X	Countywide	Countywide	County EM	A	Ongoing	Medium				X
	4	Continue to promote participation in Storm Spotter Training via partnership with the NWS.		X						Countywide	Countywide	County EM	A	Annually	High				X
	5	Continue and expand public education/outreach efforts, such as drills, exercises, programs, brochures, NOAA weather radio distribution, and website/social media information, to aid in preparedness and resilience for hazard events.	X	X	X	X	X	X	X	Countywide	Countywide	County EM, DHD #10, MDNR	A,B,C	Ongoing/Annually	Medium	X	X		X
	5a	Continue the preparedness practice of conducting the annual statewide tornado drill.		X						Countywide	Countywide	County EM	A	Annually	Medium	X			X
	5b	Increase public awareness of the locations of emergency shelters	X	X	X	X	X			X	Countywide	County EM, local fire Depts./First Responders, MDNR, ARC	A, C	Ongoing	High				X
	5c	Provide information on fire safety at parks and campgrounds			X						Countywide	County and local governments, MDNR, Fire Depts.	A, B, C, M, N	Ongoing	High				X
	5d	Continue online posting of MDNR Fire Danger Status/Maps			X						Countywide	County EM; MDNR	A	Ongoing	High				X
	5e	Promote (via social media, etc.) awareness of vegetation/fuel management for fire prevention around homes and other structures.			X						High fire-risk areas of the county:	County EM, County Building Dept., Local Fire Depts./First Responders, MDNR	A, B, C, M, N	Ongoing	Medium				X
	5f	Provide public education regarding structural modifications (such as foundation anchoring and tie downs for older mobile homes) and tree management practices to reduce risk of damage from high winds.		X							Countywide; mobile home communities are primarily located within the City of McBain, Forest Township, and Caldwell Township	Missaukee County Building Department	A, B	Ongoing	Low		X		X
	6	Continue operation of the local tornado siren in the City of McBain.		X							City of McBain	City of McBain	B	Ongoing	Medium	X			X
	7	Investigate the cost and feasibility of installing a new tornado siren in the City of Lake City.		X							City of Lake City	City of Lake City	B	2 Years	Low	X	X		X
	8	Evaluate additional designated sites to utilize to temporarily store cleanup debris from downed trees after storm events.	X	X		X					Countywide	City DPWs, MCRC, MDOT	A, B, EE, FF	1 Year	Low	X			
9	Continue to provide the Missaukee Commission on Aging's reduced cost snow plow program and telephone call services (to check in on clients during inclement weather, power outages, as well as on a regular basis.)	X	X	X	X	X			X	Countywide	Missaukee County Commission on Aging	D	Ongoing	High	X				

	MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE							WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE				
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species						Public Health Emergency	1	2	3	4
Preparation and Awareness	10	Contact communities in the County that contain areas that have been affected by flooding events, but do not participate in the NFIP, explaining the benefits of doing so. (The NFIP provides flood insurance to property owners, renters and businesses, and having this coverage helps them recover faster when floodwaters recede. The NFIP also works with communities required to adopt and enforce floodplain management regulations that help mitigate flooding effects. There is no cost for communities to participate.)				X				Countywide	County EM, MIEGLE	A, B, T, U, V	3 Years	Low	X			X
	11	Review and adopt the new FEMA floodplain study for the area around Lake Missaukee. (Estimated completion date around 2024-2025.)				X		X		City of Lake City, Lake Township, Caldwell Township	County Drain Commissioner, County Road Commission, MIEGLE, FEMA, City of Lake City, Lake Township, Caldwell Township	U	1-2 Years	High	X			
	12	Assess local fire suppression access points and equipment and pursue improvements as needed.			X			X		Countywide	Local fire departments; MDNR Wildfire Mgmt., local governments	C	Ongoing	Medium	X			X
	13	Educate residents and local fire departments about the opportunity to participate in the Firewise USA® community program. Each applicant (jurisdiction) must create a board/committee, complete a community wildfire risk assessment with three-year action plan to reduce ignition risk to homes, and complete annual educational and risk reduction actions identified in the plan.			X			X		Communities with pine forest (all except cities of McBain and Lake City)	County EM, Local Fire Depts./First Responders, MDNR, Local Governments	C, M, N	1 Year	Medium	X			X
	14	Work with campgrounds (Private, County, and MDNR) to develop a notification system regarding fire danger or severe weather alerts and establish areas of refuge and evacuation routes from campgrounds.	X	X	X					City of Lake City; Bloomfield, Butterfield, Caldwell, Richland & Norwich Townships	County EM, MDNR, Private Campgrounds	A, C, N	1 Year	High	X			X
	15	Evaluate the potential benefit/need to develop a Drought Communication Plan and early warning system to facilitate consistent communication of local drought conditions/outlook amongst farmers and land managers.						X		Countywide	County EM, MCD/USDA-NRCS, MSUE	A, B, K, L, DD, EE	Ongoing	Low	X			X
	16	Evaluate the interest of local agricultural business owners to form a local Agricultural Support Committee to develop and implement natural hazard mitigation strategies.	X	X	X	X	X	X	X	All 15 Townships	MCD/USDA-NRCS	A, B, DD, EE	2 Years	High	X		X	X
	17	Continue the application of mandatory water conservation measures during drought emergencies, such as: -- Developing an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc. -- Adopting ordinances to prioritize or control water use, particularly for emergency situations like firefighting.						X		Cities of Lake City and McBain	Cities of Lake City and McBain	B	As Needed	Low	X		X	

	MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE								WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE					
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species	Public Health Emergency						1	2	3	4		
Preparation and Awareness	18	Continue to support and promote the Missaukee Conservation District's provision of free technical assistance (in partnership with the USDA-NRCS and MAEAP) such as resource assessment, practice design, resource monitoring, and determination of financial assistance for local farmers, ranchers and forest managers.	X	X	X	X	X	X	X	X	All 15 Townships	MCD/USDA-NRCS	DD, EE	Ongoing	High	X		X	X	
	19	Ensure that County residents, particularly vulnerable populations, have access to healthy, affordable food options.							X	X	X		Ongoing			X	X	X	X	
	19a	Consider involvement in MSUE's School Gardens Program (https://www.canr.msu.edu/community_food_systems/school-gardens/) and continue provision of the Missaukee County 4-H Junior Master Gardener Program partnership with schools for grades K-6 (https://www.canr.msu.edu/missaukee/4-h/school-enrichment)							X	X	X	Cities of Lake City and McBain	School districts	CC	2 Years	Medium		X	X	X
	19b	Continue to provide and improve food assistance programs and emergency food programs to help communities prepare for unanticipated pandemics, but also increase year round food accessibility.	X	X	X	X					X	Countywide	NMCAA; local food pantries; School Districts (school meal programs)	D, F, H, I,	Ongoing	Medium	X			
	19c	Create partnerships between Friends/Restaurants/Schools for food rescue	X	X	X	X					X	Countywide	NMCAA; local food pantries; School Districts (school meal programs)	H, I, J	Ongoing	Medium	X			X
	20	Continue programs and services offered by the DHD #10 and/or MDHHS, such as: immunizations; community clinics; school health services; permitting processes for proper location and installation of water wells and septic systems; education about cleaning, monitoring and maintaining septic systems; septic or well repair financial assistance, and the inspection and licensing of food service establishments				X					X	Countywide	DHD#10; MDHHS	E	Ongoing	High	X	X	X	X
	21	Continue to coordinate with the MDHHS & DHD#10 for guidance via the State Pandemic Plan and information about new or emerging disease threats.									X	Countywide	DHD #10, MDHHS; County EM	E	Ongoing	Medium	X			X
22	Consider developing a scenario planning exercise for a potential emergency road closure event on M-55, between Jeffs Rd. and East County Line Rd. This is a major E-W route between Lake City and Houghton Lake with no ideal re-route options in Butterfield and Enterprise Townships.	X	X	X	X						Butterfield Township; Enterprise Township	County EM, Local Fire/Rescue Depts., MDOT, MCRC	A, B, C	1-2 Years	High					

	MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE								WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE				
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species	Public Health Emergency						1	2	3	4	
Shelters	23	Maintain an accurate inventory of emergency shelter sites (overnight vs. daily use types) within the service area; review annually and update as needed.	X	X	X	X	X			X	Countywide	County EM; American Red Cross	A	Annually	High	X			
	24	Provide local governments or public/private organizations information on funding sources for the installation of generators to enhance capabilities of emergency shelter locations.	X	X	X	X	X			X	Countywide	County EM; Local Fire Depts.; Senior Centers; Municipal Offices	A, W, X	As Needed	Low		X		X
	25	Evaluate the feasibility and need for construction of concrete "safe rooms" to serve as shelter areas in mobile home parks, fairgrounds, or campgrounds, or other vulnerable areas.	X	X		X	X				Fairgrounds in Falmouth (Clam Union Twp.) for Missaukee Animal Youth Show; Seasonal rodeo "Cow Camp" in Richland Twp.; Earthworks Harvest Gathering 3rd weekend in Sept. in West Branch Twp.; Timber Wolf Lake Youth Camp in Caldwell Twp. See map for identified campgrounds and mobile home areas	County Building Dept., County EM, local govts, private and public site managers	W, X	3 Years	Medium	X	X		
	26	Create signage in public parks/beaches that illustrate the nearest emergency shelter locations.	X	X	X	X	X			X	Crooked Lake Park in Lake Twp.; Missaukee Lake Park in Lake City; Ben D. Jeffs River Park in Enterprise Twp.	Missaukee County Parks and Rec	M, W	Ongoing	Low				X
	27	Maintain procedures to create quarantine areas in group living quarters, such as overnight shelters or assisted living facilities.								X	Lake City High School; Maple Ridge Living Center in Reeder Twp.; Whispering Pines in Lake Twp.	ARC, DHD #10, Assisted living facilities	E	Ongoing	High	X			
Buildings & Infrastructure	28	Continue enforcement of the County Building Code, Soil Erosion and Sedimentation Code, and District Health Dept. Code for new construction through the permitting process. (i.e., building setback requirements; fire protection system; portions of Pioneer and Caldwell Twps. require a minimum 60 lb. snow load/sq. ft. and the remainder of the county abides by the minimum 50 lb./sq. ft.)	X	X		X	X			X	Countywide	County Building Dept.; DHD#10	A, E	Ongoing	High	X			
	29	Consider revising building code requirements in high fire-risk areas to include wildland fire risk mitigation practices (i.e., provide a 25 foot cleared space/defensible space between houses and other structures.)			X						All Townships; Refer to Environmental Features Map for areas of pine forest in relation to locations of developed land.	County Building Dept.	A, B, C, N	3 Years	Low	X			X
	30	Continue to maintain awareness of the current inspection status of regulated dams in the County.				X					Enterprise Township; Clam Union Township	County EM	A, OO	Ongoing	High	X			
	30a	Maintain communication with the MDNR regarding the condition of the Reedsburg Dam upon the next State required inspection, and obtain any EAP updates.				X				X	Enterprise Township; Butterfield & Holland Townships are downstream.	County EM	A, OO	Ongoing	High	X			

		MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE								WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE				
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species	Public Health Emergency						1	2	3	4	
	30b	Maintain communication with Clam Union Twp. regarding the condition of the Falmouth Dam and its next inspection.				X					X	Clam Union Township; Community of Falmouth	County EM	A, OO	Ongoing	High	X			
	31	Continue to pursue opportunities for brownfield and blight clean-up activities, including demolition and clearance of vacant, condemned structures, to remove actual and potential sources of land, water & air contamination.	X	X	X	X				X	Countywide	Missaukee County Brownfield Redevelopment Authority; Local Governments	A, B, C	Ongoing	High	X	X	X	X	
	32	Promote the availability of low-cost residential weatherization and home improvement programs.	X	X	X	X	X			X	Countywide	NMCAA	F, G	Ongoing	High		X		X	
	33	Consider the development of a reduced-cost program to install air conditioning in the homes of low-income seniors.			X	X				X	Countywide	Missaukee County Commission on Aging	D, F, H, I	5 Years	Low		X			
	34	Identify flood-prone areas on FIRMs and pursue FEMA hazard mitigation assistance grants as appropriate to flood mitigation projects, such as infrastructure improvements (i.e., culvert/bridge replacement, storm sewer retrofitting, storm water management, dry flood-proofing of structures; structure elevation; acquisition for structure demolition or relocation.)				X					Lake Twp., Lake City, Caldwell Twp.	County EM, MI EGLE, local governments	A, B, U, F	Ongoing	High	X	X	X	X	
Buildings & Infrastructure	35	Continue to evaluate alternative methods for removing the Missaukee Lake Level control structure/pier in Lake City along M- 66 and replacing it with new infrastructure that provides sufficient streamflow to the Mosquito Creek and effectively and automatically regulates the level of Missaukee Lake. Continue collaboration amongst Lake City, MDOT, MCRC, and engineers to coordinate the road construction and lake control projects so they are completed at the same time. Also, reconstruct storm sewers that discharge into the lake under M-66.				X			X		City of Lake City, Lake Twp., Reeder Twp.	City of Lake City, Lake Twp., Reeder Twp., MCRC, County Drain Commissioner, MDOT, associated private engineering firm(s)	A, B, W, KK	5 Years	High		X	X		
	36	Inventory and prioritize improvements for problematic culverts or bridges that need reconstruction or replacement to improve water and habitat quality and reduce local flooding.				X					Countywide	MCRC, MDOT	A, B, GG, HH, II, NN	2 Years	High	X	X	X		
	36a	Stevens Road, N. of M-55: box & steel pipe culverts				X				West Branch Twp.	MCRC	High				X	X			
	36b	Stoney Corner Road between VanderMuelen and Turnerville Roads, over N. Branch Clam R.				X				Riverside Twp.	MCRC	Medium				X	X			
	36c	Driveway culvert at McBain High School, over Clam R.				X				City of McBain	MCRC	High				X	X			
	36d	Box culvert under M-66 at McBain Body Shop, over the N. Branch Clam R., across from the High School				X				City of McBain	MDOT	High				X	X			

	MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE							WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE				
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species						Public Health Emergency	1	2	3	4
36e	Bridge on N. Cottage Grove Ave., south of M-66, over the N. Branch of the Clam River				X				City of McBain	MCRC			Medium		X	X		
36f	Seeley Road, north of Boon Road, over the Clam River (on the boundary with Wexford County)				X				Lake Twp.	MCRC			High		X	X		
36g	N. Layman Rd., near Crooked Lake and north of the community of Jennings: culvert(s) often under water most of the time, making it difficult to evaluate their structural condition				X				Caldwell Twp.	MCRC			High					
37	Continue work amongst the utility companies (GLE, Consumers E.), the Missaukee County Road Commission & MDOT to clear vegetation (particularly diseased or dead trees, i.e., from Emerald Ash Borer infestations) along various road and utility right-of-ways to minimize power outages and road blockages from storm damage.	X	X	X				X	Countywide	MCRC, MDOT, Great Lakes E., Consumers E.	O, P, EE, FF	Ongoing	High	X		X		
38	Continue to maintain effective communications practices between electric utility companies and County Emergency Management regarding power restoration. (County EM to post and promote the electrical outage map on social media account.)	X	X	X	X	X			Countywide	Consumers Energy or Great Lakes Energy and the County Emergency Mgmt.	A, O, P	Ongoing	High					X
39	Investigate opportunities to bury overhead utilities, such as during new construction or in areas regularly prone to power outages.	X	X	X	X				Countywide	Local Governments, County Building Dept., Consumers Energy or Great Lakes Energy	A, B, O, P, W	Ongoing	High	X	X			
40	Continue regular maintenance of Ebels Wastewater Treatment Plant in Falmouth.				X			X	Community of Falmouth/ Aetna Twp.	Ebels / Falmouth Co-Op		Ongoing	High	X		X		
41	Continue to maintain the separate sanitary and storms sewers in communities surrounding Lake Missaukee, Crooked Lake and Sapphire Lake, as well as in the City of McBain.				X			X	City of Lake City, City of McBain, Lake Twp., Caldwell Township	City of Lake City, City of McBain, Lake Twp., Caldwell Township	B	Ongoing	High		X	X		
42	Explore the development of Continuity of Operations (COOP) plans and alternative "remote work" schedules.							X	Countywide	County and Local Government Agencies; Public Schools	A, B	Ongoing	Medium	X				
43	Expand availability of high-speed internet service to allow for widely available remote work/learning.							X	Countywide	Missaukee County, Local service providers	A, B, Q	Ongoing	High	X	X			X
44	Continue to reference, as needed, online information regarding the location and operational status of oil & gas wells and hazardous materials pipelines in the county.	X	X		X				Countywide	County EM; Fire and Rescue Depts.	R, S	As Needed	Medium	X				X
45	Explore the installation and use of dry fire hydrants for fire suppression (A non-pressurized pipe system permanently installed in a water source such as lake, stream or pond that permits the withdrawal of water by drafting from a fire truck to provide a reliable water source for fire suppression close to the incident.				X				Countywide	Emergency Manager; Local Fire and Rescue Depts.	A, C	2 Years	Low		X			

Utilities & Technology

	MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE								WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE			
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species	Public Health Emergency						1	2	3	4
Environment & Natural Resources	46	Continue to utilize and promote the technical assistance, outreach and education pertaining to invasive species management (monitoring, treatment & removal) provided by non-profit and government agencies.							X	Countywide	MCD, NC-CISMA, CRA, MI EGLE, MDNR	Y	Ongoing	High	X		X	X
	46a	Continue to provide invasive species management services with reduced-cost services for landowners.							X	Countywide	MCD, NC-CISMA, CRA	FF	Ongoing	High			X	X
	46b	Continue to conduct annual routine invasive species surveying and monitoring to identify new emergent invasive species (such as <i>Cyprus Spurge</i> or <i>Leafy Spurge</i>) before they get established and spread in the county.							X	Countywide	MCD, NC-CISMA, CRA	EE, FF	Ongoing	High	X		X	X
	46c	Continue participation in EGLE's annual Great Lakes Aquatic Invasive Species "Landing Blitz" event at public boat launches, emphasizing the need to Clean, Drain, Dry boats whenever they come out of the water, and Dispose of any unwanted bait in the trash.							X	Lake Missaukee Boat Launches; Green Road near Sapphire and Crooked Lake	MCD, Missaukee Lake Association	EE, KK	Ongoing	High			X	X
	46d	Promote MSUE's "Clean Boats, Clean Waters" comprehensive aquatic invasive species boater outreach program; apply for grant funding to communicate aquatic invasive species prevention information through outreach materials and in-person educational events to boaters.							X	Lake Twp., Lake City, Caldwell Twp.	MSUE, local governments	BB	Annually	High	X		X	X
	46e	Continue to promote EGLE's "NotMISpecies" webinars and resources on invasives control and management							X	Countywide	MCD, NC-CISMA	AA, EE, FF	Ongoing	High			X	X
	46f	Determine if the invasive species <i>autumn olive</i> and <i>Russian olive</i> are prone to wildfire.			X				X	Countywide	MCD, NC-CISMA, MSUE	CC, EE, FF	2 Years	Medium			X	
	46g	Investigate alternative, effective and less expensive invasive species control measures, such as livestock grazing.							X	Countywide	MCD, NC-CISMA, MSUE	CC, EE, FF	2 Years	High			X	
	46h	Continue to manage lake water quality with aquatic invasive species treatment programs and public awareness initiatives.				X			X	City of Lake City, Lake Township, Caldwell Township	Missaukee Lake Improvement Board, Missaukee Lake Association	JJ, KK, LL	Ongoing	High	X		X	X
	47	Evaluate the feasibility of providing staffing at the County boat launch on Lake Missaukee in order to enforce the use of the boat wash equipment.							X	City of Lake City	Missaukee County Parks and Rec; Missaukee Lake Association	A	Ongoing	Medium	X		X	X
	48	Install temporary or permanent boat-washing facilities at other water access sites to reduce the spread of invasives.							X	Crooked Lake, Sapphire Lake, Lake Missaukee	Lake Township, Caldwell Twp., City of Lake City, Missaukee Lake Association	Z, BB	3 Years	Medium	X		X	X
	49	Install boot and/or equipment cleaning facilities at popular trailheads (non-motorized, equestrian, and ORV/Motorcycle) and on logging trails to reduce the spread of invasives species.							X	Countywide	MDNR	Y, Z, EE, FF	2 Years	High	X		X	X

		MISSAUKEE COUNTY HAZARD MITIGATION STRATEGIES	HAZARD TYPE							WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead entities are in bold)	HOW - Resources	WHEN - Timeframe (Years)	PRIORITY TYPE	STRATEGY TYPE			
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Invasive Species						Public Health Emergency	1	2	3
Environment & Natural Resources	50	Consider adoption of local ordinances that regulate activities to prevent the introduction of or the contribution to the spread of invasive species, such as prohibiting the use of invasive species in landscaping and/or vegetative riparian buffers, and permit treatment of existing infestations.							X	Countywide	City governments; Missaukee Lake Association	A, B, Y, EE	3-5 Years	Medium	X		X	X
	51	Continue to identify and prioritize sites for open space protection/preservation, green infrastructure and/or stormwater management, especially in areas prone to flooding or erosion.				X	X		X	Countywide	MCD, Cadillac Area Land Conservancy, MCRC, MDOT, County and Local governments	A, B, EE, MM	Ongoing	High	X		X	X
	52	Continue implementation of MDNR Forestry Management Plans to manage the health and viability of forest ecosystems.			X		X	X	X	All communities except Lake City, McBain and Riverside Twp.	MDNR	MDNR	Ongoing	Medium	X		X	
	53	Continue to conduct wildfire management such as prescribed burns and surface fuels management projects (this also encourages regeneration of native plant species).			X				X	Countywide - public & private land managers	MDNR	MDNR, EE, FF	Ongoing	Medium	X		X	
	54	Continue efforts to regularly clean up river and lake debris, as well as clean out plugged culverts (due to beaver activity, sediment deposits, invasive species, etc.)				X				Countywide	MCD, BCRC, MDOT, Local Volunteers, MDNR, non-profit groups, schools	GG, HH, II, MM, NN	Ongoing	High			X	X

IMPLEMENTATION

Hazard mitigation is any action taken before, during, or after a disaster to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards. Mitigation is an essential element of emergency management, along with preparedness, response, and recovery. Emergency management includes four phases: actions to mitigate a disaster, a community prepares for a disaster; responds when it occurs; and then there is a transition into the recovery process. The process is cyclical and mitigation measures are evaluated and adopted constantly. The evaluation improves the preparedness posture of the County for the next incident, and so on. When successful, mitigation will lessen the impacts of natural hazards to such a degree that succeeding incidents will remain incidents and not become disasters.

Plan Review, Monitoring, and Evaluation

This Plan is intended to be a resource for building coordination and cooperation within a community for local control of future mitigation and community preparedness. The County Board will lead the implementation of the Natural Hazards Mitigation Plan with assistance from the Planning and Emergency Management Director and the Administration. The LPT is an inter-agency partnership and will collaborate to accomplish the goals and objectives of the Plan. The LPT meets on a regular basis to carry out its duties and has expanded its role to function as the Natural Hazards Task Force. The Natural Hazards Task Force will be responsible for monitoring and implementing the mitigation plan. Staff support will be provided by the Planning and Emergency Management Director and will coordinate with the County Board of Commissioners.

Natural Hazards Task Force will perform an annual review of the Missaukee County Hazard Mitigation Plan and consider the list of mitigation strategies identified in the plan. The Task Force will identify projects that have been completed and identify new projects to be completed. The following agencies have been encouraged to actively participate in revising, updating, and maintaining the plan.

- Missaukee County Government Staff
- Townships and Cities
- Missaukee County Conservation District
- Missaukee County Road Commission
- Cadillac Area Land Conservancy
- North Country Cooperative Invasive Species Management Area (NCCISMA)
- Upper Manistee River Association
- Muskegon River Watershed Assembly (MRWA)
- Networks Northwest
- Michigan State University Extension
- Michigan Department of Environment, Great Lakes, and Energy
- Michigan Department of Natural Resources
- Federal Emergency Management Agency
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture Natural Resources Conservation Service
- Insurance Companies
- Real Estate Companies

The County will coordinate with townships and cities to identify mitigation projects and develop grant applications to fund those projects. Land use issues associated with those projects (where applicable) will be handled by each jurisdiction that have an adopted Master Plan and regulate zoning in the project area.

All local municipalities in Missaukee County administer their own planning and zoning regulations. However, only the City of Lake City and the City of McBain have zoning regulations in place.

Missaukee County planning staff provide planning and administrative assistance to the Missaukee County Planning Commission in carrying out its functions:

- Develop and maintain county plans including the Missaukee County Master Plan
- Review proposed new or changes to Township plans and zoning ordinances
- Review proposed new or changes to City plans
- Review EGLE and Corps of Engineers public notices for proposed projects affecting lakes, rivers, streams and wetlands in the county

The County planning staff also serve as an information and referral source for all local municipalities regarding planning and zoning reference information, census and demographic data, and floodplain maps.

Building permits and soil erosion and sedimentation control permits are issued by the Missaukee County Department of Building.

Plan Integration

The City of Lake City, the City of McBain, and all townships in Missaukee County, and local and state agencies will consider integrating information from the hazard mitigation plan into their comprehensive and operations plans. The City of Lake City and the City of McBain have indicated they will begin updating their plans in the near future, and they will consider incorporating appropriate hazard mitigation information into the plan. The cities administer zoning. As part of the education and outreach aspect of the hazard mitigation effort, the townships will be encouraged to adopt zoning regulations to minimize the effect of hazards.

All natural hazards mitigation planning could be pursued using Michigan Public Act 226 of 2003, the Joint Municipal Planning Act. This Act provides for joint land use planning by cities, villages, and townships, and allows two or more municipalities' legislative bodies to create a single joint planning commission to address planning issues. This tool helps with planning for the "big picture" issues such as natural hazards that cross jurisdictional boundaries.

The intent of this legislation is for local governments to consider the following:

- Individual units of government modifying their ordinances simultaneously to include language that would incorporate aspects of protection
- Developing an overlay zoning district that would cross jurisdictional boundaries which would be incorporated into existing independent units of government's zoning ordinances
- Forming a new joint (multi-jurisdictional) planning commission or zoning board
- Sharing zoning administration and enforcement activities

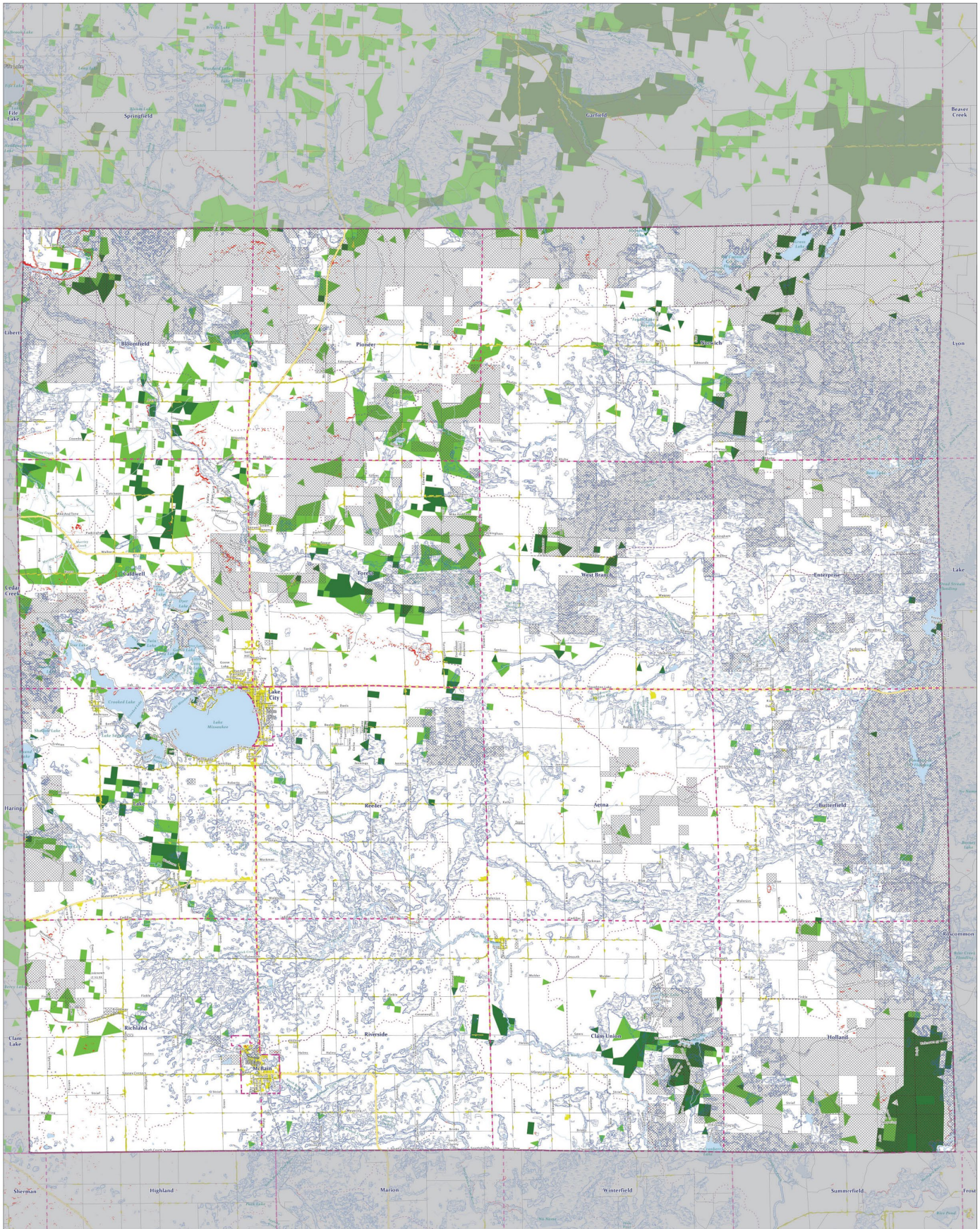
Five Year Plan Review and Update

The Stafford Act, as amended by the Disaster Mitigation Act of 2000, requires the Missaukee County Hazard Mitigation Plan to be updated, adopted, and re-submitted for Federal Emergency Management Agency (FEMA) approval every five years. The plan will be reviewed by the Natural Hazards Task Force every five years in alignment with federal regulations. The update will include determining changes in the county, such as changes in development, an increase in exposure to hazards, an increase or decrease in the communities' capability to address hazards, addition and/or removal of mitigation actions and strategies, reviewing goals, and a change in federal or state legislation. Upon plan review and update completion, the plan will be sent to the State Hazard Mitigation Officer at the Michigan State Police for final review and approval in coordination with FEMA. When the plan has received an "approved pending adoption" status from FEMA, the Missaukee County Board of Commissioners can review, approve, and adopt the plan. In order to properly update the plan, Missaukee County will need to seek funding from appropriate state and federal agencies.

Continued Public Involvement

Missaukee County is committed to keeping the public involved in the implementation and update of the Hazard Mitigation Plan. Copies of the plan will be available at the county libraries, county clerk's office, and all township offices, and will be posted on the community websites and/or regional planning agency website. The Emergency Management Office will be responsible for keeping a record of public comments on the plan.

APPENDIX A: MAPS



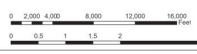
**Missaukee County
Environmental Features**
2023 Hazard Mitigation Plan

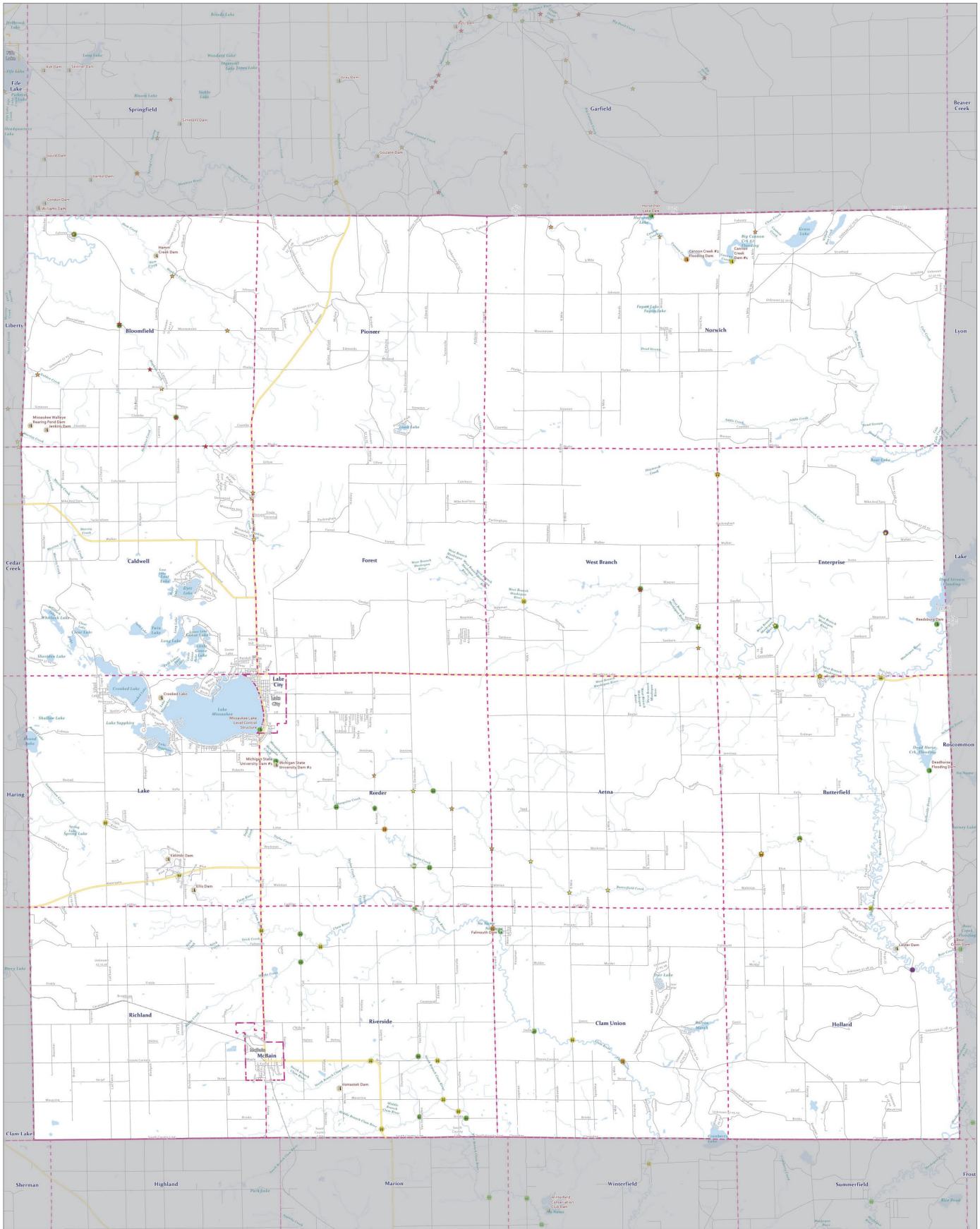
- | | | | | |
|---|--|--|---|---|
| <ul style="list-style-type: none"> Highways Road Railroad | <ul style="list-style-type: none"> River/Streams Water Bodies Part 303 Waters Watershed Boundary (2-Digit) | <p>Legend</p> <ul style="list-style-type: none"> Slope 30% or Greater Developed Land High, Medium & Low Intensity | <ul style="list-style-type: none"> Pine Forest Jack Pine Red Pine; Eastern White Pine Public Land | <ul style="list-style-type: none"> 1/4 Mile 1/2 Mile Township Boundaries Missaukee County Adjacent Counties |
|---|--|--|---|---|

Note:
The State of Michigan has not identified High Risk Erosion or Critical Dune locations in Missaukee County.
The Federal Government has not mapped Floodplains within Missaukee County.



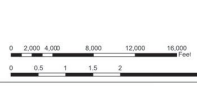
Missaukee County Hazard Mitigation Planning Process
Map produced by Networks Northwest, Community Development 2023
Map data source: State of Michigan, EPS, NAD83, USA, UTM
Networks Northwest
State / Business / Community





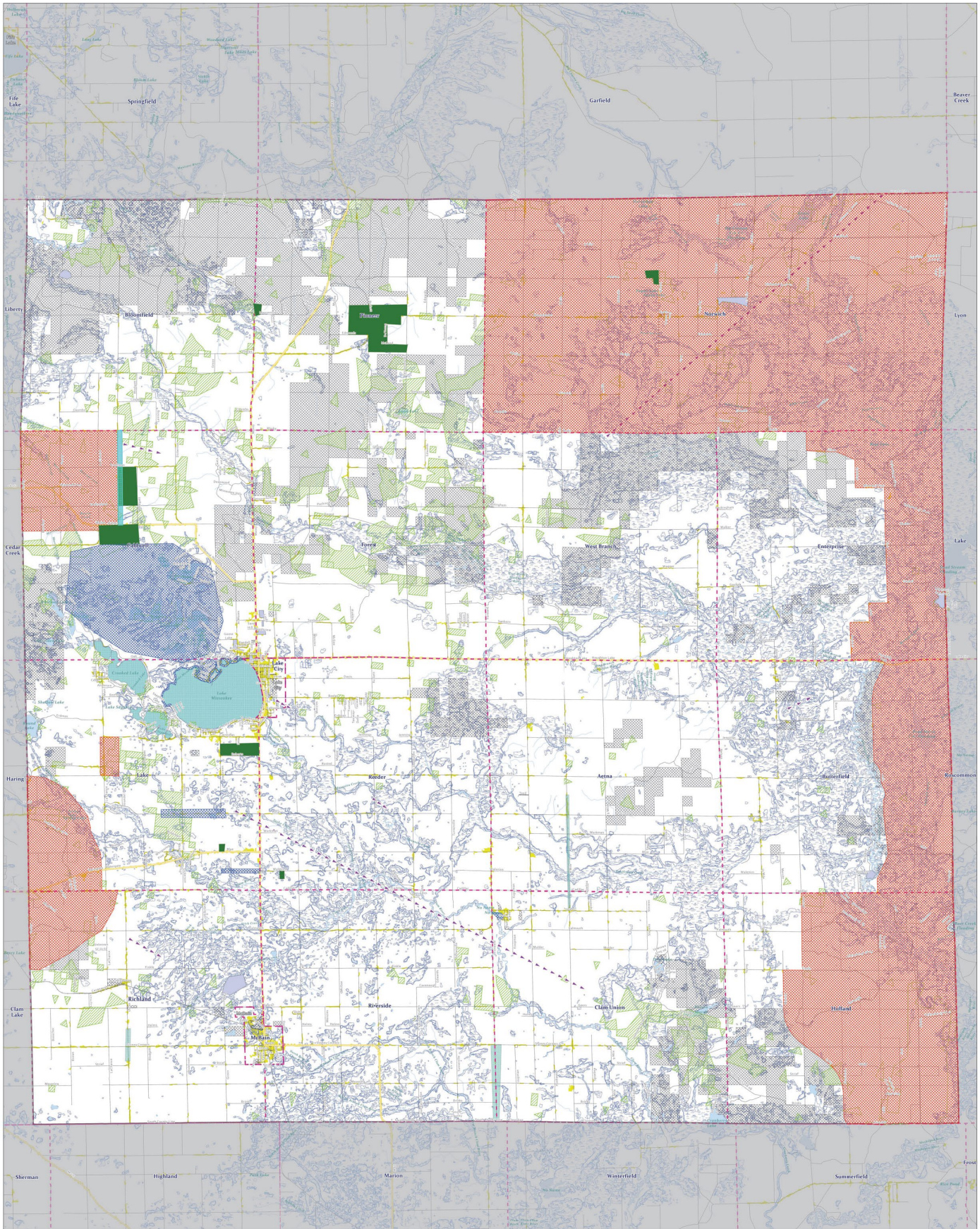
**Missaukee County
Infrastructure**
2023 Hazard Mitigation Plan

- | | | | | |
|--|---|---|--|--|
| <ul style="list-style-type: none"> Highways Roads Railroad River/Stream Water Bodies | <p>Stream Crossings (CRA)</p> <ul style="list-style-type: none"> Severe Moderate Minor Seasonal Season Unknown | <p>Bridge Condition Rating</p> <ul style="list-style-type: none"> Good Fair Poor Serious Critical Closed | <p>M/I Dam Inventory</p> <ul style="list-style-type: none"> Satisfactory Fair Poor Serious Unsatisfactory Not Rated | <ul style="list-style-type: none"> Village City Township Boundaries Missaukee County Adjacent Counties |
|--|---|---|--|--|



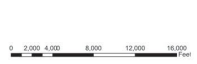
Missaukee County Hazard Mitigation Priority Project
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, ESRI, NACS, USGS, USGS, CMA, HOVIT

Networks Northwest
State / Region / Community



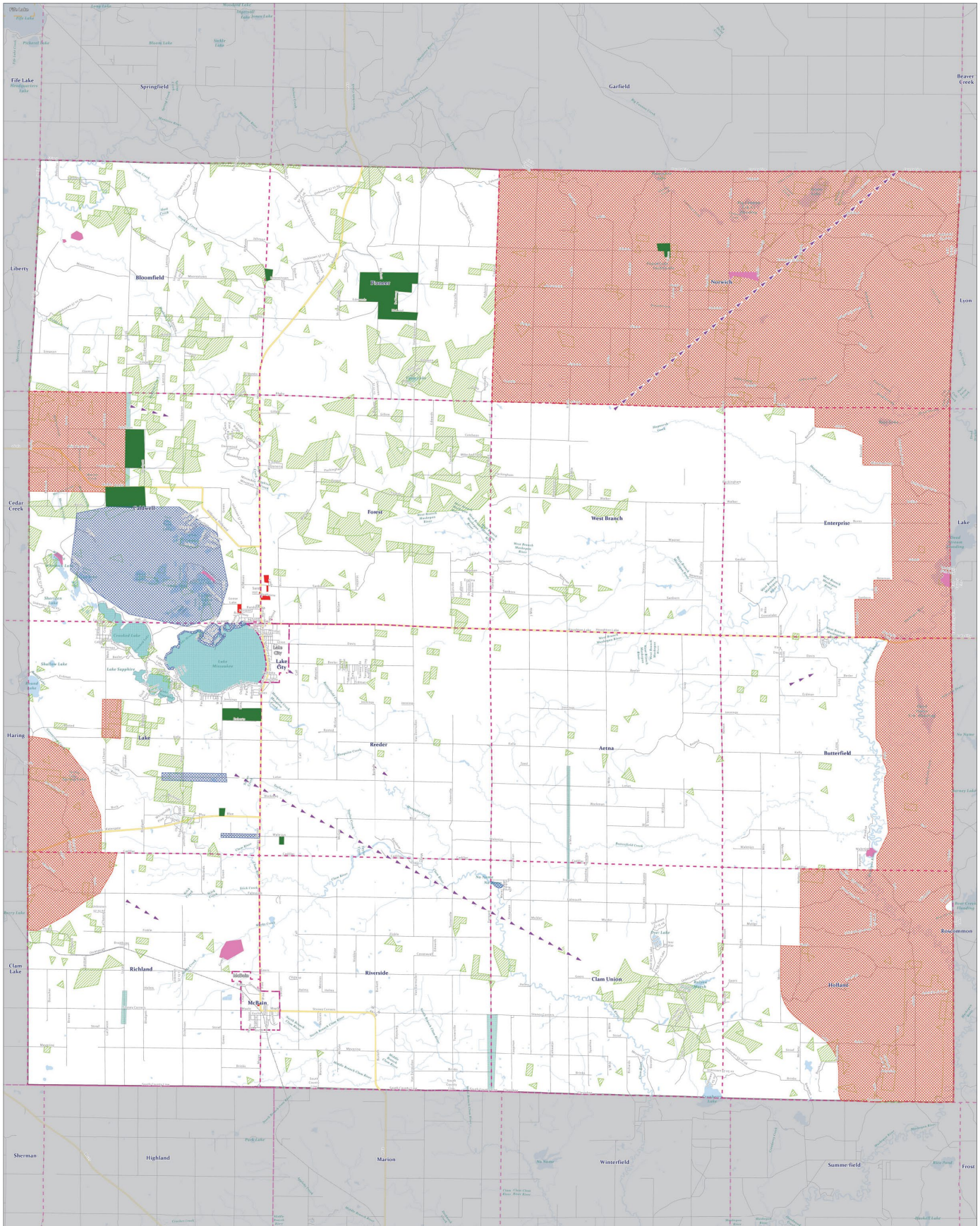
**Missaukee County
Hazard Areas**
2023 Hazard Mitigation Plan

- | | |
|-----------------------------|------------------------------|
| Hazard Area | Legend |
| Fire | Highways |
| Flood | Roads |
| Fire Forest | Railroad |
| Pre-Fire Forest Hazard Area | Water/Streams |
| Evacuation Routes | Water Bodies |
| Evacuation Routes | High Priority Wetlands |
| | Part 303 Wetlands |
| | Public Land |
| | Developed Land |
| | High, Medium & Low Intensity |
| | Villages |
| | Cities |
| | Township Boundaries |
| | Missaukee County |
| | Adjacent Counties |



Missaukee County Hazard Mitigation Planning Process.
Map produced by Networks Northwest, Contract Development 2023.
Map data sources: State of Michigan, CAGI, MCL, OSHA, MDC, CMA, REDOT
Missaukee County Emergency Management

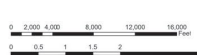




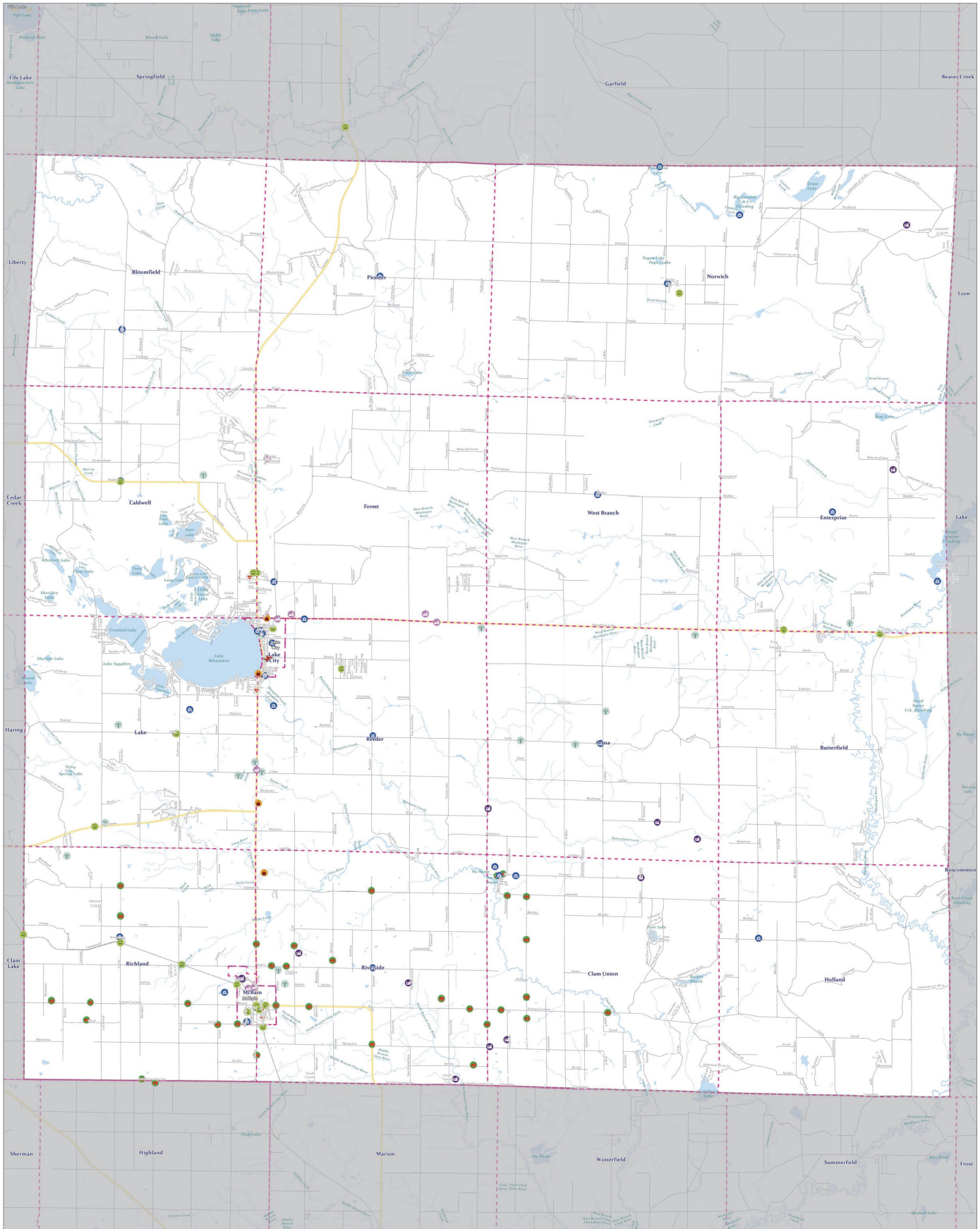
**Missaukee County
Hazard Areas &
Vulnerable Populations**
2023 Hazard Mitigation Plan

- Vulnerable Population**
- Compromised
 - Mobile Home
- Hazard Areas Type**
- Fire
 - Flood
 - Tree Farm
 - Tree Forest
 - Invasive Species
 - Seismic Hazard/Polys

- Legend**
- Highways
 - Roads
 - Railroad
 - Rivers/Streams
 - Water Bodies
 - Village
 - City
 - Township Boundaries
 - Missaukee County
 - Adjacent Counties

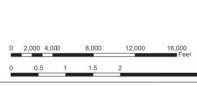


Missaukee County Hazard Mitigation Planning Process
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, ESRI, NAD83, USGS, USGS, CIA, NOAA
Missaukee County Emergency Management



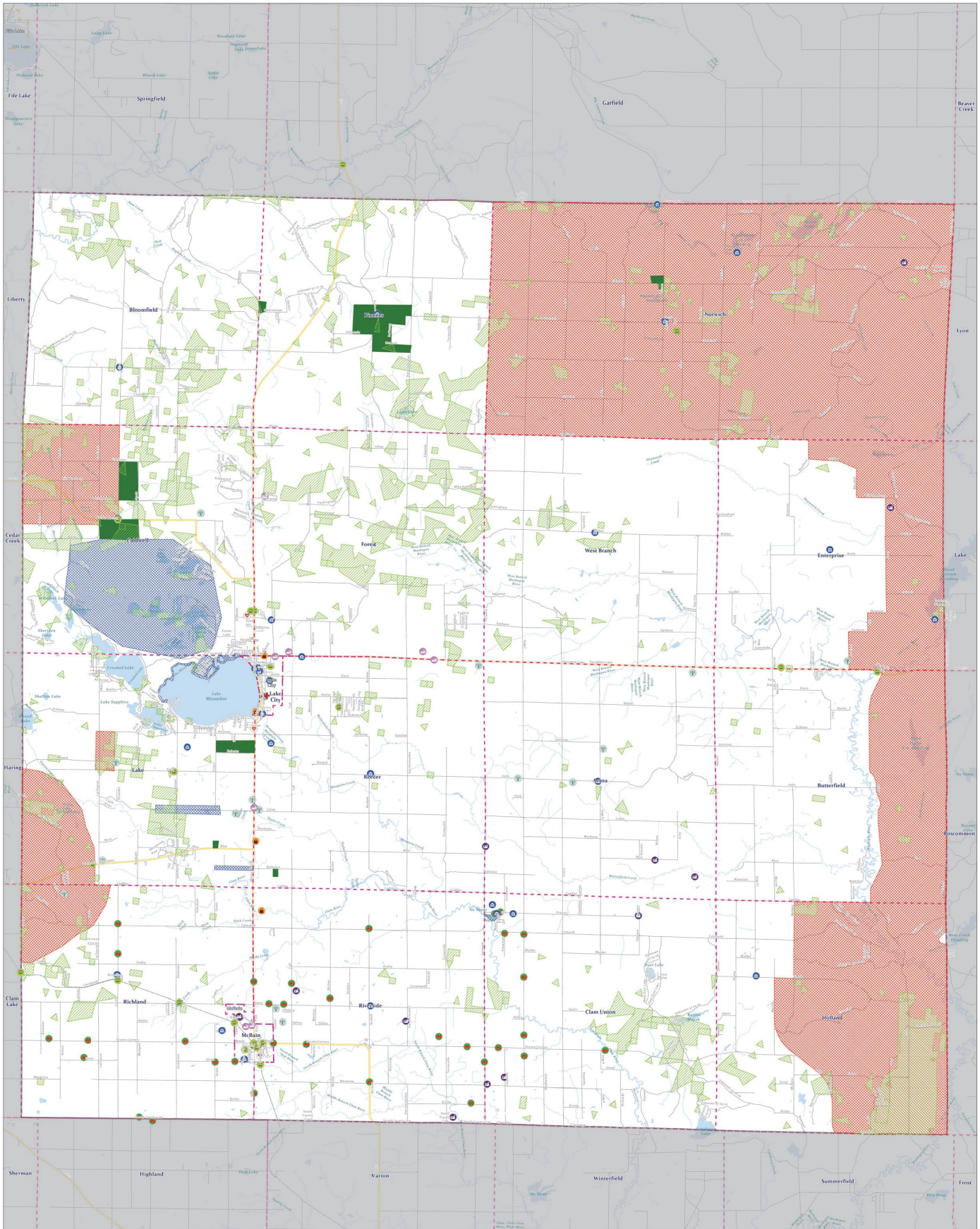
Missaukee County
Critical Infrastructure Points
 2023 Hazard Mitigation Plan

- Legend**
- | | | | |
|----------------|--------------------|---------------------|-------------------|
| Highways | Agriculture | City | Village |
| Road | Commercial | County | Township Boundary |
| Railroad | Communications | Government Facility | Missaukee County |
| Water Channels | Emergency Services | Industry | Adjacent Counties |
| Water Bodies | Transportation | Industry | |



Missaukee County Hazard Mitigation Planning Process.
 Map produced by Networks Northwest Community Development, 2023.
 Map data sources: State of Michigan, Esri, NAVI, USGS, NOAA, CMAA, NOAA, RedHot
 Missaukee County Emergency Management

Networks
 Northwest
 State / Business / Community



**Missaukee County
Critical Infrastructure
Points & Hazard Areas**

2023 Hazard Mitigation Plan

Hazard Areas		Critical Infrastructure		Legend	
Type	Sector	Sector	Sector	Highways	Wetlands
Fire	Agriculture	Government Facilities	Healthcare	Highways	Wetlands
Flood	Chemical	Healthcare	Industry	Roads	Wetlands
Tree Farms	Communications	Industry	Emergency Services	Railroad	Wetlands
	Energy	Transportation	Energy	Rivers/Streams	Wetlands
				Water Bodies	Wetlands
					Wetlands



Missaukee County Hazard Mitigation Planning Process
 Map produced by Networks Northwest, Critical Infrastructure Development 2023.
 Map data sources: State of Michigan, ESRI, MCL, USGS, USGS, CNA, MDCOT
 Missaukee County Emergency Management

APPENDIX B: COMMUNITY SURVEY RESULTS

Missaukee County Hazard Mitigation Community Survey

Q1 Please indicate the organization your represent in Missaukee County.

Answered: 27 Skipped: 0

#	RESPONSES	DATE
1	Clam Union Township	10/25/2021 8:41 PM
2	Planning commission	10/25/2021 12:39 PM
3	Sheriff Dept Cook	10/25/2021 9:32 AM
4	Missaukee County Sheriff's Office	10/25/2021 8:18 AM
5	Missaukee Planning Commission	10/22/2021 7:32 PM
6	Sheriff's Department	10/22/2021 4:19 PM
7	Missaukee County Commission on Aging	10/22/2021 10:22 AM
8	McBain fire Department	10/21/2021 8:40 PM
9	Clam Union township fire dept	10/21/2021 3:27 PM
10	Equalization	10/21/2021 11:08 AM
11	Sheriff's Office	10/21/2021 9:42 AM
12	county commissioner	10/21/2021 8:29 AM
13	Planning board building department	10/21/2021 7:20 AM
14	School Board	10/20/2021 9:55 PM
15	Missaukee EMS	10/20/2021 6:46 PM
16	Aetna township	10/8/2021 5:25 PM
17	District Health Dept. #10	10/6/2021 9:47 AM
18	LCAFD	10/6/2021 9:17 AM
19	Board of Commissioners	10/6/2021 7:56 AM
20	County Commission	10/5/2021 7:11 PM
21	County Clerk	10/5/2021 2:12 PM
22	Missaukee Conservation District	10/5/2021 11:59 AM
23	Holland Township	10/5/2021 6:51 AM
24	City Council	10/4/2021 5:06 PM
25	Merritt Area Fire Department	10/4/2021 1:28 PM
26	City of McBain	10/4/2021 11:45 AM
27	Missaukee Conservation District and Missaukee County Farm Bureau	10/4/2021 10:23 AM

Missaukee County Hazard Mitigation Community Survey

Q2 What is your role in this organization?

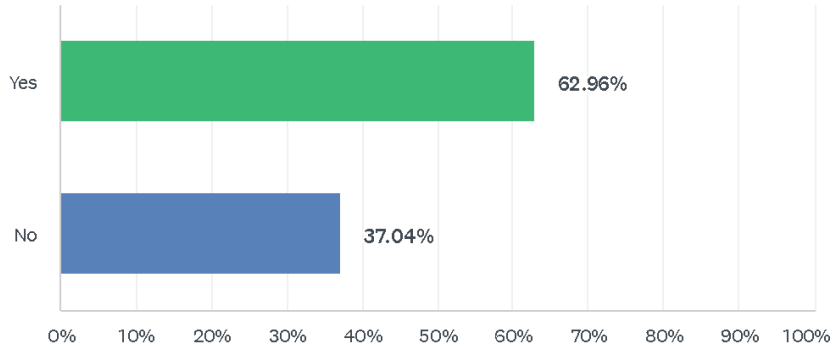
Answered: 27 Skipped: 0

#	RESPONSES	DATE
1	clerk	10/25/2021 8:41 PM
2	economic development member	10/25/2021 12:39 PM
3	Supervisor	10/25/2021 9:32 AM
4	Jail Administrator	10/25/2021 8:18 AM
5	Member	10/22/2021 7:32 PM
6	Dispatch	10/22/2021 4:19 PM
7	Executive Director	10/22/2021 10:22 AM
8	To provide help to people in emergency situations.	10/21/2021 8:40 PM
9	Chief	10/21/2021 3:27 PM
10	Director	10/21/2021 11:08 AM
11	Sheriff	10/21/2021 9:42 AM
12	county commissioner	10/21/2021 8:29 AM
13	To help in the preparation and amendment of a master plan . Review and implement necessary changes to help in the case of natural disasters and development of Missaukee county growth.	10/21/2021 7:20 AM
14	Trustee	10/20/2021 9:55 PM
15	Director	10/20/2021 6:46 PM
16	Clerk	10/8/2021 5:25 PM
17	Emergency Preparedness Coordinator	10/6/2021 9:47 AM
18	Chief	10/6/2021 9:17 AM
19	Commissioner representing District 3 (Lake City and Forest Township)	10/6/2021 7:56 AM
20	Chairman of the board	10/5/2021 7:11 PM
21	Clerk	10/5/2021 2:12 PM
22	District Manager	10/5/2021 11:59 AM
23	Clerk	10/5/2021 6:51 AM
24	City Council Member	10/4/2021 5:06 PM
25	Fire Chief	10/4/2021 1:28 PM
26	Mayor	10/4/2021 11:45 AM
27	1. MAEAP technician - works with farmers 2. President	10/4/2021 10:23 AM

Missaukee County Hazard Mitigation Community Survey

Q3 Are you familiar with the county's Natural Hazard Mitigation Plan?

Answered: 27 Skipped: 0

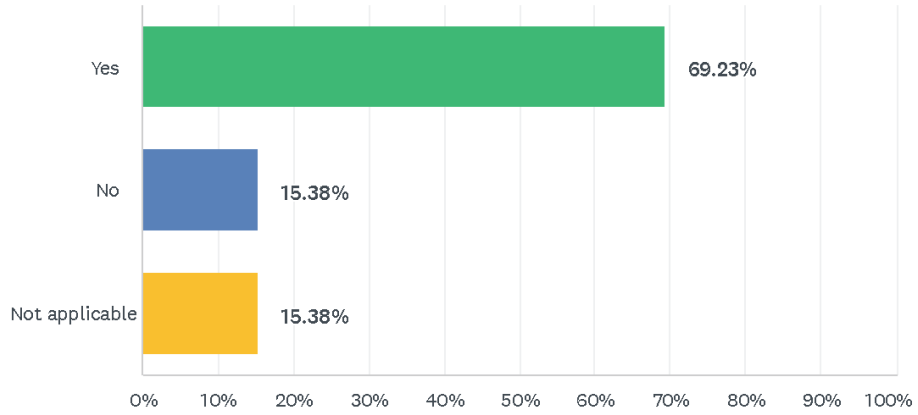


ANSWER CHOICES	RESPONSES	
Yes	62.96%	17
No	37.04%	10
TOTAL		27

Missaukee County Hazard Mitigation Community Survey

Q4 Does the community you represent have an adopted Master Plan?

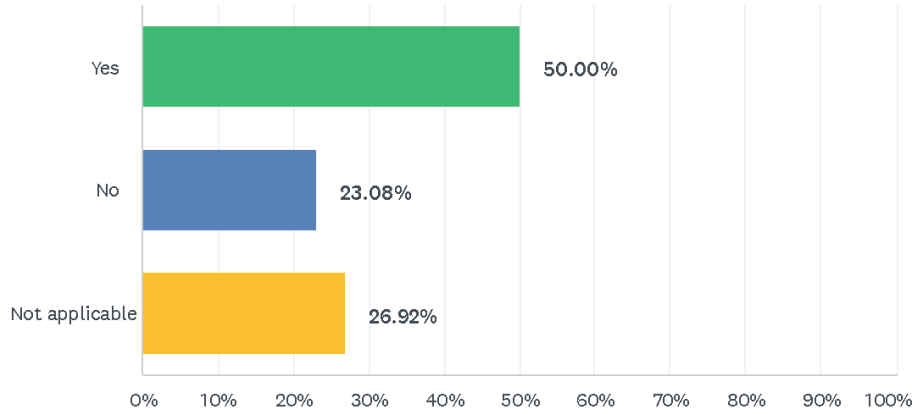
Answered: 26 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	69.23%	18
No	15.38%	4
Not applicable	15.38%	4
TOTAL		26

Q5 Does the community you represent have an adopted Capital Improvements Plan?

Answered: 26 Skipped: 1

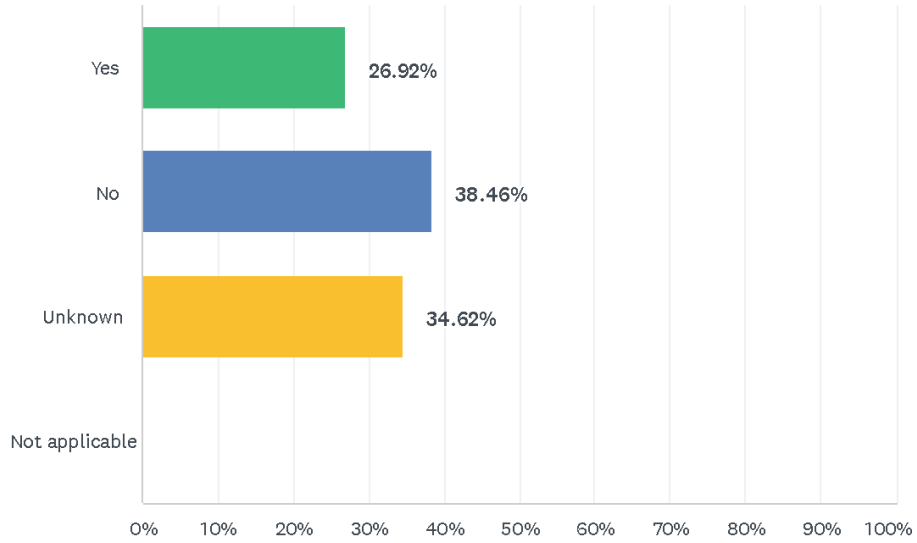


ANSWER CHOICES	RESPONSES	
Yes	50.00%	13
No	23.08%	6
Not applicable	26.92%	7
TOTAL		26

Missaukee County Hazard Mitigation Community Survey

Q6 Has the community you represent experienced a significant natural hazard event within the last 10 years?

Answered: 26 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	26.92%	7
No	38.46%	10
Unknown	34.62%	9
Not applicable	0.00%	0
TOTAL		26

Missaukee County Hazard Mitigation Community Survey

Q7 If so, what was the nature of the event?

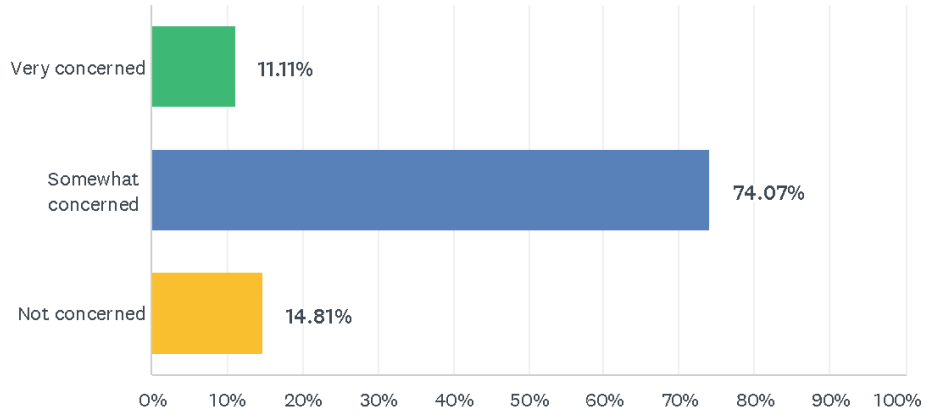
Answered: 14 Skipped: 13

#	RESPONSES	DATE
1	I'm not sure no one talks about these things or i'm just to busy to hear about the things.	10/25/2021 9:32 AM
2	N/A	10/25/2021 8:18 AM
3	Wide spread, long duration power outage.	10/21/2021 8:40 PM
4	High water	10/21/2021 3:27 PM
5	extreme winds causing power outage	10/21/2021 8:29 AM
6	?	10/20/2021 9:55 PM
7	Unknown	10/20/2021 6:46 PM
8	Covid 19	10/6/2021 9:47 AM
9	Unsure	10/6/2021 7:56 AM
10	Heavy rain with some flooding and washouts.	10/5/2021 7:11 PM
11	N/A	10/5/2021 2:12 PM
12	rainfall	10/5/2021 11:59 AM
13	High winds, power outages, snow storm, power outages	10/4/2021 1:28 PM
14	Other than 2019 with too much rainfall for decent planting and harvesting of crops, I'm not aware of another natural hazard that's affected us.	10/4/2021 10:23 AM

Missaukee County Hazard Mitigation Community Survey

Q8 How concerned are you about future natural hazard events impacting your community?

Answered: 27 Skipped: 0



ANSWER CHOICES	RESPONSES
Very concerned	11.11% 3
Somewhat concerned	74.07% 20
Not concerned	14.81% 4
TOTAL	27

Missaukee County Hazard Mitigation Community Survey

Q9 What type of natural hazard events are likely to have the largest impact on your community, for example fire, flood, drought, illness outbreak, etc.?

Answered: 26 Skipped: 1

#	RESPONSES	DATE
1	Severe storms such as a tornado through a populated area. Severe (100 year) ice event that leaves over 50% of the population with no electrical power for weeks. A truly severe pandemic that for example kills 1 in 10 persons instead of 2 or 3 per 1,000.	10/25/2021 8:41 PM
2	illness, such as what is happening right now	10/25/2021 12:39 PM
3	Sickness	10/25/2021 9:32 AM
4	Tornado	10/25/2021 8:18 AM
5	Fire	10/22/2021 7:32 PM
6	Illness Outbreak	10/22/2021 10:22 AM
7	Severe weather with high winds.	10/21/2021 8:40 PM
8	Weather, wind ,snowstorm	10/21/2021 3:27 PM
9	Snowfall, flooding	10/21/2021 11:08 AM
10	Flood, Snow storm	10/21/2021 9:42 AM
11	very few we cant handle as a community	10/21/2021 8:29 AM
12	Tornado, Fire, Flood Covid 19 or other diseases that are unknown. Drought	10/21/2021 7:20 AM
13	Illness and loss of power	10/20/2021 9:55 PM
14	Drought, storm damage, fire.	10/20/2021 6:46 PM
15	All above	10/8/2021 5:25 PM
16	Winter Weather Event/Power Outage Contagious Disease Fire	10/6/2021 9:47 AM
17	Another intentional release of an Bio-agent. Major weather related emergency.	10/6/2021 9:17 AM
18	Fire, After effects of weather events, interruptions in utilities	10/6/2021 7:56 AM
19	Tornados, fire, flood	10/5/2021 7:11 PM
20	Flooding or draught.	10/5/2021 2:12 PM
21	flooding	10/5/2021 11:59 AM
22	fire	10/5/2021 6:51 AM
23	Tornadoes, illness/ outbreak, fire	10/4/2021 5:06 PM
24	Whiter Storms, Sever weather, high winds, forest fire	10/4/2021 1:28 PM
25	Fire	10/4/2021 11:45 AM
26	Flooding and drought are always a concern during the growing season. Fire is also another hazard on any farm.	10/4/2021 10:23 AM

Missaukee County Hazard Mitigation Community Survey

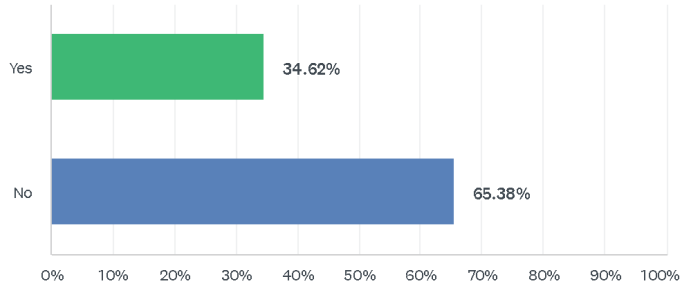
Q10 Does your community have concerns about infrastructure (dams, bridges, utilities, etc.) and the potential for a hazardous event in the future? Please describe.

Answered: 24 Skipped: 3

#	RESPONSES	DATE
1	The dam at the Falmouth pond will require extensive repair and/or maintenance at some point in the future. Many local businesses (farms and retail) have experienced significant expense due to upgrades required to provide adequate electrical service to their facilities. Utility transmission lines are undersized and experiencing stress due to inadequate load carrying capacity. This causes more frequent and wider spread power failures. Lack of natural gas service to outlying users who would benefit greatly by having it available. Little to no availability of high speed internet. This posed a significant problem during the last year when many students studied from home due to quarantine or school shutdowns. These students basically lost almost an entire year of class time.	10/25/2021 8:41 PM
2	No	10/25/2021 8:18 AM
3	No	10/22/2021 7:32 PM
4	Yes, we have some very dated infrastructure all through the county	10/22/2021 10:22 AM
5	ageing power grid. Ageing bridges,	10/21/2021 8:40 PM
6	Yes forward rd bridge	10/21/2021 3:27 PM
7	I'd say concern is a too steep of a word, but bridges in Missaukee County need some TLC.	10/21/2021 11:08 AM
8	Bridges	10/21/2021 9:42 AM
9	minimal...biggest single issue is poor powerline mtce by utilities leading to power failures due to uncut trees falling	10/21/2021 8:29 AM
10	Yes	10/21/2021 7:20 AM
11	Somewhat	10/20/2021 9:55 PM
12	Yes some areas are not accessible for fire apparatus and ambulances due to decayed roads, bridges.	10/20/2021 6:46 PM
13	No	10/8/2021 5:25 PM
14	Not sure	10/6/2021 9:47 AM
15	yes	10/6/2021 9:17 AM
16	Above ground wiring in the majority of the area and at least one older bridge in a somewhat remote area due to be closed	10/6/2021 7:56 AM
17	Aging bridges	10/5/2021 7:11 PM
18	Not that I am aware of	10/5/2021 2:12 PM
19	dams and road stream crossings	10/5/2021 11:59 AM
20	Low bridge	10/5/2021 6:51 AM
21	Not applicable	10/4/2021 5:06 PM
22	Reedsburg Dam, Muskegon River flooding, woodland fires, Pipelines and oilfield pump locations	10/4/2021 1:28 PM
23	Utilities.	10/4/2021 11:45 AM
24	With infrastructure aging and the cost of replacement, dams, bridges & roads are always an issue. As well as decent internet connection for agri-businesses.	10/4/2021 10:23 AM

Q11 Have you been involved in a natural hazard mitigation planning process before?

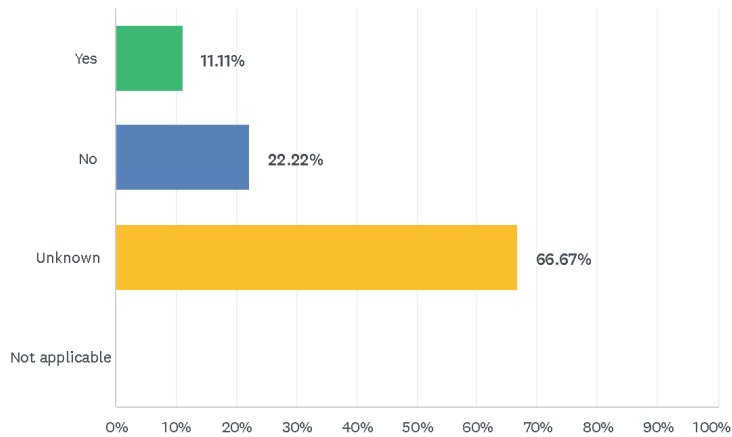
Answered: 26 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	34.62%	9
No	65.38%	17
TOTAL		26

Q12 Has your community requested assistance for mitigation projects in the past?

Answered: 27 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	11.11%	3
No	22.22%	6
Unknown	66.67%	18
Not applicable	0.00%	0
TOTAL		27

Missaukee County Hazard Mitigation Community Survey

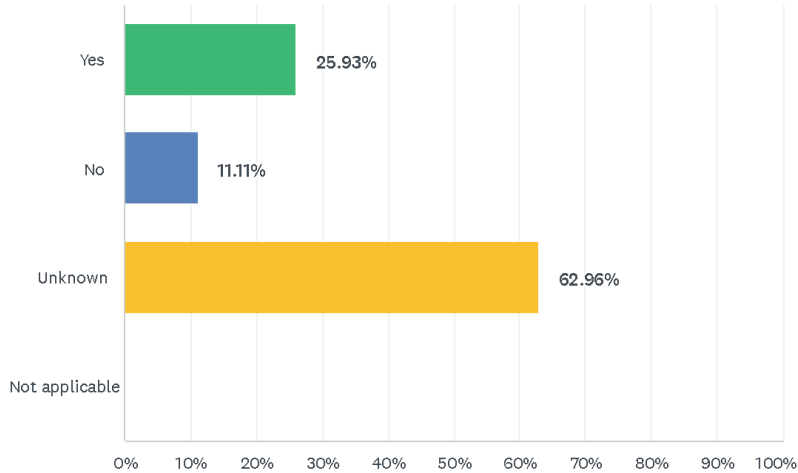
Q13 If so, was your request granted and what type of project did the request include?

Answered: 10 Skipped: 17

#	RESPONSES	DATE
1	N/A	10/25/2021 8:18 AM
2	Don't know	10/21/2021 3:27 PM
3	Not sure	10/21/2021 7:20 AM
4	Disaster relief facility	10/20/2021 9:55 PM
5	Unknown	10/20/2021 6:46 PM
6	Unsure	10/6/2021 7:56 AM
7	Not sure	10/5/2021 2:12 PM
8	n/a	10/5/2021 11:59 AM
9	N/A	10/4/2021 5:06 PM
10	N/a	10/4/2021 1:28 PM

Q14 Has your community considered mitigation strategies for potential or current hazards?

Answered: 27 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	25.93%	7
No	11.11%	3
Unknown	62.96%	17
Not applicable	0.00%	0
TOTAL		27

Q15 If so, please identify potential strategies you would like to explore in the near future.

Answered: 9 Skipped: 18

#	RESPONSES	DATE
1	N/A	10/25/2021 8:18 AM
2	NA	10/21/2021 3:27 PM
3	Red Cross support	10/20/2021 9:55 PM
4	Unknown	10/20/2021 6:46 PM
5	Unknown	10/6/2021 7:56 AM
6	N/A	10/5/2021 2:12 PM
7	Identifying road stream crossings that have the most potential for failure and flooding.	10/5/2021 11:59 AM
8	N/A	10/4/2021 5:06 PM
9	Wildland fires, traffic control for M55 between Jeff Rd and East County line.	10/4/2021 1:28 PM

APPENDIX C: CURRENT STATUS OF 2015 PLAN STRATEGIES

2015 Missaukee County Natural Hazard Mitigation Plan Action Strategies and 2023 Status

2015 Priority Area 1: Potential of severe thunderstorms and high winds, and severe winter storms throughout the County, also the concern regarding festivals and power outages				
Thunderstorm, High Winds, and Tornado Mitigation Strategies				
2015 ACTION STRATEGIES	Responsible Parties	Timeframe	2023 Status/Comments from EM	Related Strategies in the 2023 Plan and Priority Level
a. Update inventory of available shelters and develop a proposal to build additional ones if necessary	County Planning County Building Inspector Emergency Management Coordinator	Ongoing	The shelter inventory hasn't changed; the list of shelters is comprised primarily of township halls, fire departments, churches, and the schools. Lake City Middle/High School has been certified as an American Red Cross shelter. As far as I know it might be the only ARC shelter in the county.	#23 (High) #25 (Medium)
b. Work with Utility Companies <ul style="list-style-type: none"> • Tree management • Promotion of burying utility lines in new construction • Burying power lines in high outage areas 	County Building Inspector Emergency Management Coordinator	1-5 years from adoption of the plan	Consumers Energy cleared trees around lines within the past year; they cover the vast majority of the county with DTE having just a few customers. The County Building Department is working with utility companies and contractors to bury power lines where feasible.	#37 (High) #39 (High)
c. Public education activities such as programs and brochures for new construction and trailers, mobile homes, and modular homes regarding underground utilities, roofing materials, bracing, and anchoring and tie downs	County Building Inspector Emergency Management Coordinator Cities	1-3 years after adoption of the plan	The Building Department has updated its website information to clarify requirements, has developed a robust application and permitting process, information is posted publicly, and inspections are required and stringently followed.	#5 (Medium) #5a (Medium) #5f (Low) #39 (High)
d. Continue enforcement of Building codes	County Building Inspector	Ongoing	Ongoing. Permit applicants are required to provide a site plan and drawings, which are reviewed for code compliance. Deficiencies are identified for correction during process and construction cannot begin until plans meet the standards. Occupancy isn't approved until all inspections are successfully completed.	#28 (High)

e. Work with insurance companies regarding risk management	County Building Inspector Emergency Management Coordinator	1-3 years from adoption of the plan	No progress. This strategy is no longer applicable /relevant. It is not an appropriate responsibility for the County Building Inspector or Emergency Management Coordinator.	
Snow Load Mitigation Strategies				
2015 ACTION STRATEGIES	Responsible Parties	Timeframe	2023 Status/Comments from EM	Related Strategies in the 2023 Plan and Priority Level
a. Develop and implement a data collection project regarding snow loads and structures in the county	County Planning County Building Inspector Emergency Management Coordinator	Ongoing	No progress. This strategy was ultimately not feasible/needed. The County Building Department implements the State of MI Building Code, which includes design requirements pertaining to snow load according to location in Michigan.	
b. Public education and awareness activities such as programs and brochures regarding structural system modifications and structural maintenance; new construction and trailers, mobile homes, and modular homes regarding underground utilities, roofing materials, and bracing	County Building Inspector Emergency Management Coordinator Townships, City	1-3 years from adoption of the plan	The Building Department has updated its website information to clarify requirements, has developed a robust application and permitting process, information is posted for the public, and inspections are required and stringently followed.	#5 (Medium) #39 (High)

c. Continue enforcement of building code regarding snow load limits through the permitting process: State Building Code - Bloomfield Township and a small portion of Caldwell and Pioneer Townships require 60 lb. snow load and the remaining county is 50 lb. snow load	County Building Inspector	Ongoing	Ongoing. The County Building Department continues to implement the State of MI Building Code, which includes design requirements pertaining to snow load according to location in Michigan.	#28 (High)
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2015 Priority Area 2: Bloomfield, Holland, Reeder, and Norwich Townships: Potential wildfire/urban interface areas

Wildfire Mitigation Strategies

2015 ACTION STRATEGIES	Responsible Parties	Timeframe	2023 Status/Comments from EM	Related Strategies in the 2023 Plan and Priority Level
a. Assess fire suppression access and make improvements	Emergency Management Coordinator	1-3 years from adoption of the plan	Ongoing. The responsible party for this strategy has changed to fire services/fire chiefs instead of the Emergency Management Coordinator.	#12 (Medium)
b. Research the Department of Natural Resources' State Forest wildfire/urban interface rules or plan	County Planning County Building Inspector Emergency Management Coordinator	Ongoing	No progress. This is no longer considered a strategy to continue pursuing, as MDNR Fire Staff maintain communications with the County EM and local fire departments on wildfire management practices pertaining to MDNR and other forested lands.	
c. Public education and awareness activities such as programs and brochures regarding fuel management, proper vegetation, fire breaks	County Planning County Building Inspector Emergency Management Coordinator, Cities	1-3 years from adoption of the plan	Ongoing. Information from the Firewise USA program is available in the County Annex building and the Building Department for homeowners, contractors, builders, and the public.	#5c (High) #5d (High) #5e (Medium) #13 (Medium)

d. Continue enforcement of state fire codes regarding setback requirements	County Building Inspector	Ongoing	Ongoing. The County Building Department continues to implement the State of MI Building Code, which includes requirements pertaining to Fire Separation Distance for exterior building faces.	#28 (High) #29 (Low)
e. Public education utilizing the Michigan Department of Natural Resources flyers and the Federal Emergency Management Administration information at parks and campgrounds	County Planning County Building Inspector Emergency Management Coordinator Townships, City	1-3 years from adoption of the plan	Ongoing. Educational materials are provided in the County Park/campgrounds regarding fire and campfire safety.	#5c (High) #14 (High)
f. Real estate and insurance agents to distribute information	County Planning County Building Inspector Emergency Management Coordinator	1-3 years from adoption of the plan	No progress. This strategy was ultimately not feasible/appropriate and is no longer relevant.	

2015 Priority Area 3: Norwich, Enterprise, and Clam Union Townships Dams: Potential flooding from breakdown in any of these three dams

Flood Mitigation Strategies

2015 ACTION STRATEGIES	Responsible Parties	Timeframe	2023 Status/Comments from EM	Related Strategies in the 2023 Plan and Priority Level
a. Public education and awareness activities through radio and television	County Planning County Building Inspector Emergency Management Coordinator Townships, City	1-3 years from adoption of the plan	No progress. The strategy of pursuing education /awareness through radio and television was ultimately not feasible. New public education/awareness strategies related to flood mitigation are listed in the column to the right.	#3 (Medium) #5 (Medium) #10 (Low) #34 (High) #51 (High)
b. Continue enforcement of building codes and soil erosion regulations which includes the state code of a 500 foot buffer	County Building Inspector	Ongoing	Ongoing. Missaukee County Building Department issues building and soil erosion permits and provides enforcement of regulations at construction sites.	#28 (High)

<p>c. Utilize the information from Soil Conservation District, Michigan Department of Environmental Quality and the Department of Natural Resources</p>	<p>County Planning County Building Inspector Emergency Management Coordinator</p>	<p>Ongoing</p>	<p>Ongoing. EGLE's (formerly the DEQ) Michigan Dam Inventory (an interactive online map) provides updated information on the dams, including the condition assessment and downstream hazard potential rating. This information, along with MDNR-provided input on the status of their dams in Norwich and Enterprise Townships, was incorporated into the 2023 plan update.</p>	<p>#30 - #30b (High)</p>
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APPENDIX D: Rationale for Prioritization of 2023 Strategies

2023 STRATEGIES/PRIORITIES RATIONALE

Missaukee County Emergency Management prepared the following comments regarding the rationale for the priority given to each of the 2023 Hazard Mitigation Plan strategies (corresponding to each numbered strategy in the table):

1. For continuity and to encourage consistency in planning across the board.
2. Enhances and improves the safety of the community.
3. Potential to participate in state's system; explore budgetary impact.
4. Enhances public safety.
5. Different methods of outreach to access more segments of the population.
- 5a. Basic preparedness and awareness information; easy to share and make accessible.
- 5b. Public need safety information before an event, not during an event.
- 5c. Carelessness can have catastrophic consequences.
- 5d. Carelessness can have catastrophic consequences.
- 5e. Carelessness can have catastrophic consequences.
- 5f. There are age limits on mobile homes that can be installed, so the number of older mobile homes will be decreasing.
6. Community is accustomed to it.
7. Explore other, more cost-effective notification methods.
8. Already in progress.
9. Necessary resource for area seniors.
10. Other than the lakeshore areas, many of the areas with the potential to be impacted are lightly populated or not at all.
11. Potential for significant flooding issues.
12. Continuous process.
13. Minimal population in this area.
14. Vulnerable populations, wooded area, high risk.
15. Potential for significant issues in the future but currently have benefit of aquifers/irrigation. Should be developed but not a strict, tight timeline.
16. The people that are reliant on the land tend to be good stewards and advocates for preservation of resources and mitigation of problems; could involve MAEAP Technician.
17. This may be necessary but could be a tough sell due to ubiquitousness of water – difficult for people to understand there are limitations to the resource.
18. Need to stay ahead of agricultural and resource issues to catch any potential issues as they arise.
19. (Priority M) School kids have access to meals through the school and during the summer to help lessen the load on families.
 - 19a. A step toward food security, sustainability, and self-reliance.
 - 19b. A step toward food security, sustainability, and self-reliance.
 - 19c. Would have positive benefits in every aspect.
20. Benefit overall public and environmental health.

21. Benefit overall public health; preparedness.
22. Scenario has real-world potential and serious implications and would have a major impact on travelers on that route and the ability of responders to get through the area.
23. Important to have that information available prior to an event; list needs to be updated and maintained.
24. Most identified shelters (Lake City High School, McBain Public Schools, fire stations, EMS, and some township halls) are already on generator. Most areas of county have a potential shelter site with a generator somewhere nearby.
25. Events draw large numbers of people; currently no safe rooms or storm shelters to direct the public to.
26. Currently no emergency shelters.
27. Critical to lessen the spread of disease both within the facility as well as preventing spread to the general public.
28. Critical to prevent erosion issues, wildland/wildfire potential to spread to homes; protection of homes/property/people from hazards/dangers resulting from substandard construction.
29. Encouraging homeowners/builders to reduce the amount of natural fuels on their properties around structures would reduce risk and enhance the safety of the homeowners, fire services, and other first responders.
- 30a. Large dam, extensive potential impact area.
- 30b. Smaller aging dam, with extensive potential impact around the community of Falmouth.
31. Environmental protection, water protection; make properties usable again and safe.
32. Program is currently available; helps homeowners maintain the comfort and safety of their dwelling.
33. Might be difficult to find a funding source/manpower.
34. Public safety, risk management, environmental protection.
35. Public safety, risk management, environmental protection.
36. Pre-identification to allow for prioritization of need.
- 36a. High traffic area – would be significant disruption to travelers and first responders if culvert failed.
- 36b. In between two large farming operations; heavy traffic along that route.
- 36c. and 36d. Heavy traffic area, failure would disrupt school, traffic, first responders, and negatively impact the North Branch of the Clam River.
- 36e. Neighborhood area with nearby egress/ingress. Failure of bridge could negatively impact the river but residents would not be unsafe.
- 36f. Failure of bridge would negatively affect the Clam River and would disrupt the considerable amount of traffic that flows through the area.
- 36g. Failure of culvert would cut split a long section of road and result in significant detour; could also negatively affect the lake.
37. Reduction in the number and impact of power outages through maintenance and vigilance.
38. Promotes public awareness.
39. Reduction in the number and impact of power outages through transition from above-ground lines to buried.
40. Pollution prevention – Clam River is nearby; also, residences and businesses.
41. Critical for the protection of public health and environmental health.
42. Some progress toward this already – continue.
43. Critical for students, businesses, and increasingly for the general public.

44. Awareness is maintained through routine review to keep first responders apprised of the risks.
45. Fire services believe this would be very beneficial.
46. Conversations with County Parks Manager and Lake Township Supervisor about invasive species management, particularly AIS due to the lake access. Explore the possibility of some kind of grant funding/project to address the issue, especially at boat launches; control of AIS through treatments.
- 46a. – 46d. See #46
- 46e. Important for information sharing and knowledge.
- 46f. – 46g. Exploration of alternative, effective, low-impact methods of invasive species control.
- 46h. See #46 – Lake Township funds awareness campaigns at Green Road launch.
- 47 - 48. See #46 and 46h – Also explore the potential for permanent boat wash station through grant funding?
49. Could be an effective means of limiting the transmission of invasives.
50. Could be an effective means of limiting the transmission of invasives.
51. Property protection, environmental protection
52. Property protection, environmental protection; ultimately benefits the local economy by protecting the health of the forest and environment.
53. Property protection, environmental protection; ultimately benefits the local economy by protecting the health of the forest and environment.
54. Property protection, environmental protection; ultimately benefits the local economy by protecting the health of waterways and water resources.

APPENDIX E: Consideration of Alternative Strategies

Hazard Mitigation Alternatives Considered for Missaukee County

A check mark indicates it was included in the list of 2023 mitigation strategies.

Sources of alternatives: Michigan State Police's 2019 Michigan Hazard Analysis and Hazard Analysis Supplement

Hazard Mitigation Alternatives for General Thunderstorm Hazards, Hail, and/or Lightning	
✓	Increased coverage and use of NOAA Weather Radio, and public early warning systems and networks.
✓	Buried/protected power and utility lines. (NOTE: Where appropriate: Burial may sometimes cause additional problems and costs in cases where eventual cable breakages are harder to locate and more expensive to repair.)
✓	Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
✓	Using structural bracing, window shutters, laminated glass in window panes, and impact-resistant roof shingles to minimize damage to public and private structures.
✓	Moving vehicles into garages or other covered areas. <i>(Advice to be provided in public outreach efforts.)</i>
✓	Installing lightning protection devices on the community's communications infrastructure and critical structures. More widespread use of lightning protection devices might also occur. <i>(Advice to be provided in public outreach efforts.)</i>
	Purchase of insurance that includes coverage for hail damage.
✓	Using surge protectors on critical electronic equipment. <i>(Advice to be provided in public outreach efforts.)</i>

Hazard Mitigation Alternatives for Tornadoes and Severe Winds	
✓	Increased coverage and use of NOAA Weather Radio, or comparable device-based notifications.
✓	Public early warning systems and networks.
✓	Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
✓	Buried/protected power and utility lines. (NOTE: Where appropriate. Burial may cause additional problems and costs when breakage or malfunction occurs, due to the increased difficulty in locating and repairing the problem.)
✓	Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe wind damage.
✓	Proper anchoring of manufactured homes and exterior structures such as carports and porches.
✓	Securing loose materials, yard, and patio items indoors, or where winds cannot blow them about. <i>(Advice to be provided in public outreach efforts.)</i>
✓	Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas or event locations.

Hazard Mitigation Alternatives for the Extreme Temperatures Hazard	
✓	Organizing outreach to vulnerable populations during periods of extreme temperatures, including establishing and building awareness of accessible heating and/or cooling centers in the community, and other public information campaigns about this hazard.
✓	Increased coverage and use of NOAA Weather Radio.
✓	Provide and publicize designated heating and cooling centers within the community, where persons in need may go to obtain relief from outdoor temperatures.

Hazard Mitigation Alternatives for Winter Weather Hazards (Includes snowstorms, ice & sleet storms)	
✓	Increased coverage and use of NOAA Weather Radio.
✓	Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
✓	Buried/protected power and utility lines. (NOTE: Where appropriate. Burial may cause additional problems and costs in case of breakage, due to the increased difficulty in locating and repairing the problem.)
✓	Establishing heating centers/shelters for vulnerable populations.
✓	Home and public building design and maintenance to prevent roof and wall damage from "ice dams."
✓	Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.
	Agricultural activities to reduce impacts on crops and livestock.
	Pre-arranging for shelters for stranded motorists/travelers, and others.
	Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.

Hazard Mitigation Alternatives for Fluvial (Riverine) Flooding	
✓	Floodplain management—planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
	Acceptable land use densities, coverage and planning for particular soil types and topography (decreasing amount of impermeable ground coverage in upland and drainage areas, zoning and open space requirements suited to the capacity of soils and drainage systems to absorb rainwater runoff, appropriate land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
✓	Dry floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
	Wet floodproofing of structures (controlled flooding of structures to balance water forces and discourage structural collapse during floods).

✓	Elevation of flood-prone structures above the 100-year flood level.
✓	Purchase or transfer of development rights - to discourage development in floodplain areas.
	“Floating” architectural designs for structures in flood-prone areas.
✓	Construction of elevated or alternative roads that are unaffected by flooding, or making roads more flood-resistant through better drainage and/or stabilization/armoring of vulnerable shoulders and embankments.
✓	Government acquisition, relocation, or condemnation of structures within floodplain or floodway areas.
✓	Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
✓	Protection (or restoration) of wetlands and natural water retention areas.
✓	Higher engineering standards for drain and sewer capacity, or the expansion of infrastructure to higher capacity.
✓	Joining the National Flood Insurance Program (NFIP).
	Obtaining flood insurance. (Requires community participation in the NFIP.)
	Participation in the Community Rating System (CRS).

Hazard Mitigation Alternatives for Urban Flooding	
✓	Stormwater management—Adequate design, installation, maintenance, and monitoring of municipal storm sewer systems. Ordinances or amendments to assist in stormwater management (e.g. forbidding illicit discharges). Planning for and regulating areas prone to flooding (acceptable uses and development restrictions through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, purchased or transferred development rights, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
	Homeowner’s and rental insurance that includes coverage of damages and cleanup of sewer backflow impacts.
✓	Structural projects to channel water away from people and property (dikes, levees, floodwalls) or to increase drainage or absorption capacities (spillways, water detention and retention basins, relief drains, drain widening/dredging or rerouting, debris detention basins, logjam and debris removal, extra culverts, bridge modification, flood gates and pumps, wetlands protection and restoration).
✓	Higher engineering standards for drain and sewer capacity, or the expansion of infrastructure to higher capacity.
	Drainage easements (allowing the planned and regulated public use of privately owned land for temporary water retention and drainage).
✓	Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
✓	Farmland and open space preservation.
	Elevating mechanical and utility devices above expected flood levels.
✓	Flood warning systems and the monitoring of water levels with stream gauges and trained monitors.

✓	Increased coverage and use of NOAA Weather Radio.
	Anchoring of manufactured homes to a permanent foundation in flood areas, but preferably these structures would be readily movable if necessary or else permanently relocated outside of flood-prone areas and erosion areas.
✓	Control and securing of debris, yard items, or stored objects (including oil, gasoline, and propane tanks, and paint and chemical barrels) in floodplains that may be swept away, damaged, or pose a hazard when flooding occurs. <i>(Advice to be provided in public outreach efforts).</i>
	Back-up generators for pumping and lift stations in sanitary sewer systems, and other measures (alarms, meters, remote controls, switchgear upgrades) to ensure clear drainage infrastructure.
	Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
	Increasing the function and capacity of sewage lift stations and treatment plants (installation, expansion, and maintenance), including possible separation of combined storm/sanitary sewer systems, if appropriate.
✓	Wetlands protection regulations and policies.
	Use of check valves, sump pumps and backflow preventers in homes and buildings.
	Acceptable land use densities, coverage and planning for particular soil types and topography (decreasing amount of impermeable ground coverage in upland and drainage areas, zoning and open space requirements suited to the capacity of soils and drainage systems to absorb rainwater runoff, appropriate land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
✓	Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
✓	Protection (or restoration) of wetlands and natural water retention areas.
	Landslide mitigation ideas: Do not build houses, buildings, parks, or playgrounds close to steep slopes; install flexible pipe fittings to avoid gas and water line breakage.

Hazard Mitigation Alternatives for Dam Failures	
✓	Regular inspection and maintenance of dams.
	Garnering community support for a funding mechanism to assist dam owners in the removal or repair of dams in disrepair.
	Regulate development in the dam's hydraulic shadow (where flooding would occur if a severe dam failure occurred).
	Ensuring that dams meet or exceed the design criteria required by law.
✓	Public warning systems.
	Obtaining insurance.
✓	Increased coverage and use of NOAA Weather Radio
	Increased funding for dam inspections and enforcement of the Dam Safety Program (Part 315 of the Natural Resources and Environmental Protection Act) requirements and goals.

	Constructing emergency access roads to dams, where needed.
✓	Pump and flood gate installation/automation.

Mitigation Alternatives for Drought Hazard	
	Storage of water for use in drought events (especially for human needs during periods of extreme temperatures, and for responding to structural fire and wildfire events).
✓	Legislative acts, local ordinances, and other measures to prioritize or control water use.
✓	Encouragement of water-saving measures by consumers (including landscaping, irrigation, farming, lower priority lawn maintenance, and non-essential auto washing).
✓	Anticipation of potential drought conditions, and the preparation of drought contingency plans.
✓	Designs, for recreational and other water-related structures and land uses, that take into account the full range of water levels (of lakes, streams, and groundwater).
✓	Designs and plans for water delivery systems that include a consideration of drought events.
✓	Obtaining agricultural insurance.

Hazard Mitigation Alternatives for Wildfire Hazard	
✓	Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low-hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on houses; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
✓	Safe disposal of yard and house waste rather than through open burning. (<i>Advice to be provided in public outreach efforts</i>).
	Use of fire spotters, towers, planes.
✓	Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
✓	Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and lands with a history of flammable substances stored, spilled, or dumped on them).
✓	Public notification of fire weather and fire warnings.
✓	Prescribed burns and fuel management (thinning of flammable vegetation, possibly including selective logging to thin out some areas. Fuels cleared can be given away as firewood or made into wood chips for distribution.)
✓	The creation of fuel breaks (areas where the spread of wildfires will be slowed or stopped due to removal of fuels, or the use of fire-retardant materials/vegetation) in high-risk forest or other areas.

	Keeping roads and driveways accessible to vehicles and fire equipment—driveways should be relatively straight and flat, with at least some open spaces to turn, bridges that can support emergency vehicles, and clearance wide and high enough for two-way traffic and emergency vehicle access (spare keys to gates for properties should be provided to the local fire department, and an address should be visible from the road so homes can be located quickly).
	Enclosing the foundations of homes and buildings rather than leaving them open with their underside exposed to blown embers or materials.
	Safe use and maintenance/cleaning of fireplaces and chimneys (with the use of spark arresters and emphasis on proper storage of flammable items). Residents should be encouraged to inspect chimneys at least twice a year and clean them at least once a year.
	Proper maintenance and storage of motorized equipment that could catch on fire (from blown embers, etc.)
	Proper storage and use of flammables, including the use of flammable substances (such as when fueling machinery). Store gasoline, oily rags and other flammable materials in approved safety cans. Stack firewood at least 100 feet away and uphill from homes.
	Avoid building structures on hilltop locations, where they will be at greater risk from wildfires (also, hillsides facing south or west are more vulnerable to increased dryness and heat from sun exposure).
	Use of proper setbacks from slopes (outside of the "convection cone" of intense heat which would be projected up the slope of the hill as a wildfire "climbs" it).
✓	Have adequate water supplies for emergency fire-fighting (in accordance with NFPA standards).
	Obtaining insurance.

Hazard Mitigation Alternatives for Invasive Species	
	Restrictions on the import and transport of species carriers.
	Adjustments to hunting, fishing, and other policies and regulations related to wildlife populations.
	Use of barriers to prevent invasive species travel.
✓	Use of competing species or other population control techniques.

Hazard Mitigation Opportunities for Public Health Emergencies	
✓	Maintaining proper levels of PPE for healthcare workers and first responders, with additional supplies for long-term care facilities.
✓	Immunization programs to vaccinate against communicable diseases.
	Improving ventilation techniques in areas, facilities, or vehicles that are prone to crowding or that may involve exposure to contagion or noxious atmospheres.
✓	Maintaining community water and sewer infrastructure at acceptable operating standards.
	Providing back-up generators for water and wastewater treatment facilities to maintain acceptable operating levels during power failures.
✓	Demolition and clearance of vacant condemned structures to help prevent vermin

	infestation.
✓	Adequate community clinics and school health services.
✓	Brownfield and urban blight clean-up activities.
✓	Proper location, installation, cleaning, monitoring, and maintenance of septic tanks.
	Separation of storm and sanitary sewer systems.
	Spraying programs to properly control mosquito populations.
✓	Updated Continuity of Operations (COOP) plans and alternative “work from home” schedules.

APPENDIX F: Participation Table

Missaukee County Natural Hazard Mitigation Plan Participation Table															
Meeting Attended or Email Correspondence															
Participating Agency or Jurisdiction	Representative	Title / Representing	Completed Survey	HM Kick-Off Meeting 07/01/2021	Missaukee County Planning Commission 07/28/2021	LPT Meeting 10/20/2021	LPT Meeting 01/19/2022	Meeting with Missaukee County Road Commission 04/04/2022	Planning Commission Meeting/Public Input - Hazard ID 05/25/22	Planning Commission Meeting/Public Input - Draft and Strategies 09/28/22	Planning Commission Meeting/Public Input - Draft, Maps and Strategies 11/16/22	LPT Meeting 1/18/2023	Bloomfield Twp. Board Meeting 02/14/23 & 5/9/23 HM Plan Discussion	3/7/2023 Email - Draft Review Comments	PC Mtg/Public Hearing 03/22/2023
Missaukee County	Linda Harshorne-Shafer	Planning & Emergency Management Director		X	X	X	X		X	X	X	X			X
	Grace Freese	Parks Manager							X						
	Liz Vogel	Administrator/CFO							X						
	James Van Haltsma	Equalization Director	X												
	Jessica Nielsen	Clerk	X												
	Pam Niebrzowski	Commissioner													
	Will Yanzer	Sheriff													
	Aaron Sogge	EMS Director													
	Julie Stahl	911/Dispatch Administrator													
	David Denbouthen	Prosecuting Attorney													
Missaukee County Planning Commission	Craig Ardits	Mayor of Lake City			X				X	X	X				
	Sherry Blasak	Missaukee Conservation District Manager			X				X	X	X				X
	Sara Karl-Linder	County Commissioner			X				X	X	X				X
	Dean Smallegan	County Commissioner			X				X	X	X				X
	Craig Fisher	McBain Area F.D. Chief			X				X	X	X				X
	Robert Sturdevant				X										
	Bruce Miller														
	Mimi Zwolak														
	Brad Soddall	Manager													
	Heather Harris-Bryant	Executive Director													
Missaukee Conservation District	Laura Marlon	Director							X						
	Jodi DeHate	MAEAP Technician (Former); President	X												
	Vicki Sawicki	NCI/EMA Coordinator								X					
	Linda Brown	Clerk	X												
	Daymon Martinez	Clam Union Fire Dept.			X										
	Jon Quvinga	Clam Union Fire Dept.			X							X			
	Ed Nettie	Merritt Area Fire Dept.										X			
	Carl Hunt	Merritt Area Fire Dept.													
	Jim Bridson	Supervisor											X		
	Cherie Park	Clerk											X		
Bloomfield Twp.	Pat Powell	Treasurer											X		
	Michael Gillette	Trustee											X		
	Justin Stauffer	Trustee											X		
	Ed Nettie	Merritt Area Fire Dept.										X			
	Carl Hunt	Merritt Area Fire Dept.													
	David LaRoche	Lake Misaukee Fire Dept.			X							X			
	Jim Brown	Lake Misaukee Fire Dept.													
	Austin Booms	Lake Misaukee Fire Dept.											X		
	Bob Pickford	City Council Member	X												
	City of Lake City	Craig Ardits	Mayor							X					
Fred West		Lake City Area Fire Dept.			X							X			
Joey Roberts		Mayor	X						X						
Carl Hunt		McBain Area Fire Dept.			X							X			
Jay DeBoer		McBain Area Fire Dept.			X							X			
Craig Fisher		McBain Area F.D. Chief			X							X			
Steve Ebls		Clerk	X						X			X			

Missaukee County Natural Hazard Mitigation Plan Participation Table													
Participating Agency or Jurisdiction	Representative	Title / Representing	Completed Survey	Meeting Attended or Email Correspondence									
				HM Kick-Off Meeting 07/01/2021	Missaukee County Planning Commission 07/28/2021	LPT Meeting 10/20/2021	LPT Meeting 01/19/2022	Meeting with Missaukee County Road Commission 04/04/2022	Planning Commission Meeting/Public Input - Hazard ID 05/25/22	Planning Commission Meeting/Public Input - Partial Draft and Strategies 09/28/22	Planning Commission Meeting/Public Input - Draft, Maps and Strategies 11/16/22	LPT Meeting 1/18/2023	Bloomfield Twp. Board Meeting 02/14/23 & 5/9/23 HM Plan Discussion
*Notes on Fire Department Coverage:													
Fire Department	Jurisdictional Coverage/Representation												
Clam Union Fire Dept.	Clam Union Township and parts of Aetna Township and Reeder Townships												
Lake City Area Fire Dept.	City of Lake City and Lake Township												
Lake Missaukee Fire Dept.	Forest Township and parts of Reeder Township, Caldwell Township, and Pioneer Township												
McBain Area Fire Dept.	City of McBain, Riverside Township, Richland Township												
Merritt Area Fire Dept.	Enterprise township, Holland Township, and Butterfield Township, and parts of Aetna Township and West Branch Township												
Norwich Twp. Fire Dept.	Norwich Township and parts of West Branch Township												
Manton Area Fire (Wexford County)	Bloomfield Township and part of Caldwell Township are covered by Manton, in Wexford County												

APPENDIX G: MEETING DOCUMENTATION

Hazard Mitigation Plan Update Kick Off Meeting

July 1, 2021, 9:30 a.m.

Networks Northwest
600 East Front Street, Suite 205
Traverse City, MI 49686
Conference Room #2

Agenda

- I. Welcome
- II. Introductions
- III. Roles and Responsibilities
 - a. Federal Emergency Management Agency
 - b. Michigan State Police
 - c. Networks Northwest
 - d. County and Tribal Staff
 - e. Local Government Staff
 - f. Local Stakeholders
 - g. General Public
- IV. Communication
- V. The Process
 - a. Phase I – Obtain Public Input
 - b. Phase II – Complete Hazard Analysis
 - c. Phase III – Create Action Plan
 - d. Phases IV – Update Plans and Maps
 - e. Phase V – Facilitate Local Adoptions
- VI. Project Timeline
 - a. Period of Performance Expires: December 16, 2023
- VII. Next Steps

Hazard Mitigation Plan Update Kick Off Meeting

July 1, 2021, 9:30 a.m.

Networks Northwest
600 East Front Street, Suite 205
Traverse City, MI 49686
Conference Room #2

I. In-person meeting location information

The Networks Northwest main office has an attached parking garage with entrances from Front Street and Railroad Avenue. Enter the building on the second floor and access Conference Room #2 through the door on the right. The conference room is down the hall on the left, past the bathrooms.

II. Remote meeting attendance

Community Planning is inviting you to a scheduled Zoom meeting.

Topic: Hazard Mitigation Kick Off
Time: Jul 1, 2021 09:30 AM Eastern Time (US and Canada)

Join Zoom Meeting
<https://us02web.zoom.us/j/2319295012>

Meeting ID: 231 929 5012
One tap mobile
+16468769923,,2319295012# US (New York)
+13017158592,,2319295012# US (Washington DC)

Dial by your location
+1 646 876 9923 US (New York)
+1 301 715 8592 US (Washington DC)
+1 312 626 6799 US (Chicago)
+1 669 900 6833 US (San Jose)
+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)

Meeting ID: 231 929 5012
Find your local number: <https://us02web.zoom.us/j/2319295012>

Date:

Meeting Title:

	Name	Title/ Organization	Email	Phone #	Salary Fed Funded	Miles to Mtg	Miles from Mtg
1	Travis Baker	EM Director Wexford County	tbaker@wexford county.org	231-306-2130	Yes	37 47	37 47
2	Brandy Martin	3rd Lt Commander Little River Ford	brandy.martin @lrbai-asst.gov	231-398-6818	NO	60	60
3	Matthew Sorensen	EM/911 Leelanau	msorensen@ leelanau.gov	231-256-8715	Yes	25	25
4	Zach Vega	comm. planner NWNW	zach.vega@ networks.northwest. org	231			
5	Rob Carson	Networker Northwest	rob.carson@ networks.northwest. org	2	Yes	45	45
6	Frank Post		Frank.Post @live.com	231-383-0553		64	64
7							
8							
9							
10							
11							
12							
13							
14							
15							

09:34:30 From Mike Sobocinski to Community Planning(Direct Message) : Mike Sobocinski, MSP/EMHSD - Position is federally funded and therefore not eligible for matching federal planning grant.

09:34:51 From Rebecca Hubers to Everyone : Rebecca Hubers - Benzie County Emergency Management / rhubers@benzieco.net / 231-882-0567

09:36:01 From PLANNING EMD to Everyone : Linda Hartshorne-Shafer, Missaukee County Planning/Emergency Management Director, planningemd@missaukee.org, 231-839-7264 Ext 3

09:36:08 From Manistee County to Community Planning(Direct Message) : Michael Machen/Deputy 911 Director/Emergency Manager/ \$59,000 mmachen@manistee911.org/231-723-9970/ Yes Federally Funded

09:37:43 From Mike Thompson to Everyone : Mike Thompson, Kalkaska County Emergency Management Coordinator, mthompson@kalso.org, 231.258.3319 ext. 2229

09:37:49 From Garrett Fairchild GTB Fire Dept to Everyone : Garrett Fairchild / GTB Fire Chief / garrett.fairchild@gtbindians.com / 231-534-7161

09:40:07 From Mike Sobocinski to Community Planning(Direct Message) : Is this introduction separate from my agenda item?

09:40:40 From JAMurphy to Everyone : Jolanda Murphy, Grand Traverse Band Emergency Manager, Jolanda.murphy@gtbindians.com, 231-534-7111

09:42:22 From Becky Oien to Everyone : Rebecca Oien, Grand Traverse Band, Tribal Manager, becky.oien@gtbindians.com 231-534-7136

09:44:12 From Rebecca Hubers to Everyone : my mic must not be working

10:01:22 From Manistee County to Community Planning(Direct Message) : Lisa Sagala, Manistee County Administrator \$84,,200 231-398-3501, lsagala@manisteecountymi.gov

10:02:49 From Manistee County to Community Planning(Direct Message) : Mike Szokola, Manistee County Planner, \$68,500 mszokola@manisteecountymi.gov, 231-398-3527

10:10:24 From Mike Sobocinski to Everyone : FEMA Map Service Center (access to NFIP flood map information): <https://msc.fema.gov/portal/home>

10:11:46 From Mike Sobocinski to Everyone : FEMA has an impressive new mapping resource called the National Risk Index, providing information by county or even census tract. Risks from natural hazards, social vulnerability, etc. <https://www.fema.gov/flood-maps/products-tools/national-risk-index>

10:14:31 From Mike Sobocinski to Everyone : The Michigan Hazard Analysis (2019) provides an overview of natural hazards throughout Michigan. You can search the document for your county's name to find local information more quickly (Ctrl F search function) https://www.michigan.gov/documents/msp/MHA_2019__full_update_natural_hazards_653708_7.pdf

10:38:03 From Rebecca Hubers to Everyone : I'm sorry I have to walk away now to attend another meeting - thank you

MISSAUKEE COUNTY PLANNING COMMISSION

Agenda

County Annex Meeting Room

July 28 2021

5:00pm

MEMBERS PRESENT: Linda Hartshorne-Shafer (Staff)

Call to Order, Pledge of Allegiance:

Approval of May 26, 2021 Minutes:

Approval of July 28, 2021 Agenda:

NEW BUSINESS:

1. Master Plan:

a. Goals, Objectives, Strategies discussion:

b. Major Developments in the community or in nearby communities:

c. Recurring or new issues not addressed in the current plan/shift in public priorities?

2. Hazard Mitigation Plan

OLD BUSINESS:

1. Lake City Updates:

2.

MISCELLANEOUS: Resignation – Josh Pellow

Objectives to complete for September 22 2021 meeting:

1.

2.

SUBCOMMITTEE REPORTS:

P.A. 116: Koster

Public Comment**

ADJOURN:

NEXT MEETING: September 22, 2021 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

MISSAUKEE COUNTY PLANNING COMMISSION

Minutes

County Annex Meeting Room

July 28 2021

5:00pm

MEMBERS PRESENT: Linda Hartshorne-Shafer (Staff), Ardis Craig, Blaszak Sherry, Karl-Linder Stacy, Smallegan Dean, Sturdavant Robert, Zwolak Mimi

Call to Order, Pledge of Allegiance: 5:05pm

Approval of May 26, 2021 Minutes: Motion by Ardis with support from Zwolak. All in favor, minutes approved as presented.

Approval of July 28, 2021 Agenda: Motion by Zwolak with support from Ardis. All in favor, agenda accepted as presented.

NEW BUSINESS:

1. Master Plan: The Master Plan discussion was deferred to allow for review and discussion of the Hazard Mitigation plan.
2. Hazard Mitigation Plan: Background on Hazard Mitigation planning was provided, to include the basis for planning, types of natural hazards that Missaukee County is most likely to experience, and the planning process. An explanation of the FEMA grant process was provided, along with the responsibilities of Networks Northwest and the subgrantees. A review of the existing plan was conducted, with added emphasis on historical events, some of which resulted in presidential declarations. The group was familiarized with the plan itself and the five phases of the process, as well as their roles moving forward as Planning Commission and community members.

OLD BUSINESS:

1. Lake City Updates: Nothing new to report right now
- 2.

MISCELLANEOUS: Resignation – Josh Pellow – Recreation representative has resigned his position due to a promotion at work which requires travel and a greater time commitment.

Objectives to complete for September 22 2021 meeting:

1. Master Plan review
2. Recreation Plan update (Expires December 2022)
3. Hazard Mitigation Plan work, as needed

SUBCOMMITTEE REPORTS:

P.A. 116: Koster – Motion by Ardis with support from Karl-Linder that the Koster P.A. 116 application be recommended for approval by the Board of Commissioners.

Public Comment** None

ADJOURN: 5:50pm

NEXT MEETING: September 22, 2021 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

(FY2022 1st Quarter)
Local Emergency Planning Committee / Local Planning Team
Missaukee County Annex Building
October 20 2021 6:00pm
Agenda

LEPC

Called to Order:

Attendees: Linda Hartshorne-Shafer (Missaukee EM) – SEE SIGN IN

Approval of (FY 2021 4th Quarter) July 21 2021 Minutes: Not available

Approval of (FY 2022 1st Quarter) October 20, 2021 Agenda:

New Business:

- a. Tier II Reports

Old Business:

- a. Facility Updates

LEPC Adjourned:

Next meeting – January 19, 2022; 6pm, Annex

LPT

Called to Order:

Attendees: Linda Hartshorne-Shafer (Missaukee EM) – SEE SIGN IN

Approval of (FY 2021 4th Quarter) July 21, 2021 Minutes: Not available

Approval of (FY 2022 1st Quarter) October 20, 2021 Agenda:

New Business:

Hazard Mitigation Plan – Networks Northwest

Old Business:

Round Table – Department/Agency Updates:

LPT Adjourned:

Next Regular Meeting: January 19, 2022 following LEPC; Annex

(FY2022 1st Quarter)
Local Emergency Planning Committee / Local Planning Team
Missaukee County Annex Building
October 20 2021 6:00pm
Minutes

LEPC

The meeting was called to order at 6:05 by Secretary in the absence of the Chair and Vice-Chair.

Attendees: Linda Hartshorne-Shafer (Missaukee EM) – Michael Doan (NTFD), Fred West (LCAFD), Wil Yancer (MCSD), Carl Hunt (MAFD), Daymion Martinez, Jon Ouwinga (CUFD), Craig Fisher, Jay DeBoer (McBain FD), Aaron Sogge (Missaukee EMS), David LaRoche (Lake Missaukee FD), Bret Haner (DHD#10)

There were no minutes from July 21 2021.

Nothing new has been reported by facilities in the county. Todd Tolkinen, General Manager of Viking Energy, was invited but has been working at the Lincoln plant and was not in the area at the time of the meeting.

LEPC Adjourned: 6:10pm

Next meeting – January 19, 2022; 6pm, Annex

LPT

Called to Order: 6:10pm

Attendees: Linda Hartshorne-Shafer (Missaukee EM) – Michael Doan (NTFD), Fred West (LCAFD), Wil Yancer (MCSD), Carl Hunt (MAFD), Daymion Martinez, Jon Ouwinga (CUFD), Craig Fisher, Jay DeBoer (McBain FD), Aaron Sogge (Missaukee EMS), David LaRoche (Lake Missaukee FD), Bret Haner (DHD#10)

There were no minutes from July 21 2021.

New Business:

Hazard Mitigation Plan – Networks Northwest (Jenni Neal, Stephanie Loria – Community Planners) – handouts provided. NN procured grant to write Hazard Mitigation plans for seven counties and two tribes in Region 7. FEMA requires that plans be updated every five years; the update will be a two-year process. Tonight's meeting focused on the community profile; future meetings will address topics such as land use and hazards. The slides were displayed and discussed; some discrepancies and possible inaccuracies in the data were noted for further research. Items for follow-up include agriculture (number/size of farms) and the number of homes in Lake City now compared to 2010 data, and other data that will be researched with the assistance of the Building and Equalization Departments. The survey was discussed; the link will be forwarded out to the group and posted on the Emergency Management Facebook page.

FEMA requires participation in the planning process; this must be demonstrated through meeting sign in sheets, agendas, minutes, and documented by in-kind match forms.

LPT Adjourned: 7:15pm

Next Regular Meeting: January 19, 2022 following LEPC; Annex

(FY2022 1st Quarter)
Local Emergency Planning Committee / Local Planning Team
Missaukee County Annex Building
January 19 2022 6:00pm
Agenda

LEPC

Called to Order:

Attendees: Linda Hartshorne-Shafer (Missaukee EM)

Elections:

- a. Chair
- b. Vice-Chair
- c. Secretary

Review/Approval of October 20, 2021 Agenda:

Review/Approval of October 20, 2021 Minutes:

Miscellaneous/Updates:

- a. Ed Nettle – Resignation letter
- b. Viking Energy
- c. Tier II Updates

LEPC Adjourned:

Next meeting – April 20 2022; 6pm, Annex Building

LPT

Called to Order:

Attendees: Linda Hartshorne-Shafer (Missaukee EM)

Elections:

- a. Chair
- b. Vice-Chair
- c. Secretary

Review/Approval of October 20, 2021 Agenda:

Review/Approval of October 20, 2021 Minutes:

Old Business:

- a. Hazard Mitigation Plan

- b. Regional Updates

New Business:

Round Table Updates:

LPT Adjourned:

Next Regular Meeting: April 20 2022 following LEPC; Annex Building

(FY2022 1st Quarter)
Local Emergency Planning Committee / Local Planning Team
Missaukee County Annex Building
January 19 2022 6:00pm
Minutes

LPT

Called to Order: 6:00pm

Attendees: Linda Hartshorne-Shafer (Missaukee EM), Amy DeRuiter (MDNR Fire – HL Field Office), Jay DeBoer (McBain Fire), Carl Hunt (Merritt Fire), Jim Brown (Lake Missaukee Fire), Bret Haner (DHD#10), Aaron Sogge (Missaukee EMS), Michael Doan (Norwich Township Fire), Mike Carroll (MDNR Fire - Manton Field Office), Jon Ouwinga (Clam Union Fire)

Guests: Stephanie Loria, Networks Northwest

Review/Approval of January 19, 2022 Agenda: Motion by DeBoer with support from Brown, all in favor. Agenda approved as presented.

Review/Approval of October 20, 2021 Minutes: Motion by Brown with support from DeBoer, all in favor. Minutes approved as presented.

Old Business:

- 1) Hazard Mitigation Plan: Presentation by Stephanie on the process and progress of the plan. Stephanie distributed 11 X 17 maps of different areas of the county for members of the group to mark locations of critical infrastructure that they are aware of. The group discussed the various categories, with particular concern regarding pipeline infrastructure and pump stations. EM accessed online pipeline maps to assist, especially for the McBain and Norwich Township areas. Stephanie expressed concern that there wasn't more participation in the task, as it is an important step in the development of the plan.
 - A. Stephanie asked that maps be distributed to township supervisors, the cities, or members of the Board of Commissioners for their respective districts to gain additional input related to the areas that they are most familiar with. The presentation lists the types of critical infrastructure that the Hazard Mitigation plan should include. Stephanie will forward the presentation to the EM.
 - B. Engage the Road Commission in identification of areas of washouts, undersized culverts, frequent flooding, etc.
 - C. Concern was expressed by Fire Services regarding construction of new homes/structures on seasonal roads that are not maintained and are very difficult or impossible for fire apparatus to access. Discussion about collaborating with the Building Department on an educational push to make builders and homeowners aware of the problem and encourage them to take it into consideration in their planning; also include a Firewise educational component. The Building Inspector will be added to the April agenda.
 - D. Networks Northwest will be on the April 20, 2022 agenda to continue work on the Hazard Mitigation plan.

Elections:

- a. Chair – Motion by Sogge to nominate Doan for Chair; Doan declined. Motion by Brown to nominate Sogge as chair with support from DeBoer. No other nominations. All in favor. **Sogge elected as chair.**
- b. Vice-Chair – Motion by Sogge to nominate DeBoer as Vice-Chair with support from Brown. No other nominations. All in favor. **DeBoer elected as Vice-Chair.**
- c. Secretary – Motion by DeBoer to nominate Hartshorne-Shafer as Secretary with support from Brown. No other nominations. **Hartshorne-Shafer elected as Secretary.**

**These are three-year positions, to facilitate continuity. The same officers and time frame will apply to the LPT and LEPC.*

LPT Adjourned: 7:16pm

Next Regular Meeting: April 20 2022 following LEPC; Annex Building

LEPC

Called to Order: 7:16 pm

Attendees: Linda Hartshorne-Shafer (Missaukee EM), Amy DeRuiter (MDNR Fire – HL Field Office), Jay DeBoer (McBain Fire), Carl Hunt (Merritt Fire), Jim Brown (Lake Missaukee Fire), Bret Haner (DHD#10), Aaron Sogge (Missaukee EMS), Michael Doan (Norwich Township Fire), Mike Carroll (MDNR Fire -Manton Field Office), Jon Ouwinga (Clam Union Fire)

Elections:

- d. Chair – Motion by Sogge to nominate Doan for Chair; Doan declined. Motion by Brown to nominate Sogge as chair with support from DeBoer. No other nominations. All in favor. **Sogge elected as chair.**
- e. Vice-Chair – Motion by Sogge to nominate DeBoer as Vice-Chair with support from Brown. No other nominations. All in favor. **DeBoer elected as Vice-Chair.**
- f. Secretary – Motion by DeBoer to nominate Hartshorne-Shafer as Secretary with support from Brown. No other nominations. **Hartshorne-Shafer elected as Secretary.**

**These are three-year positions, to facilitate continuity. The same officers and time frame will apply to the LPT and LEPC.*

Review/Approval of January 20, 2022 Agenda: Motion by DeBoer with support from Brown, all in favor. Agenda approved as presented.

Review/Approval of October 20, 2021 Minutes: Motion by Brown with support from DeBoer, all in favor. Minutes approved as presented.

Miscellaneous/Updates:

- a. Ed Nettle – Resignation letter: Due to employment scheduling, Nettle is no longer able to chair the committees and provided a letter of resignation. He intends to remain a member of both committees and will attend when schedule permits.
- b. Viking Energy: Email update – Viking wants to enhance the fire loop surrounding the plant – McBain Fire hasn't yet been notified of this by the facility but now have it on the radar.
- c. Tier II Updates: So far, three Tier II reports have been received for 2021 in Tier II Manager. Four facilities have EHS on site, and two of those have EHS in excess of the TPQ. Three of the four sites are in the McBain area, the fourth is in Norwich .

LEPC Adjourned: 7:18pm

Fire Chief Meeting follows immediately.

Next meeting – April 20 2022; 6pm, Annex Building

Notes: Hazard Mitigation Plan Meeting 04/04/2022 with Brad Siddall, Missaukee County Road Commission

- Lake Missaukee's Lake Level Control Structure is operated by the Road Commission. Lake Twp. Supervisor, Robert Hall, is going to apply for a grant to upgrade the lake level control structure to an automatic operation method.
- Current Road Funding Priorities:
 - #1. S. Forward Road bridge over the Clam River, west of the community of Falmouth. On the boundary between Clam River and Union Twps. Looking at applying for funding with MDOT's Critical Bridge Fund.
 - #2. 13 Mile Road bridge over Buttermilk Creek, south of Lotan Rd. in Butterfield Twp. Apply for funding with MDOT's Critical Bridge Fund?
 - #3. Stoney Corner Road over the Clam River, east of 9 Mile Rd. in Clam Union Twp. (MDOT Critical Bridge Fund?)
 - #4 Dorr Road Bridge over Haymarsh Creek in Enterprise Twp. This bridge is currently weight restricted but funding has already been secured for this bridge through the Bridge Bundling Program (2023-24 replacement)
 - #5. Dolph Road bridge over the Muskegon River in Holland Twp. is temporarily closed. Not a major priority because it's located in such a rural area. ARPA funds are being considered for this project.
- 2022 Funded Major Road Improvement Projects:
 - Forward Road – 2 miles between Stoney Corner Rd and County Line, adjoining Clam Union and Riverside Twps. (crush, shape and pave; culverts currently OK)
 - Lucas Road – between Walker and Roby Road in Caldwell Twp. (crush, shape and pave; 1 culvert there has already been recently replaced)
 - 8 Mile Road – between Prosper Rd. and 0.5 mile north of Lotan Rd. in Clam Union and Aetna Twps. (reconstruct – all culverts will be replaced)
- List of "problematic" culverts that need improvement for streamflow and habitat
 - WEST BRANCH TWP: Stevens Road, North of M-55 – a box culvert and steel pipe culvert
 - RIVERSIDE TWP: Stoney Corner Road between VanderMuelen and Turnerville – over the N. Branch of the Clam River
 - CITY OF MCBAIN: Driveway culvert at McBain Public High School – over the N. Branch of the Clam River
 - CITY OF MCBAIN: Box culvert under M-66 at McBain Body Shop – over the N. Branch of the Clam River; across from High School driveway entrance
 - CITY OF MCBAIN: Bridge on Cottage Grove Rd., south of M55 – over the N. Branch of the Clam River
 - LAKE TWP.: Seeley Road, north of Boon Rd. – over the Clam River (on the boundary with Wexford County)
 - CALDWELL TWP: N. Layman Rd., near Crooked Lake and north of the community of Jennings – culvert(s) here are under water most of the time, therefore difficult to evaluate condition.

- Stephanie mentioned the MDNR's interactive Great Lakes Stream Crossing Survey - a good reference resource of all known evaluations by multiple agencies <https://gis-midnr.opendata.arcgis.com/datasets/midnr::great-lakes-stream-crossing-survey/explore>
- Davey Tree Service has been on contract with the R.C. since 2021 to prune trees in the road R.O.W. This has resulted in fewer occurrences of downed trees over roads as well as potential power outages.
- A goal of the MCRC is to inventory all their infrastructure assets with a GPS-based system to document location, condition over time, etc.
- At LPT meeting in January, it was mentioned there was an old above-ground pipeline somewhere in the NE portion of the County. Not sure if it's active or abandoned. Brad said he will try to look into that to find more info.
- Stephanie relayed specific LPT January meeting discussion and HazMit. Survey results regarding roads and bridges:
 - Lots of general concerns regarding aging roads and bridges;
 - Some bridges not accessible for fire apparatus and ambulances due to decayed roads and bridges; some people's homes don't have addresses (County building dept. needs to better communicate with building permit applicants about these risks)
 - Muskegon River flooding (Enterprise, Butterfield and Holland Twps.)
 - Land near Geers, Dickerson and Finkle Roads (Richland Twp.) has washouts; Brad said this is a regular seasonal issue
 - Goose Lake Park area (Caldwell Twp.) prone to flooding – lots of lakes and wetlands there
 - Low bridge concern/ at least one older bridge in a somewhat remote area due to be closed (likely referring to Dolph Rd Bridge over Muskegon River in Holland Twp.)
 - **Potential Haz Mit. Strategy: Scenario planning for road closure event on M-55, between Jeffs Rd. and East County Line Rd**, a major E-W route between Lake City and Houghton Lake with no good re-route options in adjoining Butterfield and Enterprise Twps.
 - **Potential Haz Mit. Strategy: identify road and stream crossings that have the most potential for failure and flooding.** This could be a good objective in the plan that the Road Commission would take responsibility for implementing.

MISSAUKEE COUNTY PLANNING COMMISSION

Agenda

County Annex Meeting Room

May 25, 2022

6:00 (Time adjusted due to Hazard Mitigation Planning presentation)

	ARDIS (Schools)		BLASZAK (Ag/Forestry)		FISHER (Emergency Services)		KARLL-LINDER (Comm/Econ Dev)
	MILLER (Ag/Forestry)		SMALLEGAN (BOC)		(Public at Large)		ZWOLAK (Recreation/Tourism)
							HARTSHORNE-SHAFER (Staff)

PUBLIC COMMENT**:

NEW BUSINESS:

OLD BUSINESS:

1. Hazard Mitigation Plan, Networks Northwest
2. Lake City Updates:

MISCELLANEOUS: None

Objectives to complete for July 27, 2022 meeting:

1. Recreation planning – continue updating
2. Hazard Mitigation Plan

SUBCOMMITTEE REPORTS:

P.A. 116:

PUBLIC COMMENT** None

ADJOURN:

++NEXT MEETING: July 27, 2022 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

MISSAUKEE COUNTY PLANNING COMMISSION

Minutes

County Annex Meeting Room

May 25, 2022

6:00 (Time adjusted due to Hazard Mitigation Planning presentation)

The Networks Northwest Community Meeting for the Hazard Mitigation Plan was held before the Planning Commission meeting and was attended by all current Planning Commission members as well as county staff, elected officials, and community members.

Members Present: Ardis, Blaszak, Fisher, Karll-Linder, Miller, Smallegan, Zwolak

Others Present: Joey Roberts – McBain Mayor, Liz Vogel – Missaukee County Administrator, Pam Niebrzydowski – Missaukee County Board, Dave DenHouten – Missaukee County Prosecutor, Bret Haner – DHD#10, Aaron Sogge – Missaukee EMS, Laura Marion – Ardis-Missaukee Library, Margie Phelps – Forest Township

Staff: Hartshorne-Shafer

PUBLIC COMMENT**: None

NEW BUSINESS:

1. Hazard Mitigation Plan, Networks Northwest: Networks Northwest staff gave Hazard Mitigation Plan update presentation to Planning Commission members and other community stakeholders present. Emphasis was placed on the importance of pre-planning and having an adopted plan to qualify for pre-disaster mitigation grants. All communities that want to be eligible must adopt the plan individually. Priority Areas, Potential Hazard Events, and other information was discussed per the power point presentation and during individual group discussion activities.

OLD BUSINESS:

2. Lake City Updates: The city of Lake City, Lake Township, and Missaukee County representatives have met to discuss a recreation planning collaboration. Each entity's recreation plan is either expired or due to expire. Representatives from other entities have been invited to participate as well in future meetings. The Missaukee Planner has met with a representative from the DNR to discuss collaborative planning requirements and options and brought the results back to the larger group. A meeting will be scheduled and will include the consulting firm that has been hired by Lake Township to complete their plan and possibly schools and other eligible entities.

MISCELLANEOUS: None

Objectives to complete for May 25, 2022 meeting:

1. Recreation planning – continue update
2. Hazard Mitigation Plan – continue update

SUBCOMMITTEE REPORTS:

P.A. 116:

PUBLIC COMMENT** None

ADJOURN: 7:30

++NEXT MEETING: July 27, 2022 5:00pmPublic Comment Rules authorized by the Missaukee County Planning Commission:** Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

**5/25/22 Meeting with Missaukee County Planning Commission and other Invited
Community Members**

Participants:

- Linda Hartshorne-Shafer, Missaukee County Emergency Management & Planning
- Sherri Blaszak, Missaukee County Planning Commission/Missaukee Conservation District
- Mimi Zwolak, Missaukee County Planning Commission
- Craig Fisher, Missaukee County Planning Commission and City of McBain DPW/Fire
- Bruce Miller, Missaukee County Planning Commission
- Stacy Karll-Linder, Missaukee County Planning Commission
- David Denhouten, Missaukee County Prosecutor's Office
- Liz Vogel, Missaukee County Administrator/Chief Financial Officer
- Pam Niebrzdowski, Missaukee County Commissioner
- Dean Smallegan, Missaukee County Commissioner
- Aaron Sogge, Missaukee EMS Director
- Laura Marion, Missaukee District Library
- Bret Haner, Emergency Response Coordinator, District Health Dept. #10
- Margie Phillips, Clerk, Forest Township
- Craig Ardis, Mayor, City of Lake City
- Joey Roberts, Mayor, City of McBain

Presenters:

- Jennifer Neal, AICP, Networks Northwest Community Planner
- Stephanie Loria, Networks Northwest Community Planner

Participants were asked to indicate their top 3 natural hazard concerns on sticky notes:

Top Natural Hazard Event or Impact	# of Responses
High Winds &/or Tornado	11
Electrical/Communication Grid Failure/Extended Power Outage	8
Large Snowstorm/Blizzard/Ice Storm	6
Invasive Species/Wildlife Diseases	4
Flooding	3
Severe Thunderstorm	2
Road or Bridge Failure	2
Wildfire	1
Extreme Heat & Cold	1

Severe Thunderstorm/Wind Storm Group Discussion

- Windstorm in mid-Dec. 2021 resulted in lots downed trees
- Often large old trees along power lines – can be a problem; need more tree maintenance along the lines. Lots of old oak trees.
- Would be good to bury power lines where possible
- Straight line winds are the biggest concern regarding damage impacts. Windstorms have lifted and overturned boats and boat lifts on lakes.

- Wind turbines – could be a hazard in very high winds – could break apart the turbine? There have been two wind turbine fires in the past (equipment malfunction).
- Roads closed from storm impacts (trees/power lines down, snow, ice, washout/flooding, etc.) results in a disruption in the local economy. Agricultural and lumber (two biggest local economic sectors) goods can't be exported, and goods being imported are delayed.
- Property damage from hail can be expensive and vast – ruins crops, Xmas trees; damages vehicles, equipment, buildings.
- With excessive rain, sometimes fields are too wet to harvest crops when they are needed
- Storm sewer overflow in cities from excessive rain.
- Only McBain has a tornado siren alert system. There is no county phone alert system in place. People rely on other phone alerts from NOAA weather phone app, etc.
- Cell phone alerts are limited as there are several areas in the county with poor cell phone service coverage.
- Community comes together to help with cleanup efforts and aid neighbors in distress.
- Campgrounds, seasonal populations are more at risk

Severe Winter Weather Group Discussion

- Ice storms are the biggest concern – shuts down mobility/ability to drive sometimes for several days; increased number of slip and fall incidents; this past winter was particularly bad with ice – had 3 days when power was out in some areas after President's Day in Feb. People can't access goods and services and may not have an emergency supply at home. Stores may be sold out of staple groceries and salt.
- Generally many are prepared for extreme heat/cold, but people still could be better prepared for these events with emergency supply kits.
- Secondary roads often don't get plowed for days after major snowstorms.
- Extreme cold – school community shelter has opened for community support – has showers.
- Heavy snow prevents emergency vehicles from accessing people in need.
- Heavy snow can also cause power outages.

Extreme Heat and Drought

- Both impact more sensitive populations with health issues; livestock; crops/Christmas Trees.
- Lots of Christmas tree farms and agricultural land, especially in Forest Township. In some areas of the county landowners are removing trees to use the land to raise cattle/livestock (Reeder Twp. by the airport, S. of M-55).
- Most of the County's population relies on well water. Some areas have shallow aquifers. These could be drawn down during a drought and result in water supply problems.
- Droughts also impact lake levels for recreation.
- High demand in A/C during heat events could put a strain on the electrical grid and cause a blackout.
- High senior citizen population, about 25%. Most do not have A/C, just fans.
- Increase in 911 calls in summer if power is out (population drinks more alcohol).
- Loss of food in households during power outages.
- People can't run their well pump for water if the power is out.
- Farming crop loss, home gardens also lose produce.
- Most people do have generators

Vulnerable Populations Group Discussion

- Many shelter options available in extreme heat/cold/severe weather events:
 - Christian Reform Church
 - Methodist Church can provide heat, water, and A/C
 - Library (no generator)
 - City Hall in McBain – they just got a generator a few months ago.
 - School serves as a community shelter with lockers, restrooms, showers, generator, food service, etc.
 - All fire stations have generators.
- More at risk:
 - Campgrounds
 - Have several adult foster care facilities
 - Schools
 - Older population – completely spread out over the county
 - Farm laborers – often housed on the farm – mostly in Richland Twp. – English is not their primary language; there is often one farm worker in the group that is bi-lingual
 - Mobile Home Park – “Meadowlark”; also many other mobile homes scattered throughout the county
- Seniors have services through the Area Agency on Aging, but many are reluctant to sign up for assistance.
- There are many living in poverty or in the “ALICE” category. They are often young people with children, living paycheck to paycheck and would not be able to financially recover from a disaster.
- There are also many people who live in isolation and may not be able to be reached or have a support system in an emergency. Would be good to get them on a call system so they can be checked on.

Invasive Species Group Discussion

- Forestry, agriculture, tourism, fisheries are the biggest industries in the county. They could be severely impacted by invasive species. Bovine TB is already an issue.
- There is a disconnect between what is known to be good Integrated Pest Management practices promoted by MSUE (no pesticides) and what the USDA requires for agricultural products to be exported (must apply pesticides to export, even if they are not needed).
- Aquatic invasive plants, like Eurasian milfoil, can be a hazard to people swimming in the lake if they get caught up in it.

Pandemic Group Discussion

- What Worked Well:
 - Vaccination distribution and clinics – partnered with DHD#10
 - EMS offered vaccination clinics
 - Schools went above and beyond expectations. Got resources and food to kids who needed it. School Board had to make tough decisions with variable guidance from the State on how to keep everyone safe; they made decisions they thought were best for the

kids and their families. The Lake City School Board decided to sell some property to get money to fund the needed supplies/changes instead of cutting their budget. Built trust between the community and the school system.

- Community members came together well to support local business and restaurants to keep them afloat – purchased gift cards, to-go meals.
 - Some restaurants offered free meals
 - The use of technology was beneficial to maintain learning, working, and communication. It was not used much before but will certainly be used in the future.
 - Community Hope and churches partnered to set up 4 food banks around the county. They were welcomed and are all still needed/utilized.
- Shortcomings:
 - The need for reliable internet was exposed – there is a serious lack of this technology in many areas of the county. The library offered mobile Wi-Fi/computers and had trouble providing that in some areas due to lack of cellular service coverage.
 - Some people had no options to work from home – healthcare workers, for example.
 - People who were getting state/federal aid during the pandemic, and currently have a job that does not offer paid sick leave, are now not getting tested if they feel sick because they can't afford to miss work. Inequalities were highlighted.
 - Staffing shortages in many industries – still an issue.
 - Work progress on projects stalled and has yet to get picked up – for example, discussions between the County and Wolverine Power and engineers to plan for bike trail development – good progress was being made and nothing has been done since the pandemic hit. Need to re-engage with project partners to re-start the project.

Mapping Exercise/Discussion: Flooding and Wildfire

- During the 2008 Governor- and Presidential-Declared Disaster for the County, the Road Commission provided lots of pictures of road damages due to washouts/flooding to show FEMA the need for assistance in repairs (assistance was granted). The storm system that impacted the County in 2008 happened very quickly. The storm events in 2014 that preempted a Governors Disaster Declaration was a slower event – lots of rainfall in the spring impacted areas that were still thawing from the winter, and led to localized flooding.
- Falmouth Dam is old and needs updates. If it fails it would have a substantial impact around Falmouth.
- Paradise Bend subdivision is downstream from the Reedsburg Dam in Enterprise Township (about 6.25 SW of the dam on Paradise Road; adjoins the Muskegon River). Good to be aware of this in case of an issue.
- Reedsburg Dam had a planned drawdown about 7-8 years ago (MDNR owned). Outflow went into the Dead Stream Swamp. Was re-built in 2021.
- Possible goal (?) Coordinate/share water supply location information amongst all fire departments.

Wildfire Concerns marked on the maps:

- Wildfire risk near homes due to pine forests in:
 - NW area of Caldwell Twp, located south of Rhoby Rd., W. of Lucas Rd., N. of Burns Rd., and E. of Seeley Rd.
 - Lake Twp. near LaChance Rd., Rosted Rd., and Jennings Rd.

- SW part of Lake Twp and the NW part of Richland Twp around M-55, west of Lucas Rd and LaChance Rd
- An active railroad runs through McBain in Richland Twp and the SW part of Riverside Twp. A fire could be started in dry and/or windy conditions from a spark from a passing train on the rail line.
- Much of Norwich Township is considered to have a high fire danger with pine trees. There are oil/gas fields out here, but a radius around the wellheads is typically mowed/cleared of vegetation.

Flooding Concerns marked on the maps:

- Flooded roads in Lake Twp: Lotan Road/Dickerson Rd area and Walenjus Road, west of M-66
-
- Falmouth Dam – sediment is accumulating in the pond behind the dam. If it were to break, it would release potential contaminants from the sediment in that water

Poll Question: Please rank the infrastructure failures that would most concern you, with 1 being the most concerning and 9 being the least concerning.

Results: Ranked from most concerning down to least concerning. (12 people completed this question)

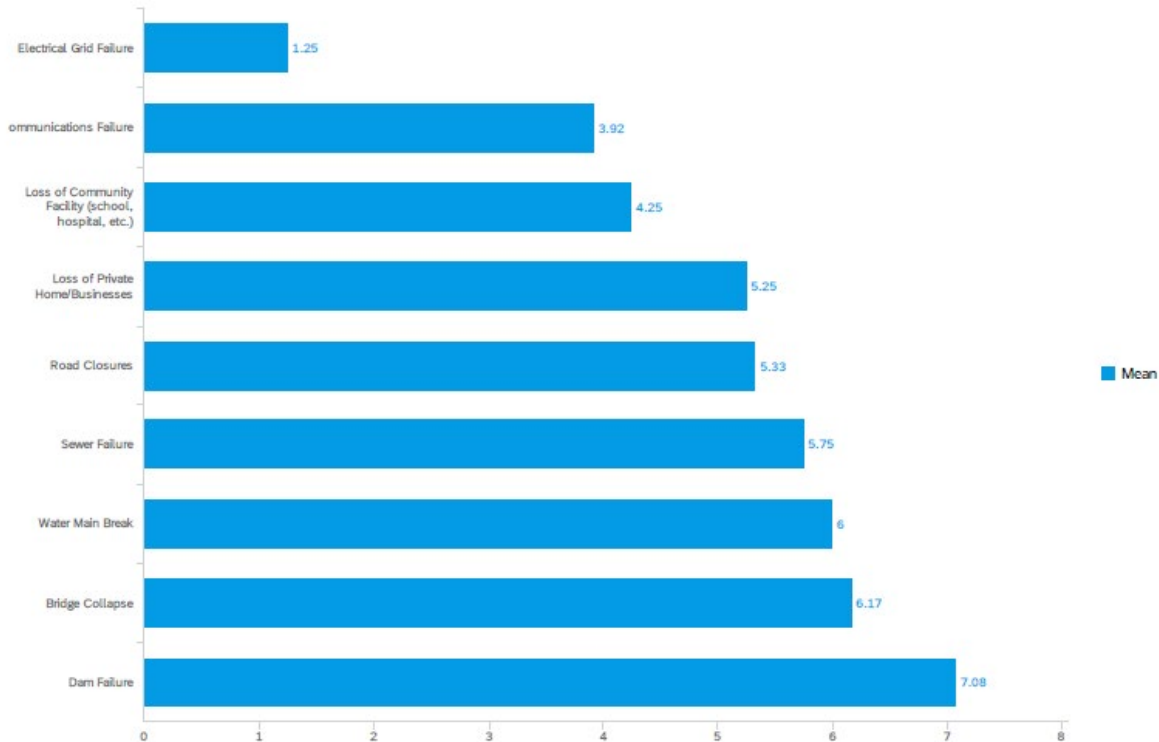




Photo of Community Meeting on 5/25/22 with the Missaukee County Planning Commission and Community Stakeholders to discuss Natural Hazards and Vulnerabilities

Small Group Discussion – Group Recorder

Instructions:

- **Choose 1 person in your group to be the recorder;** this person will write each person’s responses and will report key findings to the whole group
- **Make sure everyone in the group has a chance to share their response(s)**
- Spend **5-7 minutes** on each hazard

1) What is the potential for **THUNDER STORMS** (including wind, tornado, hail, lightning¹) to affect your economy, natural environment, or population?

2) What is the potential for **WINTER STORMS** (including wind, ice, heavy snow, extreme cold) to affect your economy, natural environment, or population?

3) What is the potential for **EXTREME HEAT** or **DROUGHT** to affect your economy, natural environment, or population?

MISSAUKEE COUNTY PLANNING COMMISSION

Agenda

County Annex Meeting Room

September 28 2022

	ARDIS (Schools)		BLASZAK (Ag/Forestry)		FISHER (Emergency Services)		KARLL-LINDER (Comm/Econ Dev)
	MILLER (Ag/Forestry)		SMALLEGAN (BOC)		(Public at Large)		ZWOLAK (Recreation/Tourism)
							HARTSHORNE-SHAFER (Staff)

CALL TO ORDER:

APPROVAL OF AGENDA FOR JULY 27 2022 MEETING:

APPROVAL OF MINUTES FROM MAY 25 2022 MEETING:

PUBLIC COMMENT**:

NEW BUSINESS:

1. PUBLIC HEARING: Capital Improvement Plan – Liz Vogel
2. Networks Northwest – Hazard Mitigation Plan

OLD BUSINESS:

1. Recreation Plan Update
2. Lake City Updates:

MISCELLANEOUS: None

Objectives to complete for September:

1. Recreation planning
- 2.

SUBCOMMITTEE REPORTS:

P.A. 116: GAC Cattle Company LLC

PUBLIC COMMENT** None

ADJOURN:

++NEXT MEETING: November 16, 2022 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

MISSAUKEE COUNTY PLANNING COMMISSION

Minutes

County Annex Meeting Room

September 28 2022 6:00pm

CALL TO ORDER: 5:01pm

MEMBERS PRESENT: Ardis, Blaszak, Fisher, Karll-Linder, Smallegan, Zwolak

Others present: Linda Hartshorne-Shafer -Staff, Liz Vogel – Administrator

The agenda for the September 28 2022 meeting was approved following a motion by Zwolak with support from Ardis; all in favor. Agenda approved as presented. The minutes from the July 27th were approved following a motion by Zwolak with support from Ardis, all in favor. Minutes approved as presented.

PUBLIC COMMENT**: None

NEW BUSINESS:

1. **PUBLIC HEARING, Capital Improvement Plan** – opened 5:05pm: Administrator Vogel presented the 2023-2028 Capital Improvement Plan for review. Vogel reported that the DTRF wouldn't be used as much in 2023 as it needs to rebuild. Some of the asks are good guesstimates/estimates. The full report can be made available digitally. Questions about the plan included:
 - a. Is it normal to have so many EMS and Law Enforcement requests? Yes, current effort is to get into a cycle to prevent the need for purchasing big-ticket items every year and make it easier to plan. Those disciplines tend to have more frequent need and turnover of equipment.
 - b. Human Services Building – projects are already in process; future projects/maintenance will include the parking lot, sidewalk, and handicap accessibility.

There were no further questions or discussion. The Public Hearing was closed at 5:16pm, Motion by Ardis with support from Zwolak to approve the 2023-2028 CIP as presented. All in favor, motion passed. Hearing closed.

2. **Networks Northwest – Hazard Mitigation Plan** – Networks Northwest staff reviewed the draft Hazard Mitigation plan and responded to questions. Vicki Sawicki of NCCISMA (North Country Cooperative Invasive Species Management Area) responded to questions and clarified information about invasive species and the threats they pose economically and to the environment. Further discussion regarding boat wash stations to limit the spread of water invasives. Local communities must adopt the county's hazard mitigation plan to be eligible to apply for grant funding. Different communities may have different priorities and must be prepared. It was noted that one inch of rain can result in \$25,000 worth of damage. Drains can be retrofitted to reduce the potential for damage and minimize damage that may occur.

OLD BUSINESS:

1. Recreation Plan Update: The board of commissioners approved \$4500 for Prein and Newhof to perform some of the work required for the plan update. The Joint plan will represent the county, Lake City, McBain, and Lake Township. A survey has been developed and distributed in the community; data from the survey will be used in the plan. Working on map updates, data, tables/graphs; will need updated Parks Department information and have contacted new parks director and administrator about that. Have added in "the Land" and considering the addition of the Upper Muskegon Management Area, the Upper Manistee Management Area, and the Osceola-Missaukee Grasslands State Game Area Master Plan and the Senior Center. Meetings have been held with the entities listed above and Prein and Newhof representatives.
2. Lake City Updates: Working with EGLE on getting water to the proposed development west of the intersection of Jennings and M66. There are a lot of empty buildings and those could be reutilized without changing the footprint. Senior housing may, or is, available at the old motel near Wesco. The City is working with Friends Ministry on the planned development on approximately 9.5 acres and 22 homes. Concerns include the increase in STRs.

Objectives to complete for September:

1. Recreation planning
2. Hazard Mitigation planning

SUBCOMMITTEE REPORTS:

P.A. 116: GAC Cattle Company LLC – Motion by Fisher with support from Zwolak to recommend the GAC Cattle Company P.A. 116 application for approval by the Board of Commissioners. All in favor, motion carried. Motion passed.

PUBLIC COMMENT** None

ADJOURN: 7:10pm; NEXT MEETING: November 16, 2022 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

(FY2023 1st Quarter)
Local Emergency Planning Committee / Local Planning Team
Missaukee County Annex Building
October 19 2022 6:00pm
Minutes

LEPC

The LEPC meeting was called to order at 6:01pm.

Attendees: Linda Hartshorne-Shafer (Missaukee EM); Craig Fisher, Jay DeBoer (McBain Fire); Carl Hunt (Merritt Fire), Bret Haner (DHD#10); David LaRoche, Austin Booms (Lake Missaukee Fire); Jonathan Ouwinga (Clam Union FD); Michael Doan (Norwich Township Fire); Julie Stahl (Missaukee SD/911)

The minutes from the July 20, 2022 meeting were approved following a motion by Doan with support from Fisher, all in favor. Minutes accepted as presented.

The agenda from the October 19, 2022 meeting were approved following a motion by Fisher with support from Doan, all in favor. Agenda accepted as presented.

Tier II: Nothing new to report.

Miscellaneous/Updates: N/A

LEPC Adjourned: 6:02pm

Next meeting – Wednesday, January 18, 2023; 6pm, Annex Building

LPT

Called to Order: 6:02pm

Attendees: Linda Hartshorne-Shafer (Missaukee EM); Craig Fisher, Jay DeBoer (McBain Fire); Carl Hunt (Merritt Fire), Bret Haner (DHD#10); David LaRoche, Austin Booms (Lake Missaukee Fire); Jonathan Ouwinga (Clam Union FD); Michael Doan (Norwich Township Fire); Julie Stahl (Missaukee SD/911)

The minutes from the July 20, 2022 meeting were approved following a motion by LaRoche with support from Doan, all in favor. Minutes accepted as presented. The minutes from the July 20, 2022 meeting were approved following a motion by Hunt with support from LaRoche, all in favor. Minutes accepted as presented.

Old Business:

The Fire Annex was reviewed a final time with a few additional updates made. All but one department was present to sign; EM will reach out for the final signature. Discussion regarding the training levels of departments and the number of personnel at each level; many personnel are currently attending training classes which will change the totals; not concerned about absolute accuracy.

New Business:

- a. Hazard Mitigation Plan Update: Networks Northwest gave presentation at September 28 2022 Planning Commission; review of information from that meeting was provided. Discussion regarding invasive species and relationship to hazard mitigation planning, including vegetation that damages or destroys roadways (Japanese Knotweed) and other invasives that have an economic impact including Phragmites (which can become a fire hazard when it dries down) and Cypress Spurge (which is toxic to horses and cows, and is currently found at the disc golf course). There are also aquatic invasives that have a negative impact both economically and within the environment.
- b. Water Access Points: In the current Hazard Mitigation Plan update draft, the lead for fire suppression access points is the EM; it should instead be the fire chiefs who are familiar with the access points in their own jurisdictions.
- c. FSE Planning/update: FSE will be held on December 3rd at McBain schools; exercise planning team is working on it. Several LPT members offered to participate as players in the exercise.
- d. AVI Plans: Plans were sent out for review; have received some feedback and updates will be made.

LPT Adjourned: 6:36pm

Next Regular Meeting: Wednesday, January 18, 2023 following LEPC; Annex Building

MISSAUKEE COUNTY PLANNING COMMISSION

Agenda

County Annex Meeting Room

November 16 2022

	ARDIS (Schools)		BLASZAK (Ag/Forestry)		FISHER (Emergency Services)		KARLL-LINDER (Comm/Econ Dev)
	MILLER (Ag/Forestry)		SMALLEGAN (BOC)		(Public at Large)		ZWOLAK (Recreation/Tourism)
							HARTSHORNE-SHAFER (Staff)

CALL TO ORDER:

APPROVAL OF AGENDA FOR November 16 2022 MEETING:

APPROVAL OF MINUTES FROM September 28 2022 MEETING:

PUBLIC COMMENT**:

NEW BUSINESS: None

OLD BUSINESS:

1. Networks Northwest
 - a. Seasonal Population Study

 - b. Hazard Mitigation Plan

2. Recreation Plan Update

3. Lake City Updates:

MISCELLANEOUS: None

Objectives to complete for September:

1. Recreation planning

SUBCOMMITTEE REPORTS:

P.A. 116:

PUBLIC COMMENT** None

ADJOURN:

++NEXT MEETING: November 16, 2022 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

MISSAUKEE COUNTY PLANNING COMMISSION

Minutes

County Annex Meeting Room

November 16 2022

X	ARDIS (Schools)	X	BLASZAK (Ag/Forestry)	X	FISHER (Emergency Services)		KARLL-LINDER (Comm/Econ Dev)
	MILLER (Ag/Forestry)	X	SMALLEGAN (BOC)		(Public at Large)		ZWOLAK (Recreation/Tourism)
						X	HARTSHORNE-SHAFER (Staff)

Others Present: Jennifer Neal, Stephanie Marchbanks (Networks Northwest); Grace Freese (Missaukee County Parks Manager)

CALL TO ORDER: 5:13 pm

APPROVAL OF AGENDA FOR November 16 2022 MEETING: Motion by Smallegan with support from Ardis – all in favor, agenda accepted as presented.

APPROVAL OF MINUTES FROM September 28 2022 MEETING: Motion by Ardis with support from Fisher – all in favor, minutes accepted as presented.

No public comment, no new business to address.

OLD BUSINESS:

1. Networks Northwest

a. Seasonal Population Study: Networks Northwest staff presented the 2022 Seasonal Population Study for Northwest Lower Michigan, focusing on Missaukee County data while comparing to the Regional numbers. This study included two new items; the Estimate of Overnight Visitors in Short Term Rentals, and the Estimate of Seasonal Workforce. Region-wide, the research indicates that population can increase by as much as 78% in the summer and in Missaukee, by as much as 88%. These seasonal increases can have an impact upon everything from available housing to emergency services and should be taken into consideration when planning. Handouts were provided for reference.

b. Hazard Mitigation Plan A packet of Hazard Mitigation Strategies was provided for review and discussion. It was determined that several of the strategies were no longer relevant or feasible and should be removed. Maps were shown that identified various areas of concern or critical infrastructure locations in the county; discussion regarding wooded areas and particularly Christmas tree farms which did not appear to be fully represented on the map. This could be due to the use of leased properties for tree farms. Missaukee County staff will forward additional campground information to Networks Northwest staff; they will continue updating the plan and maps.

2. Recreation Plan Update: Progress is being made on the joint recreation planning project. The consultant from Prein & Newhof will be ready to present Lake Township and Lake City with their plans and Missaukee Staff is still working on the county's update. Public comment period and public hearing dates will be forthcoming.

3. Lake City Updates: Craig Ardis reports that the city is addressing blight issues, particularly working with building owners to bring structures up to code if possible or explore other options for properties. Craig Fisher reports that McBain is about 6 services away from completing the lead abatement program.

MISCELLANEOUS: Nothing to report

Objectives to complete for January:

1. Recreation planning – continue work on plan.

SUBCOMMITTEE REPORTS:

P.A. 116: N/A

PUBLIC COMMENT** None

ADJOURN: 7:06pm

++NEXT MEETING: January 25, 2023 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.



Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Question on Missaukee County COA services

h.jensen@missaukeecoa.org <h.jensen@missaukeecoa.org>

Fri, Nov 18, 2022 at 3:50 PM

To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>, h.bryant@missaukeecoa.org

Hi Stephanie and thank you for your message.

Just want to clarify that we do not do Meals on Wheels through our COA. At one time, Meals on Wheels was coming to our Senior Center, but honestly after COVID, I am not sure how they are doing that right now.

But yes, we do offer Snow removal services. And yes, we do reach out to our seniors during inclement weather and power outages. Our RN Supervisor does touch base calls on the regular with clients and we provide In Home assessments of our clients and caregivers on a regular basis.

Please let me know if you would like more information or if there anything else I can do the help.

Thanks again and be safe out there if you must travel. 😊

Best regards,

Heather

From: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>**Sent:** Friday, November 18, 2022 3:42 PM**To:** h.bryant@missaukeecoa.org**Subject:** Question on Missaukee County COA services

Hello Heather,

I am a Community Planner with Networks Northwest (f/k/a Northwest MI Council of Governments) and am assisting the Missaukee County Emergency Manager, Linda Hartshorne-Shafer, with the update of the County's 5-Year Hazard Mitigation Plan.

We are in the process of developing mitigation strategies for natural hazards affecting the county, such as extreme winter weather events, extreme cold/heat, etc. Particularly concerning the elderly, home-bound population, we recognize that the Missaukee COA currently offers reduced cost snow plowing services and Meals on Wheels delivery services. These services are listed in the draft Hazard Mitigation Plan as strategies that should be continually provided to assist seniors endure hazard events.

However, I was wondering if your COA also provides something like a "telephone reassurance" call service to check on homebound seniors during extreme weather events, power outages and/or on a weekly basis? I know some other county COA's in the area do this, but wanted to know if Missaukee COA also provided this or if it is something your organization might like to provide in the future. If so, we can include this as an additional mitigation strategy in our plan.

Thanks for your assistance!

Stephanie Marchbanks**Community Planner****Networks Northwest**

Desk: 231.439.5247

Mobile: 231.590.0930

stephanie.marchbanks@networksnorthwest.org

2240 Mitchell Park Dr., Suite B

(FY2023 2nd Quarter)
Local Emergency Planning Committee / Local Planning Team
Missaukee County Annex Building
January 18, 2023 6:00pm
Minutes

LEPC

Called to Order: 6pm

Attendees: Linda Hartshorne-Shafer (Missaukee EM); Jay DeBoer, Craig Fisher (McBain FD); Michael Doan, Jordan Booms (Norwich Township FD); Wil Yancer, Julie Stahl (MCSO), Carl Hunt, Ed Nettle (Merritt FD); Aaron Sogge (Missaukee EMS); Bret Haner (DHD#10); David LaRoche, Austin Booms (LMFD); Fred West (LCAFD)

The agenda for the January 18th, 2023 meeting was approved as presented following a motion from Yancer with support from DeBoer, all in favor. The minutes from the October 19, 2022 meeting were approved as presented following a motion from Fisher with support from LaRoche, all in favor.

Tier II: Tier II reports have been coming in both electronically and hard copy. No changes regarding the number of facilities with EHS or the type of EHS.

Miscellaneous/Updates: N/A

LEPC Adjourned: 6:03

Next meeting – Wednesday, April 19, 2023; 6pm, Annex Building

LPT

Called to Order: 6:03 pm

Attendees: Linda Hartshorne-Shafer (Missaukee EM); Jay DeBoer, Craig Fisher (McBain FD); Michael Doan, Jordan Booms (Norwich Township FD); Wil Yancer, Julie Stahl (MCSO), Carl Hunt, Ed Nettle (Merritt FD); Aaron Sogge (Missaukee EMS); Bret Haner (DHD#10); David LaRoche, Austin Booms (LMFD); Fred West (LCAFD)

The agenda for the January 18th, 2023 meeting was approved as presented following a motion from Nettle with support from Fisher, all in favor. The minutes from the October 19, 2022 meeting were approved as presented following a motion from Doan with support from Nettle, all in favor.

Old Business:

a. Networks Northwest – Hazard Mitigation Plan: Jenni Neal and Stephanie Marchbanks reviewed the draft Hazard Mitigation Plan and strategies and noted changes, such as the updated seasonal population data from the most recent Networks Northwest study. The greater the population, the greater the vulnerabilities associated with the area, and some populations such as campgrounds should have plans developed for them. Strategies should be incorporated into the Master Plan. There are approximately 70 strategies that cover all hazards. A timeline must be developed. Maps were provided and comments requested on the maps.

b. Full Scale Exercise Review – Participant feedback indicated that it would be helpful to have the Road Commission use trucks to block roads/traffic to free up fire personnel for other duties. Fire Chiefs will review their plan and make adjustments as needed. It was noted that the exercise was held on a day that the school's parking lot was empty; the scenario would be very different on a school day or if there was a game or other event. Suggestion that hospital's role be elevated to better test their capabilities as well.

LPT Adjourned:

Next Regular Meeting: Wednesday, April 19, 2023 following LEPC; Annex Building

*February 14, 2023 regular meeting of the Bloomfield Township Board was called to order at 7:00 pm. Members present Powell, Gillette, Park, Stauffer, and Bridson

*Park passed out the minutes from the January 10, 2023 board meeting. Minutes will stand as read after fixing date from August 9 2022 to January 10 2023

*Treasurer's report as of February 14, 2023

GENERAL FUND CHECKING	\$105,095.00
Horizon Bank CD #1	\$57,054.39
Horizon Bank CD #3	\$75,550.13
TOTAL GENERAL FUND	\$237,699.52
ROAD Fund SAVINGS	\$95,073.08
ROAD CD #3	\$75,550.13
ROAD CD #4	\$73,780.69
TOTAL ROAD FUND	\$244,403.90

*Public comments: Chris Bridson and Allison Young no comments. Loren Reed asks how our replacing assessor was going

*Powell stated she will be collecting taxes on the last day of collections, February 28, 2023 at the hall 9-5, Her husband Rick Powell will be helping her.

*Gillette has been in contact with Linda Hartshorne about the Missaukee Hazard Mitigation Plan, we ask him to please invite her to a meeting so board can get more info

*Discussion on proposed budget for 2023-24:

↑ raise for milage change for clerk and treasurer to per mile based on national rate per IRS, motion by Gillette, second by Stauffer. All carried

*Discussion on budget for 2022-23 amendments for increasing cemetery contracted services to \$3000.00 instead of \$1800.00 motion made by Stauffer and second by Gillette. All carried

*Board agreed to resolution for dates of year 2023-2024 offered by Stauffer second by Gillette all carried (see attached)

*Board agreed to resolution to establish board salaries for year 2023-2024 offered by Stauffer second by Gillette all carried (see attached)

*Board agreed to resolution to adopt poverty exemptions for year 2023-2024 offered by Bridson second by Gillette, all carried (see attached)

*Board agreed to resolution of township investment and depository for year of 2023-2024 offered by Stauffer second by Gillette all carried (see attached)

**Board agreed to adoption of fixed asset capitalization policy and list of assets, (see attached)*

**Motion to approve new bills from Feb 14, 2023 to March 28, 2023 offered by Stauffer second by Gillette all carried*

**Motion at adjourn the meeting at 8:03 offered by Gillette second by Stauffer all carried*

February 27, 2023

Dear Missaukee County Local Government Representative,

The Missaukee County Planning and Emergency Management Department, with assistance from Networks Northwest, has prepared a draft of the County's Natural Hazard Mitigation Plan. The plan provides data and documentation on natural hazard events, the impact of such events on local communities, and strategies to mitigate the impact of future events. This is a multi-jurisdictional plan which addresses hazard events and strategies for all cities and townships in the county.

Your input on this draft plan is an essential requirement of the planning process. The final draft plan, and associated strategies, resources, and maps, are available for public review and comment. These can be viewed online at the project webpage:

<https://www.networksnorthwest.org/community/natural-hazard-mitigation/missaukee-county.html>

Your participation in the review of this plan is also a Federal Emergency Management Agency (FEMA) requirement to be eligible for federally-funded **pre-disaster** hazard mitigation grant opportunities for five years. Many of the hazard mitigation strategies have a county-wide application, but some are site-specific. Please review the plan and materials carefully to verify your community is in support of the material provided or requests changes to the draft.

A public hearing for the plan will be held on March 22, 2023 at 5:00 PM as part of the Missaukee County Planning Commission Meeting. The meeting location is in the Missaukee County Annex Building, 105 S. Canal Street, Lake City, MI. Upon review of the plan, the Planning Commission shall recommend it be sent to Michigan State Police Homeland Security Division for review and then on to FEMA for their final approval. Once FEMA has approved the plan, it will be brought before the County and all local government boards for adoption.

A copy of this letter will be shared with all local officials through electronic mail. Comments are requested either in person or by representative at the public meeting or at PO Box 506, Traverse City MI 49685, or by email at Jennifer.neal@networksnorthwest.org.

Sincerely,

Jennifer Neal, AICP
Community Planner, Networks Northwest

The Missaukee Sentinel

Classifi

CALL YOUR CLASSIFIED SPE

Legals

NOTICE - TOWNSHIP OF PIONEER

The Pioneer Township Board of Review will meet at Pioneer Township Hall, 2914 West Moorestown Road, on the following dates:

Organizational Meeting: Tuesday, March 7, 2023, 3:30 p.m.

Appeal(s) Hearing: Monday March 13, 2023, 9:00 a.m. to 3:00 p.m.

Appeal(s) Hearing: Tuesday, March 14, 2023, 3:00 p.m. to 9:00 p.m.

The Board of Review will meet to hear questions, protests, and to equalize the assessment roll. **By Township Board resolution, residents are able to protest by letter, provided protest letter is received prior to March 14, 2023.** The tentative ratios and the estimated multipliers for each class of real property and personal property for 2023 are as fol-

Legals

ATTENTION CITY OF LAKE CITY RESIDENTS NOTICE OF A PUBLIC TRUTH AND TAXATION HEARING

The requisite Public Hearing has been scheduled for Monday, March 13, 2023, at 6:00 P.M. at the City of Lake City Municipal Building, 115 W. John Street, to discuss adoption of the FY Budget. Of note, a copy of the budget will be available at the Special Council Meeting, and further a copy will be available for public inspection in the Clerk's Office at 115 W. John Street.

THE PROPERTY TAX MILLAGE RATE PROPOSED TO BE LEVIED TO SUPPORT THE PROPOSED BUDGET WILL BE A SUBJECT OF THIS HEARING.

Legals

Notice of availability of Draft Hazard Mitigation Plan and Public Meeting for Input on the Draft Hazard Mitigation Plan.

Missaukee County is in the process of updating its Hazard Mitigation Plan in accordance with the Disaster Mitigation Plan of 2000. There will be a public meeting following the public review period on March 22, 2023. The meeting will be at the Missaukee County Annex Building, 105 S. Canal Street, Lake City, MI 49651 at 5:00 PM. Public comments are requested either in person or by representative at the public meeting or at PO Box 506, Traverse City, MI 49685, or by email at jennifer.neal@networksnorthwest.org. The draft plan is available for review on Missaukee County's website and Network Northwest's website.



Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Re: Notices for community input

margie phillips <margie_phillips@outlook.com>

Tue, Mar 7, 2023 at 12:43 PM

To: Jennifer Neal <jennifer.neal@networksnorthwest.org>

Cc: Alisha Theriault <alisha.theriault@networksnorthwest.org>, Linda Hartshorne-Shafer <planningemd@missaukee.org>, Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Yes, you have my permission to share my comments. Thank you so much for responding. Margie

From: Jennifer Neal <jennifer.neal@networksnorthwest.org>

Sent: Tuesday, March 7, 2023 9:27 AM

To: margie phillips <margie_phillips@outlook.com>

Cc: Alisha Theriault <alisha.theriault@networksnorthwest.org>; Linda Hartshorne-Shafer <planningemd@missaukee.org>; Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Subject: Re: Notices for community input

Good morning Margie,

Thank you so much for your information. We will update our records accordingly. I am sorry to hear about Jim, but, yes, even though participants are no longer involved with the process we would still like to include their name. We will make the change regarding the generator as well.

Do you mind if we share this message as part of our official record of comments received?

Best regards,

Jenni

On Tue, Mar 7, 2023 at 8:46 AM margie phillips <margie_phillips@outlook.com> wrote:

First, thank you so much for providing this information for review. Just a couple of things that I would mention. I am no longer the clerk in Forest Township, Missaukee County. I am currently the Supervisor. I was clerk when I attended the meeting previously, or when I submitted a survey - but am now the Supervisor. I also would note that Jim Brown who was a former fire chief is now deceased. I don't know if this makes a difference when completing the final plan. Another change is that Forest Township now has a GENERATOR. This was installed in 2022 and I felt this was important - you might want to make this change on Page 58 of the report. I am not planning on attending the meeting and these were my only comments. Good job. Margie Phillips, Supervisor - Forest Township, Missaukee County

From: Alisha Theriault <alisha.theriault@networksnorthwest.org>

Sent: Thursday, February 23, 2023 3:11 PM

To: margie_phillips@outlook.com <margie_phillips@outlook.com>

Subject: Notices for community input

Good Afternoon Margie,

We have drafted letters to be sent out to each municipality to request input on planning projects we are working on. Each township and village will be sent a letter informing them of the upcoming meeting date and a request to provide input.

Attached is your letter for your township. Thank you for taking the time to read and respond. I hope you have a good day.

Thank you,
 Alisha J. Theriault
 Administrative Assistant
 Northwest Michigan Council of Governments dba
 Networks Northwest/ Northwest Michigan Works!


 600 E. Front Street, Suite 205
 Traverse City, MI. 49686
 Alisha.Theriault@networksnorthwest.org
 Phone: 231-929-5075

Jennifer Neal, AICP

Community Planner

Mobile: 231.709.3204

jennifer.neal@networksnorthwest.org

Networks Northwest
 2240 Mitchell Park Dr., Suite B
 Petoskey MI 49770

MISSAUKEE COUNTY PLANNING COMMISSION

Minutes

County Annex Meeting Room

March 22, 2023

Planning Commission members present: Blaszak (Ag/Forestry), Fisher (Emergency Services), Karll-Linder (Commercial/Economic Development); Miller (Ag/Forestry); Smallegan (Board of Commissioners); Linda Hartshorne-Shafer (Staff)

Others Present: Dan Gallop, Reeder Township

CALL TO ORDER: 5:10pm

Agenda: Approved with the addition of the Hazard Mitigation Plan Public Hearing. Motion by Smallegan with support from Miller. All in favor. Agenda approved with addition of Public Hearing.

Minutes: Approved following a motion by Smallegan with support from Miller. All in favor, minutes approved as presented.

PUBLIC COMMENT**: None

OLD BUSINESS:

HAZARD MITIGATION PLAN PUBLIC HEARING OPENED: 5:12PM

1. Hazard Mitigation Plan: Stephanie Marchbanks (Networks Northwest) presented maps and information about the Hazard Mitigation plan, explained the approval process, and answered questions. Pipelines and gas/oil storage fields and their locations were discussed; Planner will forward information from the NPMS Public Viewer to Stephanie and she will also follow up with other Networks Northwest staff. The maps presented at the meeting are also available on the Networks Northwest website. All jurisdictions in Missaukee County have been represented during the process; to ensure eligibility to apply for grant funding if desired those jurisdictions must now adopt the plan as well.

There were no other comments. Motion by Fisher with support from Miller to approve and adopt the Missaukee County Hazard Mitigation Plan. All in favor.

HAZARD MITIGATION PLAN PUBLIC HEARING CLOSED: 5:21PM

2. Recreation Plan Update: Notification was received on March 2, 2023 that the Recreation Plan was not approved. Planner researched in the MiGrants website and found that items that were lacking were not yet available for upload (signed/certified resolution of adoption and signed minutes from the January 10th board meeting). Planner followed up with Grant Coordinator; signed/certified resolution has been uploaded and Coordinator is aware that signed meeting minutes are not yet available. When they have been signed, they will be emailed to the Coordinator. In the meantime, if there are grants that Missaukee is interested in pursuing, we can apply on April 1st 2023 or later.

NEW BUSINESS:

1. Agriculture Water Usage/Irrigation Meeting: Presentation by representative from Midwest Water Stewards on the impact of farming irrigation on aquifer levels in Michigan. Collected data indicates that while aquifer levels may decrease due to irrigation, the levels rebound quickly and overall levels have been increasing since at least 2013; this is supported by research and data collected.

MISCELLANEOUS: None

Objectives to complete for May 2023

1. Working on Master Plan – ongoing project.

SUBCOMMITTEE REPORTS:

P.A. 116: Koster – P.A. 116 application was reviewed. Following a motion by Miller with support from Karll-Linder, the application was recommended for approval by the board of commissioners. All in favor, motion passed.

PUBLIC COMMENT** None

ADJOURN: ++NEXT MEETING: May 24, 2023 5:00pm**Public Comment Rules authorized by the Missaukee County Planning Commission: Each person recognized by the Chairman shall state their name for the record and will have a limit of 3 minutes to state an opinion. All opinions will be duly noted by the Commission & if requiring an answer will be addressed by the chairman first or his designee or in writing. The audience is asked not to interrupt at any time during public comment.

*May 9, 2023 regular meeting of the Bloomfield Township Board was called to order at 7:00 pm. Members present Powell, Gillette, Park, Stauffer, and Bridson

*Park read the minutes from the March 28, 2023 board meeting. Minutes will stand as read.

*Treasurer's report as of May 9, 2023

GENERAL FUND CHECKING	\$115,860.51
Horizon Bank CD #2	\$57,249.65
Horizon Bank CD #3	\$77,369.20
TOTAL GENERAL FUND	\$249,479.36
ROAD Fund SAVINGS	\$124,211.55
ROAD CD #3	\$76,369.20
ROAD CD #4	\$74,584.05
TOTAL ROAD FUND	\$275,164.80

*Public comments: Loren Reed, Chris Bridson and Allison Young no comments. Jessica Beals from Horizon Bank came and explained about how the FDIC coverage works and maybe different options board could take—since we are a municipality

*Powell spoke to board about meeting at township for treasurers—FDIC, credit card acceptance and post mark tax payments. Board agrees to keep doing how we are doing now--accepting credit cards and accepting tax payments by post mark date

*Discussion on Wooden Tool box coming to redo floor. He will need about a week without anyone being there.

*Missaukee County send out more info on Blight properties, we will need a resolution by Oct 1—if board plans to acknowledge this

*Justin Stauffer, sexton has noted he will need to buy a new flag for cemetery.

*County clerk sent the county's adopted resolution on support of the second amendment--see attached

* Gillette discussed his discussion with Linda Hartshorne about the Hazard Mitigation plan and had ask her about us getting a dry hydrant in the river or creek—more to follow

*Motion to approve new bills from May 9, 2023 to June 13, 2023 offered by Stauffer second by Gillette all carried

*Motion at adjourn the meeting at 7:53 offered by Gillette second by Stauffer all carried