Wexford County, Michigan
Natural Hazard Mitigation Plan

2023

FEMA LETTER OF APPROVAL

LOCAL PLAN ADOPTION DOCUMENTATION

ACKNOWLEDGEMENTS

The Wexford County Natural Hazard Mitigation Plan is prepared for Wexford County, Michigan and all the jurisdictions within it. This plan is the culmination of an interdisciplinary and interagency planning effort that required the time, technical assistance and expertise of individuals within the jurisdictions and organizations listed below. Refer to Appendix F for a table of how and when representatives participated in the development of the plan.

PARTICIPATING ENTITY	REPRESENTATIVE	TITLE
Wexford County Board of Commissioners	Jason Mitchell	District 1 (Greenwood, Liberty, Manton, Cedar Creek (N. of 37 Rd.))
	Michael Musta	District 2 (Colfax, Hanover, Antioch, Boon (minus the Village of Harietta))
	Ben Townsend	District 3 (Wexford, Slagle, South Branch, Springville, Village of Harietta)
	Kathleen Adams	District 4 (Cherry Grove (W. of 52 Rd.), Henderson, Selma)
	Michael Bush	Vice Chair, District 5 (Cadillac Precinct 1)
	Julie A. Theobald	District 6 (Cadillac Precinct 2)
	Gary Taylor	Chair, District 7 (Cadillac Precinct 3)
	Jason Baughan	District 8 (Haring (minus Cadillac City), Cedar Creek (S. of 37 Rd.))
	Brian Potter	District 9 (Clam Lake, Cherry Grove (E. of 52 Rd.))
	Mike Bengelink	County Commissioner (former)
Wexford Joint Planning Commission (WJPC)	Richard Harvey	Planning Commissioner, Boon Twp.
	Beverly Monroe	Planning Commissioner, Liberty Twp.
	Paul Osborne	Planning Commissioner, Antioch Twp.
	Marli Wendel	Planning Commissioner, Slagle Twp.
	Donna Taylor	Planning Commissioner, South Branch Twp.
	Benedict Fleis	Planning Commissioner, Wexford Twp.
	Randy Brewer	Planning Commissioner, Springville Twp.
	Christina Vipond	Planning Commissioner, Hanover Twp.
	Robert Hall	WJPC Planning & Zoning Administrator
	Heather O'Connor	WJPC Recording Secretary
Wexford County	Joe Porterfield	County Administrator/Equalization Director
	Jami Bigger	Deputy County Administrator/Human Resources Director
	Randy Boike	Emergency Management Coordinator (current) / Wexford County Sheriff's Office
	Travis Baker	Emergency Management Coordinator (former) / Wexford 911
	Trent Taylor	Wexford County Sheriff
	Richard Doehring	Wexford County Sheriff's Office
	Karl Hanson	Road Commission Engineer/Manager
	Sarah Merz	GIS Analyst
	Duane Alworden	911 Director
	Brian Draper	Wex Express Transportation
City of Cadillac	Marcus Peccia	City Manager
	Antoinette (Tiyi) Schippers	Mayor Pro-Tem
	John Wallace	Community Development Director
	Mike Coy	Zoning Administrator
	Adam Ottjepka	Director of Public Safety
City of Manton	Jake Paddock	DPW Supervisor
	Jessica Schisser	Clerk
	Sam Cronkhite	Mayor
	Bill Bates	City Commissioner

PARTICIPATING ENTITY	REPRESENTATIVE	TITLE
Village of Buckley	Michael Guernsey	Buckley Fire Chief/ DPW Supervisor
Village of Mesick	Deborah Stanton	Clerk
Antioch Township (WJPC)	Paul Osborne	WJPC
Boon Township (WJPC)	Richard Harvey	WJPC
Cherry Grove Township (WJPC)	Ben Pearson	Supervisor
Colfax Township (WJPC)	Jason Nelson	Colfax-Greenwood Fire Dept.
	Rebecca Stoddard	Clerk
Greenwood Township	Alan Mohler	Township Supervisor
	Jason Nelson	Colfax-Greenwood Fire Dept.
Hanover Township (WJPC)	Christina Vipond	WJPC
Haring Charter Township	Duane Alworden	Fire Chief
Liberty Township (WJPC)	Beverly Monroe	WJPC; Township Supervisor
Selma Township (WJPC)	Mike Boyd	Township Supervisor
Slagle Township (WJPC)	Marli Wendel	WJPC
South Branch Township (WJPC)	Donna Taylor	WJPC
	Julie Cieslak	Clerk
Springville Township (WJPC)	Randy Brewer	WJPC
Wexford Township (WJPC)	Benedict Fleis	WJPC
	David Fox	Treasurer
Wexford Conservation District / North Country Cooperative Invasive Species Management Area (NC CISMA)	Tiffany Jones	District Manager
	Vicki Sawicki	NC CISMA Program Coordinator
Wexford Council on Aging	Erin Brotherton	Supervisor of Health Care Services
Cadillac Area Land Conservancy	Chris Gentry	Executive Director
District Health Department #10	Bret Haner	Emergency Preparedness Coordinator
Michigan State Police	Trooper Travis Thenikl	
	F/Lt. Matthew McCaul	Cadillac Post
	Mike Sobocinski	Hazard Mitigation Planning Analyst
Michigan Department of Natural Resources	Breton Baker	Forest Fire Supervisor – Cadillac Management Unit
US National Forest Service - Huron-Manistee National Forest	Ben Wagner	Deputy Fire Staff Officer
	Scott Peedle	USFS District Ranger, Cadillac/Manistee Ranger District
Buckley Community Schools	Jessica Harrand	Superintendent
Wexford-Missaukee Intermediate School District	Dave Cox	Superintendent

Prepared for: Wexford County Board of Commissioners

Prepared by: Wexford County Department of Emergency Management with assistance from:

Networks Northwest
PO Box 506
Traverse City MI 49685-0506
Telephone: 231.929.5000
www.networksnorthwest.org

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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 Wexford County Natural Hazard Mitigation Plan focuses on *natural* hazards such as wildfires, flooding, severe thunderstorms, high winds, tornado, hail, severe winter weather, extreme heat/cold, dense fog, drought, dense fog, and invasive species. An exception is that it will also consider these technological and human-related hazards: potential dam failure, subsidence, and public illness outbreak. The anticipated impacts of climate change in Michigan are also discussed with relation to expected future natural hazard events.

The following natural hazards were not included in the analysis for this Hazard Mitigation Plan: earthquakes, space weather, and meteorites and other impacting objects. Based upon review of the Michigan State Police's *2019 Michigan Hazard Analysis*, most of Michigan is not located in an area subject to major earthquake activity. Damaging space weather events were not evaluated due to the lack of significant historical impact in northern Michigan. Damaging meteorite events were not evaluated due to the lack of historical impact in northern Michigan and their low probability of occurrence.

The main objective of the Wexford 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.

A broad perspective was taken in developing this plan to examine multiple hazard mitigation activities and opportunities in Wexford County. Each 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 has achieved the following key endeavor to address their priority mitigation strategy areas:

- Public education and awareness activities: Wexford County now participates in the CodeRED Emergency Communications Network, which is an electronic high-speed outbound notification service available to the general public. The system notifies a participant via their mobile phone (via text message) or land-line phone of public safety alerts.

Additionally, progress on the following hazard mitigation strategies from the 2015 plan has been "ongoing" by the county and municipalities:

- Wildfire
  - Acquire appropriate fire suppression equipment for responses
  - Consider wildland fire hazard reduction in building and zoning requirements
  - Acquire appropriate fire suppression equipment for response
- Extreme Winter Weather
  - Work with utility companies to clear vegetation near power lines and infrastructure
  - Continue enforcement of building code regarding snow load limits through the permitting process
- Severe Weather
  - Promote the anchoring of trailers and modular homes

- Flooding
    - Continue enforcement of building codes and soil erosion regulations
    - Promote flood-proofing of structures and damage reduction techniques

- Various
    - Incorporating the Plan's natural hazards mitigation concepts, strategies and policies into existing elements of local Master Plans
    - Public education and awareness activities

Appendix C provides a review of mitigation strategies included in the 2015 plan and their current status.

Section VII of this plan provides a list of hazard mitigation strategies for each hazard identified. Strategies were developed based on discussions with local officials, stakeholders, and a review of FEMA/MSP best practices for hazard mitigation. Refer to Appendix D for a list of alternative strategies that were considered.

Strategies are grouped according to their purpose: Awareness and Preparation; Shelters; Building & Development; Utilities & Technology; and Environment & Natural Resources. The strategies table also includes: a description of each strategy; what 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 may extend beyond the 5-year timeframe due to feasibility or level of difficulty.

Available local planning and zoning documentation was also reviewed for local strategies and ordinances that align with the 2023 hazard mitigation strategies; findings are provided in Appendix E.

Recognizing the importance of reducing community vulnerability to natural hazards, Wexford County is actively addressing the issue through the development and implementation of this Plan. This process will help ensure that Wexford 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 Wexford County, and serves as a resource for building coordination and cooperation within the community for local control of future mitigation and community preparedness around the following goals:

Goal 1: Increase local awareness and participation in natural hazards mitigation
Goal 2: Integrate natural hazards mitigation considerations into local planning processes
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. Wexford County has a history of mitigation planning and adopted past Natural Hazard Mitigation Plans in 2007 and 2015. The adoption of this updated Plan will reaffirm the eligibility of the county, as well as those local municipalities who participated in the planning process and adopted the plan, to apply for FEMA pre-disaster mitigation grants.

Plan Development

The update of the County's plan was led by the Natural Hazards Task Force composed of the County's Local Planning Team (LPT), which is facilitated by the Wexford County Emergency Management Coordinator. Team 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. Networks Northwest staff assisted with the creation of the updated plan by providing meeting facilitation, conducting an online survey, and writing the plan. The Task Force generally met on a quarterly basis in person at the Wexford County Building, with additional in-person public input meetings at the County Sheriff's Office Training Center. All meetings were open to the public; notifications were made via postings on the Networks Northwest project page and via email invitations.

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. Stakeholders included local and regional agencies involved in hazard mitigation activities; agencies that have the authority to regulate development; neighboring communities; 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 District Health Department #10 and Wexford Council on Aging). Please refer to the Acknowledgements section in the beginning of this plan for a list of participants and Appendices F and G for plan development participation and meeting documentation. All county jurisdictions - except for Cedar Creek Township, Clam Lake Township, Henderson Township and the Village of Harrietta - have participated in the development of this Hazard Mitigation Plan update. In the previous 2015 Wexford County Natural Hazard Mitigation Plan, all county jurisdictions were indicated as participants in the development of the plan.

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

- On July 1, 2021, Travis Baker (former Wexford County Emergency Manager) attended a project kick-off meeting with regional county and tribal emergency managers, Networks Northwest, and Michigan State Police.

- An online public survey was made available from December 1, 2021 to March 31, 2022 to obtain input on community experiences, concerns and priorities regarding natural hazard mitigation in Wexford County. A total of 24 persons participated in the survey, as described in Table 1. Survey results are included as Appendix B.

Table 1: Community Survey Participation

Survey Participant	Representative (if indicated in the survey)
Boon Township	Richard Harvey, Wexford Joint Planning Commission member
Charter Township of Haring	Elected Official
Cherry Grove Township	Supervisor
Colfax Township	Clerk
Liberty Township	Beverly Monroe, Supervisor
South Branch Township	Clerk
Springville Township	Administrator at Mesick Consolidated School District
Village of Buckley	Fire Chief/DPW Supervisor
City of Cadillac	City Manager, Public Safety Director, Mayor ProTem, Zoning Administrator, Community Development Director
City of Manton	City Clerk
Wexford County Government	County Administrator
Wexford County Sheriff's Office	Sheriff
Wexford County Road Commission	Engineer Manager
Wexford County Council on Aging	
MMR EMS Service	
Michigan State Police	
District Health Department #10	Bret Haner, Emergency Preparedness Coordinator

- LPT meetings where the Natural Hazard Mitigation Plan update work was discussed:
    - January 20, 2022 - Networks Northwest provided an introduction and timeline for the project, and presented the community profile information
    - April 21, 2022 – Networks Northwest held a public input meeting (combined with an LPT meeting) to present the hazard analysis, provide a summary of survey results, and engage community stakeholders in hazard identification
    - September 15, 2022 – Networks Northwest presented a partial draft plan, goals, objectives, and maps
    - November 17, 2022 and January 19, 2023 – discussion at the LPT meetings included the Hazard Mitigation Plan draft and next steps

- Networks Northwest staff and the Wexford County Emergency Management Coordinator also attended the Wexford Joint Planning Commission meeting on October 24, 2022 to explain the Hazard Mitigation Plan progress to date and obtain feedback on hazards of concern and the draft plan and strategies.

- On December 6, 2022, Networks Northwest staff and the Wexford County Emergency Management Coordinator held an additional community input session at the Wexford County Sheriff's Office Training Center to obtain feedback from community stakeholders to review and modify draft goals, objectives and strategies.

During development of the plan, representatives of all Wexford County municipalities were provided the opportunity to participate in the online community survey, participate in scheduled meetings, and comment on draft plan materials. Additionally, representatives from county and regional agencies that encompass or share borders with Wexford County (listed below) were invited to participate in the planning meetings, and were able to view the draft plan materials on the hazard mitigation project page of Network Northwest's website and/or Wexford County's web page.

- Gregg Bird, Emergency Management Coordinator, Grand Traverse County
- Mike Thompson, Emergency Management Coordinator, Kalkaska County
- Linda Hartshorne-Shafer, Planning and Emergency Management Director, Missaukee County
- Mark Watkins, Emergency Management Director, Osceola County
- Patrick Maddox, Emergency Management Director, Lake County
- Alvin Rishel, Emergency Management Coordinator, Manistee County
- Rebecca Hubers, Emergency Management Coordinator, Benzie County
- Robert Carson, Regional Director of Community Development, Networks Northwest

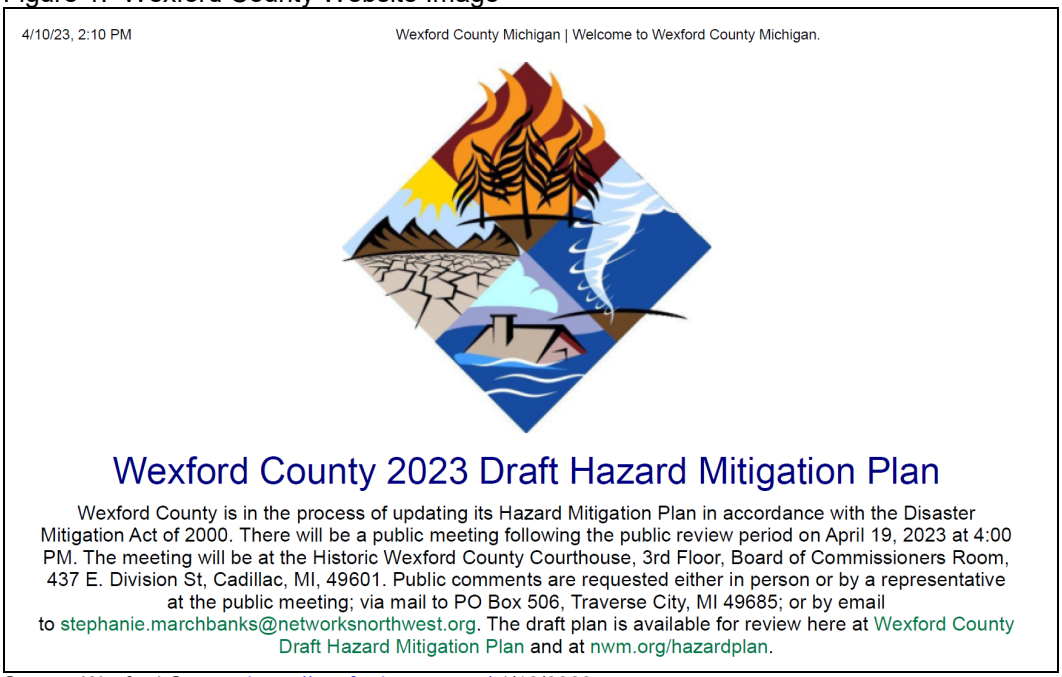
Draft Plan Review and Comment

The draft plan was published openly on the Wexford County Emergency Management website (Figure 1), as well as the project page on Networks Northwest's website (Figure 2). The public was encouraged to review the draft plan and invited to submit suggestions and ideas for updates, changes to be considered during updates. Documentation of formal comment received is included in Appendix G.

Additional notification of the draft plan was made through a direct mailing to local government offices in the county (Figure 3), and through published notices in the *Cadillac News* on March 25 and April 15, 2023 (Figure 4). These communications stated that the County's draft Natural Hazard Mitigation Plan was available for review and comment and that a public hearing would be held on plan at the County Board of Commissioner's Meeting on April 19, 2023.

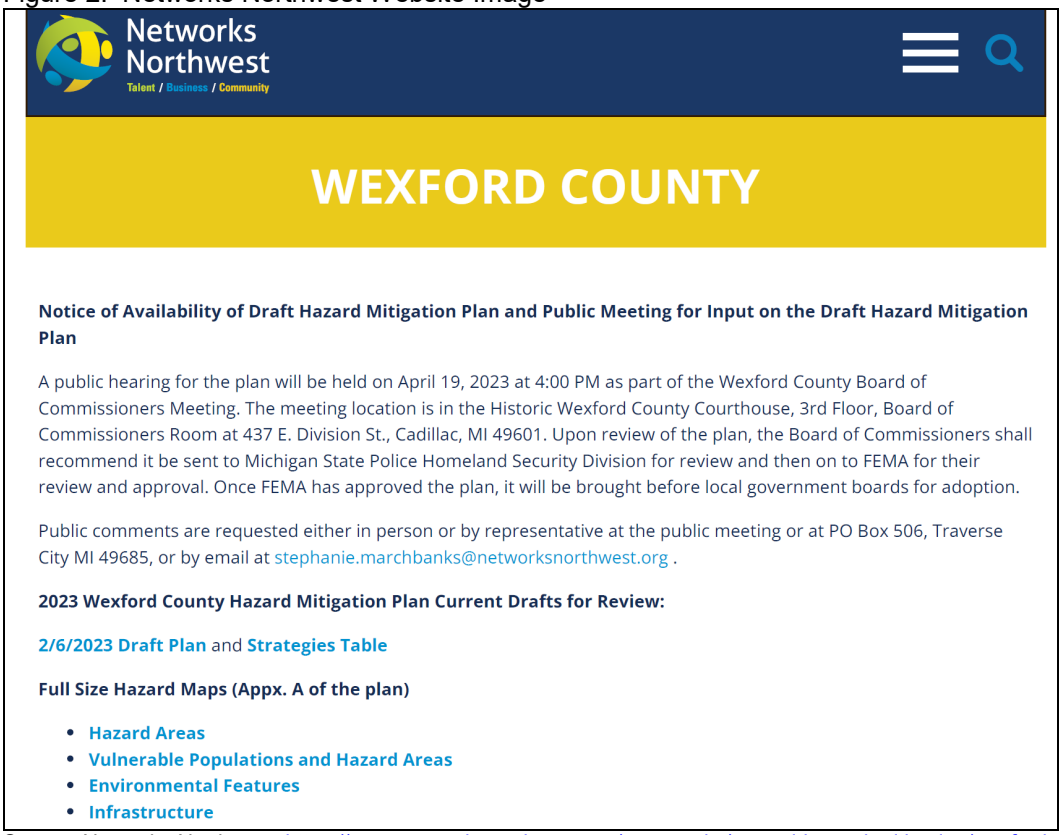
Stakeholder acknowledgement of receipt of the draft plan for review and any submitted comments on the plan are included in Appendix G.

Figure 1. Wexford County Website Image



Source: Wexford County, https://wexfordcounty.org/ 4/10/2023

Figure 2. Networks Northwest Website Image



Source: Networks Northwest, https://www.networksnorthwest.org/community/natural-hazard-mitigation/wexford-county.html 4/10/2023

Figure 3. Letter from Networks Northwest to Wexford County Local Government Officials

Networks Northwest
Talent / Business / Community

Interim Board Chair: **Bill Kennis**

Chief Executive Officer: **Terry Vandercook**

March 20, 2023

Dear Wexford County Local Government Representative,

The Wexford County Emergency Management Department, with assistance from Networks Northwest, has prepared a draft of the County's updated 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, villages 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 by visiting https://nwm.org/hazardplan and then clicking on "Wexford County" on the right hand side of the page.

Your participation in the review of this plan is also a Federal Emergency Management Agency (FEMA) requirement to be eligible for federally-funded pre- and post-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. Each community must have a representative listed in the *Acknowledgements* section of the plan (pp. 3-4) to be eligible to apply for FEMA pre-disaster (mitigation) grant funding. Your community can become a participant by providing acknowledgement of reviewing the draft plan and any comments you may have.

A public hearing for the plan will be held on April 19, 2023 at 4:00 PM as part of the Wexford County Board of Commissioners Meeting. The meeting location is the Historic Wexford County Courthouse 3rd Floor, Board of Commissioners Room at 437 E. Division St, Cadillac, MI. Upon review of the plan, and the public hearing, the County Board of Commissioners shall decide if they approve the draft plan to be sent to Michigan State Police 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 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; via postal mail to PO Box 506, Traverse City MI 49685; or by email to stephanie.marchbanks@networksnorthwest.org

Sincerely,

Stephanie Marchbanks
Community Planner, Networks Northwest

Antrim Benzie Charlevoix Emmet Grand Traverse Kalkaska Leelanau Manistee Missaukee Wexford
PO Box 506 Traverse City, MI 49685-0506 Phone (231) 929-5000 Fax (231) 929-5012 networksnorthwest.org

Figure 4. Notice for Public Hearing on Draft Plan

Affidavit of Publication

STATE OF MICHIGAN }
County of Wexford }

Tara Hall of Cadillac News, a paper published in the County of Wexford and circulated in the Counties of Wexford, Missaukee, Osceola; being duly sworn, deposed and says that she is the Business Department Leader of said newspaper and that a notice, a true copy of which is annexed hereto, has been duly published in said paper on the following date(s):

March 25, 2023,
April 15, 2023

Tara Hall

Subscribed and sworn to before me this17th day of April A.D. 2023.

Brenda Vanderhoef, Notary Public, State of Michigan, County of Osceola, Acting in County of Wexford
My commission expires: December 16, 2023

WEXFORD COUNTY
NOTICE TO THE PUBLIC
PUBLIC MEETING FOR INPUT ON THE WEXFORD COUNTY 2023 DRAFT HAZARD MITIGATION PLAN

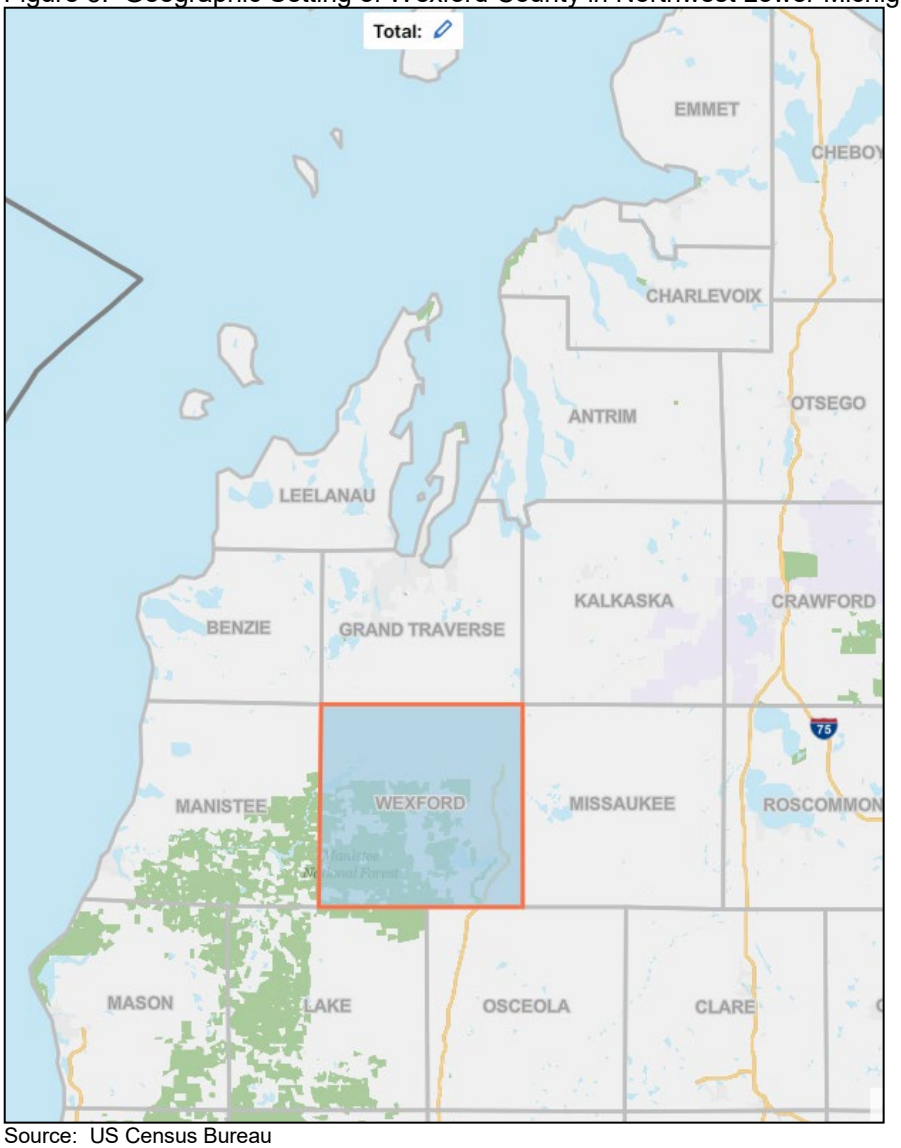
Wexford County is in the process of updating its Hazard Mitigation Plan in accordance with the Disaster Mitigation Act of 2000. There will be a public meeting following the public review period on April 19, 2023 at 4:00 PM. The meeting will be at the Historic Wexford County Courthouse, 3rd Floor, Board of Commissioners Room, 437 E. Division St, Cadillac, MI, 49601. Public comments are requested either in person or by a representative at the public meeting; via mail to PO Box 506, Traverse City, MI 49685; or by email to stephanie.marchbanks@networksnorthwest.org. The draft plan is available for review on Wexford County's website and at nwm.org/hazardplan.
March 25, April 15

Source: Cadillac News, published March 25 and April 15, 2023

III. COMMUNITY PROFILE

Location
Wexford County is located in Northwest Lower Michigan (Figure 5). The county is bordered by Grand Traverse County to the north, Kalkaska County to the northeast, Missaukee County to the east, Osceola and Lake Counties to the south, Manistee County to the west, and Benzie County to the northwest. Refer to Appendix A for maps illustrating the county's main roads, water bodies and jurisdictions.

Figure 5. Geographic Setting of Wexford County in Northwest Lower Michigan



Source: US Census Bureau

Land Use/ Land Cover
Wexford County contains 368,266 acres and is the 48th largest county in Michigan by total area.[1] Approximately 2% of the county area, or 7,325 acres, consists of open water (Table 2).

About 50% of Wexford County is made up of rolling to steep glacial moraines, with most of the remainder undulating or nearly level glacial outwash plains. The highest point in Wexford County is *Briar Hill* at 1,706 feet elevation in Antioch Township, located east of the Village of Mesick.

The natural resources of Wexford County are vital to the economic health and quality of life of area residents. The abundance of quality public forest land and water resources make this area a popular tourism destination, particularly for hunting, fishing, skiing and snowmobiling.

[1] https://data.census.gov/cedsci/profile/Wexford_County,_Michigan?g=0500000US26165

Wexford County hosts a number of both motorized and non-motorized trail systems. Snowmobiles and off-road vehicles (ORVs) are authorized to use road shoulders on County road rights-of-way, and a number of motorized trails are available on the County's public land. Trail opportunities for ORVs were expanded with Public Act 288 of 2016, which opens state forest roads to ORV use unless posted.

The County is divided into two major watersheds, or drainage areas: the Big Manistee River and the Muskegon River (Clam River/Lakes Cadillac/Mitchell). Much of the County is within the watershed of the Big Manistee River/Pine River. The Big Manistee River and runs through the northern portion of the county. The Hodenpyl Dam, a hydroelectric dam owned and operated by Consumers Energy, constricts the flow of the river and forms the Hodenpyl Dam Pond in Springville Township. The dam structure is located just outside Wexford County, in westerly adjoining Manistee County.

The streams in Wexford County are quality trout streams because of abundant groundwater discharge into the surface water resulting in cold water streams. The protection of groundwater and riparian zones is therefore important for maintaining and protecting the County's fisheries. The Manistee has had a long standing reputation for being a top-quality trout stream, and provides cold water habitat for over 75 species of fish, including trout and salmon. There are a large number of named and unnamed feeder creeks to the Big Manistee River in the north central part of Wexford County, which represents artesian flow from groundwater moving north from the glacial hills toward the river.

The Pine River, a federally-designated Wild and Scenic River, runs through southwest Wexford County in South Branch Township. The lower 26-miles of the Pine River was designated a National Scenic River in 1992, has the fastest average flow of any river in lower Michigan, and is considered a premier top-quality stream (which Michigan once classified as a "Blue Ribbon Trout Stream").

Major lakes in Wexford County include:

- Lake Mitchell (Cherry Grove and Selma Townships)
- Lake Cadillac (City of Cadillac)
- Hodenpyl Dam Pond (Springville Township)
- Long Lake (Haring Charter Township)
- Lake Gitchegumee (Village of Buckley & Hanover Township)
- Pleasant Lake (Selma Township)
- Stone Ledge Lake (Clam Lake Township)
- Lake Meauwataka /"Dayhuff Lake" (Colfax Township)
- Berry Lake (Clam Lake Township)
- Woodward Lake (Selma Township)
- Round Lake (Haring Township)

The forests of Wexford County include hemlock and other coniferous trees, such as red and white pine, spruce and fir, and deciduous trees, such as birch, beech, maple, basswood, and oak. Swamp and wetland vegetation patterns are also found along with a multitude of shrubs. As a result of intensive lumbering in the past, most of these forested areas are second growth and, to some degree, the original forest habitat patterns have been altered. Forest cover types represent the largest land cover in Wexford County. The three principal segments are the United States Manistee National Forest, the Michigan Pere Marquette State Forest and the large tracts of land owned by Consumers Energy along the Manistee River. All of these areas are under some type of woodland-wildlife-recreation management plan. [2]

According to the 2017 USDA Census of Agriculture, the county had 40,208 acres of land in farms for a total of 304 farms. This represents a 15% drop in the number of farms since the 2012 Census of Agriculture, which reported 357 farms in Wexford County. However, the average size of a farm in Wexford County was 132 acres, which represents a 17% increase since the 2012 Census of Agriculture.

About 48% of the market value of agricultural products sold in the county as of 2017 was from crops, with the remaining 52% from livestock, poultry and other animal products. Wexford County ranks 2nd out of 76 counties in the state for sales of Christmas trees and short rotation woody crops. Total crop sales for the county accounted for $8,704,000, coming primarily from grains, oil seeds, dry beans and pea crops and Christmas tree/short rotation woody crops. Total animal product sales accounted for $9,445,000, coming primarily from milk from cows and cattle/calves.

Per Table 2, the predominant land cover type in Wexford County is "Forested", which is composed of deciduous forest, evergreen forest and mixed forest types. The second most prevalent land cover type is "Herbaceous and Shrub/Scrub", followed by "Wetlands" and "Agriculture" (a combination of cultivated crops and hay/pasture lands) at 9.32% and 9.31%, respectively. The largest concentrations of people and businesses are located within and surrounding developed areas, such as the cities of Cadillac and Manton, the villages of Buckley, Mesick and Harietta, and along major roadways.

[2] Wexford County Recreation Plan 2019-2023 https://wexfordcounty.org/wp-content/uploads/2019/10/Wexford-CO-Rec-Plan-2019-FINAL-with-appendices.pdf

Table 2: Wexford County Land Cover by Type

Land Cover Classification	Acres	Percent
Developed, High Intensity	767.84	0.21%
Developed, Medium Intensity	2,190.14	0.59%
Developed, Low Intensity	6,843.60	1.86%
Developed, Open Space	17,797.61	4.83%
Forested (deciduous, evergreen and mixed)	209,685.90	56.94%
Herbaceous & Shrub/Scrub	54,258.93	14.73%
Wetlands (woody and emergent herbaceous)	34,331.57	9.32%
Agriculture (cultivated crops; hay/pasture)	34,299.46	9.31%
Open Water	7,324.57	1.99%
Barren Land	766.77	0.21%
TOTAL	**368,266.39**	**100.00%**

Source: Networks Northwest

The 2015 Wexford County Hazard Mitigation Plan indicated that 281,700 acres, or 76%, of the county was composed of forested lands. Current data shows that 209,685.9 acres, or nearly 57% of Wexford County is forested. While growth in the county has remained steady, it has been noted that the type of growth is changing. Office and industrial development has largely stopped and commercial development has slowed, but residential development is occurring as quickly as plans can be approved. 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 *Environmental Features* Map in Appendix A shows the intensity of development in the county in relation to natural features.

Transportation

Wexford County is served by six state/federal highways including US-131, Old US-131/Business US-131, M-115, M-55, M-37, and M-42. The Cadillac/Wexford Transit Authority, or WexExpress, is a door-to-door public transit service for residents and visitors of Wexford County. Additionally, the Wexford County Airport, owned by the City of Cadillac and Wexford County, is open to the public and is a general aviation airport. It is located two miles north of the City of Cadillac. Wexford County is also serviced by the Great Lakes Railway Company from Clare, Mt. Pleasant, Midland and points north to Traverse City, Yuma, and toward Petoskey. The railway north of Yuma (a settlement in Springville Township within Wexford County) has been removed.

Climate

Wexford County seldom experiences prolonged periods of hot, humid weather in the summer or extreme cold during winter due to the movement of pressure systems across the nation. Wexford County is located about 21 to 28 miles east of Lake Michigan. As a result of prevailing westerly winds crossing Lake Michigan, Wexford County experiences a lake effect influence on the weather. The lake effect is mainly in the winter, providing increased cloudiness and snowfall. With northeast winds the sky may clear and provide lower temperatures more commonly experienced at interior locations. The lake effect has almost no effect in the summer, or for agricultural purposes. Wexford's climate is characterized by larger temperature ranges than in areas at the same latitude near the Great Lakes.[3]

Table 3 provides available local climate data for Wexford County from NOAA's Online Weather Data searchable database. Monthly summarized data records for Wexford County date back to 2009, although there are some months with missing data.

[3] *2019-2023 Wexford County Recreation Plan*

Table 3. NOAA Online Weather Data for Charlevoix County, 2009-2023

NOAA Weather Station	Cadillac 9 &10 News
Monthly Total Precipitation – Highest Monthly Mean	4.4" in October; 4.2" in April; 4.16" in August
Monthly Total Precipitation – Annual Mean	38.76"
Monthly Mean Avg. Temperature – Annual Mean	46.2 degrees
Warmest Month	July
Coldest Month	February
Maximum Record Temperature	95 degrees in June 2009
Minimum Record Temperature	-31 degrees in February 2015
Monthly Total Snowfall - Mean	83.2"
Monthly Total Snowfall – Max.	98.4" in 2018-2019 season
Monthly Total Snowfall – Min.	67.9" in 2009-2010 season

Source: National Weather Service's Climate Information, NOAA Online Weather (NOW) data https://www.weather.gov/wrh/Climate?wfo=apx

Population

Wexford County is the 2nd most populated county in the ten county region of Northwest Lower Michigan (Table 4) and is the ranked 46 out of 83 counties in the state by population estimates.[4] The 2019 American Community Survey (ACS) estimated the county population to be 33,256 people. A comparison of the 2010 and 2019 ACS data indicates the population of Wexford County grew slightly between 2010 and 2019 by an estimated 1.8% (Table 5). The 2019 estimated population per square mile is approximately 58.9 persons.

Table 4: 2019 Estimated Regional Population by County, State

Jurisdiction	Population
Missaukee County	15,028
Kalkaska County	17,585
Benzie 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

Wexford County is composed of sixteen (16) townships, three (3) villages and two (2) cities. All communities - with the exception of the Village of Mesick, the City of Manton, and the Townships of Cherry Grove, Clam Lake, Slagle, South Branch, and Springville - experienced population increases between 2010 and 2019 (Table 5). The most populated community is the City of Cadillac, at an estimated 10,419 persons. Note that the population estimates for the villages are shown separately for informational purposes; however, those population count estimates are incorporated into the totals for the respective township in which the Village is located.

The second most populated community, at an estimated 3,530 persons, is Haring Township, located just north of the City of Cadillac. The township contains portions of the US-131 highway corridor, M-55 and BR/Old US-131.

The third most populated community is Cherry Grove Township, at 2,433 persons, located southwest of the City of Cadillac and contains portions of Lake Mitchell and M-55. Closely following is Clam Lake Township, at an estimated 2,427 persons. Clam Lake Township adjoins the City of Cadillac to the south and contains portions of US-131, BR-131, M-115, and M-55

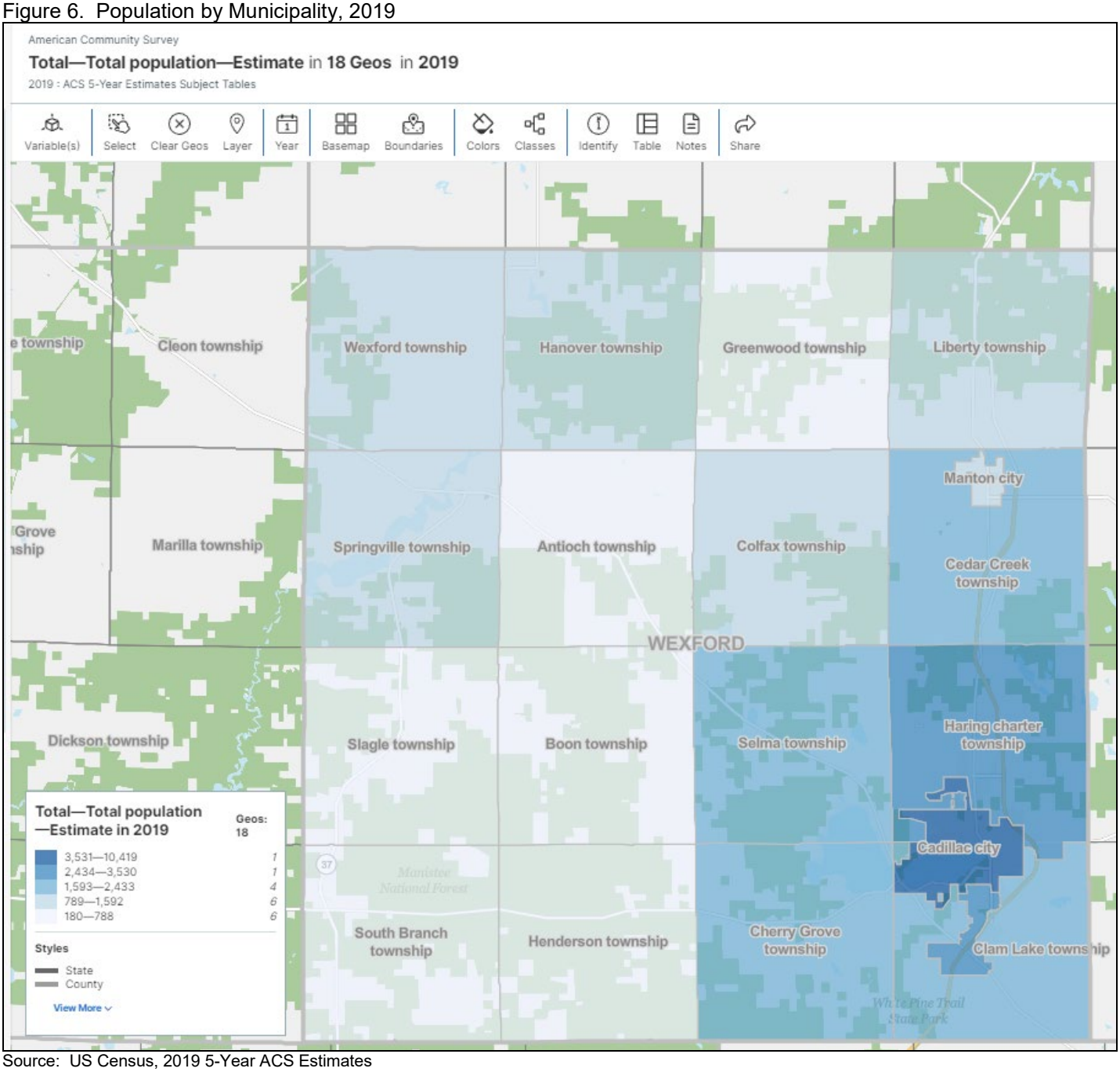
[4] https://www.michigan-demographics.com/counties_by_population

Table 5: Population Estimates and Change by Municipality, 2010 and 2019

Municipality	2010 Est. Population	2019 Est. Population	Numeric Change	Percent Change	Jurisdiction Status*
Village of Buckley	580	759	179	30.9%	P
Village of Mesick	454	366	-88	-19.4%	P
Village of Harrietta	113	154	41	36.3%	N
City of Cadillac	10,384	10,419	35	0.30%	P
Haring Charter Township	3,167	3,530	363	11.50%	P
Cherry Grove Township	2,488	2,433	-55	-2.20%	P
Clam Lake Township	2,593	2,427	-166	-6.40%	N
Selma Township	2,196	2,202	6	0.30%	P
Cedar Creek Township	1,644	1,811	167	10.20%	N
Hanover Township	1,364	1,592	228	16.70%	P
Springville Township	1,780	1,583	-197	-11.10%	P
City of Manton	1,456	1,123	-333	-22.90%	P
Colfax Township	897	1,071	174	19.40%	P
Wexford Township	934	983	49	5.20%	P
Liberty Township	891	935	44	4.90%	P
Antioch Township	660	788	128	19.40%	P
Boon Township	571	744	173	30.30%	P
Greenwood Township	562	620	58	10.30%	P
Slagle Township	595	515	-80	-13.40%	P
South Branch Township	303	300	-3	-1.00%	P
Henderson Township	168	180	12	7.10%	N
WEXFORD COUNTY	**32,653**	**33,256**	**603**	**1.8%**	

Source: US Census, 2010 and 2019 ACS 5-year Estimates
* 2023 Hazard Mitigation Plan Participation Status: P = a participant; N = a non-participant

Figure 6. Population by Municipality, 2019



Source: US Census, 2019 5-Year ACS Estimates

Like many northwest Michigan communities, Wexford County experiences an influx of seasonal residents and tourists throughout the year. However, the decennial Census and the American Community Survey only consistently and comprehensively track the permanent population. Networks Northwest's *2022 Seasonal Population Study for Northwest Lower Michigan* analyzed the 2020 seasonal population for the ten counties in northwest Michigan: Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Kalkaska, Leelanau, Manistee, Missaukee, and Wexford. The study collected data for permanent and part-time residents and overnight visitors in accommodations and short-term rentals (STRs) by county. Northwest Lower Michigan's permanent base population is 310,802 and expands to include its largest amount of part-time residents and overnight visitors in July at an estimated total of 676,052 persons, a 118% increase.

Wexford County is the least-seasonal county in the region, with the total population change of 42% between 40,879 in the month of February and 58,168 in July. The permanent population represents roughly 78% of the total population in the off-season and 61% of the total population in the on-season. The seasonal growth of the county is driven by people staying in traditional accommodation businesses (hotels, motels, bed & breakfasts, campgrounds, etc.). Table 6 illustrates the monthly estimated differences between the permanent population and seasonal residents/overnight visitors for the county.

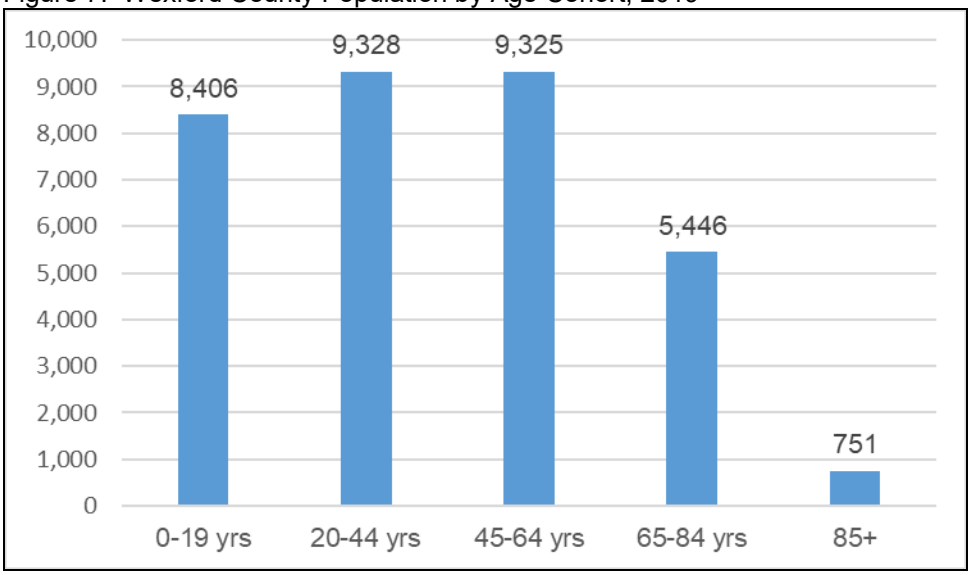
Table 6: Wexford County Seasonal Population Change by Month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Permanent Population	33,673	33,673	33,673	33,673	33,673	33,673	33,673	33,673	33,673	33,673	33,673	33,673	
Part-Time & Overnight Population	7,799	7,206	10,952	11,196	19,258	22,637	24,495	24,388	19,273	13,028	11,297	7,737	14,939
Total Population	41,472	40,879	44,625	44,869	52,931	56,310	58,168	58,061	52,946	46,701	44,970	41,410	48,612
Percent Change	**23%**	**21%**	**33%**	**33%**	**57%**	**67%**	**73%**	**72%**	**57%**	**39%**	**34%**	**23%**	**44%**

Age, Race & Disability

Understanding the age distribution and median age of Wexford County residents can help identify social, economic, and public service needs in the community. The county's total 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 7 indicates the largest population cohorts are almost equal in size; the 20 to 44 year old group, at an estimated 9,328 persons, is followed very closely by the 45 to 64 age group at 9,325 persons.

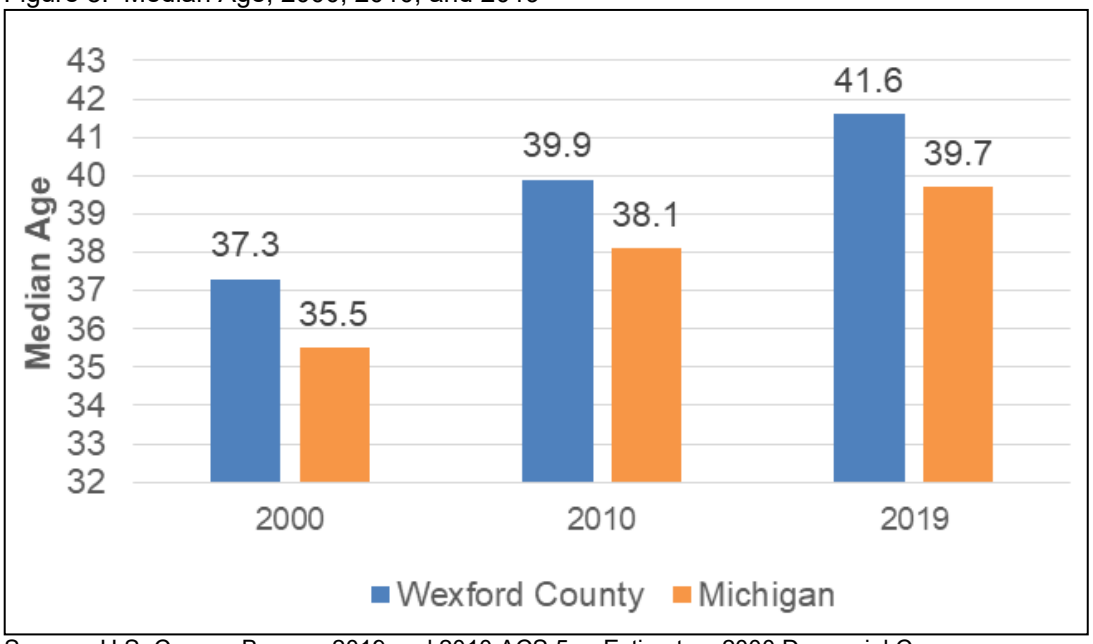
Figure 7: Wexford County Population by Age Cohort, 2019



Source: U.S. Census Bureau, 2019 ACS 5-yr Estimates

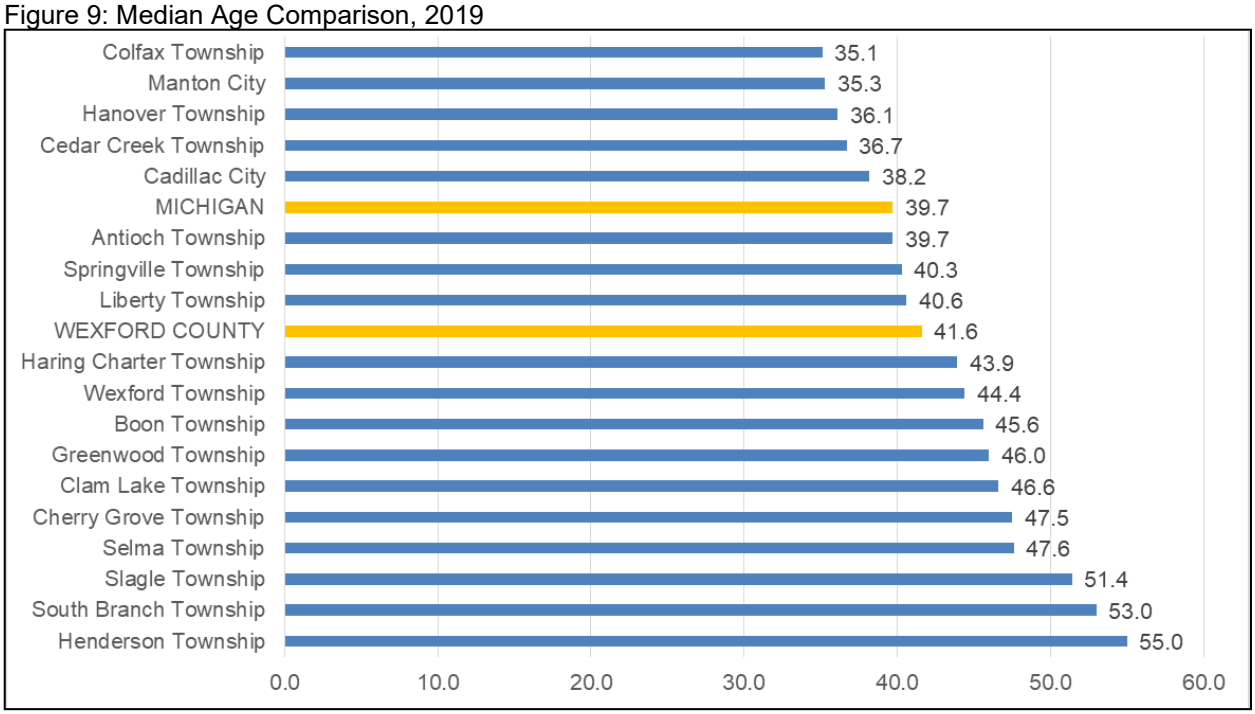
As shown in Figure 8, the median age (the midpoint where half the population is younger and half the population is older) of Wexford County is 41.6 years, which is slightly older than the State of Michigan (39.7 years). The populations of Wexford County and the State of Michigan have been in an aging trend since 2000 (Figure 8). The youngest community in Wexford County is Colfax Township with a median age of 35.1 years; the oldest community in the county is Henderson Township with a median age of 55 years (Figure 9).

Figure 8: Median Age, 2000, 2010, and 2019



Source: U.S. Census Bureau, 2019 and 2010 ACS 5-yr Estimates; 2000 Decennial Census

Figure 9: Median Age Comparison, 2019



Source: U.S. Census Bureau, 2019 ACS 5-year Estimates

Persons over the age of 65 can be more vulnerable to the effects of natural hazard events, such as power outages, extreme temperatures, and illness outbreaks. The communities with the greatest percentage of their population aged 65 and older are Hanover Township (41.1%), Slagle Township (27.2%) South Branch Township (23.7%) and Cherry Grove and Selma Township (23.6% each). In addition, an estimated 50.2% of county residents aged 65 years or older has one or more type of disability (Table 7).

Table 7. Estimated Population Over Age 65 by Jurisdiction

Jurisdiction	Est. Population Age 65+	% of Est. Community Total Population
City of Cadillac	1,935	18.60%
Haring Charter Township	719	20.40%
Cherry Grove Township	574	23.60%
Selma Township	520	23.60%
Clam Lake Township	491	20.20%
Springville Township	267	16.90%
Hanover Township	225	41.10%
Cedar Creek Township	217	12.00%
Colfax Township	186	17.40%
Antioch Township	166	21.10%
Wexford Township	159	16.20%
City of Manton	148	13.20%
Slagle Township	140	27.20%
Liberty Township	136	14.50%
Boon Township	110	14.80%
Greenwood Township	88	14.20%
Village of Buckley	76	10.00%
South Branch Township	71	23.70%
Village of Mesick	65	17.80%
Henderson Township	45	25.00%
Village of Harrietta	26	16.90%

Source: U.S. Census Bureau. "AGE AND SEX." American Community Survey, ACS 5-Year Estimates Subject Tables, Table S0101, 2019

As indicated in Table 8, an estimated 16.1% of Wexford County residents, or 5,325 persons, have one or more type of disability. An estimated 42% of all persons with a disability are of age 35-64. An estimated 50.2% of persons aged 75 years and over have a disability. The City of Cadillac has the greatest estimated number of persons with a disability (1,907) and Henderson Township has the fewest (37) (Table 9). The City of Manton has the greatest estimated percentage of their community's population with a disability (23.2%), followed by Henderson Township (20.6%) and the City of Cadillac (18.6%).

Table 8: Estimated Wexford County Persons with a Disability, 2019

Total Civilian Noninstitutionalized Population	33,062 persons
With one or more disability	16.1% (5,325 persons)
Age 0-17 with a disability	6.6%* (375 persons)
Age 18-34 with a disability	7.4%* (463 persons)
Age 35-64 years with a disability	17.5%* (2,263 persons)
Age 65-74 with a disability	26.8%* (968 persons)
Age 75+ with a disability	50.2%* (1,256 persons)

Source: US Census, 2019 ACS Estimates
* Percentages are representative of estimates for each specific age cohort

Table 9. Estimated Persons with a Disability in Wexford County Jurisdictions

Jurisdiction	Est. total civilian noninstitutionalized population	Est. # with a disability	Est. % with a disability
City of Cadillac	10,248	1,907	18.60%
Haring Charter Township	3,522	489	13.90%
Clam Lake Township	2,427	392	16.20%
Cherry Grove Township	2,433	351	14.40%
Selma Township	2,202	335	15.20%
Springville Township	1,583	291	18.40%
Cedar Creek Township	1,811	270	14.90%
City of Manton	1,108	257	23.20%
Hanover Township	1,592	191	12.00%
Wexford Township	983	161	16.40%
Liberty Township	935	127	13.60%
Colfax Township	1,071	120	11.20%
Boon Township	744	119	16.00%
Antioch Township	788	94	11.90%
Slagle Township	515	92	17.90%
Greenwood Township	620	50	8.10%
South Branch Township	300	42	14.00%
Henderson Township	180	37	20.60%

Source: U.S. Census Bureau. "DISABILITY CHARACTERISTICS." American Community Survey, ACS 5-Year Estimates Subject Tables, Table S1810, 2019

The racial composition estimates of each jurisdiction in the County, as well as those identifying as being of Hispanic and Latino origin, are shown in Table 13. The racial makeup of Wexford County is predominantly white (94.5%). 2.0% of the population is Hispanic or Latino; 2.0% is of two or more races; 0.5% is Black or African American; 0.5% is Asian; 0.4% is American Indian and Alaska Native; and 0.1% is Native Hawaiian and Other Pacific Islander.

Persons of a minority race/ethnic origin are considered socially vulnerable populations in a hazard event scenario. Yellow highlighted entries in Table 10 indicate the largest estimates of persons of non-white race or those of Hispanic or Latino origin by geography. These include the City of Cadillac, Clam Lake Township, Haring Charter Township and Selma Township. There may be an increased need for public assistance in these communities as these population groups may have limited social and financial resources to withstand or recover from a hazard event.

Table 10. Race and Hispanic/Latino Origin Population Estimates, Wexford County Communities

	Total Est. Population	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race alone	Two or more races	Hispanic or Latino (of any race)
Antioch Township	788	752	0	0	23	0	0	13	10
		95.40%	0.00%	0.00%	2.90%	0.00%	0	1.60%	1.30%
Boon Township	744	734	0	2	0	0	4	4	6
		98.70%	0.00%	0.30%	0.00%	0.00%	0.5	0.50%	0.80%
City of Cadillac	10,419	9,928	187	13	10	0	4	281	207
		95.30%	1.80%	0.10%	0.10%	0.00%	0	2.70%	2.00%
Cedar Creek Township	1,811	1,743	11	4	0	0	0	53	10
		96.20%	0.60%	0.20%	0.00%	0.00%	0	2.90%	0.60%
Cherry Grove Township	2,433	2,358	14	20	14	0	0	27	22
		96.90%	0.60%	0.80%	0.60%	0.00%	0	1.10%	0.90%
Clam Lake Township	2,427	2,322	0	53	23	0	22	18	178
		95.70%	0.00%	2.20%	0.90%	0.00%	0.9	0.70%	7.30%
Colfax Township	1,071	1,049	11	0	0	0	0	11	3
		97.90%	1.00%	0.00%	0.00%	0.00%	0	1.00%	0.30%
Greenwood Township	620	594	3	0	0	10	0	13	9
		95.80%	0.50%	0.00%	0.00%	1.60%	0	2.10%	1.50%
Hanover Township	1,592	1,543	4	0	12	0	7	29	27
		96.90%	0.30%	0.00%	0.80%	0.00%	0.4	1.80%	1.70%
Haring Charter Township	3,530	3,370	0	0	25	0	32	127	70
		95.50%	0.00%	0.00%	0.70%	0.00%	0.9	3.60%	2.00%
Henderson Township	180	179	0	0	0	0	0	1	0
		99.40%	0.00%	0.00%	0.00%	0.00%	0	0.60%	0.00%
Liberty Township	935	929	2	2	0	0	0	2	5
		99.40%	0.20%	0.20%	0.00%	0.00%	0	0.20%	0.50%
City of Manton	1,123	1,059	0	27	11	0	8	18	29
		94.30%	0.00%	2.40%	1.00%	0.00%	0.7	1.60%	2.60%
Selma Township	2,202	2,041	5	0	47	15	6	88	36
		92.70%	0.20%	0.00%	2.10%	0.70%	0.3	4.00%	1.60%
Slagle Township	515	506	4	0	0	0	0	5	27
		98.30%	0.80%	0.00%	0.00%	0.00%	0	1.00%	5.20%
South Branch Township	300	293	0	0	3	0	0	4	0
		97.70%	0.00%	0.00%	1.00%	0.00%	0	1.30%	0.00%
Springville Township	1,583	1,508	0	23	7	3	6	36	14
		95.30%	0.00%	1.50%	0.40%	0.20%	0.4	2.30%	0.90%
Wexford Township	983	928	4	9	5	0	0	37	0
		94.40%	0.40%	0.90%	0.50%	0.00%	0	3.80%	0.00%

Source: U.S. Census Bureau. "ACS DEMOGRAPHIC AND HOUSING ESTIMATES." American Community Survey, ACS 5-Year Estimates Data Profiles, Table DP05, 2019

Housing

Wexford County has an estimated 12,963 total households as reported in the 2019 ACS 5-Year Estimates (Table 11). The Census defines a household as all the people who occupy a single housing unit, regardless of their relationship to one another. The average estimated household size for Wexford County residents is 2.54 persons, which is slightly higher than the State's average of 2.46.

In 2019, an estimated 76.4% of the County's housing units were occupied (indicating physically occupied, principal residence housing units; Table 14). Of the 16,960 total housing units, 9,858 (87.1%) are occupied; the 23.6% of "vacant" housing units are homes that are either not occupied year-round, or were abandoned or unoccupied at the time of the Census survey.

Table 11: Housing Tenure, 2019, Wexford County

Total housing units	16,960	%
Occupied housing units	12,963	76.4%
Owner-occupied	9,958	87.1%
Median Housing Value	$108,300	
Renter-occupied	3,005	12.9%
Median Gross Rent	$706	
Vacant housing units	3,997	23.6%

Source: US Census, 2019 ACS Estimates

The City of Cadillac has the largest percentage of housing units of all municipalities in the county (29.4%), followed by Haring Charter Township and Cherry Grove Township (Table 12).

Table 12: Housing Units by Municipality, 2019

Municipality	2019 Housing Units (ACS)	Percent of Total
Wexford County	**16,960**	
Buckley Village*	285	1.7%
Mesick Village*	173	1.0%
Harrietta Village *	100	0.6%
City of Cadillac	4,987	29.4%
Haring Charter Township	1,506	8.9%
Cherry Grove Township	1,379	8.1%
Selma Township	1,193	7.0%
Springville Township	1,039	6.1%
Clam Lake Township	1,006	5.9%
Hanover Township	786	4.6%
Cedar Creek Township	776	4.6%
City of Manton	585	3.4%
Colfax Township	564	3.3%
Liberty Township	494	2.9%
Wexford Township	477	2.8%
South Branch Township	463	2.7%
Slagle Township	425	2.5%
Antioch Township	415	2.4%
Boon Township	412	2.4%
Greenwood Township	317	1.9%
Henderson Township	136	0.8%

Source: US Census, 2019 ACS Estimates; * The number of housing units for each village is incorporated into the totals for the respective township in which each village is located

The 2019 ACS also estimates that 74.7% of the county's household units are 1-unit, detached structures, which are commonly referred to as single-family homes. An estimated 14.6% are mobile homes, which can be at risk for damage/destruction from high wind storms and tornadoes. Table 13 indicates the estimated number of mobile home units by community. The City of Cadillac has the most units (567), followed by Springville Township (349), Selma Township (181), Cedar Creek Township (172), Hanover Township (161), Wexford Township (121) and Clam Lake Township (100). The remaining communities are estimated to have less than 100 mobile home units each. The locations of concentrated mobile/manufactured homes in the county are indicated on the Hazard Area Maps in Appendix A.

Table 13. Estimated Mobile Home Units, Wexford County

Community	Mobile Homes	% of Housing Units
Wexford County	2,471	14.60%
City of Cadillac	567	11.40%
Springville Township	349	33.60%
Selma Township	181	15.20%
Cedar Creek Township	172	22.20%
Hanover Township	161	20.50%
Haring Charter Township	143	9.50%
Wexford Township	121	25.40%
Clam Lake Township	100	9.90%
Slagle Township	93	21.90%
South Branch Township	92	19.90%
Liberty Township	88	17.80%
Boon Township	75	18.20%
Cherry Grove Township	70	5.10%
City of Manton	68	11.60%
Antioch Township	66	15.90%
Colfax Township	60	10.60%
Greenwood Township	44	13.90%
Henderson Township	21	15.40%

Source: U.S. Census Bureau. "SELECTED HOUSING CHARACTERISTICS." American Community Survey, ACS 5-Year Estimates Data Profiles, Table DP04, 2019

Furthermore, an estimated 55% of the County's residential units were built before 1980 (Table 14). Older homes that have not been renovated to meet modern building and zoning codes may also be more at risk to damages from severe weather, such as high winds, heavy snow events and flooding.

Table 14: Year Housing Structure Built, Wexford County

Year Built	Housing Units	Percentage of Units
Built 2010 or later	350	2%
Built 2000 to 2009	2,594	15%
Built 1980 to 1999	4,792	28%
Built 1960 to 1979	4,217	25%
Built 1940 to 1959	2,337	14%
Built 1939 or earlier	2,670	16%
Total Housing Units	**16,960**	

Source: US Census, 2019 ACS 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 15 provides a comparison of annual average wage for each county in the CEDS planning area for 2018. The average annual wage is represents that of workers within each county, not the residents in the county. Wexford County has the 4th highest average annual wage at $40,586. Kalkaska County has the highest average annual wage, at $50,971, followed by Grand Traverse County at $44,562. It is likely that some residents of Wexford County travel to adjoining Grand Traverse County or Kalkaska County for work.

Table 15: 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

The Economic Profile of Antrim County is further described in Table 16. The table provides the county's industry makeup divided into 20 different North American Industry Classification Sectors (NAICS) as well as industry's establishments, jobs, percent distribution, and annual average wage. The industry with the largest percent distribution is "Other (includes private, utilities, management of business, and unallocated)" at 36.9% of jobs (no average annual wage data available), followed by "Manufacturing" at 19.4% ($45,158 average annual wage), and "Retail Trade" at 10.3% ($31,562 average annual wage). The industry with the highest annual average wage is "Finance and Insurance" at $49,629.

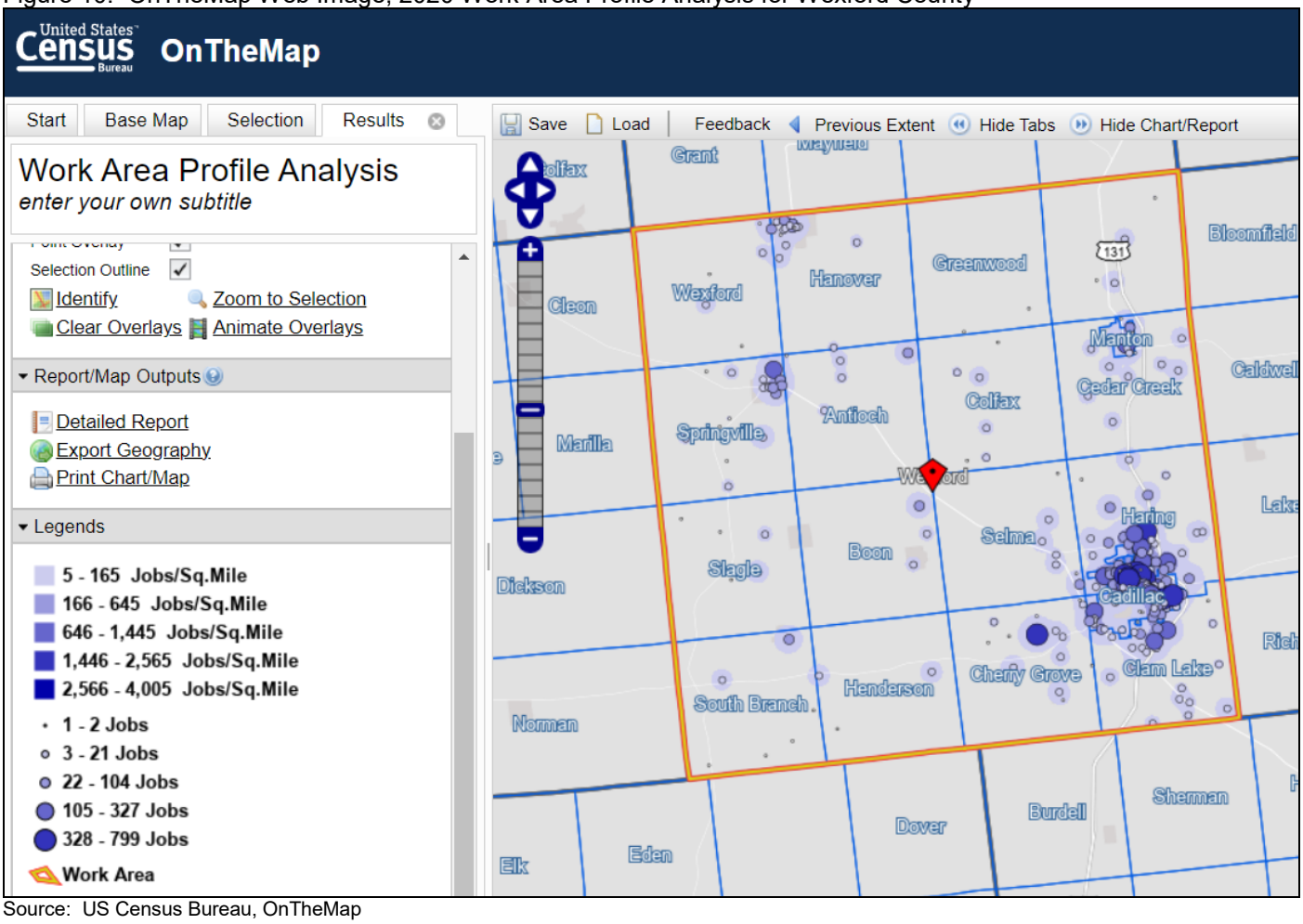
Table 16: Wexford County Economic Distribution by Industry, 2018

Industry Description	Establishments	Jobs	Percent Distribution	Annual Average Wage
Total Covered Employment	**342**	**3,301**	**100.0%**	**$35,917**
Agriculture, forestry, hunting	46	D	D	D
Mining	2	D	D	D
Construction	56	179	5.4%	$37,107
Manufacturing	25	642	19.4%	$45,158
Wholesale trade	9	101	3.1%	$46,705
Retail trade	30	341	10.3%	$31,562
Transportation, warehousing	26	245	7.4%	$42,242
Information	5	7	0.2%	$24,672
Finance and insurance	11	107	3.2%	$49,629
Real estate, rental, leasing	6	9	0.3%	$23,409
Professional, technical services	16	65	2.0%	$38,753
Administrative, waste services	7	20	0.6%	$19,026
Educational services	5	N/A	N/A	N/A
Health care, social assistance	34	N/A	N/A	N/A
Arts, entertainment, recreation	4	15	0.5%	$13,908
Accommodation and food services	15	110	3.3%	$13,518
Other services, excluding public admin.	31	94	2.8%	$27,678
Public administration	14	151	4.6%	$31,066
Other (includes private, utilities, management of business, and unallocated)	0	1,215	36.9%	N/A

Source: 2021 Comprehensive Economic Development Strategy, Networks Northwest
**D means limited industries of a sector that would disclose confidential information*

Additionally, OnTheMap, an online interactive tool available from the US Census Bureau, allows for viewing of estimated job density within the county. This website is useful for emergency preparedness planning as related to response and potential impact to local economic activity areas. Figure 10 is a screenshot of the interactive map when completing an area profile analysis for all workers with primary jobs in the county in 2020. It appears the greatest density of jobs occurs in and around the City of Cadillac, including Haring Charter Township, Clam Lake Township and Cherry Grove Township. Other key areas of employment are in the Villages of Mesick and Buckley, and the City of Manton.

Figure 10. OnTheMap Web Image, 2020 Work Area Profile Analysis for Wexford County



Source: US Census Bureau, OnTheMap

Figures 11 and 12 present a comparison of the median household income (MHI) across the ten county region, the State of Michigan, and local jurisdictions. Wexford County has the second lowest median household income ($47,193) in the region, just ahead of Kalkaska County ($46,898).

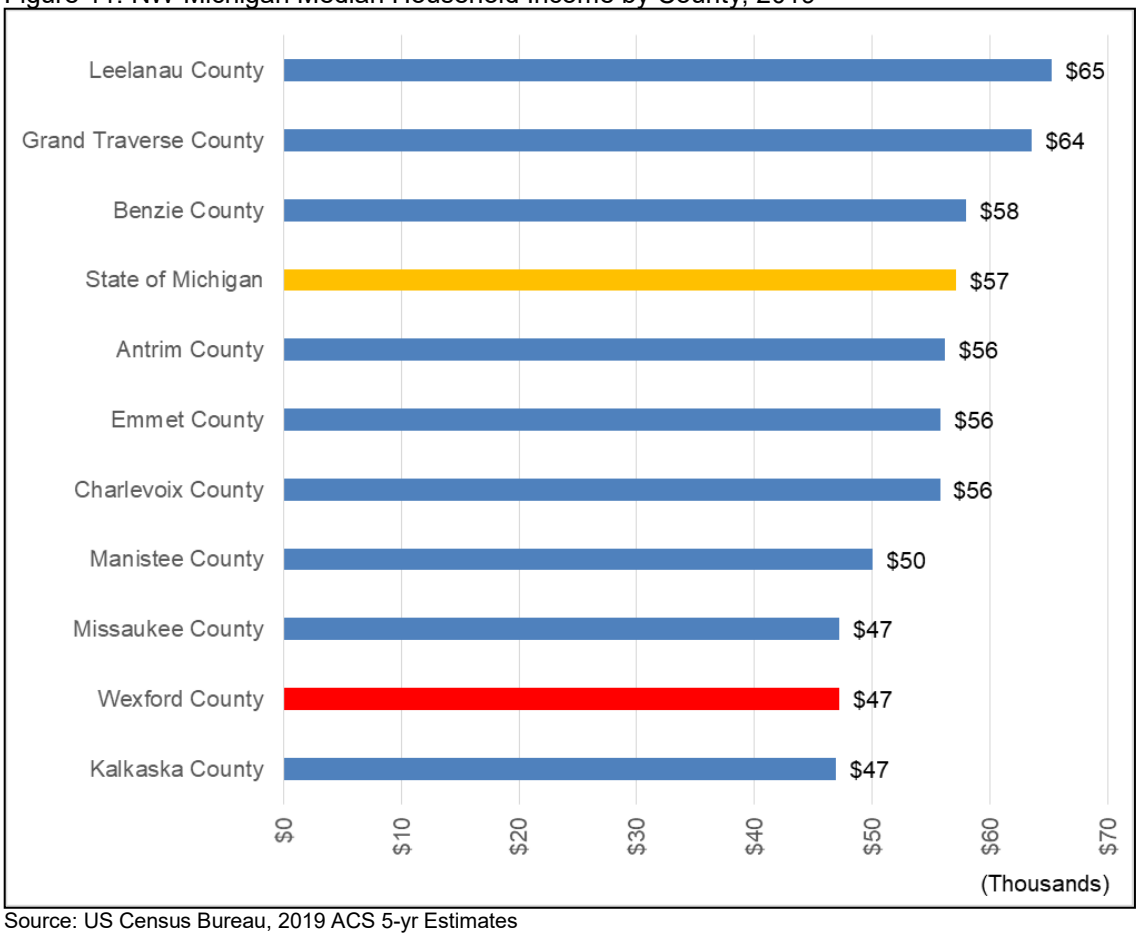
The county's economic profile can be further described by considering the cost of housing, transportation, and other goods and services. The budgeting rule of thumb has been that a household should spend no more than 30 percent of its income on housing costs. According to the 2023 Housing Needs Assessment (produced by Bowen Research for Housing North), the greatest rental housing gaps in the county are for the two lowest housing affordability segments (rents below $1,515 that are affordable to households earning up to 80% of the Average Household Median Income). The study also found that the greatest for-sale housing gap in the county is for product priced between $201,868 and $302,800, which is affordable to households earning between $60,561 and $90,840. Additionally, many renter households are already cost burdened – paying more than 30% of their income toward housing costs (Table 17).

Table 17. Cost Burdened Households in Wexford County

Cost Burdened Households – Paying more than 30% of income toward housing costs		Severe Cost Burdened Households – Paying more than 50% of income toward housing costs	
Renter	**Owner**	**Renter**	**Owner**
43.2%	15.6%	22%	6%

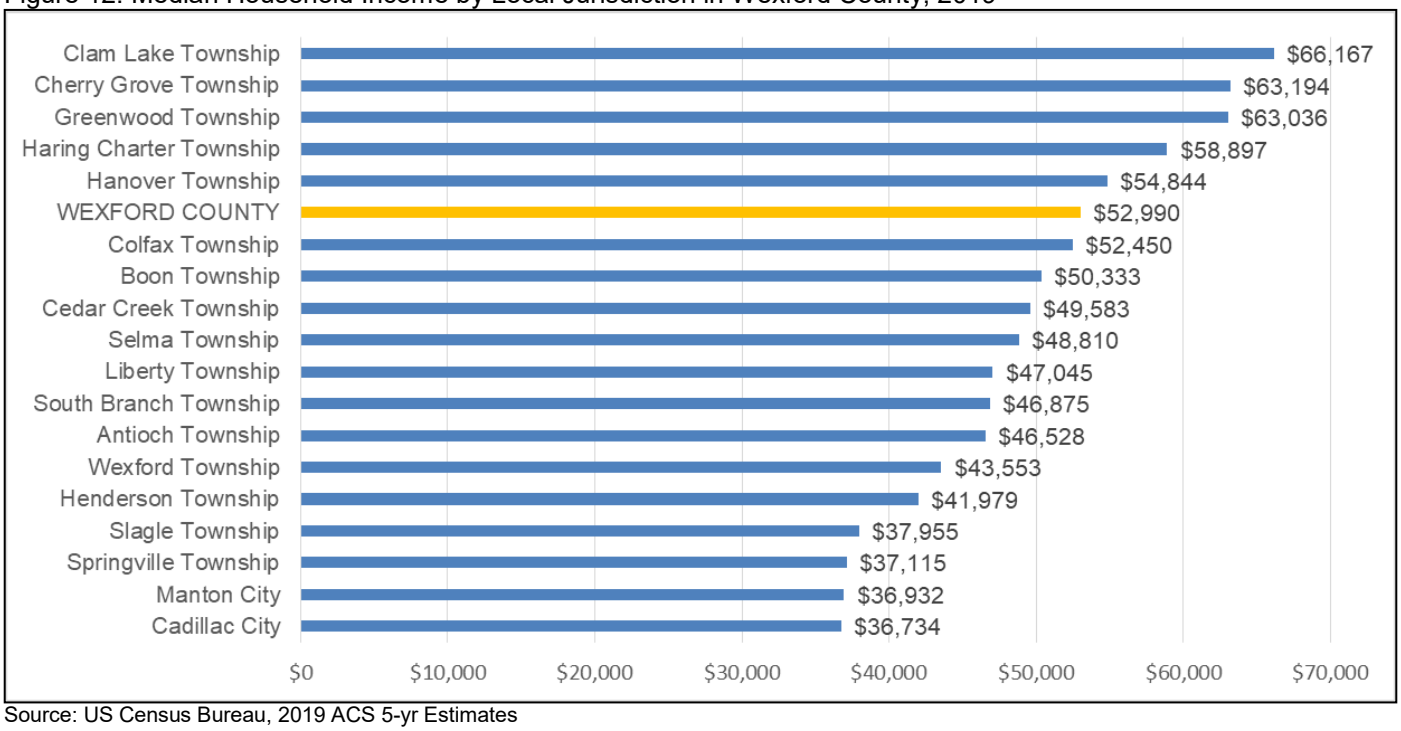
Source: Housing North *2023 Housing Needs Assessment: Wexford County Data Summary* https://www.housingnorth.org/housing-data#HNACOUNTY

Figure 11: NW Michigan Median Household Income by County, 2019



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

Figure 12: Median Household Income by Local Jurisdiction in Wexford County, 2019



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

The following tables describe the population with the lowest incomes. It is estimated that 14.2% of all persons in the county are living at or below the poverty level (Table 18). 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 19.

Table 18: Wexford County Poverty Estimates, 2019

Poverty	Statistics
All persons in poverty	14.2% (4,665 persons)
All families in poverty	9.9% (873 families)
Families with related children under age 18, in poverty	19% (718 families)

Source: US Census, 2019 ACS 5-yr Estimates

Table 19: 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 those with more than 8 persons, add $4,420 for each additional person.*

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 20 identifies the percentage of households that are estimated to be considered ALICE and living below poverty thresholds for each county subdivision (no data available for Henderson Township). These households likely would not have reserve savings to cover an emergency, such as impacts from a natural hazard event.

Table 20: 2019 Estimated Households in Poverty and ALICE[5]

Wexford County Subdivision*	Total Households	% of HH in Poverty and ALICE
Greenwood Twp.	207	27%
South Branch Twp.	133	45%
Boon Twp.	268	34%
Colfax Twp.	349	33%
Antioch Twp.	293	42%
Slagle Twp.	232	54%
Liberty Twp.	356	44%
Wexford Twp.	368	45%
Clam Lake Twp.	868	21%
Hanover Twp.	584	35%
Cedar Creed Twp.	628	39%
Manton City	470	54%
Cherry Grove Twp.	948	30%
Springville Twp.	618	51%
Haring Charter Twp.	1,237	27%
Selma Twp.	884	44%
Cadillac City	4,433	53%
WEXFORD COUNTY	**12,876**	**39.9%**

[5] Michigan Association of United Ways. *ALICE in Michigan: A Financial Hardship Study*. 2021. https://www.uwmich.org/alice-report

Areas of New Development in Wexford County
Since the completion of the 2015 Wexford County Hazard Mitigation Plan, there has been some new development within the County, notably in these areas:

- Haring Charter Township received an additional estimated 363 residents between 2010 and 2020, according to US Census ACS 5-Year Estimate data. This is the largest number of residents added out of all jurisdictions in the county for this time period.

  New commercial development/redeveloped has occurred and continues to occur along Business Route US 131 and M-115 in the Township, including recent plans for expansion of the Veteran's Clinic, addition of a hotel, and new retail/office developments. The Township also adjoins the City of Cadillac, the most populated and developed community in Wexford County.

- The City of Cadillac grew slightly in population between 2010 and 2020, adding an estimated 35 residents. Recent development/redevelopment projects include the Consumers Energy Solar Garden, Long Road Distillers, Cadillac Lofts (42 apartments), and Market and Plaza in Cadillac Commons. The City is Redevelopment Ready Certified (RRC) by the Michigan Economic Development Corporation (MEDC). This certification is like the "Good Housekeeping" seal of approval, indicating that the city goes above and beyond statutory requirements and is truly open for investment. It also means that the city:
  - Has streamlined its development processes and procedures and internally makes better use of staff time
  - Will remain eligible for community development incentives
  - Will be eligible to receive staff support from the state and receive technical assistance funds
  - Will receive assistance from the State to promote up to 3 of the city's redevelopment sites

- Hanover and Wexford Townships have experienced recent new residential development around the Village of Buckley.

Table 21 provides a comparison of the estimated number of housing units by local jurisdiction between 2010 and 2020. The City of Cadillac and Cherry Grove Township added the most housing units (135 each), followed by Boon Township (116), Colfax Township (86), Haring Charter Township (75), Liberty Township (68), and Antioch Township (64).

Table 21. Estimated Change in Housing Units, 2010 to 2010, Wexford County Jurisdictions

Jurisdiction	2010 Housing Units	2020 Housing Units	Difference
Cadillac City	5,017	5,152	135
Cherry Grove Township	1,256	1,391	135
Boon Township	329	445	116
Colfax Township	450	536	86
Haring Charter Township	1,325	1,400	75
Liberty Township	379	447	68
Antioch Township	370	434	64
Cedar Creek Township	681	709	28
Henderson Township	125	149	24
South Branch Township	429	448	19
Selma Township	1,247	1,246	-1
Manton City	623	619	-4
Wexford Township	484	470	-14
Hanover Township	752	736	-16
Slagle Township	412	374	-38
Greenwood Township	435	362	-73
Clam Lake Township	1,221	1,135	-86
Springville Township	1,120	988	-132

Source: U.S. Census Bureau. "HOUSING UNITS." American Community Survey, ACS 5-Year Estimates Detailed Tables, Table B25001, years 2010 and 2020.

IV. Hazard Identification and Assessments

Hazard Analysis Overview

Wexford County is vulnerable to a wide range of natural hazards that have the potential to impact local residents, economic drivers in the community, critical infrastructure and the built environment, and the natural environment. The Wexford County Emergency Services Department is challenged with managing these threats to protect life and property.

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 persons of racial/ethnic minority groups, the economically disadvantaged, elderly (particularly those living alone), homeless, and persons with a disability. Those that live unsheltered or in homeless encampments, assisted living facilities, mobile homes, or isolated residences are more susceptible to impacts from hazardous events. Campgrounds are also areas where persons in RVs or tents are more vulnerable to the effects of thunderstorms, high winds, lightning, hail, tornadoes, wildfire and extreme heat.

Areas of campgrounds and mobile homes are represented on the Vulnerable Populations and Hazard Areas Map in Appendix A. There may be additional locations of vulnerable populations that are not listed.

It is also important to note that Northwest Michigan receives an influx of seasonal residents in the summer months. According to the 2022 report by Networks Northwest, *Seasonal Population Study for Northwest Lower Michigan*, the highest estimated monthly population (combined full-time, part-time and overnight visitors) within Wexford County occurs in August at 58,061 persons. This is a 72% increase from estimated number of year-round/full time residents (33,673 persons).

The natural environment is the primary reason people choose to live and vacation northwest Michigan. Wexford County is home to plentiful forest lands, inland lakes, rivers and streams and all of the wildlife within them that are integral to the identity of the community. While natural resources are abundant, they are also vulnerable to many types of natural hazards. Northwest Lower Michigan has many sensitive wildlife and plant populations that require specific climates and habitats to survive. Damaged, destroyed, or changing natural environments may decrease the chances for certain species' survival.

Additionally, countywide critical infrastructure is represented on the Critical Infrastructure Map, shown in Appendix A. Wexford County Office of Emergency Management and community stakeholders identified the critical facilities and infrastructure on the base map. Table 22 lists critical infrastructure sites in Wexford County.

Table 22: Critical Facilities and Infrastructure in Wexford County

# of Sites	Facilities
52	**Commercial** • Agriculture and Food Production Distribution (29) • Agriculture Processing, Packaging and Production (2) • Agriculture and Food Product Storage and Distribution Warehouse (1) • Agricultural Supply (1) • Wexford Civic Center in Cadillac • Banking Services (15 in Cadillac; 1 in Buckley; 1 in Manton; 1 in Mesick)
42	**Communications** (cellular, radio, broadband, television broadcasting, landline telephone, etc.)
41	**Industry** • Manufacturing (26 in Cadillac) • Chemical/Hazardous Materials Storage/Use (13 in Cadillac; 2 in Buckley; 1 in Manton)
28	**Energy** • Petroleum product retail sites • Electricity • Natural Gas (DTE natural gas pipeline through the Townships of Clam Lake, Haring Charter, Cedar Creek, Greenwood, and Colfax)

29	**Emergency Services**
	• County (Emergency Mgmt., Sheriff's Office, Jail)
	• City of Cadillac and City of Manton Police Departments
	• Michigan State Police Post #71
	• Mobile Medical Response (3)
	• Buckley Rescue and Mesick Rescue Squad
	• Local Fire Depts. (12)
	  ○ City of Cadillac
	  ○ City of Manton
	  ○ Village of Buckley
	  ○ Selma Township
	  ○ Cedar Creek Township
	  ○ Haring Charter Township
	  ○ Colfax-Greenwood Township
	  ○ Springville Township
	  ○ Slagle Township – Village of Harrietta
	  ○ Boon Township
	  ○ South Branch Township
	  ○ Cherry Grove Township
	  ○ Cadillac YMCA (emergency shelter site)
	  ○ Senior Centers in Manton and Cadillac (emergency shelter sites)

11	**Healthcare** • Munson Hospital in Cadillac • Health practitioner/clinic (7 in Cadillac; 1 in Manton) • Homeless/safe house shelters (2 in Cadillac)
9	**Government** • Public water supply/storage (Buckley, Mesick, Manton, Cadillac, Haring Charter Twp.) • Wastewater facilities (Cadillac, Manton, Mesick, Haring Charter Twp.)
5	**Dams** • Hodenpyl Hydroelectric Dam in Mesick • Lake Billings Dam in Manton • Lakewood on the Green Dam in Cadillac • Lake Gitchegumee Dam in Buckley • Slagle Creek Dam in Harrietta
4	**Transportation** • Airports (Wexford County Airport; Eagles Landing in Harrietta) • Mass Transit (Indian Trails Bus Lines; Wex Express)

Source: Wexford County Office of Emergency Management

This Plan includes a profile for each hazard event the county is likely to encounter. Descriptions of the location, extent, previous occurrences, probability of future events, and a vulnerability assessment are provided for each type of hazard, as described below:

- 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 a 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 estimate the likelihood of future events and predict potential impacts. The extent of historic events may be included when the data is available. This 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 and any trends that may appear. Probability may be defined using historical frequencies or statistical probabilities.
- Vulnerability assessment accounts for the type, amount, and value of assets such as: existing and future buildings, infrastructure, critical facilities, populations, recreation areas and environmental features that may be impacted by a hazard, along with existing community assets to mitigate or respond to the hazard.

Data for natural hazard events in Wexford 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. All sources include:

- FEMA's webpage on Disaster Declarations for States and Counties and the *Michigan Hazard Analysis*, completed by the Michigan State Police in 2019, were referenced for the most up-to-date data on Presidential and State Governor declared emergencies and disasters pertaining to Wexford County (Table 12).
- Climate: https://www.weather.gov/wrh/Climate?wfo=apx – Historical local observed weather data; Climate prediction and variability; local high impact event summaries
- Past Weather: NOAA Storm Events Database https://www.ncdc.noaa.gov/stormevents/ - Data available to search beginning in 1950 to within approximately 3 months prior to present day; however, information on record for various types of events is limited and non-contiguous. The database provides local storm reports, damage reports, and recorded event descriptions. The event types researched include the following (the event types in *italics* indicate how they are listed in the Storm Events Database):
    - Severe Winter Weather (*Blizzard, Freezing Fog, Frost/Freeze, Heavy Snow, Ice Storm, Lake-Effect Snow, Sleet, Winter Storm, Winter Weather*)
    - Flooding *(Flash Flood, Flood, Heavy Rain*)
    - Thunderstorms and High Wind (*High Wind, Strong Wind, Thunderstorm Wind*)
    - Lightning *(Lightning)*
    - Hail (*Hail*)
    - Tornado (*Tornado, Funnel Cloud, Waterspout*)
    - Extreme Temperatures (*Cold/Wind Chill, Extreme Cold/Wind Chill, Heat, Excessive Heat)*
    - Dense Fog (*Dense Fog*)
    - Drought (*Drought*)
    - Wildfire (*Wildfire*)
- The *Michigan Hazard Analysis* was referenced to collect data on wildfires that occurred on State of Michigan owned land between 1981 and 2018 (as reported by the MDNR). Additionally, the 2021 USDA/USFS publication Spatial Wildfire Occurrence Data for the United States, 1992-2018 [FPA_FOD_20210617] was used to collect data on wildfires that occurred on state/private or federally-owned land within the county.
- The websites for the National Inventory of Dams and MI-EGLE's Michigan Dam Inventory were used to collect information on dams in the county.
- Historical drought data was obtained from the US Drought Monitor.

The Historical Analysis of weather-related hazards in Wexford County uses information on impacts and losses from previous hazard events to predict potential impacts and losses during a similar future event. The more frequent these events are, the more likely a community will have experience with and data on impacts and losses. Table 26 lists the federal- and state-declared emergency and disaster events that have included Wexford County. These events are included in the hazard analysis for individual event types.

Table 23: Presidential and Governor Declared Disasters / Emergencies for Wexford County

Date of Declaration	Type of Event	Affected Area	Type of Declaration/ Fed ID #
March 2020	COVID-19; Pandemic	Statewide & National	State of Emergency, National Emergency (3455), and Governor and Presidential Declared Major Disaster (4494)
1/29/2019	Extreme Cold	Statewide	Governor Declared Emergency
4/12/2014	Flooding	8 counties: Isabella, Mecosta, Missaukee, Muskegon, Newaygo, Osceola, Roscommon and **Wexford Co.**	Governor Declared Disaster
7/14/2008	Thunderstorms, flooding	12 counties: Allegan, Barry, Eaton, Ingham, Lake, Manistee, Mason, Missaukee, Osceola, Ottawa, Saginaw, and **Wexford**.	Presidential Declared Major Disaster (1777) and Governor Declared Emergency
9/4/2005 and 9/7/2005	Hurricane (Katrina) Evacuation	Statewide (Declared due to the emergency conditions in the State of Michigan, 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	**Wexford** and 43 other counties	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

The NOAA-NCEI Storm Events Database is updated on a rolling basis (approximately every three months), and thus the database is always being added to. The database indicates that 205 severe weather events were reported for Wexford County between 01/01/1950 and 12/31/2022 (26,663 days). There were a total of 176 days with an event, 1 day with an event and injury (the result of a tornado in 1974); and 46 days with an event and property damage. There were no days on record with "an event and crop damage" or "an event and a death". Those events, as well as the emergency/disaster declaration events, are included in the hazard analysis. It is important to note when viewing the data that most of the events on record started in the 1990's, even though the available search range dates back to 1/1/1950.

Table 24 provides a summary of all hazard events in Wexford County. Wildfire is the most frequently occurring hazard event, followed by severe winter weather; thunderstorm/wind and high winds; hail; flooding; and tornados.

Table 24: Summary of Hazard Events for Wexford County

Type of Event	# of Events	Event Location	Time Interval / Year Event Recorded
Wildfire	510	476 On MDNR land in the County; 34 On Federal land in the County	1983-2018 1992-2018
Severe Winter Weather	77	Countywide/Regional/Statewide	1978*, 1997-2012, 2015, 2016, 2018-2022
Thunderstorm Wind/High Wind	70	Countywide	1956, 1960, 1964, 1965, 1976, 1985, 1990-1993, 1995, 1996, 1998, 1999, 2001-2003, 2005-2013, (* in 2008), 2015-2019, 2021, 2022
Hail	33	Countywide	1984, 1988, 1991, 1993, 1996-1998, 2000, 2003, 2004, 2006-2008, 2010-2012, 2020-2022
Flood/Flash Flood	11	Countywide, City of Cadillac, City of Manton, Lake Cadillac, and areas along the Manistee River and its tributaries	2000, 2001, 2004, 2008*, 2012, 2013, 2014*
Tornado	8	Clam Lake Twp.; Haring Charter Twp., Cherry Grove Twp.; Liberty Twp.; Selma Twp., Village of Buckley	1963, 1968, 1974, 1976, 1980, 1989, 2006, 2010
Extreme Cold / Wind Chill	4	Countywide/Regional/Statewide	2007, 2014, 2015, 2019*
Drought	2	Countywide/Regional	1977*, 2001
Heat/Excessive Heat	2	Countywide/Regional	2001, 2018
Lightning	1	Countywide/Regional	2000
Public Health Emergency (COVID-19 Pandemic)	1	Statewide/Nationwide	2020*
Subsidence	1	City of Cadillac	2023
Invasive Species	-	Countywide/Regional	Ongoing

Sources: NOAA NCEI Storm Events Database; MDNR; USFS/USDA; Michigan State Police-Dept. of Homeland Security; FEMA; www.upnorthlive.com
Note: * indicates a state or federal declaration of an emergency or disaster.

The estimated economic impact of the previously described Wexford County natural hazard events that were *reported* to NOAA is $2,492,000 in property damages and $0 in crop damages (Table 25). The COVID-19 pandemic accounted for 124 deaths and 8,587 illnesses. It should be noted that many events, such as hail, likely cause numerous small amounts in property damage, but such damages often go unreported.

Table 25: Deaths, Injury/Illness and Damage Estimates by Event Type

Wexford County	Deaths	Injuries /Illness	Property Damage	Crop Damage
Wildfire	N/A	N/A	N/A	N/A
Thunderstorm Wind and Severe/High Winds	0	0	$406,500	$0
Extreme Winter Weather	0	0	$283,000	$0
Hail	0	0	$0	$0
Riverine and Urban Flood/Flash Flood	0	0	$982,000	$0
Tornado	0	1	$820,500	$0
Extreme Cold / Wind Chill	0	0	$0	$0
Drought	0	0	$0	$0
Heat/Excessive Heat	0	0	$0	$0
Lightning	0	0	$0	$0
Public Health Emergency (Pandemic)*	124	8,587	N/A	N/A
Subsidence	0	0	unknown	$0
TOTAL	**124**	**8,588**	**$2,492,000**	**$0**

Sources: NOAA's National Centers for Environmental Information; State of MI https://www.michigan.gov/coronavirus/stats
* As of record on January 10, 2023.

Table 26 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). 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. Based on data from the 2022 Season Population Study for NW Lower Michigan, add an average of a 44% increase in the base population estimates to account for the seasonal population in the county throughout the year. Specific areas of hazard concerns were identified based on GIS mapping capabilities and public input session feedback.

Table 26: Geographic and Economic Impact by Event

Hazard Event	Geography	Population Estimates	State Equalized Value
Extreme Winter Weather, Thunderstorm, Wind, Hail, Lightning, Tornado, Extreme Temperatures, Drought, Public Health Emergency	Wexford County	33,256	$1,356,823,400
Riverine and Urban Flooding	Manistee River, Clam River, Pine River, Lake Mitchell, Lake Cadillac [Antioch, Springville, Wexford, Hanover, Greenwood, Liberty Haring, South Branch, Cherry Grove and Selma Townships; Cities of Cadillac and Manton; Village of Mesick]	26,508	$232,677,805.80
Wildfire	Areas with pine forest – scattered throughout every community	33,256	$239,862,486.90

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

Furthermore, mobile homes and campgrounds are areas where concentrations of people and property can be particularly vulnerable during events such as severe winter weather, thunderstorm, high wind, lightning, hail, tornado, wildfire, and extreme temperatures. Their approximate locations in the county are indicated on the *Vulnerable Populations & Hazard Areas Map* in the Appendix. Table 27 lists the communities in Wexford County where these areas are located and the SEV for those properties.

Table 27: Geographic and Economic Impact of Severe Weather on Vulnerable Population Areas

Vulnerable Population Areas	Geography	State Equalized Value
Campgrounds	Cities of Cadillac and Manton; Townships of Cedar Creek, Cherry Grove, Clam Lake, Greenwood, Haring, Liberty, Springville and South Branch	$4,883,440
Mobile Homes	Cities of Cadillac and Manton; Townships of Clam Lake, Hanover, Haring, South Branch and Springville	$39,798,403

Severe Winter Weather

National Weather Service defined as: *phenomenon (such as snow, sleet, ice, wind chill) that impacts public safety, transportation, and/or commerce.* It typically occurs during the climatological winter season between October 15 and April 15. The Severe Winter Weather category in this Plan's hazard analysis 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, the 29 counties of the Northern Lower Peninsula of Michigan have an annual average of 79 snowstorm events, with 0 average annual deaths or injuries, $6.53 million in average annual property damage and $20 million in 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.

Ice and sleet storms 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. Ice storms are often accompanied by snowfall, which can cause property damage, treacherous conditions, and power loss. When electric lines are down, households are inconvenienced, and communities experience economic loss and the disruption of essential services. Conversely, sleet storms are small ice pellets that bounce when hitting the ground or other objects. The ice pellets do not stick to objects, but can cause hazardous driving conditions.

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
Severe 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 Wexford County is at risk from severe winter weather events.

Extent
Snowstorms can be measured based on snowfall accumulations or damages. The average total snowfall in Wexford County is 76.1 inches.[6] The most damage from a winter weather event in Wexford County occurred on March 2, 2012 with a reported $250,000 in property damages caused by heavy snow. Severe winter weather events have resulted in a total of $283,000. There are no reported crop damages, deaths or injuries associated with these events.

Previous Occurrences
Since 1978, there have been 77 severe winter weather events, including heavy snowstorms, ice storms, blizzards, winter weather, and winter storms reported in Wexford County (Table 28). In 1978, the entire State of Michigan received a Presidential Emergency Declaration for a snowstorm and blizzard. In recent years, the more common events are winter storms with moderate snowfall of 5-10 inches. Heavy snow, blizzards, and lake-effect snows have been less common. Nonetheless, extreme winter weather events are the second-most frequently occurring, and the mostly costly, type of natural hazard event in Wexford County, with the potential to impact the entire county and cause widespread damage.

Table 28: Severe Winter Weather Events in Wexford County

Event Type	# of Events	Property Damage	Crop Damage	Event Year(s)
Winter Storm	41	$ 23,000	$ -	1997-99, 2002-12, 2015, 2016, 2018-22
Heavy Snow	23	$ 250,000	$ -	1999-02, 2004-09, 2011, 2012
Blizzard	5	$ -	$ -	*1978, 1997-99, 2019
Ice Storm	5	$ -	$ -	2001, 2002, 2005, 2022
Winter Weather	1	$ 10,000	$ -	2006
Lake-Effect Snow	2	$ -	$ -	2008, 2010
TOTAL	**77**	**$ 283,000**	**$ 0**	

* indicates a Governor- or Presidential-declared emergency or disaster
Source: NOAA - National Centers for Environmental Information; FEMA; Michigan State Police.

[6] Source: Western Regional Climate Center, records from 1909-2016 https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?mi1176

The NOAA episode narrative for the March 2012 heavy snow event:

> "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. Also included in the tree damage was substantial damage to fruit trees in the Grand Traverse Bay region, particularly cherry trees. In Corwith Township in Otsego County, the weight of snow caused the roof of the former township hall to collapse."

Probability of Future Events and Vulnerability Assessment

Between the years 1997 and 2022, Wexford County has had 76 severe winter weather events. This averages to about to about 3 events every year. Therefore, the probability of a severe 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 and river water and ice past the shoreline, causing damage to public infrastructure and residential property.

Ice, heavy snow, and wind storms have the capability to take out power. A power outage combined with below freezing temperatures can cause broken plumbing lines and an inability to operate drinking water well pumps and septic/sewer system pumps.

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 from highly desirable Northern Michigan communities like those in Wexford County. Many aspects of the county, including natural wooded areas and proximity to lakes/rivers, are attractive to prospective buyers and the permanent population is expected to continue to grow. New residents, especially those locating in remote areas, increase the chance of risk to life and property. 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.

The public online community survey results indicated that severe winter weather (i.e., blizzard, heavy snow, ice storm) as the fifth most likely type of natural hazard event that would have a major impact on the county's communities.

Thunderstorms and Severe Winds

The National Weather Service defines a “Thunderstorm Wind” event as having winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage. These storms can also produce 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.

“Strong Wind” and “High Wind” events on record with the NWS are considered severe wind events. Strong Winds are non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage. High Winds are sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (or otherwise locally/regionally defined).

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 Wexford County is at risk to the occurrence and impacts from thunderstorms and severe winds.

The most damaging event occurred on August 2, 2015. A historic severe weather outbreak in northern Michigan, as multiple waves of severe thunderstorms crossed the region. A passing cold front would finally end the activity during the evening hours. This episode featured widespread straight-line wind damage in parts of northwest Lower Michigan, and the largest hail on record in northern Michigan in Ogemaw County. This event resulted in $600,000 in property damages.

Extent
Thunderstorms can be measured based on wind speed or damages. The average wind speed for thunderstorm/wind events (that have recorded wind speeds associated with the event) in Wexford County is 52 knots. The highest recorded wind speed was 58 knots (estimated gust) during a thunderstorm/wind event in 2007. There are $406,500 in reported property damages caused by thunderstorms and severe winds (Table 29). There are no reported deaths, injuries or crop damages associated with these events.

Previous Occurrences
Since 1956, there have been a total of 70 thunderstorm/wind and high wind events reported in Wexford County. This is the third-most frequently occurring type of severe weather event in the county.

Table 29: Wexford County Thunderstorm and Wind Events Previous Occurrences

Event Type	Number of Events	Property Damage	Event Years
Thunderstorm Wind	7	$0	1956, 1960, 1964, 1965, 1976, 1985
Thunderstorm Wind	54	$281,500	1990-1993, 1995, 1996, 1998, 1999, 2001-2003, 2005-2009, (*in 2008) 2011-2013, 2015-2019, 2021, 2022
High Wind/Strong Wind	9	$125,000	1998, 2003, 2005, 2008, 2010, 2011, 2015, 2021
TOTAL	**70**	**$406,500**	

Source: NOAA: National Centers for Environmental Information
* indicates a Governor- or Presidential-declared emergency or disaster

The NOAA event and episode narratives for the 6/12/2008 thunderstorm wind event are provided below. This event resulted in a Governor Declared State of Emergency and Presidential Declared Major Disaster for Wexford and 11 other counties.

> "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.
>
> [In Wexford County,] two spotters estimated winds at 60 mph. Several trees were downed, and a pole barn was partially unroofed."

Probability of Future Events and Vulnerability Assessment

Since 1956, Wexford County has had a total of 70 recorded "thunderstorm wind", "high wind" or "strong wind" events. However, seven (7) of those 70 events occurred on record in 1956, 1960, 1964, 1965, 1976, and 1985 (2 events). After 1990, recorded events of this type on record occurred more consistently in the NOAA NCEI database. Due to the time span of the seven events over the 34 years prior to 1990, they are not considered in the probability estimate.

Since 1990, Wexford County has had 63 thunderstorm/wind and high wind events. This averages to about two events a year. The probability of an event occurring in a given future year is 100 percent. Additionally, the online community survey results indicate that high winds (or a tornado) was the second most likely type of natural hazard event that would have a major impact on the county's communities.

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 summer months, the base population expands by as much as 73% due to the peak presence of seasonal homeowners and overnight visitors. Residents and visitors are attracted to both rural, sparsely populated natural areas as well as village and city centers throughout the year for outdoor recreation (motorized & non-motorized trails; year-round camping, hunting, swimming/boating) and festivals/special events.

Mobile homes and campgrounds were identified as specific areas of concern with regard to thunderstorms and high winds; their approximate locations are indicated on the *Vulnerable Populations & Hazard Areas Map* in Appendix A.

Additionally, wind damage to trees and resulting road blockages/power outages is a specific hazard concern in heavily forested, rural communities in Wexford County, such as Greenwood Township.

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 mis-operation of a dam. The hazard potential classification does not reflect in any way on the current condition of the dam. Three classification levels are adopted as follows: Low, Significant, and High, listed in order of increasing adverse incremental consequences (Figure 13).

Figure 13. Dam Hazard Potential Classification

DAM HAZARD POTENTIAL CLASSIFICATION	LOW HAZARD POTENTIAL	SIGNIFICANT HAZARD POTENTIAL	HIGH HAZARD POTENTIAL
LOSS OF HUMAN LIFE	None Expected	None Expected	Probable
ECONOMIC LOSSES	Low and generally limited to owner	Yes	Yes *(but not necessary for this classification)*
ENVIRONMENTAL DAMAGES	Low and generally limited to owner	Yes	Yes *(but not necessary for this classification)*
LIFELINE INTERESTS IMPACTED	No	Yes	Yes *(but not necessary for this classification)*

Source: National Inventory of Dams https://nid.sec.usace.army.mil/#/learn/manage-dams

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 EGLE estimates, as that Metro Detroit flood event was quite similar to Federal Disaster 1346 during the previous decade).

The 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.

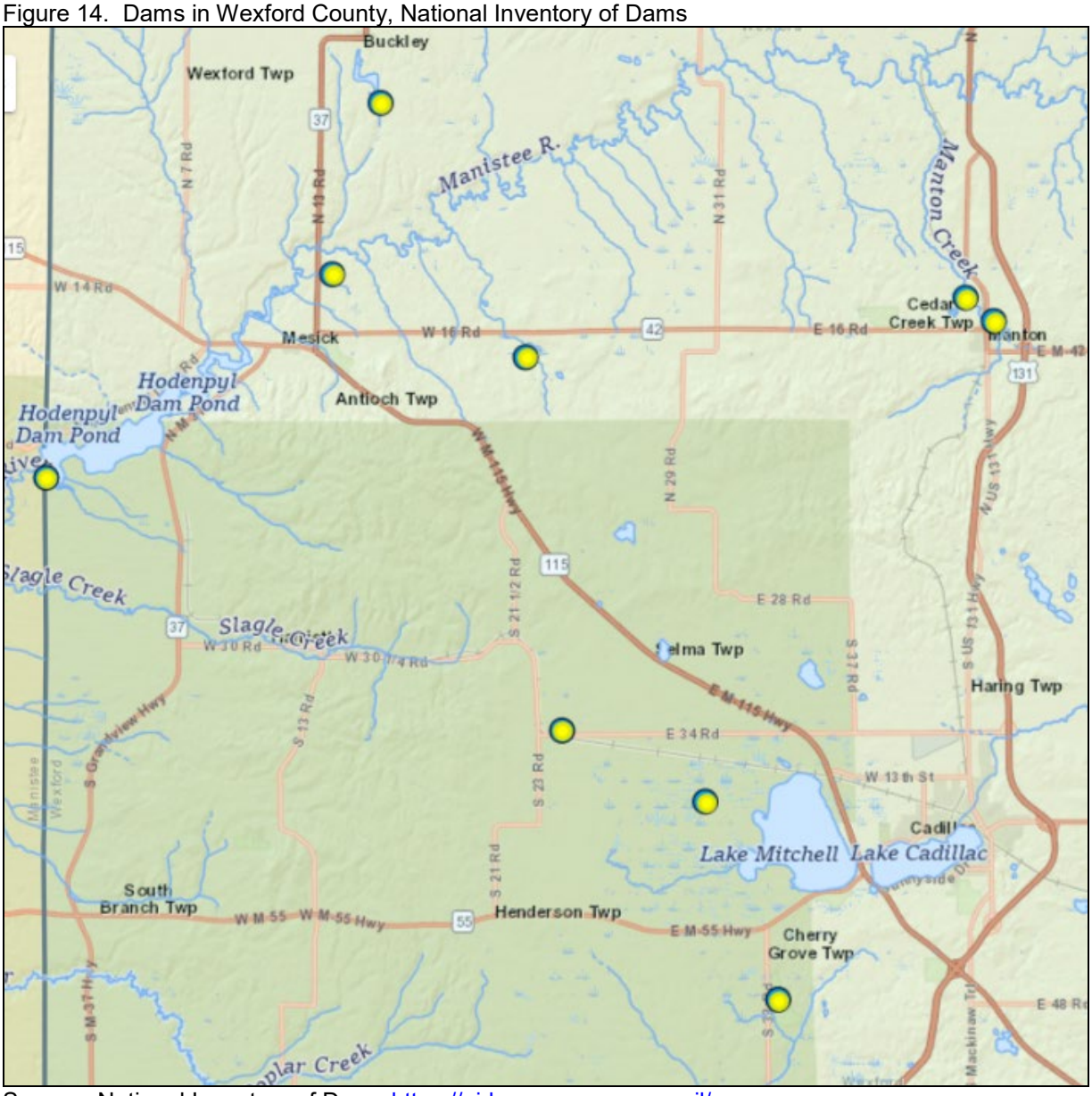
Location
The Manistee River flows through the northern portion of the County and is constricted at the Hodenpyl Dam in Springville Township. The Townships of Liberty, Greenwood, Hanover, Wexford and particularly Springville, as well as the Village of Mesick, are at risk from potential flooding along the Manistee River.

Potential flooding risk is present along the Pine River, which flows through the southwest portion of South Branch Township, and has tributaries also in South Branch Township and Henderson Township.

The Clam River, much of which has been channelized in an urbanized landscape of the City of Cadillac and part of Haring Charter Township, flows from the control dam on Lake Cadillac. The areas around Lake Cadillac and the Clam River are vulnerable to urban flooding in heavy rain events.

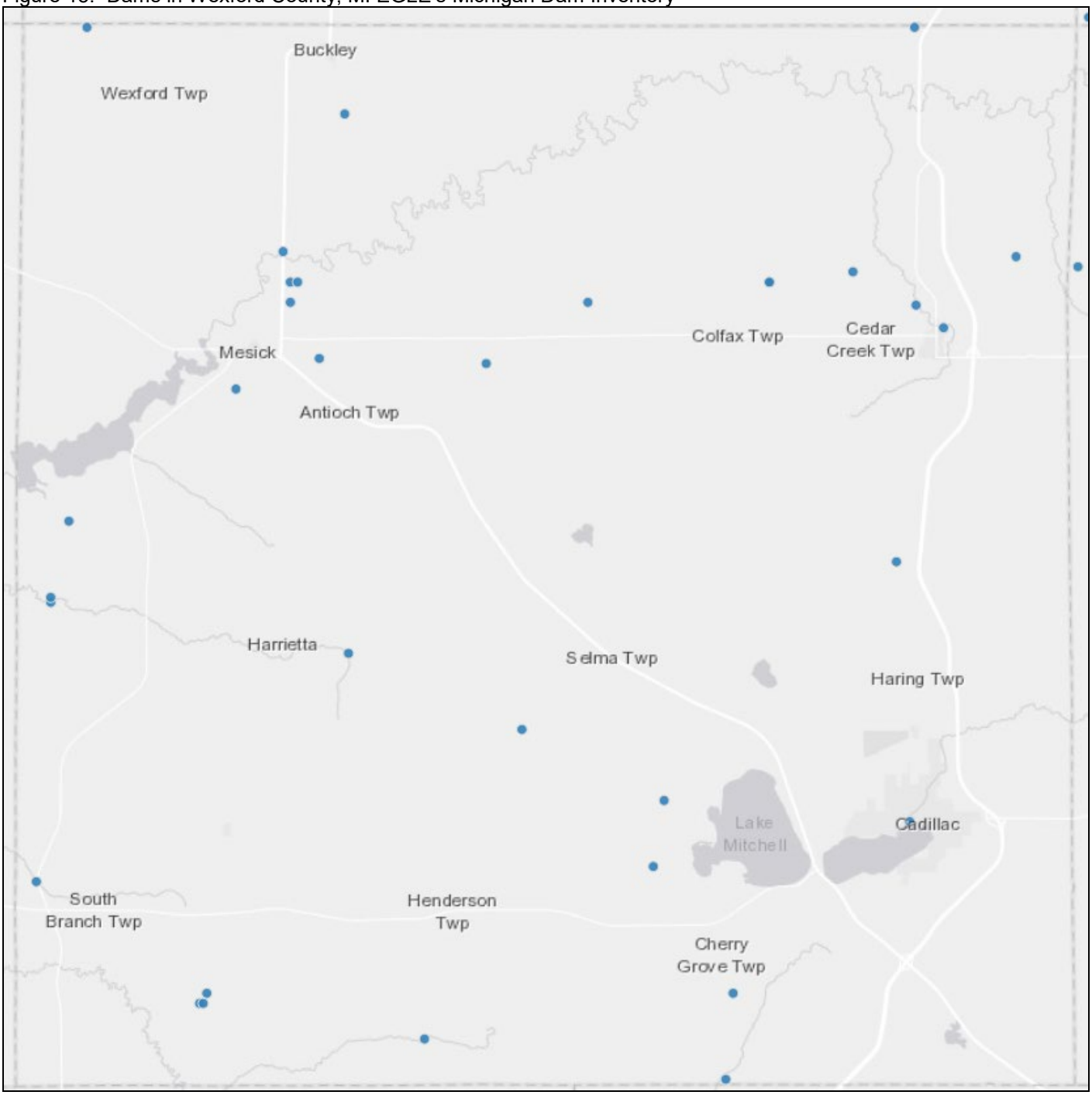
The National Inventory of Dams indicates there are nine dams located in Wexford County (Figure 14), and Michigan's EGLE's State Dam Inventory has a record of 30 dams in the County (Figure 15). In total, there are 28 active dams in the County and four (4) dams which have been removed or have failed. The appended Wexford County Infrastructure Map in Appendix A illustrates the location of dams and their reported condition status. The details of the eight dams in the county that are regulated by State of Michigan or the Federal government are provided in Table 30. Table 31 lists four dams that have been removed or have failed in the County. Table 32 lists the 20 dams in the County that are unregulated, privately owned, and have a "low" rating for downstream hazard potential if they were to fail.

Figure 14. Dams in Wexford County, National Inventory of Dams



Source: National Inventory of Dams https://nid.sec.usace.army.mil/

Figure 15. Dams in Wexford County, MI EGLE's Michigan Dam Inventory



Source: MI EGLE Maps and Data, https://gis-egle.hub.arcgis.com/

Table 30. Regulated Dams in Wexford County

Name	Hodenpyl Dam	Lake Billings Dam	Wheeler Creek Dam	Clam River Control Dam	White Lake Dam/ Barnes Dam	Brandy Brook Dam	Mitchell Creek Dam	Norman Smith Dam
Downstream Hazard Potential	High	Significant	Significant	Low	Low	Low	Low	Low
Location	Springville Township	City of Manton	Hanover Township	City of Cadillac	Antioch Township	Selma Township	Cherry Grove Township	Cherry Grove Township
Dam Type	Gravity, Earth	Earth	Earth	Other	Earth	Earth	Earth	Earth
Structural Height (Ft)	90	14	21	6	20	7	5.6	15.6
Maximum Storage (Acre Ft)	39,684	110	1,144	8,000	160	80	45	180
Water Body	Manistee River	Lake Billings/ Manton Creek	Lake Gitchegumee/ Wheeler Creek	Cadillac and Mitchell Lakes; Clam River	Tributary to Adams Creek	Brandy Creek	Mitchell Creek	Tributary to Spaulding Creek
Owner	Consumers Energy Company	City of Manton	Lake Gitchegumee Property Owners Association	Wexford County	Ronald White	Huron-Manistee National Forests	DOI FWS	SAKK Investments LLC
Year Completed	1925	1919	1965	1975	1973	1964	1963	1974
Purpose	Hydroelectric	Recreation	Recreation	Recreation	Recreation	Other	Recreation	Recreation
Regulatory Agency	FERC	MI EGLE	MI EGLE	MI EGLE	MI EGLE	Federal	Federal	MI EGLE
Condition Assessment	Not Available	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Fair	Not Rated	Satisfactory
Inspection Frequency	Annually	4 years	4 years	3 years	5 years	3 years	Unknown	5 years
Emergency Action Plan (EAP) Prepared?	Yes	Yes	Yes	Not Required	Not Required	Not Required	Not Required	Not Required
Last EAP Revision	10/11/2019	2/24/2009	8/8/2018					

Source: MI EGLE's Michigan Dam Inventory; National Inventory of Dams

Table 31. Failed or Removed Dams in Wexford County

Dam Name	Location	Waterbody	Owner Name	Inspection Date	Inspection Status	Year Completed	Dam Type	Purpose	Downstream Hazard Potential Class
Manton Millpond Dam	City of Manton	Manton Creek	City of Manton	9/16/2011	Removed	1919	Earth	Retired Hydro	Low
Archie Castle's Dam	Boon Twp.	Tributary to Brandy Creek	Mark Platz (Private)	Unknown	Failed	1963	Earth	Recreation	Low
Bond Millpond Dam	Haring Charter Township	Tributary to Clam River	MDNR Wildlife	10/9/1998	Failed	Unknown	Unknown	Unknown	Low
Garlets Dam	South Branch Township	Peterson Creek	Garlets (Private)	10/25/1989	Failed	1954	Earth	Recreation	Low

Source: MI EGLE's Michigan Dam Inventory

Table 32. Other Low Hazard Dams in Wexford County

Name	Downstream Hazard Potential	Location	Water Body	Dam Type	Structural Height (Ft)	Maximum Storage (Acre Ft)	Owner	Year Completed	Purpose
Spink Dam	Low	Antioch Township	Burkett Creek	Earth	33	0	Clarice Smith		Recreation
Jackson Dam	Low	Antioch Township	Burkett Creek	Earth	6	0	Lester Barnes		Irrigation
Bayma Dam	Low	Boon Township	Slagle Creek	Earth	8	0	Raymond Bayma	1967	Recreation
Malmstrom Dam	Low	Cherry Grove Township	Trib to North Branch Pine	Earth	8	0	Harold Malmstrom	1967	Recreation
Brooke Dam/ Roundhouse Dam	Low	Colfax Township	Tributary to Soper Creek	Gravity	10	0	George Powers	1952	Recreation
Parks No One Dam	Low	Greenwood Township	Tributary to Silver Creek	Gravity	10	0	John A. Parks		Recreation
Parks No Two Dam	Low	Greenwood Township	Tributary to Silver Creek	Gravity	10	0	John A. Parks		Recreation
Kerr Upper Dam	Low	Hanover Township	Tributary to Manistee River	Earth	25	39	Marlin Kerr	Unknown	Unknown
Kerr Lower Dam	Low	Hanover Township	Tributary to Manistee River	Earth	16	8	Marlin Kerr	Unknown	Unknown
Guthrie Dam	Low	Hanover Township	Wheeler Creek	Earth	24	25	Margie Gowell		Recreation
Taylor Dam	Low	Liberty Township	East Chase Creek	Earth	6	0	Ward Taylor		Recreation
Woodworth Dam	Low	Liberty Township	Tributary to Buttermilk Creek	Gravity	8	0	Robert Borin	1961	Recreation
Corlett Dam	Low	Slagle Township	Slagle Creek	Earth	15	0	Robert Mattson		Recreation
Slagle Trout Club Dam	Low	Slagle Township	Slagle Creek	Earth	10		Slagle Trout Club	1915	Recreation
Carlson Dam No One	Low	South Branch Township	Yates Creek	Gravity	9	0	Thomas Boersma		Recreation
Carlson Dam No Two	Low	South Branch Township	Yates Creek	Gravity	11	0	Thomas Boersma		Recreation
Korr Dam	Low	South Branch Township	Yates Creek	Gravity	9	0	George Korr		Recreation
McNitt Dam	Low	Springville Township	Tributary to Manistee River	Gravity	6	0	Jerry Mc Nitt	1962	Recreation
Von Hofe Dam	Low	Springville Township	Seaton Creek	Gravity	7	0	Lincoln W. Ward	1967	Recreation
Nehez Dam	Low	Wexford Township	Tributary to Fletcher Creek	Earth	13	0	N. J. Nehez	1968	Recreation

Source: MI EGLE's Michigan Dam Inventory

Of the eight regulated dams in the County, one is classified as "High" downstream hazard potential and two are classified as "Significant" downstream hazard potential. Details of these dams are provided below.

The Hodenpyl hydroelectric dam is located in Springville Township in Wexford County, near the border with westerly adjoining Manistee County. The dam was commissioned in 1925, is owned by Consumers Energy (CE) and is considered a "High" potential downstream hazard dam, meaning that failure or dam misoperation will probably result in loss of human

life. CE is required to maintain an Emergency Action Plan on file with the Federal Energy Regulation Commission (FERC). The hydro operating license issued by FERC to CE for the dam will expire in 2034. Future potential options for the dam include: 1) Relicense the dam, meeting all the new regulatory requirements, and continue to generate power; 2) Surrender the license and sell the dam to a third-party owner, who could maintain the dam structure and impoundment; 3) Remove the dam and return the river to its natural state; or 4) Replace the dam with an alternative structure.

From August – October 2022, CE and Public Sector Consultants held a local public engagement session regarding input on potential future plans for the dam; they also surveyed property owners located within 100 feet of CE property lines to obtain their feedback as well. In 2023, CE intends to provide their long-term hydro strategy, and between 2023 and 2034, the relicensing and/or retiring process will be underway, which will continue to include community engagement efforts. Refer to CE's website for updated information about planning for the future of hydroelectric dams in Michigan: https://www.consumersenergy.com/company/electric-generation/renewables/hydroelectric/hydro-future

The Wheeler Creek Dam on Lake Gitchegumee in the Village of Buckley/Hanover Township and the Lake Billings Dam on Billings Lake in the City of Manton are classified as dams with "Significant" downstream hazard potential. An Emergency Action Plan and regular 3-year inspections by Michigan Dept. of EGLE are required for these dams. They are both rated as being in "satisfactory" condition.

The most recent inspection for the Lake Billings Dam from 2021 indicates that the dam is in fair conditional overall, but there are several recommendations for monitoring and repair of deficiencies that do not currently pose an immediate threat to the safety of the dam but should be completed. The report provided the following recommendations listed in order of importance:

- Broken concrete along spillway walls should be removed, the underlying material and sheet pile wall inspected, backfill any areas disturbed, compact fill, and resurface areas with concrete. Monitor sheet piling walls for further seepage after work has been performed. This work should be completed by December 31, 2022.
- Annually review the Emergency Action Plan (EAP) with the Emergency Services Coordinator for Wexford County and update it as appropriate. In accordance with Part 315, provide a copy of the findings of the EAP review and any updates to the plan to the Dam Safety Program and the Wexford County Emergency Management Coordinator by December 31, 2022.
- Create an Operation and Maintenance Plan (O&M Plan). This should include routine maintenance, address repair procedures when required, and include operation of the spillway gates during flood conditions by June 30, 2022.
- Monitor cracks on concrete cap of sheet piling for further deterioration and consider resurfacing concrete where hairline cracks are visible.
- Routinely monitor embankments for wave erosion and animal burrows. Sloughs and burrows should be filled, compacted and seeded or riprapped as needed.

The following is a description of the Wheeler Creek Dam from the Lake Gitchegumee Property Owner's Association's website http://www.lgpoa-mi.org/ :

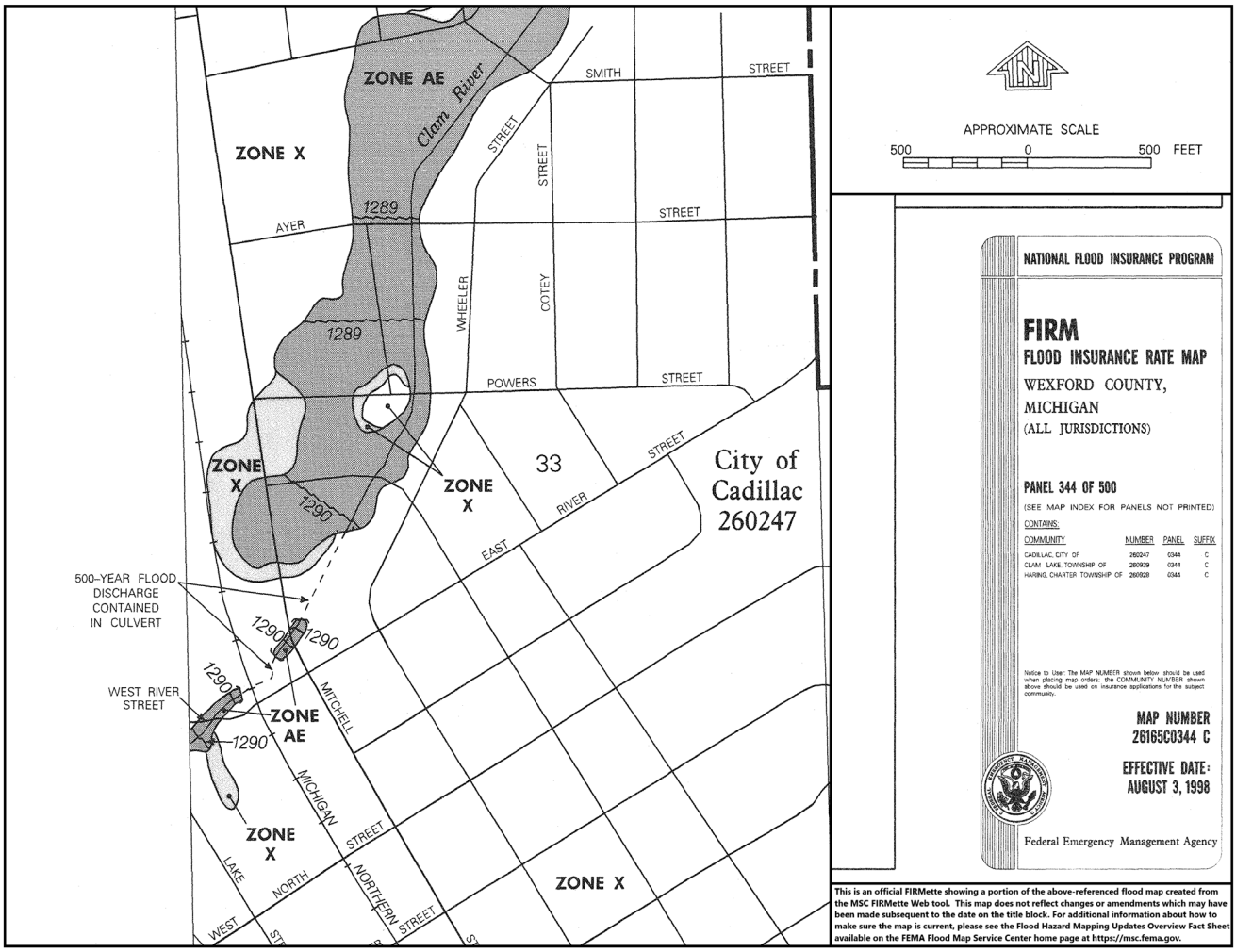
> "The Wheeler Creek Dam Overflow System has had repairs over the years such as replacement of the stop logs. These stop logs control the water level in the lake. In June, 2012, the Board of Directors authorized repairs to the outlet pipe of the Dam Overflow System. In July, 2016, major repairs were made to the water side of the Dam Overflow system. The Directors believe these repairs will ensure safe operation and minimal maintenance of the Dam Overflow System for many years."

The City of Cadillac is most at risk for urban flooding, due to the high amount of impervious surfaces in the City. The City of Cadillac, along with adjoining Clam Lake Township, Cherry Grove Township, Selma Township and Haring Charter Township are also at risk from riverine flooding due to the presence of Lake Mitchell, Lake Cadillac and the Clam River.

During the public input process for developing this plan, the following concerns were identified regarding flooding and/or erosion concerns. These are areas are also indicated on the appended hazard area maps.

- The aging Clam River Control Dam, located where Lake Cadillac feeds into the Clam River in the City of Cadillac, is in need of a major retrofit within the next ten years. This infrastructure upgrade will aid in alleviating flooding and shoreline erosion issues that have occurred on the land surrounding the lake and the Clam River (affecting areas in the City of Cadillac, Clam Lake Twp., and Haring Charter Twp.)
- The Clam River is considered a flood hazard concern in the City of Cadillac and Haring Charter Township. One current problem with the Clam River is where part of it is channelized underground in the City of Cadillac, located east and west of Mitchell Street and north of River Street (refer to Figure 16 for a FEMA FIRM indicating the areas "50-Year Flood Discharge Contained in Culvert"). The culverts in this area containing the Clam River are aging and failing underneath the paved parking lot north of the building occupied by Wexford Jewelers, resulting in subsidence of the parking lot (refer to the subsection in this Plan on "subsidence" hazards).

Figure 16. FEMA Flood Insurance Rate Map Number 26165C0344C



- Shoreline erosion concerns along Lake Mitchell as well (affecting Cherry Grove Twp. and Selma Twp.)
- Properties located in the City of Cadillac, between Lake Street and the railroad, with Haynes St. bordering to the north and Pine St. to the south, have experienced seasonal flooding/ basement flooding. Activities from a former lumber mill northeast of Lake Cadillac resulted in sawdust/lumber waste deposited in the soil. This area includes property public and private commercial/office and residential property.
- In the Lake Mitchell flood zone areas, high water has been a contributing factor to sanitary sewer overflows and has also caused water damage in basements.
- Land that surrounds Lake Mitchell in Cherry Grove and Selma Township, much of which contains Part 303 State regulated wetlands
- Land along Slagle Creek (in Slagle and Boon Townships, including the Village of Harrietta), the Manistee River (in Liberty, Greenwood, Hanover, Wexford, and Springville Townships), and the Pine River (South Branch Twp.)
- Land near the Lake Billings Dam in the City of Manton/Cedar Creek Twp.
- Roads in Wexford Twp.
    - W4 Rd., located NE of N7 Rd.
    - N9 Rd. between W. County Line Rd. and W4 Rd.
    - Around the intersection of W. 2 ½ Rd. and N11 Rd.
    - N11 Rd. between W. 12 Rd. & W. 12 ½ Rd.
- Roads in Greenwood Twp.
    - Manistee River surrounded by the following roads: N 27 ½ Rd., E 2 ½ Rd., N 29 ½ Rd., and River Rd.
- Cedar Creek Twp. and Colfax Twp.
    - Road intersection of N37 Rd and E16 Rd.

Extent/Previous Occurrences

There have been 11 flooding events that have occurred between 2000 and 2021 (Table 33), resulting in a total of $980,000 of property damage. Nine of these events were flash floods; two were flooding events. Many of the events have occurred within the City of Cadillac, as well as in communities along the Manistee River in the northern portion of the county, and around Lake Cadillac/Lake Mitchell to the west of the City of Cadillac. Flooding is the most costly type of natural hazard event in Wexford County, based on available NOAA NCEI Storm Database information.

Table 33: Wexford County Flood Events

Event Type	Begin Date	Begin Location	End Location	End Date	Property Damage
Flash Flood	5/12/2000	Cadillac	Cadillac	5/12/2000	$0
Flash Flood	4/12/2001	Countywide	Countywide	4/16/2001	$0
Flash Flood	5/15/2001	Countywide	Countywide	5/15/2001	$0
Flash Flood	5/19/2001	West portion	West portion	5/20/2001	$0
Flash Flood	5/9/2004	Cadillac	Cadillac	5/9/2004	$20,000
Flash Flood	6/12/2008*	Hoxeyville	Harlan	6/13/2008	$750,000
Flood	6/13/2008*	Harrietta	Meauwataka	6/17/2008	$40,000
Flash Flood	7/25/2012	Haring	Sherman	7/25/2012	$40,000
Flash Flood	7/27/2012	Cadillac	Lake Cadillac	7/27/2012	$12,000
Flash Flood	11/17/2013	Lake Mitchell	Lake Cadillac	11/17/2013	$10,000
Flood	4/14/2014*	Lake Cadillac	Manton	4/15/2014	$110,000
TOTAL	**11 events**				**$982,000**

Source: NOAA: National Centers for Environmental Information
Note * indicates a State or Federal Declaration of an Emergency or Disaster

The most damaging event on record occurred between June 12 and 17, 2008, when heavy rainfall caused widespread flooding in southern Wexford County, with isolated flooding in the north, after to three to six inches of rainfall in a few hours either side of midnight. Numerous roads were washed out, especially on the northwest side of Lake Cadillac, and near and north of Mesick. One hundred and fifty homes were impacted by flood water. The flooding lingered for several days after the heavy rain event ended, mainly on the Manistee River and its larger tributaries. The Manistee River at Sherman established a new flood of record on the 14th, reaching 16.4 feet. Several homes just above Hodenpyl Dam Pond had to be evacuated. As a result of the flooding, the Governor declared a State of Emergency for Manistee and Wexford Counties, along with other counties downstate. This flash flood event resulted in $790,000 in reported property damages in Wexford County.

This 2008 event also resulted in a Federally-Declared Major Disaster (Federal Disaster #1777) affecting 12 counties, including Wexford. A description of this event, obtained from the Michigan State Police's 2019 *Michigan Hazard Analysis*, is provided below:

> "Beginning on June 6, severe weather impacted twelve counties and two major population centers in the southwest and central Lower Peninsula. The National Weather Service reported two flash floods that exceeded the "100-year" threshold, confirmed three EF1 tornadoes, and also noted severe thunderstorms with winds exceeding 100 mph. Rainfall totals were estimated between 7 and 12 inches, exceeding the "100-year" rainfall values of 3.5 inches in less than 6 hours. Flash flooding washed out roads, flooded crops, and caused moderate flooding of rivers and streams. A large severe thunderstorm squall line affected Southwest Michigan on June 8, with four counties experiencing winds of 75 to 100 mph. Disaster declarations were requested and received in July, for 11 full counties. Some of the worst damages were noted in Allegan County ($2 million in property damage and $2 million in crop damage), Mason County ($3 million in property damage, $0.5 million in crop damage), Lake County ($2 million in property damage, $0.5 million in crop damage), Ottawa County ($1 million in property damage, $1.5 million in crop damage), Osceola County ($1 million in property damage, $0.25 million in crop damage), Manistee County (nearly $1 million in property damage), and Wexford County (about $¾ million in property damage). Three persons died in this event—two at Castle Park (Allegan County) when a car plunged down a 50-foot ravine along a washed-out road, and one in Holland (Ottawa County) as a farmer tried to remove boards from the Worley Drain Dan during the event."

The second-most damaging flood event occurred on April 14, 2014. A tardy spring thaw was enhanced by a widespread 1 to 2 inches of rain that fell on the 13th and 14th., Two areas of concentrated flooding occurred in Wexford County, with a number of road closures. One was along Lake Mitchell, just west of Cadillac. The other was along the Manistee River in far northern sections of the county. Water entered multiple homes at both location, along with properties along the Manistee River in the north section of the county. This flood event resulted in a reported $110,000 in property damage.

This event is associated with a Governor's disaster declaration for Wexford and seven other counties in Michigan. Copy of a press release[7] describing this declaration is provided below:

> "Six counties added to governor's disaster declaration due to severe weather, flooding
>
> Wednesday, May 7, 2014
>
> LANSING, Mich. - Gov. Rick Snyder today directed the Michigan State Police to amend a recent disaster declaration for Newaygo and Osceola counties to include six additional Lower Peninsula counties after severe storms, snowfall and heavy rains caused widespread flooding and wind damage from April 12 to present.
>
> In addition to Newaygo and Osceola counties, the amended disaster declaration adds Isabella, Mecosta, Missaukee, Muskegon, Roscommon and Wexford counties.
>
> "The severe weather and flooding that affected our communities last month has taken a toll on our homes, businesses and public roads and buildings," Snyder said. "We are looking at all options to assist with the recovery and rebuild our communities."
>
> The six counties requested a governor's declaration after determining local resources are insufficient to address the situation and state assistance is required to protect public health, safety and property to lessen or avert the threat of a crisis. The Michigan Emergency Management Act allows the director of the Michigan State Police, or his or her designee, to amend a declaration with the concurrence of the governor.
>
> Lower Peninsula communities have been severely impacted by flooding and wind damage, affecting hundreds of homes, businesses and public facilities and infrastructure. Public health and safety is a concern due to damaged roads and bridges causing increased emergency response times.
>
> Snyder declared on April 17 a "state of disaster" for Newaygo and Osceola counties due to severe weather and widespread flooding, making available state aid and assistance to communities in the disaster area. The governor's declaration authorizes the Michigan State Police, Emergency Management and Homeland Security Division to coordinate state response and recovery efforts."

Probability of Future Events and Vulnerability Assessment

Flooding, due to high rainfall events, high groundwater levels and/or aging and failing infrastructure, 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 water or sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

Between the years 2000 and 2022, Wexford County has had eleven flash flood or flood events, which equates to a 48% chance that a flood event would occur in a future year. The magnitude and severity of a heavy rainfall event also depends on the population densities, seasonal activity, and the spread of development. During the warm or summer months, the population expands to include both the permanent resident base population and the seasonal short- and long-term population. The seasonal population is attracted to both rural, sparsely populated rural areas and urban activity centers.

Specific flood hazard areas were identified during public meetings and are identified on the Hazard Areas Map provided in Appendix A. Most of the public input received regarding flooding concerns were related to the urbanized and floodplain areas around Lake Mitchell, Lake Cadillac, and the Clam River. The public online community survey results indicated that flooding was the third most likely type of natural hazard event that would have a major impact on the county's communities. Additionally, when survey participants were asked what types of infrastructure failures they were most concerned about being able to withstand a natural hazard event, the following responses were related to the possibility of flooding:

- Utility/Electrical Outage (7) (Lake Mitchell may overflow if water level control dam is not powered)
- Failing bridges/culverts/roads (7)
- Failing dams (3)
- Water contamination (1)

[7] https://www.michigan.gov/formergovernors/recent/snyder/press-releases/2014/05/07/six-counties-added-to-governors-disaster-declaration-due-to-severe-weather-flooding

Flood hazard information may be obtained from the Flood Insurance Rate Maps (FIRM) available for jurisdictions (see Table 35).

The Infrastructure Map included in Appendix A illustrates the locations of road/stream crossings, bridges and dams with their currently available condition rating. It should be noted that data is not available for every infrastructure location. All communities in the County - with the exception of the Village of Buckley, the Village of Harietta, Selma Township, Haring Charter Township, and the City of Cadillac - have road/stream crossings that are rated as having a "moderate" or "severe" condition. The N. 19 Road Bridge over the Manistee River in Hanover Township has a "serious" rating, as does the Power Street Bridge over the Clam River in the City of Cadillac. The S1 Road Bridge over Slagle Creek in Slagle Township has a "poor" condition rating.

NFIP Participation Status

FEMA's online National Flood Hazard Layer (NFHL) is a geospatial database that contains current effective flood hazard data, which support the National Flood Insurance Program (NFIP). Flood Insurance Rate Maps, or FIRMs, can be viewed for participating areas in the U.S. through the NFHL. The FIRMs aid in better understanding a property's level of flood risk and type of flooding in the area. The maps show the delineation of the 1% Annual Chance Floodplain Boundary (the "100-Year Flood Boundary") and the 0.2% Annual Chance Floodplain Boundary (the "500-Year Flood Boundary").

For a particular river, USGS collects river streamflow data over time, determines the largest flood in each year, and then calculate statistical data for that river. The more years of data available, the more accurate the estimates for the various flood quantiles. As more years of data become available, the estimates become more refined, which can result in revisions to the quantiles and thus revised floodplain boundaries.[8] Urban development and installation of flood controls can also result in changes in streamflow data over time.

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. NFIP and FIRM information for Wexford County communities is provided in Table 38.[9] Digital Flood Insurance Rate Maps are not currently available for NFIP-participating communities in Wexford County.

An NFIP-insured structure that has had at least two paid flood losses greater than $1,000 each in any 10-year period since 1978 is considered a "repetitive loss" property by FEMA.[10] A formal request has been made to FEMA Region 5 (via email at FEMA-R5-NFIP@fema.dhs.gov) for current information on repetitive loss properties within Wexford County. At the time this hazard mitigation plan was finalized and sent to the Michigan State Police and FEMA for review, a response to the request had not been received.

Additionally, Michigan State Police's *2019 Michigan Hazard Analysis* provides the following National Flood Insurance Statistics for Wexford County (Table 34):

Table 34: NFIP Statistics for Wexford County

Total Premium	Policies	A-Zone Policies	Total Coverage	Claims since 1978	Total Paid since 1978
$38,792	39	22	$7,372,300	7	$20,098

[8] https://www.usgs.gov/faqs/why-do-values-100-year-flood-seem-change-every-flood

[9] The City of Manton; the Villages of Buckley, Harrietta, and Mesick; and the Townships of Antioch, Boon, Colfax, Hanover, Henderson, Liberty, Slagle, Springville and Wexford do not participate in the NFIP and no FIRMs have been created for those communities.

[10] https://www.fema.gov/glossary/repetitive-loss-structure

Table 35: Wexford County NFIP Participation Status and Related Information

Municipality	City of Cadillac	Cedar Creek Township	Cherry Grove Township	Greenwood Township	Selma Township
Floodplain Management Adoption*	Y	Y	Y	Y	Y
FIRM Map Adoption	Y	Y	Y	Y	Y
Current Effective Map Date	8/3/1998	NSFHA	8/3/1998	NSFHA	8/3/1998
Reg- Emerg Date**	3/18/1996	9/26/2016	7/28/1999	6/30/1997	9/30/1998
Community ID #	260247#	260935#	260938#	260947#	260757#
Implementation Method***	The City issues their own building permits based on the Michigan Building Codes; City zoning ordinance provisions for floodplain setback requirements	The Township issues their own building permits based on the Michigan Building Codes; Township zoning ordinance provisions for floodplain setback requirements	Wexford County issues building permits for the community based on the Michigan Building Codes; WJPC zoning ordinance provisions for floodplain setback requirements	Wexford County issues building permits for the community based on the Michigan Building Codes for floodplain setback requirements	Wexford County issues building permits for the community based on the Michigan Building Codes; WJPC zoning ordinance provisions for floodplain setback requirements
Appointed Designee****	City Building Dept./City Planning & Zoning Dept.	Township Building Dept/Planning & Zoning Dept.	County Building Dept./Wexford Joint Planning Commission	Wexford County Building Department	County Building Dept./Wexford Joint Planning Commission
Implementation of Damage Provisions*****	Per the State of Michigan Building Code, should a structure located in the flood plain be damaged by any means to an extent of more than fifty (50%) percent of the structure's pre-catastrophe market value as recorded by the assessing officer, it shall not be reconstructed. Any building damaged by any means to an extent of less than fifty (50%) percent of the structure's pre-catastrophe market value as recorded by the assessing officer may be modified, repaired, or replaced, but any alterations must incorporate floodproofing of utility and sanitary facilities up to the level of the 100 year floodplain or the level to be inundated during an Intermediate Regional Flood as determined by the U.S. Army Corps of Engineers. The costs of said improvements for floodproofing shall not be included in determining the damage costs.				

Source: FEMA Community Status Book, accessed 4/6/2023

Notes:
* Adoption of NFIP minimum floodplain management criteria via local regulation.
** The date the community first joined the NFIP.
*** How local floodplain management regulations are implemented and enforced.
**** The designee or agency that is appointed to implement the addressed commitments and requirements of the NFIP.
***** How participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.

A Non-Special Flood Hazard Area (NSFHA) is an area that is in a moderate-to-low risk flood zone (Zones B, C, X Pre- and Post-FIRM). An NSFHA is not in any immediate danger from flooding caused by overflowing rivers or hard rains. However, it's important to note that structures within a NSFHA are still at risk. In fact, nearly 1 in 4 NFIP flood claims occur in these moderate- to low-risk areas. (www.fema.gov)

Table 36 lists three communities in the County that are non-participants in the NFIP, but FIRMS have been issued for their communities. Networks Northwest contacted officials in these communities regarding why they have chosen to be non-participants in the program. No responses were received.

Table 36. Non-NFIP Participants in Wexford County with Issued FIRMs

Municipality	Clam Lake Township	Haring Charter Township	South Branch Township
Current Effective Map Date	8/3/1998	8/3/1998	8/3/1998
Sanction Date*	8/3/1999	8/3/1999	8/3/1999
Community ID #	260939#	260928#	260944#

* "Sanctioned" or non-participating communities choose not to join the NFIP after the data has been provided upon which a floodplain regulation can be based, or do not fulfill their obligations to the NFIP program. In "sanctioned" communities, 1) residents are denied the opportunity to purchase NFIP flood insurance, and 2) Federal agencies are prohibited from approving any financial assistance for acquisition or construction in SFHA. This includes Federal agencies making loans or grants for the permanent repair of damaged buildings.

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, livestock 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 Analysis*, Michigan has an annual average of 191 hail storms incurring over $17 million in property damages, nearly $600,000 in crop damages, and 0.2 deaths. 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 Michigan's 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, 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 Wexford County is at risk from hailstorms damage. Most Michigan counties see an average of two hail events per year.

Extent

According to the NOAA National Centers for Environmental Information, the approximate size of hail is described as follows in Table 37. If a thunderstorm produces hail that is 1 inch in diameter (quarter size) or larger, it is considered to be a severe thunderstorm.

Table 37: 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

Source: https://www.ncdc.noaa.gov/stormevents/faq.jsp

The greatest extent hail reported in Wexford County is 2 inches in diameter. This occurred on July 25, 2012 during a hailstorm between Manton and Missaukee JCT, and on September 7, 2021 in Cadillac. According to the scale, hailstones of this size are equivalent to a hen egg.

Previous Occurrences

Between 1984 and 2022, Wexford County had 33 hailstorms reported to NOAA (Table 38). There are no reported property damages, crop damages, injuries or deaths attributed to hail in Wexford County.

Table 38: Wexford County Hail Events

Begin Location	Date	Magnitude (in.)
	6/17/1984	0.75
	7/23/1988	0.88
	3/27/1991	1.75
Cadillac	8/3/1993	0.75
S WEXFORD COUNTY	5/18/1996	0.75
CADILLAC	6/10/1996	0.88
BUCKLEY	4/6/1997	0.75
MANTON	7/16/1997	1.5
CADILLAC	8/23/1998	0.75
CADILLAC	8/23/1998	1
CADILLAC	5/12/2000	0.75
CADILLAC	6/8/2003	0.75
CADILLAC	6/8/2003	0.75
MANTON	5/24/2004	0.88
CADILLAC	6/27/2006	1.5
CADILLAC	7/9/2006	0.75
CADILLAC	10/2/2006	0.75
BAXTER	5/9/2007	0.88
CADILLAC	10/18/2007	0.75
MESICK	6/12/2008	1.75
MANTON	6/12/2008	0.75
CADILLAC	6/12/2008	0.88
LAKE CADILLAC	6/22/2008	0.75
CADILLAC	7/18/2010	0.75
LAKE CADILLAC	4/10/2011	0.75
MANTON	5/29/2011	0.88
MANTON	7/25/2012	2
CADILLAC	4/7/2020	1
CADILLAC	4/7/2020	0.75
MANTON	4/7/2020	1.25
CADILLAC	9/7/2021	2
CADILLAC	9/7/2021	1
YUMA	9/21/2022	0.75

Source: NOAA: National Centers for Environmental Information

Probability of Future Events and Vulnerability Assessment

There have been 33 hail events reported in Wexford County in 19 years. This equates to an average of 1.7 hail events per year. All buildings, exposed infrastructure, and populations are at risk from hailstorms since hail causes damage to roofs, brick walls, glass, landscaping, crops, and vehicles. Mobile homes and campground populations located throughout the county and are more susceptible to hail damage (refer to the Vulnerable Populations and Hazard Areas map in Appendix A). 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.

The magnitude and severity depend on the county population, seasonal activity, and the spread of development. During the summer months, the base population expands by as much as 73% due to the peak presence of seasonal homeowners and overnight visitors. Residents and visitors are attracted to both rural, sparsely populated natural areas as well as village and city centers throughout the year for outdoor recreation (motorized & non-motorized trails; year-round camping, hunting, swimming/boating) and festivals/special events.

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 Wexford County is at risk from lightning strikes.

Extent/Previous Occurrences
Lightning can be measured by damages-caused including deaths, injuries, and property or crop damages.

There has been one lightning event reported to NOAA that included Wexford County and other counties in the Northern Lower Peninsula, as described below.

> On September 1, 2000 a series of evening thunderstorms across the northwest Michigan region produced lightning that was nearly continuous. One man was killed by the lightning (in Grand Traverse County) when he and his 9 year old son climbed a small hill behind a shopping mall to view the approaching lightning. The 40 year old father was struck and killed by a lightning bolt. His son was thrown to the ground, but only sustained minor injuries. Lightning that Friday night also disrupted numerous high school football games. Many games were cancelled or postponed until the following Saturday morning. Many of the schools which began play had lengthy delays and many waited an hour or more before fans and players could return to the field. This was widely covered by area newspapers and television stations. The cost of postponed games is not known.

Probability of Future Events and Vulnerability Assessment
There has been one impactful lightning event on record affecting Wexford County in the last 23 years, indicating there is a 4.3% annual chance that a damaging lightning event would occur in a future year. However, not all lightning events may have been reported since events with injuries, deaths, and extensive damages tend to be the only ones reported. Therefore, the number of lightning events and damages are likely higher.

Lightning strikes can cause structural, gas well, or wildland fires (especially in drought/dry soil conditions); disruption of outdoor events; inoperability of electrical, telecommunications, and utility systems; destruction of personal property; and injury or death to people. Persons that work outside or participate in outdoor recreation activities have a higher risk of being struck by lightning.

The magnitude and severity of a lightning event depend on the county's seasonal population, activity, and the spread of development. During the summer months, the base population expands by as much as 73% due to the peak presence of seasonal homeowners and overnight visitors. Residents and visitors are attracted to both rural, sparsely populated natural areas as well as village and city centers for outdoor recreation (motorized & non-motorized trails; year-round camping, hunting, swimming/boating) and festivals/special events.

The approximate locations of campgrounds in the county are indicated on the *Vulnerable Populations & Hazard Areas Map* in the Appendix. These are areas where concentrations of people and property can be particularly vulnerable during a severe winter weather, thunderstorm, high wind, lightning, hail, tornado, wildfire, extreme temperatures, or public health emergency.

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 injury or 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 Hazard 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 1999 and 2019, Michigan has had 314 reported tornado events with 52.9% as EF0 (weak) or EF1 (moderate), 38.9% reported as F0 or F1 (weak), 6.7% as EF2 (significant) or EF3 (severe), and 1.6% as F2 (strong). In Northern Michigan, tornados are most likely 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 Wexford County is at risk from tornadoes. It should be noted that it is impossible to predict where and with what magnitude a tornado will touch down. Approximate trajectories of recorded tornadoes with NOAA are illustrated on the Hazard Areas Map in Appendix A.

The eight tornadoes described in Table 43 have impacted different communities in Wexford County. The appended *Hazard Areas* map and *Vulnerable Populations and Hazard Areas* map show the estimated trajectories of the reported tornado events in the county.

Extent

The Fujita Scale (Table 39) 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.

Wexford County's most damaging tornados occurred on July 31, 1963 and June 7, 1974 with winds ranging from 110-137 mph, with damages totaling $275,000. One injury occurred as a result of the 1974 tornado.

Table 39: Fujita and Enhanced Fujita Scale Comparison

Fujita Scale		EF Scale	
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

Since 1963, Wexford County has had 8 reported tornadoes, causing a total of $820,500 in property damages and one injury (Table 40).

Table 40: Wexford County Tornado Events

Location	Date	Deaths	Injuries	Scale	Property Damage	Crop Damage
Haring Charter Twp, & Clam Lake Twp.	7/31/1963	0	0	F2	$250,000	-
Clam Lake Twp.	8/4/1968	0	0	F1	$2,500	-
Cherry Grove Twp.	6/7/1974	0	1	F2	$25,000	-
Liberty Twp.	6/15/1976	0	0	F1	$25,000	-
Selma Twp.	7/7/1980	0	0	F0	$0	-
Village of Buckley	10/15/1989	0	0	F1	$250,000	-
Cherry Grove Twp.	10/4/2006	0	0	F0	$260,000	-
Clam Lake Twp.	7/18/2010	0	0	EF0	$8,000	-
TOTAL	**8 Tornados**	**0**	**1**	**F0 – F2**	**$820,500**	**$0**

Source: NOAA's National Centers for Environmental Information Storm Events Database

Probability of Future Events and Vulnerability Assessment

There have been eight tornado events reported in Wexford County between 1963 and 2022 (60 years), equating to a 13.3% annual chance a tornado would occur in a future year. While the chance for a tornado is low, if an event occurs, there is potential for a higher magnitude tornado to touch down. Most of the reported historic events have caused property damage. Additionally, the public online community survey results indicated that high winds/tornado was the second most likely type of natural hazard event that would have a major impact on the county's communities.

The magnitude and severity of a tornado impact can vary depending on the county's seasonal population and activity, and the spread of development. During the summer months, the base population expands by as much as 73% due to the peak presence of seasonal homeowners and overnight visitors. Residents and visitors are attracted to both rural, sparsely populated natural areas as well as village and city centers throughout the year for outdoor recreation (motorized & non-motorized trails; year-round camping, hunting, swimming/boating) and festivals/special events.

The approximate locations of mobile homes and campgrounds in the county are indicated on the *Vulnerable Populations & Hazard Areas Map* in the Appendix. These are areas where concentrations of people and property can be particularly vulnerable during a severe winter weather, thunderstorm, high wind, lightning, hail, tornado, wildfire, extreme temperatures, or public health emergency.

The county utilizes the "*Code Red*" mass notification system for notification of tornado warnings and watches, along with other severe weather alerts. The system notifies a participant via their mobile or land-line phone. The National Weather Service may concurrently utilize their notification system when deemed necessary in severe weather event situations to send phone notifications to all users within signal of a cellular tower. Tornado sirens are no longer utilized in the county as they are not as effective or efficient as the Code Red system.

Cellular phone reception has been known to go down during wind storms, lightning strikes to cellular towers or as a result of high system demand in the peak summer tourism season. With this loss of communication, a backup system for communications is recommended, such as battery or solar powered NOAA weather radios. Additionally, local governments should pursue discussions with cellular utility providers regarding improvements to the cellular communications grid, such as additional towers or generator installation.

Wexford County Emergency Management Department maintains contracts with the eleven local fire stations in the county so that they may be utilized as temporary shelters in the event of an emergency. Additionally, the American Red Cross (ARC) can set up temporary shelters within 12-24 hours after an emergency event occurs; usually this is done within an existing structure. The Wexford County Senior Centers in Manton and Cadillac, as well as the Cadillac YMCA, can be utilized during the day hours for temporary heating/cooling shelters.

The American Red Cross can assist with organizing long-term shelters to house large amounts of people overnight; the Wexford Civic Center can hold about 4,000 people for this purpose if necessary. The Cadillac-Wexford Transportation Authority can be utilized for transporting people to shelters after an emergency.

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.

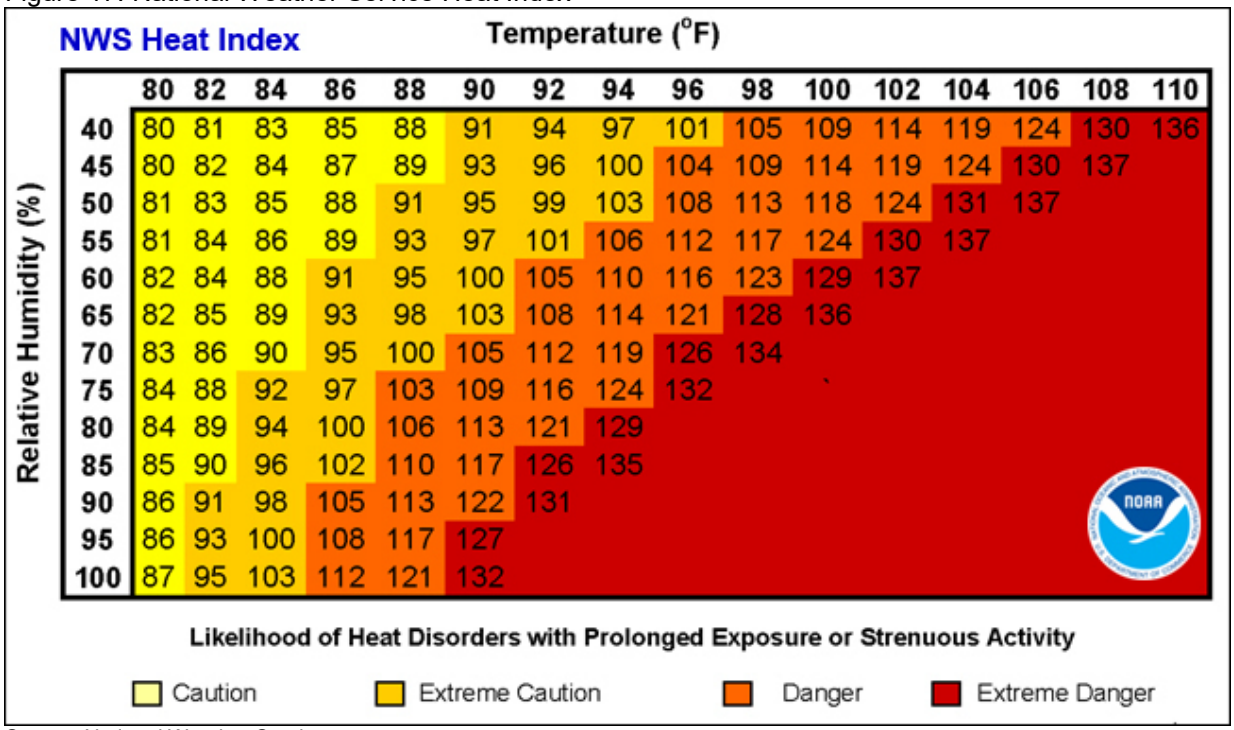
Nationwide, there have been approximately 175 deaths per year that are attributable to extreme heat according to the 2019 Michigan Hazard Analysis. The threats from extreme heat are heatstroke, sunstroke, muscle cramps, heat exhaustion, and fatigue. It is hazardous to livestock and agricultural crops, 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.

Measuring Extreme Temperatures (Extreme Heat and Extreme Cold)
Extreme heat is measured with the National Weather Service's Heat Index Chart (Figure 17). 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.

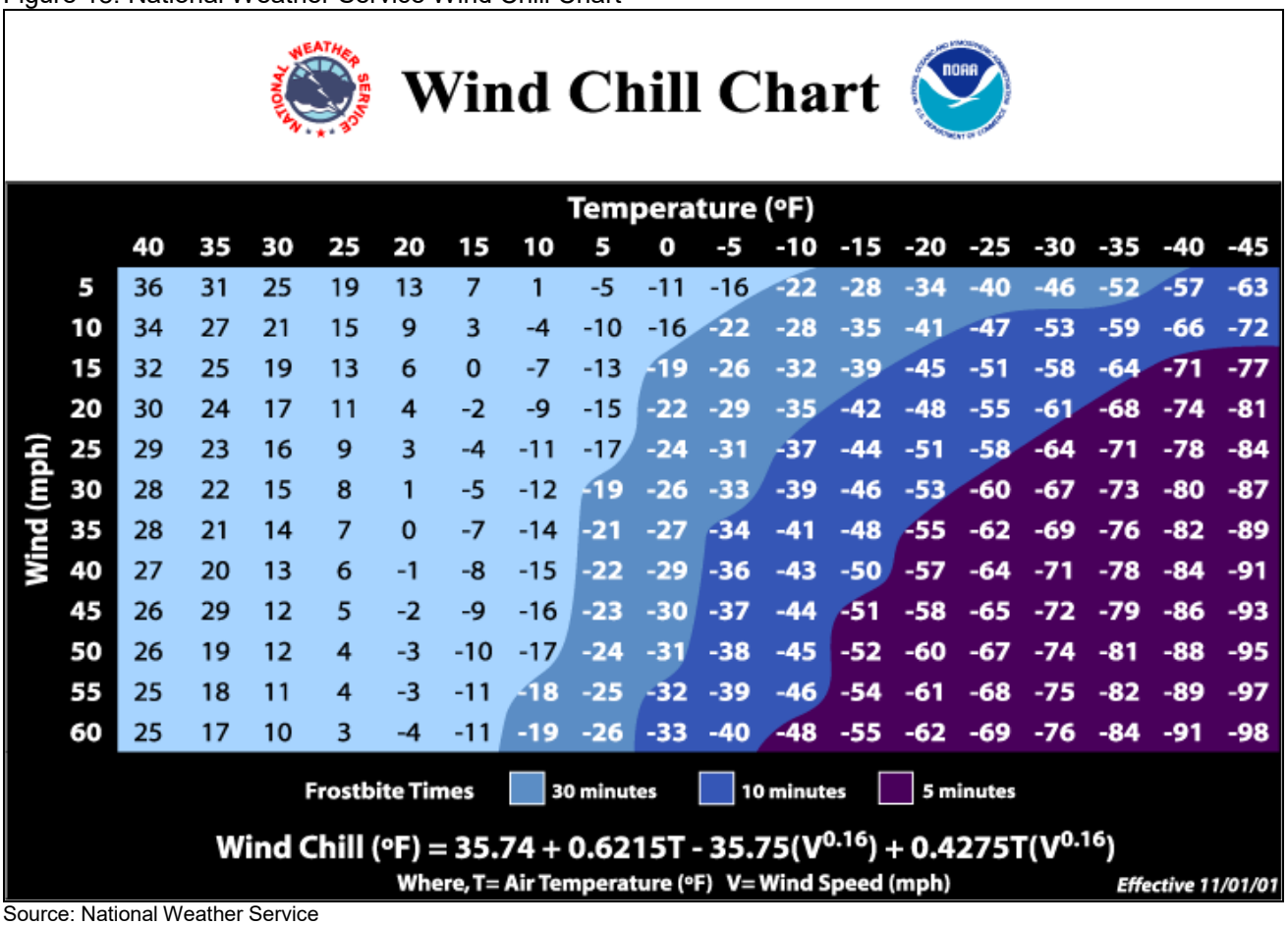
Figure 17: National Weather Service Heat Index



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 18 shows the NOAA Wind Chill Chart as it corresponds to various temperatures and wind speeds.

Figure 18: National Weather Service Wind Chill Chart



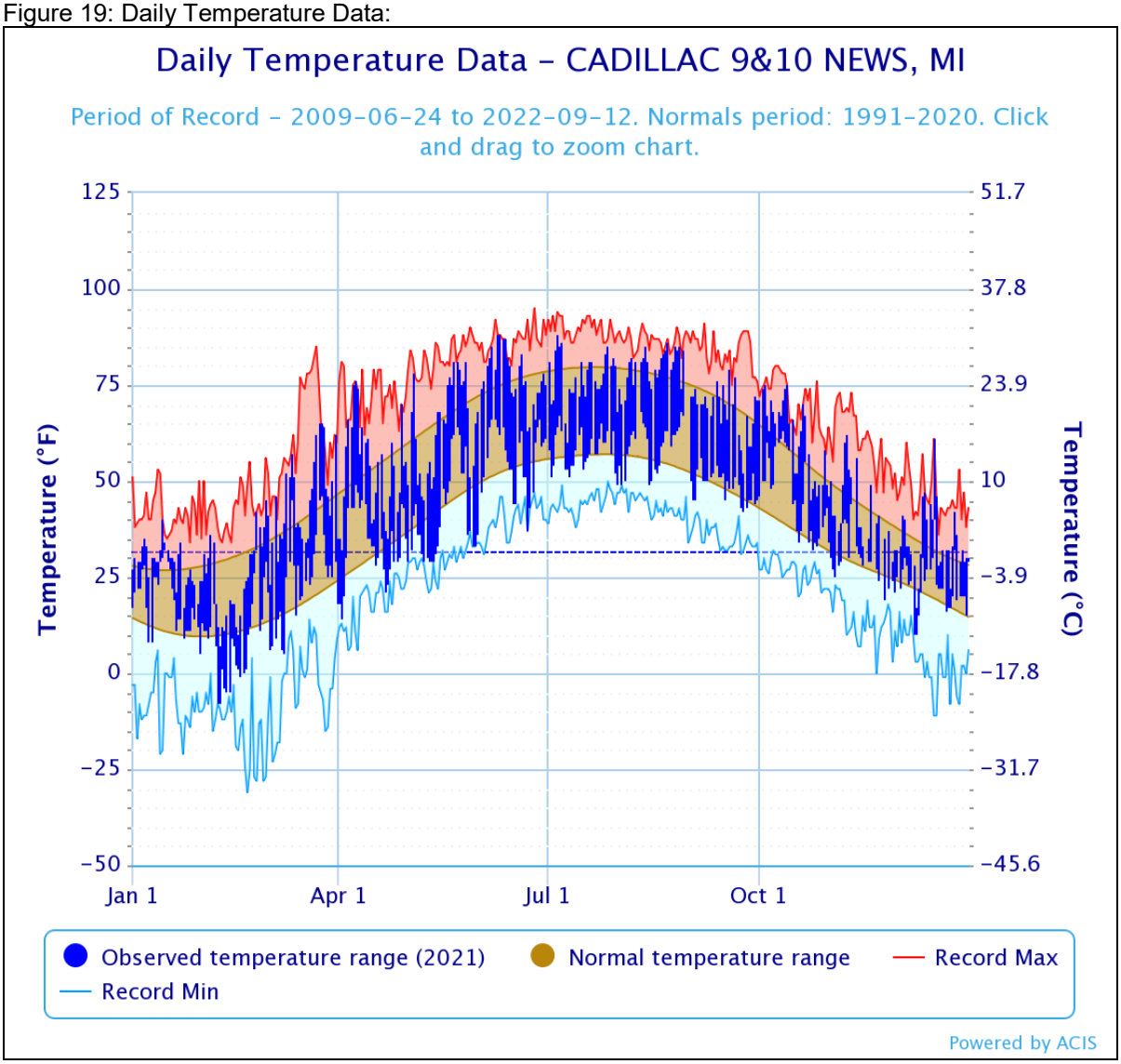
Wind (mph)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Source: National Weather Service

Figure 19 illustrates the observed daily temperature ranges at the Cadillac 9&10 news station for 2021. The dark blue line shows temperatures recorded between January 1, 2021 and December 21, 2021. The red line above shows record high temperatures for that day, and the light blue line below indicates record low temperatures for that day on record since 1991. Several record temperatures were reached in 2021 for the following days:

- January 14: 40 degrees F.
- February 7: -8 degrees F. (record low)
- March 4: 46 degrees F.
- March 11: 57 degrees F.
- March 24: 65 degrees F.
- March 25: 64 degrees F.
- April 8: 76 degrees F.
- April 9: 74 degrees F.
- June 9: 88 degrees F.
- June 10: 88 degrees F.
- June 11: 87 degrees F.
- June 22: 37 degrees F. (record low)
- October 13: 75 degrees F.
- October 20: 70 degrees F.
- December 16: 61 degrees F.

Figure 19: Daily Temperature Data:



Source: NOAA Climate Data Online

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 Wexford County is at risk from extreme temperature events.

Previous Occurrences

Wexford County has had two extreme heat events in 2001 and 2018. The events did not have any deaths, injuries, or property/crop damages. The heat events consisted of hot and humid conditions that caused outdoor events to be modified and attendance at outdoor events to be lower than normal. Details of these events from the NOAA Storm Events Database are provided below:

> The first instance of reported excessive heat occurred on August 1, 2001. Excessive Heat was also a problem the first two weeks in August across all of northern Michigan. Temperatures reach the mid to upper 90s, on average, a few days each year; however, for a 5 day (8/5 - 8/9) stretch overnight low temperatures failed to fall below the lower 70s in most areas. This very humid air mass was unusual for northern Michigan, an area which typically sees cool nighttime temperatures and for this reason has very few homes with air conditioners. No heat related deaths or injuries were reported; however, most outdoor events were modified due to the forecasts of hot and humid conditions. County fairs sent animals home, yet still there were livestock losses at fairs in Otsego and Alcona counties. Attendance at county fairs was well below normal and this was attributed to the heat. This period of excessive heat also brought on a drought event at the same time.
>
> The second instance of reported excessive heat occurred on June 30, 2018. The month of June closed with one of the hottest days in recent memory. Highs were well into the 90s, including 99 at Alpena, and 98 at Traverse

City and Gaylord. The National Weather Service office near Gaylord also hit 98; that was (by several degrees) the warmest reading recorded at that location since observations began there in the late 1990s. Heat indices exceeded 105 degrees across most of northern Lower Michigan, and some locations exceed 110. The warmest reported heat index on the day was 114 near Indian River. An estimated 25 to 30 individuals visited local hospitals due to heat-related illnesses.

There have been three extreme cold events/wind chill events on record with NOAA for Wexford County - in 2007, 2014 and 2015 - as well as one Governor-declared statewide emergency for extreme cold in 2019. Details are provided below:

The first reported event occurred on February 4, 2007. Exceptionally cold air surged into Northern Michigan. High temperatures on the 4th (Super Bowl Sunday) were around zero, with low temperatures that night from five to ten below zero. Gusty northwest winds produced hazardous wind chills of 20 to 30 below zero, along with blowing and drifting snow. Many area schools closed on the 5th, due to the extreme cold and poor road conditions.

The second instance of extreme cold/wind chill in the Great Lakes Region was in 2014 was the coldest since at least January 1994. Near- to below-zero temperatures were accompanied by blustery northwest winds. Away from the warming influence of Lake Michigan, wind chills sunk to 30 below zero or colder. The coldest wind chills observed were -44 near Cedarville, -39 near Engadine, -36 at Sault Ste Marie, and -33 at West Branch and Houghton Lake. All of these were reached in the morning hours of the 7th; school closings were widespread across northern Michigan on the 7th.

The third instance of extreme cold/wind chill occurred on February 19, 2015. Wind chills reached 30 to 40 below zero across part of northern Michigan, bottoming out at -43 near Cadillac early in the morning on the 19th.

The fourth instance of extreme cold/wind chill was the Governor Declared Emergency that occurred on January 29, 2019. Wind chills of 15 to 30 below zero were common in northern Lower Michigan. Wind chills were much colder in the UP, including -51 at Kinross, and -42 at Sault Ste Marie and Mackinac Island. The low temperatures caused schools to close.

Probability of Future Events and Vulnerability Assessment

There have been two extreme heat events on record with NOAA in Wexford County in the past 22 years. This indicates that there is 9% annual chance of an extreme heat occurring in a future year.

Since 2007, there have been four extreme cold/wind chill events on record for Wexford County. This indicates that there is a 25% chance of another extreme cold event occurring in a future year. Since extreme cold events tend to occur during the winter months and are coupled with blustery winds and snowstorms, these events may have been reported as other hazards or not at all, which means these events may occur more frequently.

Extreme heat and cold events are most likely to impact unsheltered populations (i.e., people at campgrounds, participating in outdoor recreation activities, and the homeless) as well as persons with existing health conditions living in poorly insulated structures. There are two homeless/safe house shelter sites in the county, located in Cadillac: New Hope Center and Oasis Family Resource Center.

Furthermore, the *Northwest Lower Michigan Coastal Resilience Atlas,* produced by the Land Information Access Association (LIAA), includes a Heat Vulnerability Assessment[11] 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 folowing factors:

- Persons > 65 years old
- 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)

While LIAA's study did not include Wexford County communities as they do not adjoin Lake Michigan, these demographic factors should be considered when developing future mitigation planning efforts to protect vulnerable populations in Wexford County from extreme temperature events.

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

Drought

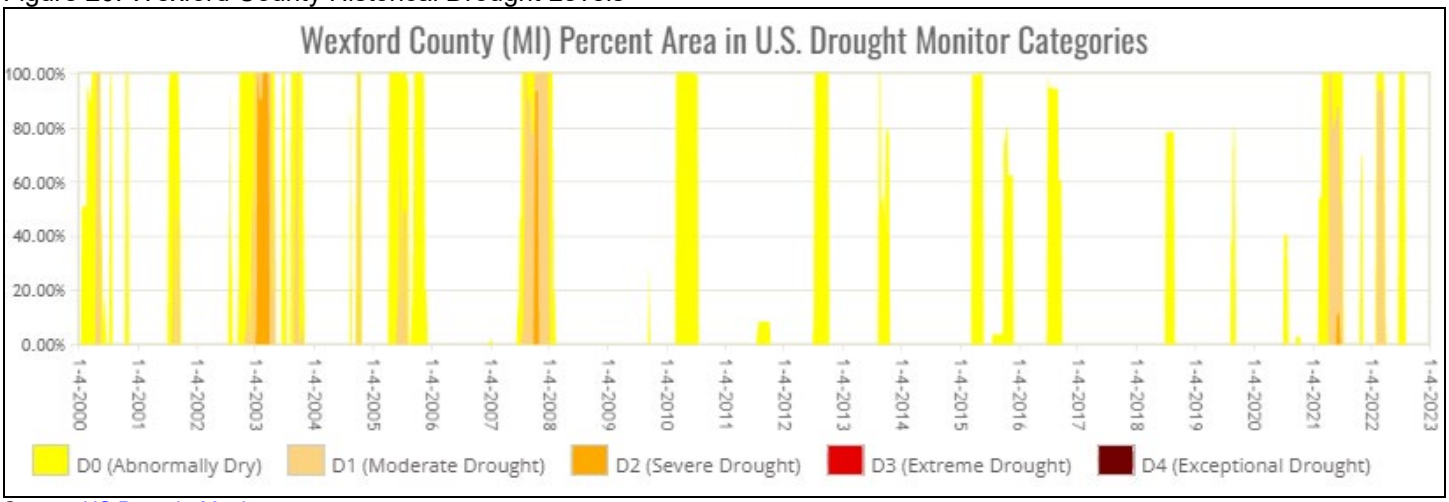
Drought is a normal part of the climate cycle. It is a slow-moving hazard, which causes people to underestimate the damage it can do, but losses from drought are as substantial as those from hurricanes, tornadoes and other faster-moving disasters. Drought can cause agricultural production loss; affect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

Location
Drought is a regional event that is not confined to geographic boundaries and range in severity across the affected areas. All of Wexford County is at risk 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 (Figure 20) 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) (Figure 21).

Figure 20: Wexford County Historical Drought Levels



Source: US Drought Monitor

Figure 21: 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
On March 2, 1977, a Presidential Emergency was declared for drought problems affecting 44 counties in Michigan, including Wexford County.

Additionally, the NOAA NCEI Storm Events Database contains a drought incident for Wexford County between August 1 and 9, 2001. 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 have been two incidents of a drought incident affecting Wexford County in the past 46 years. This indicates a 4.3% chance of a drought occurring in a future year. In Northern Michigan's forested regions, drought can adversely impact timber and agricultural production and some tourism and recreational enterprises. This can also result in a drop in local income, which impacts other economic sectors.

The biggest problem drought presents, however, is the increased threat of wildfire. Much of Wexford County is heavily forested, especially with pine trees, and are therefore highly vulnerable to wildfire in drought conditions.

Unpaved roads may also require applications to control dust during drought conditions, which is an expensive and short-term solution provided by County Road Commission.

Additionally, the threat to water sources should also be considered. Many residents rely on ground water wells for drinking water and/or irrigation. Even drought events in category D1 experience water well level decline. Drought events combined with excessive heat can also have severe impacts on those with health conditions and the elderly.

Wildfire

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 dependent 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 wildfire is from human activities, specifically burning outdoor debris. Recently, only about 4% of all wildfires in Michigan were caused by lightning strikes, and most other causes have been attributed to human activity. Most Michigan wildfires occur close to where people live and/or 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 the affected area or who are using recreational facilities in the area. 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 the state of 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 (1) increased use of specialized equipment to suppress the fires, and (2) intensified efforts toward fire prevention.

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 279,956 acres or 76% of Wexford County is forested. Red Pine comprises 32.9% of the county's forested land; Jack Pine comprises 3.39% and Eastern White Pine comprises 0.03%. Refer to the locations of pine forest shown on the *Hazard Areas* Map and *Environmental Features* Map in Appendix A.

Extent and Previous Occurrences

Extent can be measured by the number of acres burned and the cost of property damage. Approximately 41% of the county's total acreage is managed by the National Forest Service and the Michigan Department of Natural Resources.

According to the *2019 Michigan Hazard Analysis* from the Michigan State Police, between 1981 and 2018 there were 467 reported wildfires on lands in Wexford County under MDNR jurisdiction. This is equal to 31.6 acres burned and 12.3 wildfires per year on MDNR land. Additionally, in the 10-county NW MI Region, Wexford is ranked second in the state for MDNR wildfire frequency (Kalkaska County is #1).

The MDNR responded to the "Bond Mill Pond Fire" on May 1, 2018 in Haring Twp., about 5 miles N/NW of Cadillac. An estimated 79 acres were burned, mostly involving state forest lands. The USFS provided helicopter support for fire suppression with a water drop. (Source: MSP's 2019 Michigan Hazard Analysis).

According to the 2021 USDA/USFS publication *Spatial Wildfire Occurrence Data for the United States, 1992-2018 [FPA_FOD_20210617*], there were 34 fires that occurred on federal lands in Wexford County between 1992 and 2018, comprising about 141 acres of land burned.

Probability of Future Events and Vulnerability Assessment

There is a 100% chance in any given year that there will be a wildfire on MDNR or USFS lands, and a small chance there will be a wildfire on lands outside of these areas. Forest types (Red Pine, Eastern White Pine, and Jack Pine) within Wexford County are most susceptible to wildfires. With the exception of the City of Cadillac and Clam Lake Township, the remaining jurisdictions in Wexford County are heavily forested with pine and are therefore highly vulnerable to wildfire threats.

Factors that increase fire risk include drought, dead or dying trees as a result of disease/invasive species (such as the Emerald ash borer), lightning strikes, fallen power lines due to high winds, and 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. Local fire departments have mutual aid agreements in order to provide additional coverage for rural, sparsely populated, or difficult to reach areas. Residential development in rural Wexford County is often isolated from town centers and emergency services. Many of these areas interface with public lands and local emergency services coordinate fire services with State and Federal fire protection agencies.

The online community survey results received for this hazard mitigation plan update indicated "wildfire" as the top natural hazard event that would have the largest impact on Wexford County. A survey respondent in Cherry Grove Township indicated: *"Large parcels of federal lands are forested in our township and could create a large fire."* Additional public input received from communities as a part of the planning process included concerns about un-attended campfires and unpermitted bonfires as a wildfire risk factor on state and federal recreation lands.

As a proactive fire prevention measure, the Wexford Joint Planning Commission's 2017 zoning ordinance[12] includes in the General Provisions, Section 1042, "High-Forest Fire Urban Interface Regulations", as quoted below. This zoning ordinance applies to the 10 Townships of Wexford, Hanover, Liberty, Springville, Antioch, Slagle, Boon, Selma, South Branch, and Cherry Grove.

> "Any structure constructed or altered after the effective date of this Ordinance which is located in a highly combustible vegetation area shall comply with the requirements of this section. "Highly combustible vegetation area" means an area which has predominantly evergreen tree species with lower branches which do not die and are near to the ground, such as, but not limited to, Jack Pine or Scrub Pine (Pinus banksiana), Scotch Pine or Scotch Fir (Pinus Sylvestris), Red Pine or Norway Pine (Pinus resinosa), Spruces (Picea), Hemlock (Tsuga candensis), and Cedars or Junipers (Pinaceae); and other situations where structures encroach into wildlands.
>
> A. Defensible space.
> 1. A three (3) foot primary fire-defensible space shall be established on all sides of each structure. Primary fire-defensible space shall:
> a. not have any combustible materials.
> b. have landscaping which includes, but is not limited to, non-combustible materials such as gravel, marble chips, concrete, or mineral soil. c. Not have a cluster of combustible trees, and no Jack Pine or Scrub Pine (Pinus banksiana), and Scotch Pine or Scotch Fir (Pinus Sylvestris) species.
>
> 2. A thirty (30) foot secondary fire-defensible space within the parcel shall be established on all sides of each structure. The thirty (30) foot secondary fire-defensible space shall be increased by one (1) foot for each one (1) foot where the ground slopes more than 15% down from the structure. Secondary fire-defensible space shall have:
> a. tree branches below six (6) to ten (10), or more, feet pruned and removed.
> b. trees spaced so the edges of crowns are ten (10) to sixteen (16), or more, feet apart.
> c. household and other debris, brush, ground fuels (leaves and pine needles) removed.
> d. landscaping which includes, fire-resistant plants such as those listed in Michigan State University Extension bulletin E-2948 "Wildfire-Resistant Landscape Plants for Michigan" of 2005 or a manicured lawn or garden.
>
> 3. A tertiary space beyond the thirty (30) to one hundred (100) foot secondary fire-defensible space within the parcel shall be established on all sides of each structure. Tertiary space shall have:
> a. trees spaced so the edges of crowns are ten (10), or more feet apart and distance from power lines.
> b. trees spaced so trunks are twenty (20), or more feet from other trees.
> c. tree branches below six (6), or more, feet shall be pruned and removed.
> d. household and other debris, brush, ground fuels (leaves and pine needles) removed.
>
> B. At minimum of ten (10) feet shall be between each structure, firewood storage pile, fuel storage, and storage of other flammable items; or shall be situated outside of the secondary fire-defensible space.
> C. Chimneys and flues shall be provided with an approved spark arrester made of 12-gauge welded or woven wire mesh with holes no larger than ½ inch. A ten (10) foot secondary fire-defensible space shall be established on all sides of each chimney, flue, grille or similar structure.
>
> D. In addition to requirements of P.A. 230 of 1972, as amended, (being the Stille-Derossett-Hale Single State Construction Code Act of 1972, M.C.L. 125.1501 et seq.) the following design features are recommended:

[12] http://www.wexfordjpc.org/uploads/9/7/9/9/97992734/wexford_joint_zoning_ord_feb_2021-web_copy_updated_1-25-23.pdf

1. Roofs are designed and constructed to minimize the possibility of ignition from a wildfire and to minimize the spread of a structural fire to the wildland by use of National Fire Protection Association class A standards (metal, fiberglass shingle, clay, or tile).

2. Exterior walls are constructed of at least ½ inch sheathing or an equivalent material. Exterior sheathing shall extend from the roof line to ground level. Preferred siding should be non-flammable materials (such as brick, stone, stucco, or metal).

3. Foundations, crawl spaces enclosures, space under mobile homes; areas under porches, decks, or similar areas are provided with full enclosure skirting constructed of ½ inch nominal sheathing or the equivalent and made of non-combustible material (such as metal, block, cement, stone, stucco). Crawl spaces which have vents through the foundation and other similar openings are enclosed with metal screening with less than ⅛ inch openings.

4. Vents, eaves, fascias, soffits and other similar openings are enclosed with metal screening with less than ⅛ inch openings.

5. Windows are double pane glass. All windows, window wells in the foundation wall, and glazed openings within thirty (30) feet of concentrations of vegetative fuels should be provided with closeable, solid, exterior shutters, especially in areas of highly hazardous fuels, such as pine or spruce. Window wells in the foundation are enclosed with fire-resistant screening or other fire resistant material to prevent collection of flammable debris in the window well.

6. Space under decks is enclosed with fire-resistant screening or other fire-resistant material to prevent collection of flammable debris under the deck."

Dense Fog

Fog forms when water vapor condenses into tiny liquid water droplets that remain suspended in the air just above the Earth's surface, reducing visibility to values equal to or below locally/regionally established values for dense fog (usually 1/4 mile or less) and impacting transportation or commerce.

Two ways that air can become saturated with water are by cooling it to its dew point temperature, or by evaporating moisture into it to increase its water vapor content. Although most fog, by itself, is not generally a hazard because it does not actually apply damaging forces, the interaction between humans and fog can be a dangerous situation, sometimes resulting in disastrous consequences. It must be noted, however, that freezing fog (a hazard for which the National Weather Service issues special statements) can cause direct harm by causing slickness on roadways, walkways, bridges, and highway ramps, and therefore leading to serious transportation accidents.

Fog is not so easy to classify as a severe and high-impact hazard, although it has caused costs and casualties in the transportation sector, especially—sometimes with deadly consequences. Fog has played a contributing role in several multi-vehicle interstate highway pileups during recent years. While statistics suggest that highway accidents and fatalities, in general, have fallen, that trend is not evident with respect to accidents and fatalities caused by fog. The vast majority of automotive accidents are caused by unsafe driving habits and risk-taking behaviors, such as following too closely behind another vehicle, driving too fast for weather and visibility conditions, and distracted driving. Airplanes have their own inherent vulnerabilities when foggy conditions develop and make a safe landing more difficult.

Fog can be very dangerous when it reduces visibility. Although some forms of transport can penetrate fog using radar, road vehicles have to travel slowly and use their lights to become visible to each other. Localized fog is dangerous if drivers are surprised by it. At airports, some efforts have been made to develop methods (such as using heating or spraying salt particles) to aid fog dispersal, especially at temperatures near or below freezing.

One severe fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles, although real property and structures are usually unaffected. Fog has not yet been identified as one of the most significant hazards in any of Michigan's local hazard mitigation plans.

Location
Dense fog can be a local, regional, or state-wide event that is not confined to geographic boundaries and ranges in severity across the affected areas. The entire County is at risk from a dense fog event.

Extent
Dense fog can be measured by damages-caused from fog-related transportation accidents, such as deaths, injuries, or property damage.

Previous Occurrences
There are no dense fog incidents on record for Wexford County in the NOAA NCEI Storm Events Database.

Probability of Future Events and Vulnerability Assessment
Dense fog events are likely to occur more frequently than reported to NOAA, but likely go unreported if injuries, deaths and damages do not occur. The entire County can be impacted by a dense fog event, which can make travel of any mode very hazardous. The continued and increased use of NOAA Weather Radio and mobile alert systems can inform people of hazardous conditions and the appropriate precautions to take (such as limiting travel) during a dense fog event.

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 Wexford 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.

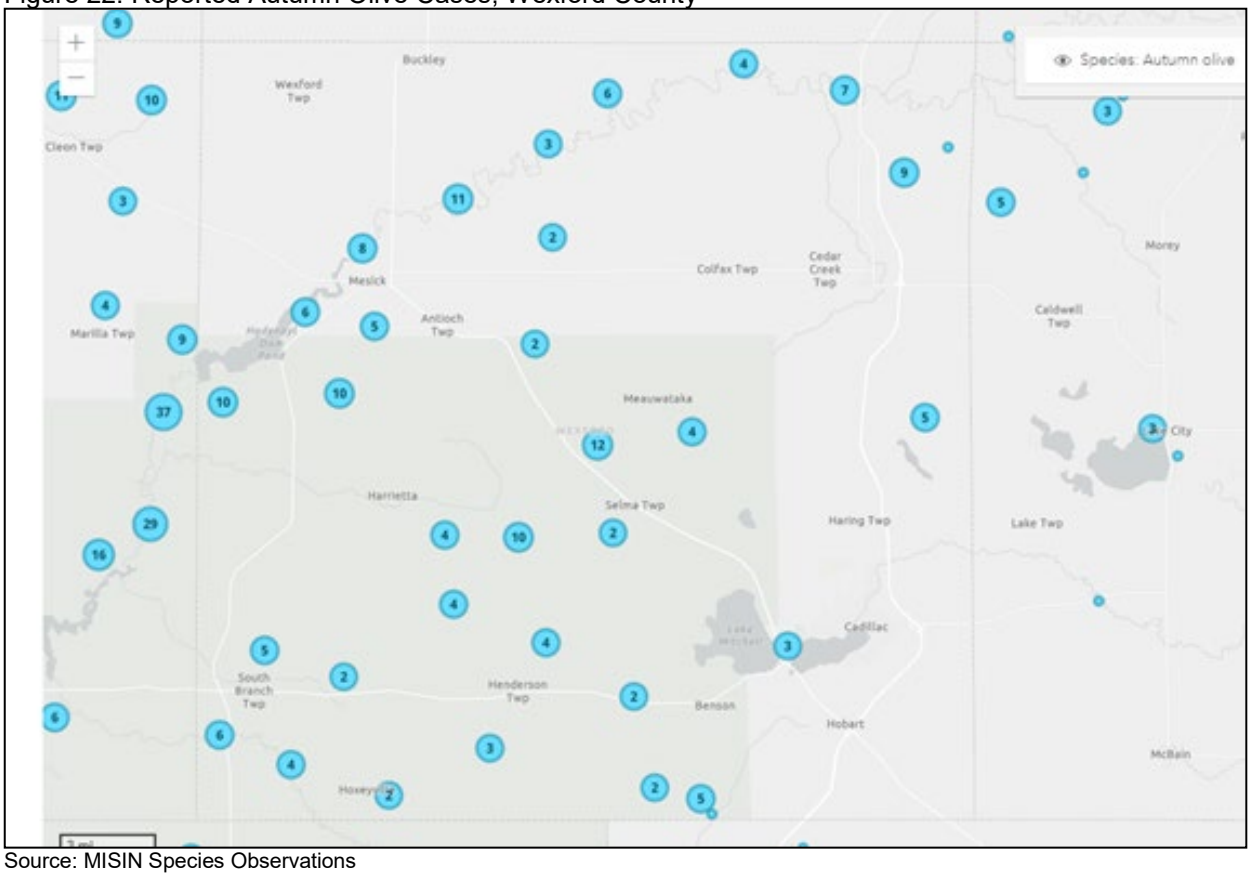
The Midwest Invasive Species Information Network (MISIN) is a regional effort to develop and provide early detection and response resources for invasive species. Among many tools and resources, the website (misin.msu.edu) provides a catalog of species information and a report of occurrences submitted within each state. Animals, plants, and diseases are included in the catalog. The top five reported species in Michigan are: Phragmites (invasive) with 66,793 reported observations; Garlic mustard with 20,396; Autumn olive with 17,346; Spotted knapweed with 16,436; and Brown marmorated stink bug with 13,310.

Location

Invasive species threaten those sensitive ecosystems and may be present in Wexford County forest, wetland, farmland, grassland, aquatic, and urban environments. 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 22 identifies reported Autumn olive cases throughout the county. Many of the reported cases are along the Manistee River or Pine River.

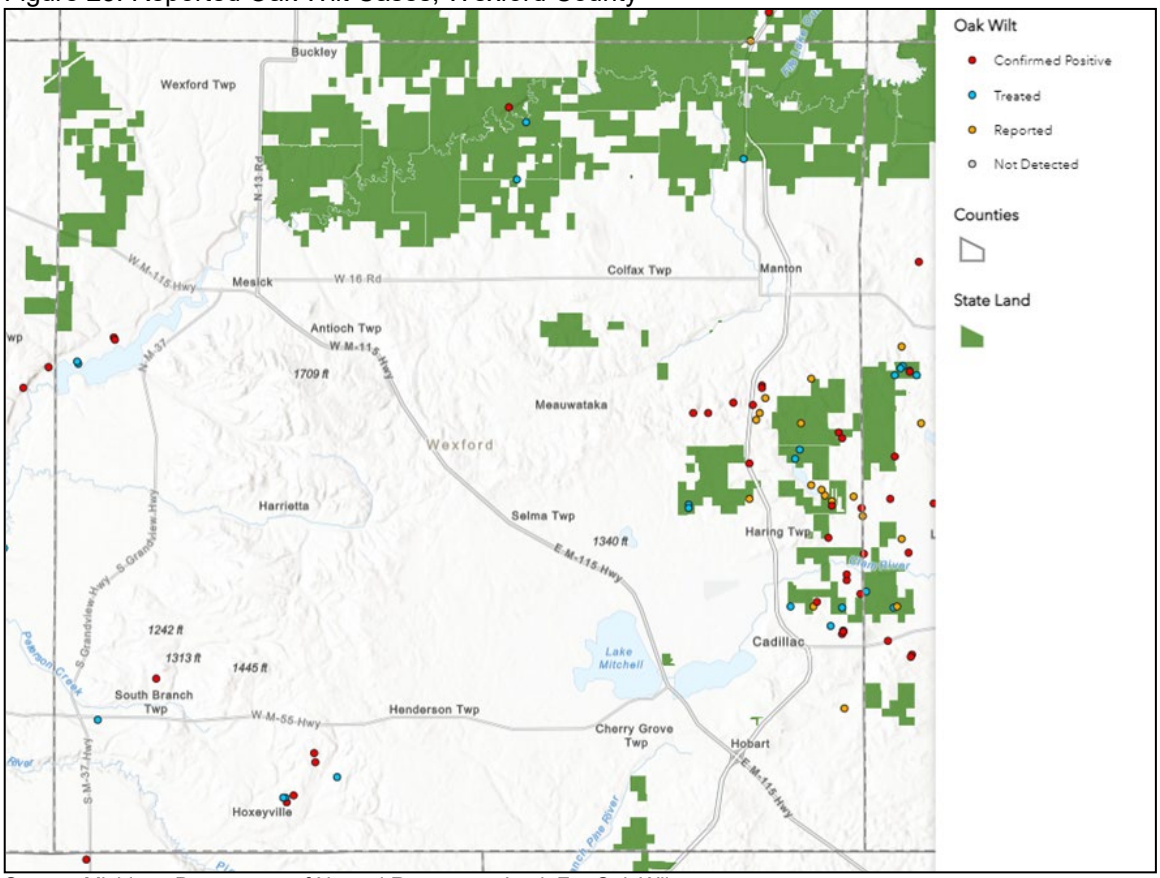
Figure 23 presents the MDNR interactive mapping resource “Look For Oak Wilt”, which allows users to submit and Oak Wilt Report throughout Michigan. Multiple numbers of Oak Wilt cases have been reported throughout Wexford County. These include trees confirmed positive for the disease, trees that have been treated, and reported cases. The reports of Oak Wilt disease are largely found in heavily forested areas and public lands in the northern, eastern and southwest portions of the county.

Figure 22: Reported Autumn Olive Cases, Wexford County



Source: MISIN Species Observations

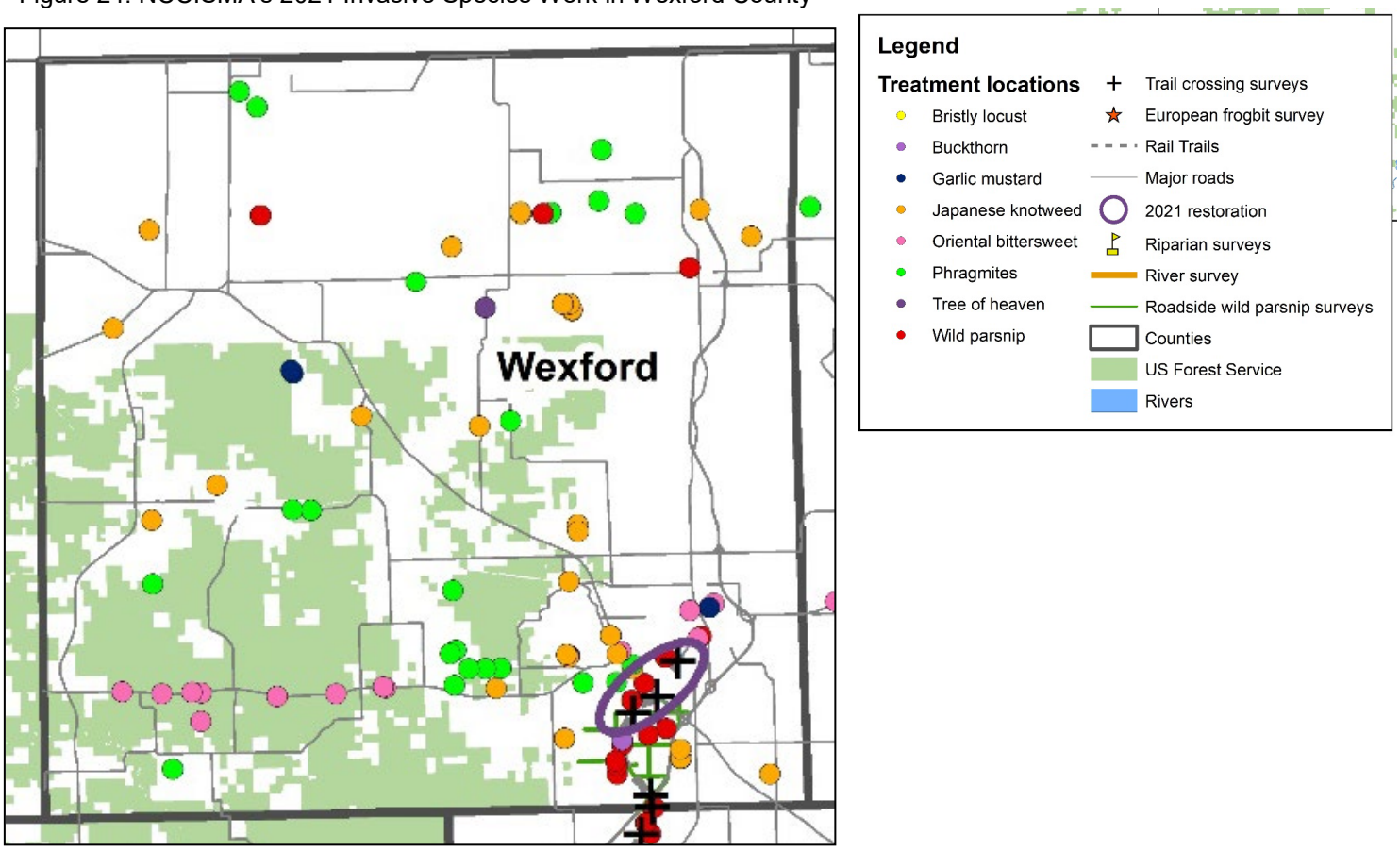
Figure 23: Reported Oak Wilt Cases, Wexford County



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

Additionally, the North Country Cooperative Invasive Species Management Area (NCCISMA) covers the six counties of Lake, Mason, Mecosta, Missaukee, Osceola, and Wexford. NCCISMA and its partners are committed to managing invasive species in northern Michigan through education, prevention, control, and restoration. Figure 24 is an excerpt from NC-CISMA's 2021 Annual Report, indicating invasive species treatment locations, surveying and restoration work in Wexford County.

Figure 24. NCCISMA's 2021 Invasive Species Work in Wexford County



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 impacts:

- The State of Michigan estimates 42% of threatened or endangered species are considered 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 2009[13]. A map of oak wilt cases in Wexford County is shown as Figure 18.

The Lake Mitchell Improvement Board's proposed 2022-2023 budget for invasive species management (PLM Lake Management, Restorative Lake Science, and weed pickup & processing) is $81,000.

[13] 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.

Previous Occurrences
The Department of Environment, Great Lakes, and Energy (EGLE) oversees invasive species programs for the State of Michigan. EGLE 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.

Since 2006, the City of Cadillac has administered a Eurasian milfoil management (EWM) program on Lake Cadillac. EWM is a submergent, aquatic perennial that reached 3-10 feet or more in length. Once established in a lake, control of EWM becomes a regular/annual maintenance program. In 2010, voters approved a three-year citywide millage to fund the program, which is designed to help improve recreational use in the lake while preserving the fragile balance that is required to keep the lake healthy. Lake Improvement Boards in the county, which are provided direction from the County Drain Commissioner, are charged with managing the water quality of highly used and valued inland lakes in Wexford County. Eurasian milfoil treatment and management remains an ongoing issue for these lakes.

The principle focus of the NCCISMA efforts is on invasive plant species, both in upland and wetland landscapes. However, cooperation with the efforts of the MDNR, the US Forest Service and other partners like Trout Unlimited and the area Foresters on target insect and aquatic invaders, is a secondary NCCISMA goal.

Based on its overall goal and goal elements in their Strategic Plan, NCCISMA has identified lists of Priority Species, Watch List Plants, and Other Watch List Species.

Priority Species are those invasive plants that have been shown elsewhere to have the potential for adverse landscape level impacts, but which NCCISMA and its partners believe can still be controlled in their region. While they have been observed in a number of locations throughout the NCCISMA region, by employing strategic targeted action that includes education, prevention and aggressive treatment, their further spread and adverse impacts can be largely prevented. Identifying and pursuing treatment of these plants sits at the top of the NCCISMA operations agenda.

Figure 25. NCCISMA High Priority Invasive Species

Source: http://www.northcountryinvasives.org/high-priority-species.html

- (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 also become a fire hazard when it dies down.

- 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.

- Glossy buckthorn is a shrub or small tree with simple, shiny leaves and pea-sized red to purple fruit. Despite the name, glossy buckthorn has no thorns. It is a threat to native plants in prairie fens and other ecologically important wetland communities. It is a host for alfalfa mosaic virus and crown fungus and may be a possible host for the soybean aphid.

- Common buckthorn is a shrub or small tree that can grow to 25 feet. It has oval, slightly toothed leaves. Twigs often have a single, sharp thorn at their tips. It spreads quickly through seeds distributed by birds and wildlife and crowds out native shrubs and understory plants. It is a host for alfalfa mosaic virus and crown fungus, and may be a possible host for the soybean aphid.

- Garlic mustard is an 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. It releases chemicals in the soil that interfere with the mycorrhizal fungus in the soil that our spring ephemerals require to survive. In this way it outcompetes native species and forms dense monocultures, not only eliminating native forbs on the forest floor, but also inhibiting tree regeneration.

- Oriental bittersweet is a vine plant that can strangle a tree and causes tree mortality. Its aggressive growth has been known to pull down awnings and fences. It overtops trees and girdles them, thus killing the trees, which creates the hazard of downed trees during wind events. This impacts ecosystem health and economic health that is associated with tree health.

- Wild parsnip is a single stemmed plant that grows to 5 feet tall. Yellowish green flowers form umbrella-shaped clusters 4 to 8 inches across. It spreads aggressively through seeds carried by wind, water and equipment. Its stem, leaves, and flowers contain chemicals that can increase skin sensitivity to sunlight and cause severe rash or blistering. Plant chemicals are known to reduce weight gain and fertility in livestock that eat wild parsnip.

- Tree of Heaven is a fast-growing, deciduous tree reaching up to 70 feet. Its leaves resemble native sumac, but its fruits are flat, twisted, winged seeds. Tree of Heaven's flowers and leaves have an unpleasant odor, somewhat like rotten peanut butter. Root shoots can develop into dense thickets. Roots can damage sewers and structures. Roots also produce chemicals that inhibit the growth of other plants.

- Bristly locust is a tree or small suckering shrub, growing from 2-10 ft tall, and new shoots are glandular-bristly. Often found in thickets since it spreads rapidly from root suckers. Leaves are alternate, pinnately compound; 9-13 entire, elliptical leaflets; 7-9 in long, green in color above and paler below. Stems are slender, zigzag and covered in bristly red hairs, later turning a gray-brown in color. Buds sunken, no spines. Produces attractive, rose colored pea-like in hanging clusters, yellow spot in the center, appearing in late spring.

NCCISMA “Watch List Plants” are invasive plants that have been observed in other locations, particularly southern Michigan and its bordering states. They either have not been observed in the NCCISMA geographic region, or their observation has been limited to a few isolated occurrences. For example, Chinese yam has spread to 16 southeastern states since its introduction in the 1800’s and has been recorded in some locations in Michigan. It can grow up to 16 feet in height, engulfing surrounding vegetation along the way. While this vine dies back in the winter, it grows and reproduces quickly enough to reduce plant diversity and threaten native ecosystems. The management objectives for these species rests heavily on education and identification efforts that will hopefully prevent them from becoming established and spreading in our region. Finding a watch list species triggers an Early Detection Response (EDR).

- Flowering rush
- European frogbit
- Pale swallow-wort
- Black swallow-wort
- Chinese yam
- Japanese stiltgrass
- Jetbead
- Kudzu
- Giant hogweed
- Water hyacinth
- Water lettuce
- Water soldier
- Yellow floating heart
- Lesser celandine
- Japanese chaff flower
- Himalayan balsam

NCCISMA "Other Watch List Species" consists of those non-plant species that NCCISMA and other partners have identified as being a priority in their invasive species efforts. The Asian long-horned beetle, for example, is currently found in Ohio, but has not been observed in Michigan. If the species were to gain a foothold in Michigan, the potential damage to Michigan's hardwood forest resource would be extensive and very expensive. Programs aimed at those species are being led by outside partnering agencies and partners. NCCISMA performs as a supporter of those programs, in an effort to extend their reach, and increase citizen awareness of the need for prevention and control efforts.

- Asian long-horned beetle can attack and kill many tree species including poplar, willow, sycamore, and horse chestnut, but its favorite host are maple trees. The larvae feed in tunnels in the wood of the tree branches and trunks, eventually killing the tree.
- Hemlock woolly adelgid are tiny insects that secrete white wax as they feed on sap from hemlock shoots and branches which can result in tree death.
- 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. The species is spread by illegal use as bait, and then dumping of the unused bait.
- 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. According to NC-CISMA, there is no known control for this species. Fly fishermen are thought to be the main means of its spread, and can aid in containing its spread by cleaning their waders between fishing trips with the cleaning agent "Formula 409".
- Thousand cankers disease involves an insect native to the southwestern U.S. The disease affects black walnut trees, a valuable economic and ecological resource in Michigan.
- Jumping worm, or "crazy snake worm", eat large amounts of leaf litter, changing the soil composition of forest floors, gardens and agricultural fields. Jumping worms can displace native insects and animals and make soil less favorable for plant growth.
- Spotted lanternfly sucks sap from the stems and leaves of orchard trees, grape vines, oaks, pines and other host plants.
- 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.

In addition to these targeted invasive species, NCCISMA also recognizes a number of invasive species as being "Species of Local Concern". The Species of Local Concern group includes invasive plants that are already generally well established and fairly wide-spread in the region. Nevertheless, in specific locations and habitats many NCCISMA partners may want to pursue aggressive control efforts against these species to achieve specific management objectives. Examples include aggressively controlling spotted knapweed in areas where endangered Karner blue butterflies are being managed, or controlling autumn olive in areas that are being managed for public recreation use. NCCISMA can effectively support these efforts by providing information and equipment, and publicizing the need for, and success, of these projects.

The NCCISMA Species of Local Concern include:

- 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. According to NC-CISMA, on a landscape scale, the fight against autumn olive has already been lost. While it is recommended that people interested in habitat restoration objectives remove autumn olive on their property, it is already too well established, and therefore is not considered a priority species for treatment/eradication efforts.
- Spotted knapweed is a bushy, perennial plant growing 2-3 feet with bluish- or grayish-green leaves and thistle-like pinkish-purple flowers. It is poisonous to other plants, creating barren areas where only knapweed grows. It is a threat to pastures and dry ecosystems including prairies and dunes. Can be a skin irritant.
- Oak wilt disease is an infectious vascular disease that can affect all species of oak. Red oaks get the disease more often and succumb more readily than white oak. The disease spreads via root grafts and sap-feeding beetles.
- Purple loosestrife is an herbaceous wetland perennial reaching 5 feet in height 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. According to NC-CISMA, It is now well controlled by the imported gallerucella beetle. When they are introduced into large populations of purple loosestrife they provide effective control for about 5 years. After the loosestrife population crashes, then the beetle population crashes. When the loosestrife population rebounds, beetles need to be introduced again.

- Multi-flora rose is a multi-stemmed shrub growing to 15 feet. Flowers are small, white to pink, and have a strong fragrance. Bright-red rose hips develop in the fall and persist into winter. It spreads aggressively, both by rooting canes (ends of branches) and by seed dispersed by birds and wildlife. Dense thickets of this shrub crowd out beneficial shrubs and plants and may deter native birds from nesting.
- Japanese barberry
- Honeysuckle
- Baby's breath
- Burning bush
- Norway maple
- Bradford pear
- Black locust
- Oregon grape

Agricultural pests are not included in NCCISMA's high priority, watch list, or local concern species lists. Agricultural pests do not meet NCCISMA's criteria for being listed as an invasive species. A focus on agricultural pests may diminish the core message of NCCISMA regarding the threats associated with invasive species as important to all citizens of the region, as opposed to a niche group, such as farmers. This is not to imply that agricultural pests are not important, or that they could not have a serious negative impact on the economy of the region, but rather they are excluded since there are other entities in place that routinely work with farmers and are better situated to handle these issues. Questions received by NCCISMA regarding exotic agricultural pests, such as spotted wing drosophila, Asian chestnut gall wasp, and brown marmorated stink bug, will be referred to the appropriate MSU Extension professionals.

Probability of Future Events and Vulnerability Assessment

The ongoing efforts of the North Country Cooperative Invasive Species Management Area (NCCISMA) and other partners, such as the US Forest Service, MDNR, Trout Unlimited and area Foresters, are essential to protect, enhance, and promote Wexford County's natural resources through invasive plant management, education, and outreach. Additionally, MSU Extension serves as an educational resource for agricultural pest and disease prevention and treatment, and Wexford Conservation District employs a Forester that can educate citizens about forest disease and pest prevention and treatment. Wexford County's natural resources are highly vulnerable to invasive animals, plants, and diseases. Significant natural features include forested areas such as the Pere Marquette State Forest and the Manistee National Forest, and water bodies such as Lake Cadillac, Lake Mitchell, the Manistee River and Pine River. The impact of the species listed on watch lists could be catastrophic for Wexford 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-fold[14]" (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*[15], 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.[16] 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).[17]

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.

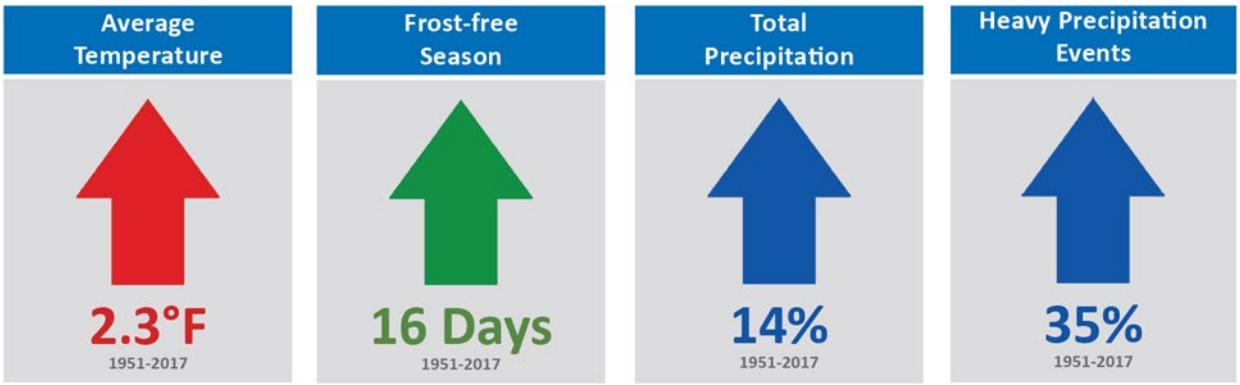
[14] *World Meteorological Organization*. (2021, August 31). Retrieved from Weather-related disasters increase over past 50 years, causing more damage but fewer deaths: https://public.wmo.int/en/media/press-release/weather-related-disasters-increase-over-past-50-years-causing-more-damage-fewer

[15] (2/4/2019). Retrieved from Climate Change in the Great Lakes Region: https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Pager.pdf

[16] 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.

[17] 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.

From 1951-2017, the 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***)**.

Climate Change Vulnerability Assessment
A vulnerability assessment in the report *Climate Change in the Great Lakes Region* by GLISA at https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Pager.pdf lists key challenges from climate change:

- **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.

Public Health Emergency (Infectious Disease)

Public health emergencies occur when there is a widespread and/or severe epidemic, contamination incident, bioterrorist attack, 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).

Location
A 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 Wexford County is at risk from an infectious disease event. Depending on the type of disease, different sectors populations are more susceptible.

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 Wexford 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. Additionally, according to the State of Michigan, as of January 10, 2023, there have been 8,587 cumulative cases of COVID-19 and 124 confirmed deaths due to COVID-19 in Wexford County. Those 80 years and older have the most deaths of any age group.[18]

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. In March 2020, the State of Michigan fell under declarations for a State of Emergency, National Emergency (3455), and Governor and Presidential Major Disaster (4494) for the COVID-19 Pandemic. Variants of the corona virus are still being found after the initial spread; vaccinations are available to limit the reaction from exposure and limit the spread of the disease.

Probability of Future Events and Vulnerability Assessment
Naturally occurring pandemics may result in widespread precautions around the world. The Michigan Department of Health and Human Services created a Pandemic Response Plan (Annex 12 of the MDHHS Emergency Operations Plan, June 2023) to respond to a large-scale outbreak of influenza and other highly infectious respiratory diseases. The elderly, immune-compromised, and low income populations are most vulnerable to public health emergencies.

The public online community survey results indicated an illness outbreak/pandemic (i.e., blizzard, heavy snow, ice storm) as the fourth most likely type of hazard event that would have a major impact on the county's communities.

[18] https://www.michigan.gov/coronavirus/stats

Subsidence
Note: much of the information presented in this section was obtained from MSP's 2019 Michigan Hazard Analysis.

Subsidence is defined as the lowering or collapse of a land surface, caused by natural or human-induced activities that erode or remove subsurface support. Natural subsidence occurs when the ground collapses into underground cavities produced by the dissolution of limestone or other soluble materials by groundwater. Human-induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining.

More than 80% of the identified subsidence in the United States is a consequence of human impact on subsurface water. Three distinct processes account for most of the water-related subsidence: compaction of aquifer systems, drainage and subsequent oxidation of organic soils, and dissolution and collapse of susceptible rocks. Compaction of soils in some aquifer systems can accompany excessive ground-water pumping and cause subsidence.

Approximately 18% of the United States land surface is underlain by cavernous limestone, gypsum, salt, or marble, making the surface of these areas susceptible to collapse into sinkholes. The term *karst*, first applied to a plateau region of the Dinaric Alps in Yugoslavia, is now used to describe regions throughout the world that have features formed largely by underground drainage. Karst terrains are characterized by caves, steep valleys, sinkholes, and a general lack of surface streams. Within Michigan, sinkholes are found predominantly in the northeastern Lower Peninsula and eastern Upper Peninsula.

Additionally, an increasing number of urban subsidence events have resulted from infrastructure failures, such as water main breaks, which cause road surfaces to collapse. Construction-related incidents have also occurred in Michigan.

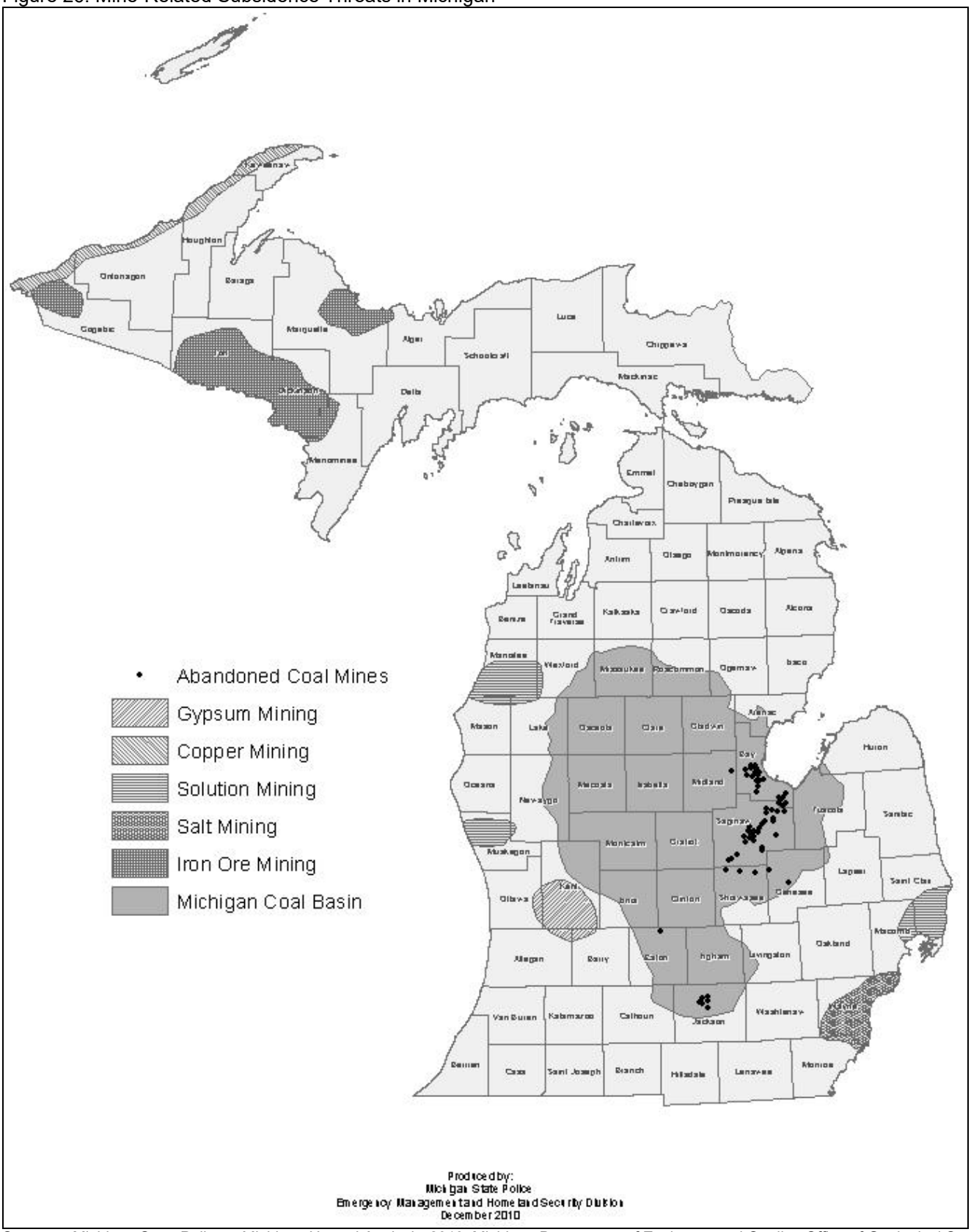
Location
Within Wexford County, the potential for mine-related subsidence threats are as follows (refer to Figure 26).

- Solution mining (injecting freshwater into salt formations and retrieving the resulting brines) in the western portion of the County.
- Presence of the "Michigan Coal Basin" (but no known abandoned coal mines) in the southeast part of the County.

The risk level of sinkholes naturally occurring in Wexford County is characterized as "absent of likely absent" based on area landscape ecosystems, according to the MSU Extension and the Michigan Natural Features Inventory (Figure 27).

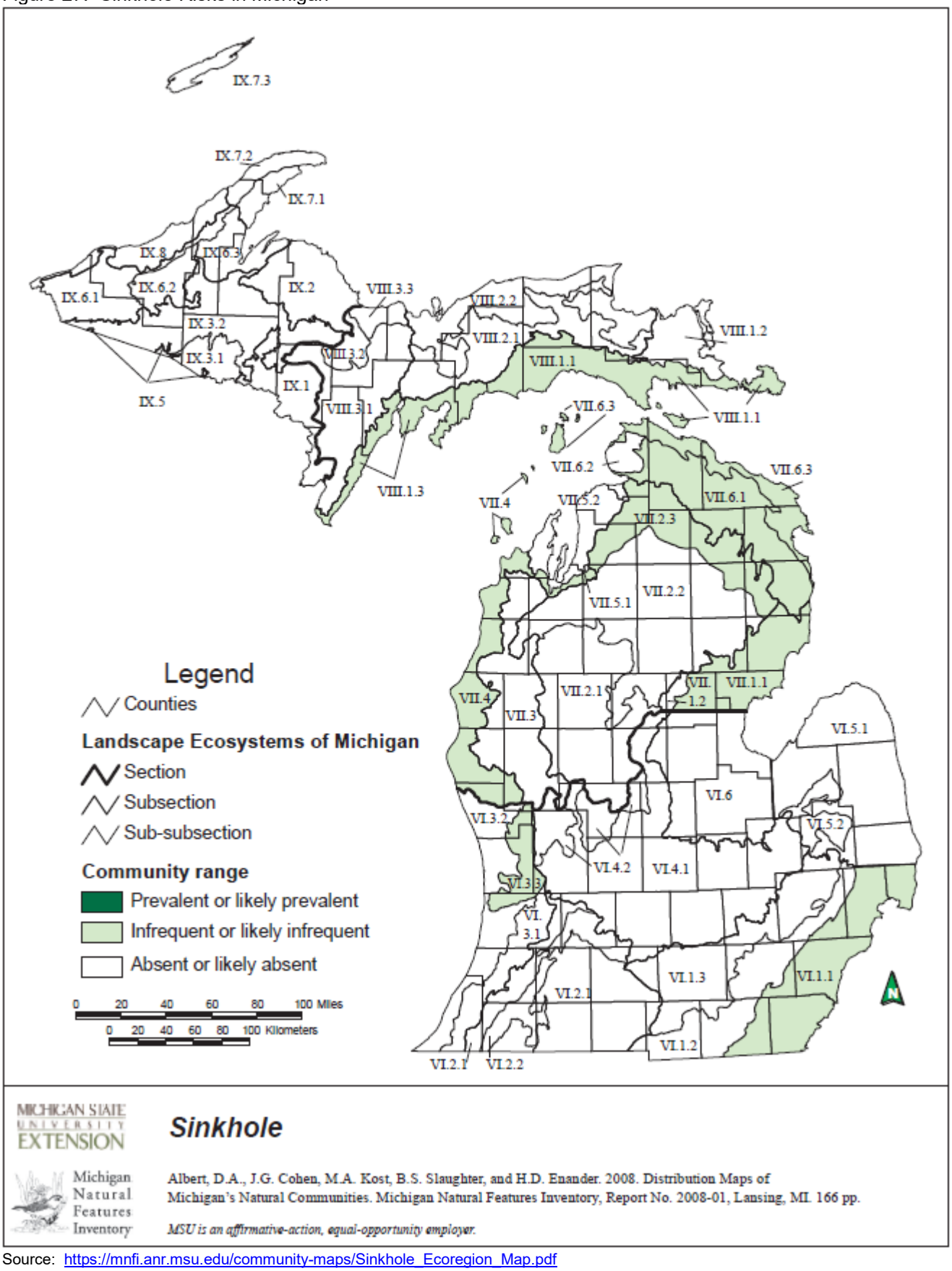
Extent
Although some subsidence incidents may cause private property damage and casualties within Michigan, others may affect roadways or other public infrastructure, and thus cause a more general impact on the population of an area. Most past incidents have had limited effect upon the general public, but in time, some exception may arise. Roadways have now been identified that are in proximity to, if not completely overlaying, abandoned mine lands that therefore may be vulnerable to collapse, potentially injuring or killing persons traveling in vehicles or trapped within a collapse area. A recent rain event revealed that mudslides and structural collapse can occur as a result of rapid hydrological runoff within hilly areas of the state, and can cause fatal impacts. The number of houses and other buildings that may be at substantial risk has not yet been pinned down, but probably numbers over 100 on the basis of the identified mine locations mapped by MDNR. Infrastructure is likely to be affected just as surface roads are. It is not yet clear what facilities may be at risk, but they probably include some that will impact the quality of life in some of Michigan's oldest communities (both small and large). Likely forms of infrastructure vulnerability include transportation, water supply, urban sewage, and underground pipelines for oil and gas. One of the most serious such events could have resulted from the 2016 incident in the City of Fraser, which involved a major component of the water infrastructure within one of the most heavily and densely populated counties in Michigan (Macomb County), but fortunately was handled promptly and carefully in a way that limited its impacts to the broader metropolitan area.

Figure 26. Mine-Related Subsidence Threats in Michigan



Sources: Michigan State Police – *Michigan Hazard Analysis*, 2019; Michigan Department of Environmental Quality, Office of Geological Survey

Figure 27. Sinkhole Risks in Michigan



Source: https://mnfi.anr.msu.edu/community-maps/Sinkhole_Ecoregion_Map.pdf

Previous Occurrences
The 2019 Michigan Hazard Analysis, completed by the Michigan State Police, does not indicate that any significant subsidence incidents, such as mine cave-ins or sinkholes, have occurred within Wexford County.

However, there is an active area of a subsidence issue in the City of Cadillac, northwest of the intersection of W. River Street and Business Route US-131. The Clam River Culvert, which spans the length of several downtown businesses and parking lots, was first built in the 1960s to channelize a portion of the Clam River, and has deteriorated over time. Wexford Jewelers' building is located right next to the Clam River Culvert and in 2023 had to shut down parts of its parking lot due to the critical culvert failure and resulting growing sinkhole. The holes caused by the culvert failure have been fenced off (Figure 28) as city leaders search for a long-term solution.

Figure 28. Fenced-off areas of the parking lot of Wexford Jewelers over the Clam River Culvert, August 2023

Photo Source: https://upnorthlive.com/news/local/cadillac-seeks-state-funds-due-to-crumbling-culvert 8/27/2023

Probability of Future Events and Vulnerability Assessment
The probability of a subsidence event resulting from mining activity or natural causes (such as dissolution of limestone subsurface materials by groundwater) occurring within Wexford County area is low. However, recently a human-induced subsidence event has occurred over the failing Clam River Culvert in the City of Cadillac, which remains to be resolved. Because the Clam River is a public waterway and under the jurisdiction of the State of Michigan, it is ultimately the State's responsibility to repair the drain. City of Cadillac officials have reached out to the State requesting $1 million towards the repair of the culvert. Left untreated, the culvert could completely collapse and cause flooding, additional property damage and loss of business in the area.

A possible mitigation project with multiple community benefits beyond the current site of subsidence is to investigate the possibility of "daylighting" areas of the Clam River where it is currently channelized underground in the City of Cadillac. This could solve the current issue of an impaired underground drainage infrastructure system for the Clam River and open it up to provide valuable city greenspace to filter stormwater runoff and provide a quality-of-life asset for years to come.

It is also important for communities that provide public water and/or sewer services to budget for the lifecycles this infrastructure, via capital improvements planning. This can ensure the sustained provision of clean potable water and collection and treatment of sanitary sewer, as well as proactively address any structural problems before they can escalate to a subsidence issue.

V. COMMUNITY VULNERABILITIES AND CAPABILITIES

The table on the following pages summarize much of the information presented in Sections III (Community Profile) and IV (Hazard Identification and Assessments) as it pertains to hazard vulnerabilities and mitigation capabilities for each community in Wexford County. While most types of hazards considered 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 vulnerabilities (as well as assets) for each type of hazard. For reference, the locations of some of these characteristics (i.e., public lands, pine forest area, infrastructure, campgrounds, mobile home areas, and flood and fire concern areas) are illustrated in the maps provided in Appendix A.

Wexford County Community Vulnerabilities

	Wexford County Townships/Cities																	Wexford County Villages		
	Antioch	**Boon**	**Cedar Creek**	**Cherry Grove**	**Clam Lake**	**Colfax**	**Greenwood**	**Hanover**	**Haring Charter**	**Henderson**	**Liberty**	**Selma**	**Slagle**	**South Branch**	**Springville**	**Wexford**	**City of Cadillac**	**City of Manton**	**Buckley**	**Harrietta**	**Mesick**
Population Estimates (2019)	788	744	1,811	2,433	2,427	1,071	620	1,592	3,530	180	935	2,202	515	300	1,583	983	10,419	1,123	759	154	366
Severe Winter Weather and Extreme Temperature Vulnerabilities																					
Public Outdoor Recreation Areas	Twp. Park	Twp. Park; Pinoco Park	Manton Free Methodist Campground	Forest Lawk Drive and West Shore Park Boat Launches; Hemlock Campground	Mitchell State Park; Berry Lake Access Site; Eckhert Roadside Park	Lester A. Barnes Memorial Park	Baxter Bridge Campground and Canoe Camp	Harvey Bridge Access Site	CASA Ballfields and Soccer Fields; Long Lake SF Campground; Northern District Fairgrounds	Ravine Picnic Area & CG	Chase Creek CG; Old 131 Bridge CG and Canoe Camp; Casey Jones Roadside Park	Pleasant Lake Park; Camp Torenta	State Fish Hatchery, Julius Becker Roadside Park; Slagle Twp. Park	Peterson Bridge South Camping Area; Peterson Bridge North Canoe Access and Camping Area; Dodson Bridge Canoe Landing	Seaton Creek Picnic Area & CG; Hodenpyl Backwater Scenic Turnout; Mesick Wildlife Sanctuary; Mesick Memorial Park	Keith Baguley Roadside Park	Diggins Hill; Kenwood Beach, Park, and Boat Launch; Dog Park; Lakefront Park; CASA Fields; Skate Park; Cadillac Commons; Community Tennis Courts; Kiwanis Park	Railroad Park, Lake Billings Park, Rotary Memorial Park		Harrietta Community Park	Mesick Community Park
Est. number of residents > age 65	166	110	217	574	491	186	88	225	719	45	136	520	140	71	267	159	1,935	148	76	26	65
Est. # of jurisdiction residents that are of a minority race (not Hispanic or Latino origin)	36	10	68	75	116	22	26	52	184	1	6	161	9	7	75	55	495	64			
Est. # of jurisdiction residents that are of Hispanic or Latino origin	10	6	10	22	178	3	9	27	70	0	5	36	27	0	14	0	207	29			
Est. # of households that are lower income (ALICE or below poverty level)	293	268	628	948	868	349	207	584	1,237		356	884	232	133	618	368	4,433	470			
Thunderstorm, High Winds, Hail, Tornado Vulnerabilities																					
Mobile Home Neighborhoods	66	75	172	70	100	60	44	161	143	21	88	181	93	92	349	121	567	68			
Campgrounds			2	1	1		1		2		4			5	5		1	1			
Public Outdoor Recreation Areas	Twp. Park	Twp. Park; Pinoco Park	Manton Free Methodist Campground	Forest Lawk Drive and West Shore Park Boat Launches; Hemlock Campground	Mitchell State Park; Berry Lake Access Site; Eckhert Roadside Park	Lester A. Barnes Memorial Park	Baxter Bridge Campground and Canoe Camp	Harvey Bridge Access Site	CASA Ballfields and Soccer Fields; Long Lake SF Campground; Northern District Fairgrounds	Ravine Picnic Area & CG	Chase Creek CG; Old 131 Bridge CG and Canoe Camp; Casey Jones Roadside Park	Pleasant Lake Park; Camp Torenta	State Fish Hatchery, Julius Becker Roadside Park; Slagle Twp. Park	Peterson Bridge South Camping Area; Peterson Bridge North Canoe Access and Camping Area; Dodson Bridge Canoe Landing	Seaton Creek Picnic Area & CG; Hodenpyl Backwater Scenic Turnout; Mesick Wildlife Sanctuary; Mesick Memorial Park	Keith Baguley Roadside Park	Diggins Hill; Kenwood Beach, Park, and Boat Launch; Dog Park; Lakefront Park; CASA Fields; Skate Park; Cadillac Commons; Community Tennis Courts; Kiwanis Park	Railroad Park, Lake Billings Park, Rotary Memorial Park		Harrietta Community Park	Mesick Community Park
Previous Tornadoes				2	3						1	1							1		
Est. number of residents > age 65	166	110	217	574	491	186	88	225	719	45	136	520	140	71	267	159	1,935	148	76	26	65
Est. # of jurisdiction residents that are of a minority race (not Hispanic or Latino origin)	36	10	68	75	116	22	26	52	184	1	6	161	9	7	75	55	495	64			
Est. # of jurisdiction residents that are of Hispanic or Latino origin	10	6	10	22	178	3	9	27	70	0	5	36	27	0	14	0	207	29			
Est. # of households that are lower income (ALICE or below poverty level)	293	268	628	948	868	349	207	584	1,237		356	884	232	133	618	368	4,433	470			

Wexford County Community Vulnerabilities

	Wexford County Townships/Cities																		Wexford County Villages		
	Antioch	**Boon**	**Cedar Creek**	**Cherry Grove**	**Clam Lake**	**Colfax**	**Greenwood**	**Hanover**	**Haring Charter**	**Henderson**	**Liberty**	**Selma**	**Slagle**	**South Branch**	**Springville**	**Wexford**	**City of Cadillac**	**City of Manton**	**Buckley**	**Harrietta**	**Mesick**
Population Estimates (2019)	788	744	1,811	2,433	2,427	1,071	620	1,592	3,530	180	935	2,202	515	300	1,583	983	10,419	1,123	759	154	366
Lightning Vulnerabilities																					
Campgrounds			2	1	1		1		2		4			5	5		1	1			
Communications Critical Infrastructure	1	2	3		2	1		1	8	1		2		2	2	5	6	2			
Energy Critical Infrastructure Sites			Natl Gas Pipeline		1 plus Natl Gas Pipeline	Natl Gas Pipeline	Natl Gas Pipeline	2	7 including Natl Gas Pipeline			3	1	1			9	1	1		2
Public Outdoor Recreation Areas	Twp. Park	Twp. Park; Pinoco Park	Manton Free Methodist Campground	Forest Lawk Drive and West Shore Park Boat Launches; Hemlock Campground	Mitchell State Park; Berry Lake Access Site; Eckhert Roadside Park	Lester A. Barnes Memorial Park	Baxter Bridge Campground and Canoe Camp	Harvey Bridge Access Site	CASA Ballfields and Soccer Fields; Long Lake SF Campground; Northern District Fairgrounds	Ravine Picnic Area & CG	Chase Creek CG; Old 131 Bridge CG and Canoe Camp; Casey Jones Roadside Park	Pleasant Lake Park; Camp Torenta	State Fish Hatchery, Julius Becker Roadside Park; Slagle Twp. Park	Peterson Bridge South Camping Area; Peterson Bridge North Canoe Access and Camping Area; Dodson Bridge Canoe Landing	Seaton Creek Picnic Area & CG; Hodenpyl Backwater Scenic Turnout; Mesick Wildlife Sanctuary; Mesick Memorial Park	Keith Baguley Roadside Park	Diggins Hill; Kenwood Beach, Park, and Boat Launch; Dog Park; Lakefront Park; CASA Fields; Skate Park; Cadillac Commons; Community Tennis Courts; Kiwanis Park	Railroad Park, Lake Billings Park, Rotary Memorial Park		Harrietta Community Park	Mesick Community Park
Flooding Vulnerabilities																					
Prior Flood Incident Areas				Lake Mitchell	Lake Cadillac		Manistee River	Manistee River	Clam River		Manistee River	Lake Mitchell		Pine River	Manistee River	Manistee River	Lake Cadillac/Clam River				
Flood Hazard Concern Areas (from HMP Public Input)				1 area	1 area		1 area		2 areas			1 area				4 areas	2 areas				
Communities in the NFIP; FEMA FIRM issued			X (NSFHA)	X			X (NSFHA)					X					X				
Communities not in the NFIP, but a FIRM was issued					X				x												
Increased land development adjoining flood hazard areas since 2015 HMP	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Regulated dam(s)	White Lake Dam/ Barnes Dam (Low Haz.)			Norman Smith Dam and Mitchell Creek Dam (Low Haz.)				Wheeler Creek Dam (Significant Haz Pot.)				Brandy Brook Dam (Low Haz.)			Hodenpyl Dam (High Haz Pot.)		Clam River Control Dam (Low Haz.)	Lake Billings Dam (Significant Haz Pot.)			
Unregulated, privately owned, "Low Hazard" dams	2	1		1		1	2	3			2		2	3	2	1					
# of Road/Stream Crossings with a Moderate to Severe Rating	5 moderate; 6 severe	2 moderate; 3 severe	3 moderate; 1 severe	14 Moderate; 3 Severe	6 Moderate	6 Severe	9 Moderate; 8 Severe	5 Moderate; 7 Severe		8 Moderate; 2 Severe	9 Moderate; 3 Severe		4 Moderate; 2 severe	6 Moderate; 2 Severe	7 Moderate; 10 Severe	6 Moderate; 8 Severe		1 Moderate; 1 Severe			
# of Bridges with Poor, Serious, Critical or Closed Ratings								1 Serious Condition Bridge: N. 19 Road Bridge over the Manistee River					1 Poor Condition Bridge: S1 Rd over Slagle Creek				1 Serious Bridge: Powers St. over the Clam River				
Est. number of residents > age 65	166	110	217	574	491	186	88	225	719	45	136	520	140	71	267	159	1,935	148	76	26	65
Est. # of residents that are of a minority race (not Hispanic or Latino origin)	36	10	68	75	116	22	26	52	184	1	6	161	9	7	75	55	495	64			
Est. # of residents of Hispanic or Latino origin	10	6	10	22	178	3	9	27	70	0	5	36	27	0	14	0	207	29			
Est. households that are lower income	293	268	628	948	868	349	207	584	1,237	N/A	356	884	232	133	618	368	4,433	470			

Wexford County Community Vulnerabilities

	Wexford County Townships/Cities																	Wexford County Villages		
	Antioch	**Boon**	**Cedar Creek**	**Cherry Grove**	**Clam Lake**	**Colfax**	**Greenwood**	**Hanover**	**Haring Charter**	**Henderson**	**Liberty**	**Selma**	**Slagle**	**South Branch**	**Springville**	**Wexford**	**City of Cadillac**	**City of Manton**	**Buckley**	**Harrietta**	**Mesick**
Population Estimates (2019)	788	744	1,811	2,433	2,427	1,071	620	1,592	3,530	180	935	2,202	515	300	1,583	983	10,419	1,123	759	154	366
Wildfire Vulnerabilities																					
Jack Pine Forest	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
Campgrounds			2	1	1		1		2		4			5	5		1	1			
Recent Large Fire Incidents							"Colfax Fire" 5/22/2021; 425+ acres burned between 12 and 8 Roads and W 31 and W 33 Roads.		"Bond Mill Pond Fire" 5/1/2018; 79 acres mostly on MDNR land							"Four Corners Fire" 7/10/2023; Manistee and Wexford Counties total 225 acres					
Est. number of residents > age 65	166	110	217	574	491	186	88	225	719	45	136	520	140	71	267	159	1,935	148	76	26	65
Est. # of residents that are of a minority race (not Hispanic or Latino origin)	36	10	68	75	116	22	26	52	184	1	6	161	9	7	75	55	495	64			
Est. # of residents of Hispanic or Latino origin	10	6	10	22	178	3	9	27	70	0	5	36	27	0	14	0	207	29			
Est. # of households that are lower income	293	268	628	948	868	349	207	584	1,237	N/A	356	884	232	133	618	368	4,433	470			
Drought Vulnerability																					
USFS and/or MDNR Forested Lands	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Agricultural Land	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Invasive Species Concerns																					
Locations of particular concern				Lake Mitchell (Lake Mitchell Improvement Board)	Stone Ledge Lake Assn.		Manistee River	Manistee River	Clam River		Manistee River	Lake Mitchell (Lake Mitchell Improvement Board); Pleasant Lake Association		Pine River	Manistee River	Manistee River	Lake Mitchell (Lake Mitchell Improvement Board); Lake Cadillac; Clam River				
Public Health Emergency Vulnerabilities																					
Senior Living (ALF), Nursing Home or Adult Foster Care (AFC) Facilities	1 AFC		1 AFC	2 AFCs	Maple Ridge ALF				Curry House ALF, Northern Roots ALF			2 AFCs					Green Acres ALF, Sunnyside ALF, Samaritas Nursing Home, Lakeview Nursing Home, Daybreak AFC				
Est. number of residents > age 65	166	110	217	574	491	186	88	225	719	45	136	520	140	71	267	159	1,935	148	76	26	65
Est. # of jurisdiction residents that are of a minority race (not Hispanic or Latino origin)	36	10	68	75	116	22	26	52	184	1	6	161	9	7	75	55	495	64			
Est. # of residents of Hispanic or Latino origin	10	6	10	22	178	3	9	27	70	0	5	36	27	0	14	0	207	29			
Est. # of households that are lower income (ALICE or below poverty level)	293	268	628	948	868	349	207	584	1,237	N/A	356	884	232	133	618	368	4,433	470			
Subsidence Vulnerabilities																					
Locations of particular concern																	Failing Clam River culvert underneath Wexford Jewelers' property				

Wexford County Community Assets

	Wexford County Townships/Cities																		Wexford County Villages		
	Antioch	Boon	Cedar Creek	Cherry Grove	Clam Lake	Colfax	Greenwood	Hanover	Haring Charter	Henderson	Liberty	Selma	Slagle	South Branch	Springville	Wexford	City of Cadillac	City of Manton	Buckley	Harrietta	Mesick
Population Estimates (2019)	788	744	1,811	2,433	2,427	1,071	620	1,592	3,530	180	935	2,202	515	300	1,583	983	10,419	1,123	759	154	366
Community Capabilities (Assets)																					
Fire and/ or EMS Station		Twp. Fire	Twp. Fire	Twp. Fire/EMS		Greenwood-Colfax F.D.			Twp. Fire			Twp. Fire		Twp. Fire	NW Wexford Emergency Authority Station 2		City Fire Dept; MMR Ambulance Service	City Fire Dept.	NW Wexford Emergency Authority Station 1	Slagle-Harrietta F.D.	
Law Enforcement Office					Michigan State Police - Cadillac Post												City Police; County Sheriff/Jail	City Police			
Shelter Sites		Twp. Fire	Twp. Fire	Twp. Fire/EMS		Greenwood-Colfax F.D.	Greenwood-Colfax F.D.		Twp. Fire			Twp. Fire	Slagle-Harrietta F.D.	Twp. Fire	NW Wexford Emergency Authority Station 2		City Fire Dept.; YMCA; Senior Center, Civic Center	City Fire Dept./ Manton Senior Center	NW Wexford Emergency Authority Station 1	Slagle-Harrietta F.D.	
Health Care Facilities					2 Primary Care Clinics				1 Urgent Care Clinic							1 Primary Care Clinic	Munson Hospital and Urgent Care; 2 Primary Care Clinics; DHD#10 office	1 Primary Care Clinic			
Long Range Capital Improvements Plan																	Yes; 6-yr CIP				
Current County 5-Year Parks and Recreation Plan	Yes; 2024-2028																				
County Planning Commission	None; Wexford County repealed its planning and zoning capabilities in 2016 and has not updated the County Master Plan since it was created in 2004.																				
Local Planning Commission and Master Plan	Yes - Wexford Joint Planning Commission (WJPC)	Yes - WJPC	Yes	Yes - WJPC	Yes	No	No	Yes - WJPC	Yes	No	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes	Yes	Yes	No	Yes
Local Zoning Ordinance	Yes - WJPC	Yes - WJPC	Yes	Yes - WJPC	Yes	No	No	Yes - WJPC	Yes	No	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes	Yes	Yes	No	Yes
Wexford County 2023 HMP Mitigation Strategies with related goals/objectives in local plans (see Appendix E)																					
State Soil Erosion, Sedimentation, and Stormwater Control Act 91 of the NREPA	Wexford County Building Department																City of Cadillac	Wexford County Building Dept.			
State of Michigan Construction Codes Enforcement	Wexford County Building Department		Cedar Creek Township Building Dept.	Wexford County Building Department													City of Cadillac via Associated Government Services	City of Manton	Wexford County Building Dept.		
Local Floodplain Management Ordinance (NFIP participant; FIRMs issued)			2016 (NSFHA)	1998			1998 (NSFHA)					1998					1998				
Communities not in the NFIP, but a FIRM was issued					1998				1998					1998							
Outdoor burning regulations	Recreational fires are not permitted on state or federal recreation lands when MDNR or USFS has issued a burning ban. MDNR posts current status on burning allowances/requirements at https://www.dnr.state.mi.us/burnpermits/																City Code of Ordinances Section 26-9 "Open Fires" : camp fires are allowed as long as there is not a DNR state-mandated ban on burning.	City Code of Ordinances Ch 16 Fire Prevention & Protection, Article 11: "Open Burning" provisions	MDNR posts current status on burning allowances/requirements at https://www.dnr.state.mi.us/burnpermits/		
Zoning Ordinance includes High-Forest Fire Urban Interface Regulations	Yes - WJPC	Yes - WJPC		Yes - WJPC				Yes - WJPC			Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC	Yes - WJPC					
"#Ride, Clean, Repeat" program for ORV users	X	X	X			X	X	X	X	X	X										
Lake Management / Improvement Efforts				Lake Mitchell Improvement Board	Stone Ledge Lake Assn.							Lake Mitchell Improvement Board; Pleasant Lake Association					LMIB; City's invasive species management program for Lake Cadillac				

VI. Goals and Objectives

The mission of the Wexford 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 local governments and 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
    - Include Member of Understanding (MOUs) between local government and county agencies
- Encourage public and private organizations to participate, *including organizations who advocate for individuals with functional or access needs (vulnerable populations)*

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

- Provide a list of desired community mitigation measures to the State for possible future funding
- 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

VII. Mitigation Strategies

Types of Mitigation Strategies

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 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
- Building 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 Wexford 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 utility services such as electric and internet connectivity, and prevent wasteful public and private expenditures. The County Infrastructure, Vulnerability, and Hazard Maps in Appendix A can assist with the determining future problem areas.

The following resources are available to Wexford County to assist in hazard awareness, mitigation and response efforts.

Emergency Warning System Coverage
Integrated Public Alert & Warning System (IPAWS): 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.

Mobile warning system: Wexford County uses the CodeRED Emergency Communications Network, which is an electronic high-speed outbound notification service available to the general public. The system notifies a participant via their mobile or land-line phone. The National Weather Service may concurrently utilize their mobile warning notification system when deemed necessary in severe weather event situations to send phone notifications to all users within signal of a cellular tower.

Radio warning system: Wexford County uses radio channels 580 AM and 103.5 FM for emergency weather alerts. Additionally, NOAA Weather Radio All Hazards is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service office. NWR broadcasts official Weather Service warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week.

Tornado/Severe Weather Systems: The IPAWs and Code Red notification systems are primarily used to notify the public in the event of a potential or current severe weather event. The City of Cadillac also operates a tornado siren.

Flood warning system: For dam failures/flooding downstream an active warning system is pre-determined utilizing geographic boundary information and the CodeRED Emergency Communications Network and IPAWS alerts.

- The Federal Energy Regulatory Commission requires hydroelectric facilities to be able to quickly notify residents and visitors of any developing emergency at the plants. As westerly adjoining communities in Manistee County are located downriver of the Hodenpyl Dam, sirens are located in Manistee County near: the Tippy Dam (downstream of the Hodenpyl Dam in Manistee County), the High Bridge U.S. Forest Service boat launch, the Hodenpyl Dam, and the Red Bridge U.S. Forest Service boat launch. In an emergency, the sirens would only be used if the threat of a dam failure is imminent at one of the facilities. At that time, anyone on or near the river should evacuate at once to high ground. Additional information would be provided on local radio and television stations. The siren systems are tested each August and December.

Wexford County Emergency Management Department maintains agreements with following facilities in the county so that they may be utilized as public shelters in the event of an emergency (Table 41).

Shelter Sites

Table 41. Emergency Shelter Sites in Wexford County

Emergency Shelter Site Name	Street Address	City	ZIP	Generator?	Overnight Accommodations?
Boon Township Fire	204 Myrtle ST	Boon	49618	No	No
Buckley Fire	106 S Industrial DR	Buckley	49620	No	No
Cadillac Fire Department	200 N Lake ST	Cadillac	49601	No	No
Haring Township Fire	505 Bell AVE	Cadillac	49601	No	No
Selma Township Fire	4299 S 35 RD	Cadillac	49601	No	No
Cherry Grove Township Fire	4830 E M-55 HWY	Cadillac	49601	No	No
YMCA	9845 Campus DR	Cadillac	49601	Yes	Yes
Cadillac Senior Center	601 Chestnut ST	Cadillac	49601	Yes	No
The Wexford Civic Center "The Wex"	1320 N Mitchell ST	Cadillac	49601	Yes	Yes
USFS - Huron-Manistee National Forest Headquarters	1755 S Mitchell ST	Cadillac	49601	No	No
Slagle-Harrietta Fire	108 W Gatson AVE	Harrietta	49638	No	No
Cedar Creek Fire	2530 N 41 1/2 RD	Manton	49663	No	No
City of Manton Fire	402 N Michigan AVE	Manton	49663	No	No
Colfax-Greenwood Fire	4950 N 31 RD	Manton	49663	No	No
Manton Senior Center	302 W Main St	Manton	49663	Yes	No
Springville Township Fire	4785 N M-37 HWY	Mesick	49668	No	No
South Branch Fire	10510 E M-55 HWY	Wellston	49689	No	No

Boat Launches for Emergency Use

Table 42. Boat Launches in Wexford County

Boat Launches in Wexford County Source: 2019 Wexford County Recreation Plan
Cherry Grove Township
Forest Lawn Drive Boat Launch
Hemlock Campground
West Shore Park Boat Launch
City of Cadillac
Kenwood Beach
Lakefront Park
Clam Lake Township
Mitchell State Park
Berry Lake Access Site
Colfax Township
Lester A. Barnes Memorial Park

Greenwood Township
Baxter Bridge Access Site
Baxter Bridge, Campground and Canoe Camp
Hanover Township
Harvey Bridge Access Site
Haring Charter Township
Long Lake S.F. Campground
Liberty Township
Chase Creek Campground
Old 131 Bridge Campground and Canoe Camp
South Branch Township
Peterson Bridge North Canoe Access & Camping Area
Dodson Bridge Canoe Landing
Springville Township
Burton's Landing Boat Launch at Hodenpyl Dam Pond

Mitigation Strategies
Strategies were developed based on discussions amongst the Task Force, local officials and a review of FEMA best practices for hazard mitigation. A list of alternative strategies that were considered is included as Appendix D. The strategies table is grouped according to the following purpose types: 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 help execute the strategy); when the strategy could feasibly begin; 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 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 and their current status. Note that the 2015 mitigation strategies were not given a priority level of "high", "medium", or "low", as they are in this plan; they were simply categorized within the following natural hazards priority areas:

- Priority Area 1: Extreme Winter Weather – Countywide heavy snow and extreme temperatures. Potential for ice damage specifically along lakeshores. Mitigation Strategies: Extreme Winter Weather
- Priority Area 2: Countywide potential wildfire/urban interface. Mitigation Strategies: Wildfire
- Priority Area 3: Countywide Severe Weather (Thunderstorms, High Winds, Tornados) – High damage potential affecting seasonal population influx and festivals held in various towns and villages throughout Wexford County. Mitigation Strategies: Severe Weather
- Priority Area 4: Potential flash flooding in the Lake Mitchell, Muskegon River, and Manistee River watersheds. Mitigation Strategies: Flooding

Available local planning and zoning documentation was also reviewed for local strategies and ordinances that align with the 2023 hazard mitigation strategies; findings are provided in Appendix E.

Rationale for Prioritization of the Mitigation Strategies
The Wexford County Emergency Manager and Local Emergency Planning Committee 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 were given either a high, medium, or low priority level based on the following rationale:

PRIORITY LEVEL	RATIONALE
HIGH	High priority strategies are considered critical to preserve life and property, and will have the largest benefit for the community. High priority strategies often address human health, community safety, and protection of property and critical infrastructure. Many of these strategies have an enforcement standard and financing in place; a high level of need and/or anticipated economic benefit; or a high probability of immediate benefit public health or safety if the hazard event were to occur.
MEDIUM	Medium priority strategies address hazards that do not appear to have immediate impacts to public health or safety, but may have impacts to specific residents or visitors. Many of these strategies consist of education or planning efforts.
LOW	Low priority strategies are considered to be long-term mitigation efforts that will be worked on as resources (such as staff or financing) become available. The probability of an event occurring in the geographic area is low, but not impossible, so it should be considered. The strategy's priority level may also change based on natural events or time.

Each strategy may also correspond with one or more of the following strategy types, as indicated the far right columns of the strategies table:

STRATEGY TYPES

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

		WEXFORD COUNTY 2023 HAZARD MITIGATION PLAN STRATEGIES	HAZARD TYPE										WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead parties are in **BOLD**)	HOW - Resources	WHEN - Timeframe	PRIORITY LEVEL	STRATEGY TYPE			
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency							Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Awareness and Preparation	1	**Continue to proactively inform the public about emergency events and available shelter sites** via utilization and promotion of the Code Red mass notification system, NWS weather radios (as a good backup plan) and social media (Facebook).	X	X	X	X	X	X	X		X		Countywide; Also see Appx. A for a map indicating locations of campgrounds and modular home/mobile home developments, which are vulnerable to impacts from severe storms, flooding, hail, wind, tornado and lightning.	**County EM**, NWS	A - D	Ongoing	**High**	X			X
	2	**Continue operation of local tornado siren(s)** for notification of severe, non-winter storm events.		X									City of Cadillac	**City of Cadillac**	B	Ongoing	**High**	X			X
	3	**Continue the preparedness practice of conducting the annual statewide tornado drill.**		X									Countywide	**County EM**	A	Annual	**High**	X			X
	4	**Continue to promote participation in Storm Spotter Training** - preferably in person - via partnership with the NWS.		X									Countywide	**County EM**	A	Annual	**Med**	X			X
	5	**Continue and strengthen partnerships with local government agencies and non-profits to provide education on individual emergency preparedness.**	X	X	X	X	X	X	X		X		Countywide	**County EM**, DHD #10, USFS, MDNR	A	Ongoing	**Med**	X			X
	6	**Promote public awareness of the locations of emergency shelters.**	X	X	X	X	X						Countywide	**County EM**	A	Ongoing	**Med**	X			X
	7	**Ensure that communities have a good snow removal plan and share this with the County Road Commission**	X										Villages of Mesick and Buckley; Cities of Manton and Cadillac	**Villages of Mesick, Buckley; Cities of Manton and Cadillac**; Road Commission	B	Ongoing	**Med**	X			X
	8	**Continue to offer Wexford County Council on Aging's reduced cost snow plow program and their "telephone reassurance" call service to check on homebound seniors** regularly.	X	X	X	X	X				X		Countywide	**Wexford County Council on Aging**	D	Ongoing	**Med**	X			X
	9	**Ensure that County residents, particularly vulnerable populations, have access to healthy, affordable food options.**								X	X		Countywide			Ongoing	**Med**	X	X	X	X
	9a	**Create community gardens** in urban locations and/or school locations to promote learning about growing local food and native pollinating plants.								X	X		**Public and Private Schools**; **Cities of Cadillac and Manton; Villages of Buckley and Mesick**		BB	Ongoing	**Low**		X	X	X
	9b	**Continue to provide and improve food assistance programs and emergency food programs** to help communities prepare for unanticipated pandemics, but also increase food accessibility.									X		Countywide	**NMCAA; local food pantries; School Districts (school meal programs)**	F, H, I	Ongoing	**Med**	X			X
	9c	**Food rescue programs**, involving public/private partnerships between restaurants, hotels and other venues of large food production, **can partner with local food pantries** to make good food more widely available.									X		Countywide	**Local food pantries**		Ongoing	**Med**	X			X
	10	**Continue programs and services offered by the District Health Dept. #10** 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**	E	Ongoing	**Med**	X	X		X

		WEXFORD COUNTY 2023 HAZARD MITIGATION PLAN STRATEGIES	HAZARD TYPE										WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead parties are in **BOLD**)	HOW - Resources	WHEN - Timeframe	PRIORITY LEVEL	STRATEGY TYPE			
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency							Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Awareness and Preparation	11	**Continue to coordinate with the MDHHS for guidance via their State Pandemic Plan and information about new or emerging disease threats.**									X	Countywide	DHD #10; **MDHHS**; County EM; Munson Hospital	A, E	Ongoing	**High**	X			X
	12	**Improve communication amongst County Dispatch, Road Commission, law enforcement and EMS about road closures as quickly as possible to improve emergency response arrival time.**	X	X	X	X	X		X		X	Countywide	RC, **County EM**, MSP, County Sheriff	A, E	Ongoing	**High**	X			X
	13	**Evaluate additional designated sites to utilize to temporarily store cleanup debris from downed trees** after storm events.	X	X		X						Countywide	**Community DPWs**, EM, **County Road Commission**	B, C	Annual	**Med**	X			
	14	**Provide outreach to all communities in the County that contain concentrations of people living in floodplain areas to participate in FEMA's Flood Insurance Program, and 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 to participate.)				X						Clam Lake Township, Haring Charter Township, South Branch Township	**EM**, MI EGLE	S	Ongoing	**Med**	X			X
	15	**Continue notification of MDNR/NFS Fire Danger Status online and via CodeRED.**			X							Countywide	**County EM**, USFS, MDNR	A	Ongoing	**High**	X			X
	16	**Install a Fire Danger Level sign along a major road on the north end of Cadillac.**			X							Countywide	**County EM**, MDOT or RC, MDNR, Local Fire Departments	L, M, W	Ongoing	**High**		X		X
	17	**Maintain proper levels of PPE for local first responders.**									X	Countywide; Local fire stations and EMS services.	County EM; **local fire/EMS**	A, B, C, E	Ongoing	**Low**	X			
	18	**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		X	Countywide	County Sheriff and **EM**	A-C	Ongoing	**High**	X			
	19	**Incorporate the County Hazard Mitigation Plan's strategies** into elements of **local community master plans.**	X	X	X	X	X	X	X	X	X	**Wexford Joint Planning Commission; Villages of Mesick and Buckley; Cities of Manton and Cadillac; Charter Township of Haring, and Greenwood Township**		A, B	Ongoing	**High**	X	X	X	X
	20	**Continue to regularly assess fire suppression access points and equipment** and **pursue improvements as needed.**			X			X				Countywide	**Local fire departments; MDNR Wildfire Mgmt.; USFS**	C	Ongoing	**High**	X	X		
	21	**Annually update the County's basic Wildfire Operations Plan** (coordinate with MDNR/USFS)			X							Countywide	**County EM**, Local Fire Depts./First Responders, MDNR, USFS	A	Annual review	**High**	X			
	22	**Identify communities with the county that have an interest in becoming a recognized Firewise USA® community.** 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.			X			X				Consider areas with Jack Pine forest (every community except City of Manton and Villages of Mesick and Buckley) particularly where it is near developed areas, tree farms, and campgrounds.	**County EM**, Local Fire Depts./First Responders, MDNR, USFS	A, C, L	1 year	**Med**	X			X
	23	**Continue to promote (via social media, etc.) awareness of vegetation/fuel management for fire prevention around homes and other structures.**			X							Countywide	**County EM**, County Building Dept., Local Fire Depts./First Responders, MDNR, USFS	A, C, L, M	Ongoing	**Med**	X			X

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			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency						Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Awareness and Preparation	**24**	**Continue to provide campgrounds (Private, MDNR and USFS) with information on fire safety and establish evacuation routes.**			X							City of Cadillac; City of Manton; Townships of Greenwood, Liberty, Springville, Cedar Creek, Haring, South Branch and Cherry Grove	**County EM**	A, C, L, M	Ongoing	**Med**	**X**			**X**
	25	**Consider developing a drought communication plan and early warning system** to facilitate timely communication of local drought conditions/outlook to officials, decision makers, emergency responders, and the general public.						X				Countywide	**County EM**, WCD/USDA-NRCS	J, K, CC, DD	Annual	**Med**	**X**			**X**
	26	**Continue the Wexford 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 after a natural disaster.						X				Countywide	**WCD/USDA-NRCS**	CC, DD	Ongoing	**Med**	**X**			**X**
Shelters	**27**	**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	Annual	**Med**	**X**			
	28	Increase collaboration between the Wexford County Office of Emergency Management with local communities and non-profits to **increase the number of emergency shelters available to the public for heating/cooling during extreme temperature days and when power outages occur.**	X	X	X	X	X				X	Countywide	**County EM**; American Red Cross; Local Fire Depts.; Senior Centers; Municipal Offices	A - D	Annual	**Med**	**X**	**X**		
	28a	**Install generator(s) to enable a facility's use as an emergency shelter.**	X	X	X	X	X				X	Countywide	County EM; **Local Fire Depts.; Senior Centers; Municipal Offices (Selma Twp., City of Manton)**	U, V	Annual	**Med**		**X**		
	29	**Evaluate the feasibility of constructing additional community storm shelters, such as concrete "safe rooms", at campgrounds and mobile/modular home communities.**	X	X	X	X	X					See hazard map for locations of campgrounds and mobile homes	**County EM**; County Building Dept.; local govts; private and public campground managers	U, V	Annual	**Low**		**X**		
	30	**Continue to establish areas of refuge and evacuation routes for campgrounds and other sites of large outdoor events.**	X	X	X	X	X				X		**County EM**; campground managers; local fire depts.	A	Ongoing	**Med**	**X**			**X**
	31	**Create a communications plan, similar to Code Red and what Charlevoix County uses, to communicate to the public where shelters are during an emergency event.**	X	X	X	X	X				X	Countywide	County EM	A	Ongoing	**High**	**X**			**X**
	32	**Maintain procedures to create quarantine areas in group living quarters** (overnight shelters, assisted living facilities).									X		**Munson Hospital, American Red Cross, Assisted Living Facilities**	A, E	Ongoing	**Med**	**X**			**X**

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			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency						Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Buildings & Infrastructure	33	**Identify flood-prone areas and properties that have reported repetitive loss damages due to flooding on FIRMs and pursue FEMA hazard mitigation assistance grants related to flood mitigation**, such as innovative stormwater management solutions, property acquisition, structure demolition or relocation, dry flood proofing, structure elevation, or project scoping (engineering, environmental, feasibility, and/or benefit-cost analysis)				X			X			Communities in the Muskegon River watershed (Lake Mitchell/Lake Cadillac/Clam River) and Manistee watershed, and the Pine River watershed; particularly areas with identified "Special Flood Hazard Areas" on FIRMS	**County EM**, MI EGLE, Drain Commissioner	T, U, V	Annual	**Med**	X	X	X	
	34	**Investigate solutions to mitigate persistent flooding issues on property located northeast of Lake Cadillac.** Properties located in the City of Cadillac, between Lake Street and the railroad, with Haynes St. bordering to the north and Pine St. to the south, have experienced seasonal flooding/ basement flooding. Activities from a former lumber mill northeast of Lake Cadillac resulted in sawdust/lumber waste deposited in the soil. This area includes public and private property (commercial, office, & residential use).				X			X			City of Cadillac, property owners	**City of Cadillac**, property owners	T, U	0-10 years	**High**	X	X		
	35	**Continue communications between the City of Cadillac and the State of Michigan regarding the need for assistance to repair the failing Clam River Culvert** underneath the parking lot owned by Wexford Jewelers.					X		X			City of Cadillac; affected property owners northwest of the intersection of W. River Street and BR US-131	**City of Cadillac**, State of MI	City of Cadillac funds; State of MI funds	0-3 Years	**High**		X		
	36	**Stay informed about future plans for the Hodenpyl Dam**; participate in input sessions provided by Consumers Energy.				X		X		X		County Government; Springville Township; Village of Mesick	**County Government; Springville Township; Village of Mesick**	N	0 - 10 years	**Low**		X	X	
	37	**Install electrical controls with a back-up generator system and plan for eventual replacement of the Clam River outlet control dam** to ensure water levels on Lake Cadillac and Lake Mitchell remain at safe levels.	X	X		X					X	City of Cadillac, Clam Lake Twp., Haring Twp., Cherry Grove Twp., Selma Twp.	City of Cadillac; **Wexford County Drain Commissioner**	T, U, City of Cadillac funds; County Funds	0-5 years for generator; 5-10 for replacement of dam	**Low**	X	X		
	38	**Consider revising local zoning requirements to include wildland fire risk mitigation practices similar to the WJPC zoning ordinance**, Section 1042. High-Forest Fire Urban Interface Regulations			X							Greenwood Township, Haring Charter Township	**Greenwood Township, Haring Charter Township**	B, L, M	Annual	**Med**	X			
	39	**Continue enforcement of State building codes and soil erosion regulations** (Soil Erosion and Sedimentation Code is applicable if aproject involves earth change that disturbs one or more acre, or is within 500 feet of a lake, stream or wetland) **with new construction through local permitting.**				X						Countywide	**County Building Dept., City of Cadillac, City of Manton**	A, B	Ongoing	**Med**	X	X	X	
	40	**Improve ability of public buildings to shed/hold snow.**	X									Countywide	**County and Local Governments**	A, B, U	Ongoing	**Med**	X	X		

		WEXFORD COUNTY 2023 HAZARD MITIGATION PLAN STRATEGIES	HAZARD TYPE									WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead parties are in **BOLD**)	HOW - Resources	WHEN - Timeframe	PRIORITY LEVEL	STRATEGY TYPE			
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency						Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Buildings & Infrastructure	**41**	**Promote structural modifications (such as foundation anchoring and tie downs) for mobile homes and tree clearance** to reduce structural damage from high winds.		X								Countywide; also see Appx. A for mapped locations of mobile home neighborhoods	**County Building Dept.**, **City of Cadillac**, EM	A, B	Ongoing	**Med**		**X**		**X**
	42	**Consider developing a reduced-cost program to install air conditioning in the homes of low-income seniors.**		X			X					Countywide	**Wexford County Council on Aging**	D, H	0-3years	**Low**		**X**		
	43	**Promote the availability of residential weatherization and home improvement programs.**	X	X			X					Countywide	**NMCAA**	A, B, F, G	Annual	**Low**		**X**		**X**
	44	**Improve ventilation techniques in areas, facilities, or vehicles that are prone to crowding or that may involve exposure to contagion or noxious atmospheres.**									X	Gymnasiums, theatres, stadiums, public transportation, Wex Civic Ctr.	**Wexford County**	A, B, U	1-3 years	**Low**	**X**	**X**		
	45	**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 and air contamination.**									X	City of Cadillac	**City of Cadillac**	Cadillac Brownfield Redevelopment Authority	Ongoing	**Med**	**X**	**X**	**X**	
	46	Continue to regularly **clean out plugged culverts** (due to beaver activity, sediment deposits, invasive species, etc.) **and/or upgrade to larger sized replacement culverts** to better accommodate high volume streamflows.				X				X		Countywide	**Road Commission, MDOT, City of Cadillac, City of Manton, Villages of Buckley and Mesick**	A, B, T, U, FF, NN	Ongoing	**Med**	**X**	**X**	**X**	
Utilities & Technology	**47**	**Continue work amongst the utility companies and the County Road Commission to clear vegetation** (particularly diseased or dead trees) **along road and utility ROWs** to minimize power outages and road blockages from storms.	X	X						X		Countywide	**Road Commission**, utility companies	O, P, Q	Ongoing	**Med**	**X**			
	48	**Continue to maintain effective communications between electric utility companies regarding power restoration after storms.** (County EM to post and promote the electrical outage map on social media.)	X	X								Countywide	Consumers E., Cherryland Electric, or Great Lakes Energy and the **County EM.**	O, P, Q	Ongoing	**Med**	**X**			
	49	**Investigate opportunities to bury overhead utilities**, such as during construction or in areas prone to power outages.	X	X	X							Countywide	Electric utility providers, **Local Governments**	A, B, O, P, Q	0-3 years	**Low**		**X**		
	50	**Identify the locations of where backup generators on sewer pump chambers are needed** to alleviate manual pumping/hauling duing a power outage; **apply for funding.**	X	X		X					X	Haring, Cherry Grove and Selma Townships; Villages of Mesick and Buckley; Cities of Manton and Cadillac	**Haring, Cherry Grove and Selma Townships; Villages of Mesick and Buckley; Cities of Manton and Cadillac**	U	0-5years	**Med**		**X**		
	51	**Install needed check valves on stormwater discharge sites.**		X		X					X			U	0-5years	**Low**		**X**		
	52	**Continue to maintain community water and/or sewer infrastructure at acceptable operating standards.**				X					X			B	Ongoing	**Med**	**X**			
	52a	**Continue efforts to secure funding for the sanitary sewer system replacement project along the shoreline of Lake Mitchell** (prevent backflow into water supply).				X					X	Selma Twp., Cherry Grove Twp., City of Cadillac	**Lake Mitchell Sewer Authority**; Lake Mitchell Property Owners Inc.; County Drain Commissioner	U, KK	0-5years	**Low**		**X**	**X**	
	53	**Maintain Continuity of Operations (COOP) plans and alternative "remote work" schedules.**									X	County and Local Government Agencies; Public Schools	**County and Local Government Agencies; Public Schools**	A, B	Ongoing	**Low**	**X**			
	54	**Expand availability of high-speed internet service to allow for widely available remote work/learning.**									X	Countywide; Colfax Twp. has specifically expressed need	Local governments; **ISPs**; MI High Speed Energy Office	OO	Ongoing	**Med**	**X**	**X**		

		WEXFORD COUNTY 2023 HAZARD MITIGATION PLAN STRATEGIES	HAZARD TYPE									WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead parties are in **BOLD**)	HOW - Resources	WHEN - Timeframe	PRIORITY LEVEL	STRATEGY TYPE			
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency						Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Environment & Natural Resources	55	**Continue to provide technical assistance, outreach and education pertaining to invasive species management.**								X		Countywide	**WCD, NC-CISMA, USDA-NRCS, MSUE, MDARD**	X	Ongoing	**Low**	**X**	**X**	**X**	**X**
	55a	**Support invasive species management services with a cost-share option between land owners and NC-CISMA.**								X		Countywide	**NC-CISMA**, Wexford Conservation District	EE	Ongoing	**Low**			**X**	**X**
	55b	**Continue to conduct annual routine invasive species surveying and monitoring to identify new emergent invasive species** before they get established and spread.								X		Countywide	**NC-CISMA**, Wexford Conservation District	EE	Ongoing	**Med**			**X**	
	55c	**Utilize the Michigan Invasive Species Grant Program** to submit proposals for projects that will: prevent the introduction or spread of invasive species by engaging the public in prevention practices and reducing the risk of moving invasive species into high-risk areas; or aid in early detection and response efforts for species on Michigan's Watch List; or increase response preparedness for new or emerging invasive species; or develop or improve tools to inform management and control decisions								X		Countywide	**NC-CISMA**, Wexford Conservation District	Y, DD, EE	Ongoing	**Med**	**X**		**X**	**X**
	55d	**Utilize MSUE's "Clean Boats, Clean Waters" comprehensive aquatic invasive species boater outreach program resource**s; apply for grant funding to communicate aquatic invasive species prevention information through outreach materials and in-person educational events to boaters.								X		Countywide	**NC-CISMA**, Wexford Conservation District	AA	Ongoing	**Med**	**X**		**X**	**X**
	55e	**Utilize and promote EGLE's "NotMISpecies" webinars and resources** on invasives control and management								X		Countywide	**NC-CISMA**, Wexford Conservation District	Z	Ongoing	**Med**			**X**	**X**
	55f	**Continue participation in the annual Great Lakes Aquatic Invasive Species "Landing Blitz" event**, 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		Countywide	**NC-CISMA**	Z, EE	Ongoing	**Med**			**X**	**X**
	55g	**Provide boat wash stations and signage** at all public boat launch sites.								X		See appended list of boat launches	**USFS, MDNR, local governments**; see appended list of boat launch locations and owners	Y, AA	1-5years	**Low**	**X**		**X**	**X**
	55h	**Install boot-cleaning and/or equipment cleaning facilities** at popular trailheads (unpaved non-motorized, equestrian, and ORV/Motorcycle) to reduce the spread of invasives species.								X		Townships of Antioch, Boon, Cedar Creek, Clam Lake, Greenwood, Hanover, Haring Charter, Henderson, Liberty, and South Branch; City of Cadillac	**USFS, MDNR, North Country Trail Association**	Y, EE	Ongoing	**Low**		**X**	**X**	**X**

		WEXFORD COUNTY 2023 HAZARD MITIGATION PLAN STRATEGIES	HAZARD TYPE									WHERE - Affected Locations or Groups	WHO - Responsible Parties (Lead parties are in **BOLD**)	HOW - Resources	WHEN - Timeframe	PRIORITY LEVEL	STRATEGY TYPE			
			Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Flooding and Erosion	Extreme Temperatures	Drought	Subsidence	Invasive Species	Public Health Emergency						Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness
Environment & Natural Resources	56	**Continue to manage inland lake aquatic invasive species with treatment programs and public awareness of invasive species management.**								X		City of Cadillac, Clam Lake Twp., Cherry Grove Twp., Selma Twp.	**Lake Cadillac Invasive Species Control Program - City of Cadillac; Lake Mitchell Improvement Board - City of Cadillac, Selma Twp., Cherry Grove Twp.; Pleasant Lake Assn. in Selma Twp.; Stone Ledge Lake Association in Clam Lake Twp.;** County Drain Commissioner & BOC	EE, HH - MM	Ongoing	**Med**	**X**		**X**	**X**
	57	**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.**								X		WJPC; Cities of Cadillac and Manton	**Wexford Joint Planning Commission; Cities of Cadillac and Manton**	X, II	0-5 years	**Low**	**X**		**X**	
	58	**Implement nature-based solutions to mitigate stormwater runoff** in construction projects.				X				X		Countywide	**Local governments**	T, U, X	0-5 years	**Low**	**X**	**X**	**X**	
	59	**Continue to identify and prioritize sites for open space protection/preservation, green infrastructure and/or stormwater management.**				X				X		Countywide	Wexford Conservation District, **Cadillac Area Land Conservancy**, and the NC-CISMA	FF, GG, HH, MM	Ongoing	**Low**	**X**		**X**	
	60	**Support implementation of Forestry Management Plans that include mitigation efforts for invasive species.**								X		Countywide	**MDNR, USFS, Wexford Conservation District**	A, B, CC, DD, EE, MM	Ongoing	**Med**	**X**		**X**	
	61	**Continue to conduct wildfire management such as prescribed burns and surface fuels management projects on open space/public land** (this also encourages regeneration of native plant species).			X					X		All townships in Wexford County	**MDNR, USFS**, Cadillac Regional Land Conservancy, Wexford Conservation District	EE, MM	Ongoing	**Med**	**X**		**X**	
	62	**Continue efforts to regularly clean up river and lake debris** (such as the clean up of Manton Creek between the Mill Dond and the dam in the City of Manton)				X				X		Countywide	**City of Manton, Pine River & Upper Manistee River Associations, Cadillac Area Land Conservancy, Muskegon River Watershed Assembly, Pleasant Lake Assn., Stoneledge Lake Property Owners Assn., MDNR, USFS, WCD, CRA**	DD, GG, HH, KK, MM	Ongoing	**Med**			**X**	
	63	**Implement soil erosion mitigation techniques along the shorelines of Lake Mitchell.**	X	X		X				X		Cherry Grove Twp., Selma Twp.	**Lake Mitchell Property Owners Inc.**	B, II, JJ, KK	0-5 years	**Low**	**X**		**X**	
	64	**Investigate the possibility of "daylighting" parts of the Clam River in the City of Cadillac** to prevent future flooding and subsidence impacts to other nearby properties, and increase greenspace/green infrastructure assets.				X	X	X	X	X		City of Cadillac; affected property owners northwest of the intersection of W. River Street and BR US-131	**City of Cadillac**, County Drain Commissioner, MI EGLE, affected property owners	T, U, City of Cadillac funds	0-10 years	**Med**		**X**	**X**	

Resources Table for Implementing Wexford County's 2023 Hazard Mitigation Strategies

ID	Resource	Description	Hazard Type	Website
A	**Wexford County staff**	Wexford County staff as appropriate	All hazards	https://wexfordcounty.org/
B	**Local government staff**	All local units of government; Wexford Joint Planning Commission members: Antioch Township - Boon Township - Cherry Grove Township - Hanover Township - Liberty Township - Selma Township - Slagle Township - South Branch Township - Springville Township - Wexford Township	All hazards	http://www.wexfordjpc.org/
C	**Local Emergency Services and Fire Departments**	Boon; Buckley; Cedar Creek; Cherry Grove; Colfax-Greenwood; Haring; Manton; Springville; Selma; Slagle-Harrietta; South Branch, USFS, MDNR	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Wildfire; Flooding; Extreme Temperatures; Public Health Emergency	
D	**Wexford County Council on Aging**	The Wexford County Council on Aging provides resources and support for residents aged 60 and older. Some services include homemaking services, personal care, adult day care and low-cost snow removal program. 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://wexfordcoa.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 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. NMCAA also operates the Meals on Wheels program for seniors.	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	**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.	All hazards	https://cadillacfoundation.org/
I	**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/
J	**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
K	**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/
L	**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
M	**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. 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
N	**Consumer's Energy Hydro Planning**	Information on planning processes and documents related to the future of hydropower dams in Michigan.	Flooding, Invasive Species	www.consumersenergy.com/hydrofuture
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	**Cherryland Electric Cooperative**	Cherryland Electric is a regional cooperative that provides electric service in Springville and Wexford Townships in Wexford County.	All hazards.	https://cherrylandelectric.coop/outage/
R	**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.mcgi.state.mi.us/wetlands/mcgiMap.html

Resources Table for Implementing Wexford County's 2023 Hazard Mitigation Strategies

ID	Resource	Description	Hazard Type	Website
S	**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/manage-risk/local
T	**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. • $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)	Flooding	https://www.fema.gov/grants/mitigation/floods
U	**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 doubled for BRIC to $2.295 billion for FY21. • 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 match • Economically disadvantaged rural communities are eligible for 10% non-federal match	All hazards	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
V	**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
W	**HMGP Post-Fire Assistance (PFA) grant program**	This grant funds projects that make a community more resilient after a designated wildfire disaster. States and federally-recognized tribes affected by fires resulting in a Fire Management Assistance Grant (FMAG) declaration on or after October 5, 2018, are eligible to apply.	Wildfire, Drought	https://www.fema.gov/grants/mitigation/post-fire
X	**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
Y	**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
Z	**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
AA	**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\ 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_boats_clean_waters/index
BB	**Michigan State University Extension (MSUE)**	Resources available for: training elected and appointed officials, agriculture and food support programs (such as school community gardens), and natural resources protections.	All hazards	https://www.canr.msu.edu/outreach/ https://www.canr.msu.edu/community_food_systems/school-gardens/
CC	**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/
DD	**Wexford Conservation District (WCD)**	The mission of the WRC is to enable the citizen of Wexford County to be stewards of their natural resources. By providing services such as tree sales, plant sales, workshops, and the Michigan Forestry Assistance Program (FAP). We also partner and work with USDA-NRCS, Missaukee Conservation District, and the North Country Cooperative Invasive Species Management Area (NCCISMA).	Flooding & Erosion; Invasive Species; Wildfire; Drought; Extreme Temperatures; Public Health Emergency	https://www.wexfordconservationdistrict.org/
EE	**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/
FF	**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/
GG	**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; shorescaping workshops; and habitat improvement.	Flooding & Erosion; Invasive Species, Public Health Emergency, Drought, Extreme Heat	https://mrwa.org/

Resources Table for Implementing Wexford County's 2023 Hazard Mitigation Strategies

ID	Resource	Description	Hazard Type	Website
HH	**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/
II	**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/
JJ	**Lake Mitchell Improvement Board**	The Lake Mitchell Improvement Board collects special assessments from benefiting properties for approved lake improvements. Virtually all assessment monies are spent to control invasive and nuisance native vegetation as well as monitor water quality and protect the fishery. The lake board membership includes a riparian representative who is elected for a four-year term, appointed representatives from Selma Township, Cherry Grove Township, the city of Cadillac, a Wexford County Commissioner, and the Wexford County Drain Commissioner. Township, County Commission and City Commission representatives are appointed for indefinite terms. The Drain Commissioner who is elected in a county election.	Flooding & Erosion; Extreme Heat; Invasive Species, Public Health Emergency, Drought	https://www.lakemitchell.org/lmib-duties/
KK	**Lake Mitchell Property Owners Inc.**	Efforts are focused on lake water quality, lake levels, dam management, sewer, the health of fish and wildlife, and all questions related to property owners on the lake.	Flooding & Erosion; Extreme Heat; Invasive Species, Public Health Emergency, Drought	https://lakemitchellpo.com/
LL	**Lake Cadillac - City of Cadillac Milfoil Management Program**	Since 2006, the City of Cadillac has administered a milfoil management program on Lake Cadillac. In 2010, voters approved a three-year citywide millage to fund the program, which is designed to help improve recreational use in the lake while preserving the fragile balance that is required to keep the lake healthy.	Invasive Species	https://www.cadillac-mi.net/383/Milfoil-Management-Program
MM	**Cadillac Area Land Conservancy**	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: - 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 easement properties. - 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.	Flooding & Erosion; Invasive Species; Public Health Emergency; Wildfire; Drought; Extreme Heat	https://calc-landtrust.org/
NN	**Great Lakes Stream Crossing Inventory**	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.	Flooding & Erosion	https://great-lakes-stream-crossing-inventory-michigan.hub.arcgis.com/
OO	**Michigan High Speed Internet Office**	Information on plans and funding opportunities to increase high speed internet service in Michigan.	All hazards.	https://www.michigan.gov/leo/bureaus-agencies/mihi

VIII. 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.

Resources to Assist with Implementing the Strategies
To assist with the funding and/or enacting of the proposed natural hazards mitigation strategies, the Resources Table on the previous pages lists multiple resources that can help fund, staff or otherwise support the implementation of hazard mitigation strategies. Each potential entity or program is assigned a letter code, listed in the "Resources" column of the strategies table.

The following is a general list of some of the financial assistance entities to help fund strategic actions of the Plan.

- Federal Emergency Management Administration – Hazard Mitigation Grant and Building Resilient Infrastructure and Communities Programs
- U.S. Environmental Protection Agency
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Department of Agriculture Rural Development: Rural broadband opportunity – high speed telecommunication funding from the Public Telecommunications Facilities Planning and Construction grants
- U.S. Department of Housing and Urban Development
- Michigan Department of Environment, Great Lakes, and Energy
- Michigan Department of Natural Resources
- National Oceanic and Atmospheric Administration
- Community, Regional Foundations
- Businesses

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 Emergency Management Coordinator 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 Wexford County Emergency Management Office and will coordinate with the County Board of Commissioners.

Natural Hazards Task Force will perform an annual review of the Wexford 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.

- Wexford County Government Staff
- Township, city and village governments
- Wexford Conservation District
- Wexford County Drain Commissioner
- Wexford County Road Commission
- District Health Department #10
- North Country Cooperative Invasive Species Management Area
- Cadillac Area Land Conservancy
- 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. Forest Service

- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture Natural Resources Conservation Service
- American Red Cross
- National Weather Service (Gaylord)
- Insurance and real estate companies

In addition, the local communities have indicated to the county emergency manager that they will follow the county's lead in identifying mitigation projects and developing grant applications to fund those projects. Land use issues associated with those projects will be handled by each jurisdiction that have an adopted Master Plan and regulate zoning in the project area. Community planning services are provided by the professional staff of each municipality within the county that provide planning and zoning. The respective planners assist communities in developing plans and zoning ordinances, provides resource information and technical assistance, and convenes communities to address land use issues of common interest.

The Wexford County Building Department issues construction code permits (building, electrical, mechanical, and plumbing permits) for all areas of Wexford County except for Cedar Creek Township, the City of Cadillac, and the City of Manton; those communities issue their own building permits. Additionally, the County Building Department administers and enforce the Soil Erosion and Sedimentation Control program for Wexford County, pursuant to Part 91 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Except for the City of Cadillac.

Plan Integration

Wexford County, all townships, cities, and villages in Wexford County, as well as local and state agencies will consider integrating information from the hazard mitigation plan into their comprehensive and operations plans. The Wexford Joint Municipal Planning Commission is in the process of updating their Master Plan in 2023.

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

The Wexford Joint Planning Commission was created to provide planning and zoning to the following ten participating municipalities: Antioch Township, Boon Township, Cherry Grove Township, Greenwood Township, Hanover Township, Liberty Township, Selma Township, Slagle Township, South Branch Township, Springville Township, and Wexford Township.

The following communities provide planning and zoning services for their respective communities: the City of Cadillac, Village of Buckley, Village of Harrietta, Village of Mesick, Cedar Creek Township, Clam Lake Township, and Haring Charter Township.

There is no zoning in Colfax, Greenwood, or Henderson Townships. Wexford County does not administer planning and zoning services for local governments, nor does it have a County Planning Commission.

As part of the education and outreach aspect of the hazard mitigation effort, communities with planning and zoning in the county will be encouraged to adopt zoning regulations that minimize the effect of natural hazards.

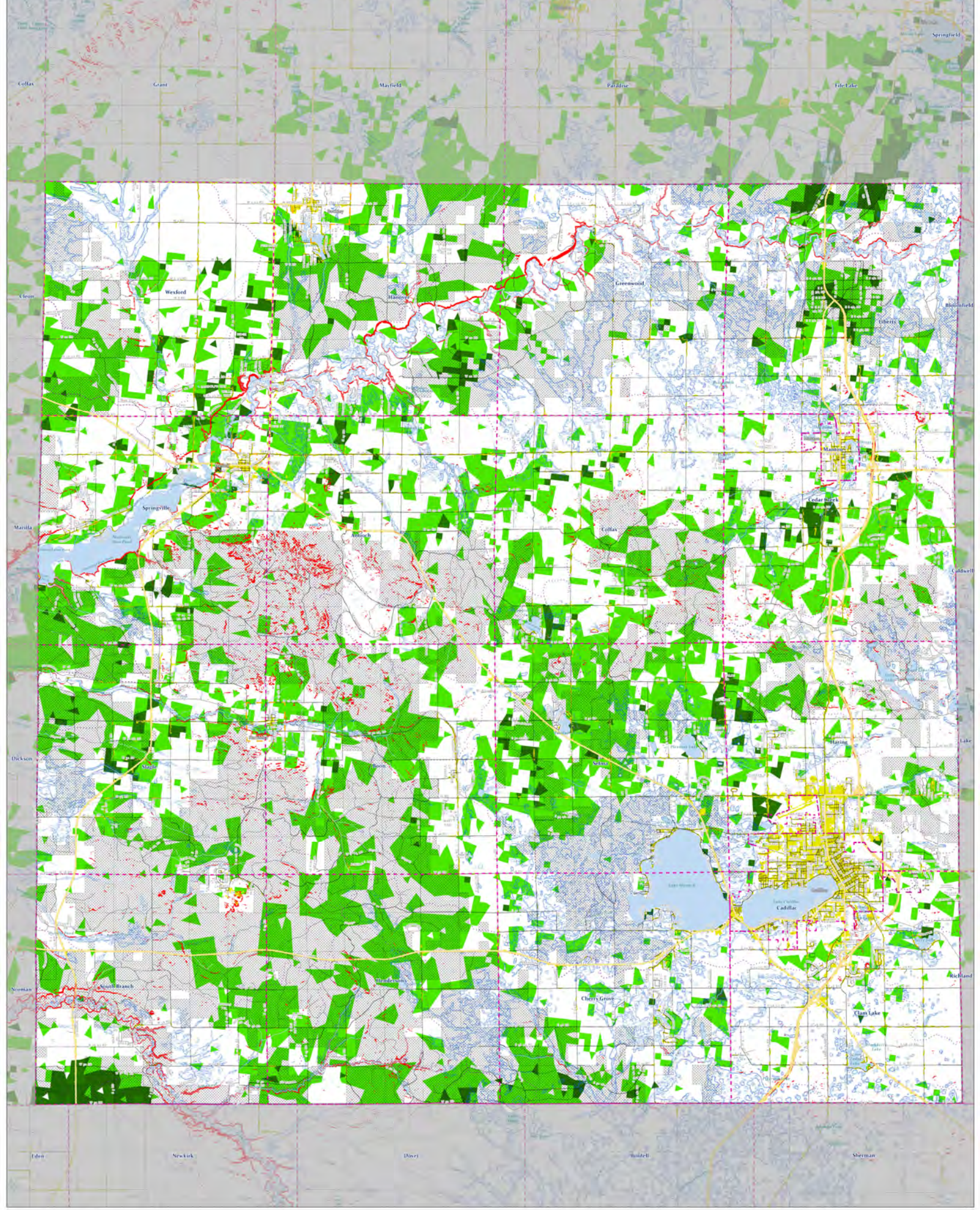
Five Year Plan Review and Update

The Stafford Act, as amended by the Disaster Mitigation Act of 2000, requires the Wexford 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 Wexford County Board of Commissioners can review, approve, and adopt the plan. In order to properly update the plan in the future, Wexford County will need to seek funding from appropriate state and federal agencies.

Continued Public Involvement

Wexford 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



Wexford County Environmental Features

2023 Hazard Mitigation Plan

Legend

- Highways
- Roads
- Railroad
- Rivers/Streams
- Water Bodies
- Part 303 Wetlands
- Watershed Boundary 12 Digit
- Slope 30% or Greater
- Developed Land
- High, Medium & Low Intensity
- Pine Forest
- Jack Pine
- Red Pine/ Eastern White Pine
- Public Lands
- Villages
- Cities
- Township Boundaries
- Wexford County
- Adjacent Counties

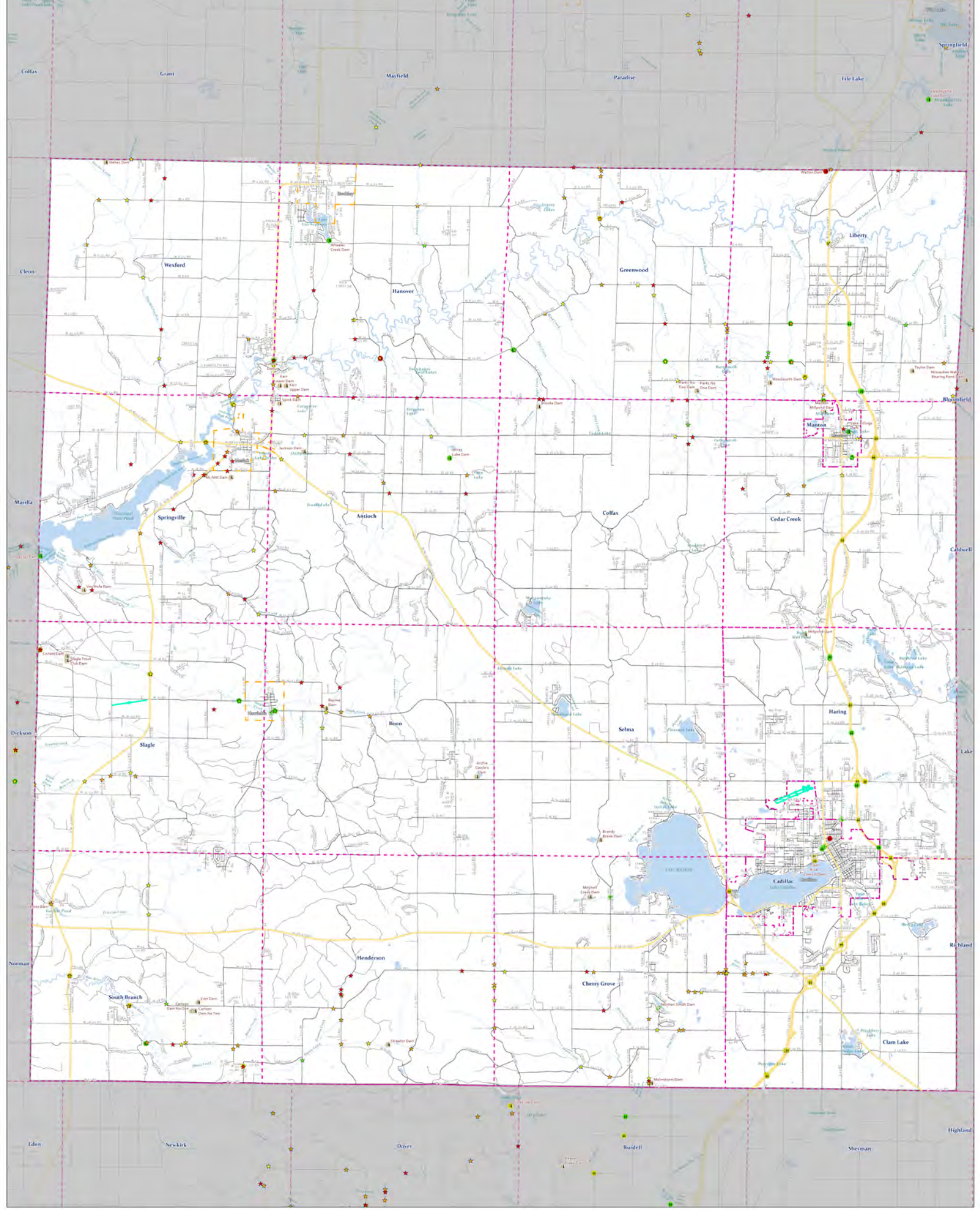
Note:
The State of Michigan has not identified High Risk Erosion or Critical Dune locations in Wexford County.
The Federal Government has not mapped Floodplains within Wexford County.

0 2,000 4,000 8,000 12,000 16,000 Feet

N W E S

Wexford County Hazard Mitigation Planning Process
Map produced by Networks Northwest Community Development 2022.
Map data sources: State of Michigan, ESRI, NRCS, USDA, USGS

Networks Northwest



Wexford County Infrastructure

2023 Hazard Mitigation Plan

Highways
Roads
Railroad
Rivers/Streams
Water Bodies

Stream Crossings (CRA) Severity
Restored
Minor
Moderate
Severe

Bridge Condition Rating
Good
Fair
Poor
Serious
Critical

Legend

MI Dam Inventory Condition
Satisfactory
Fair
Poor
Unsatisfactory

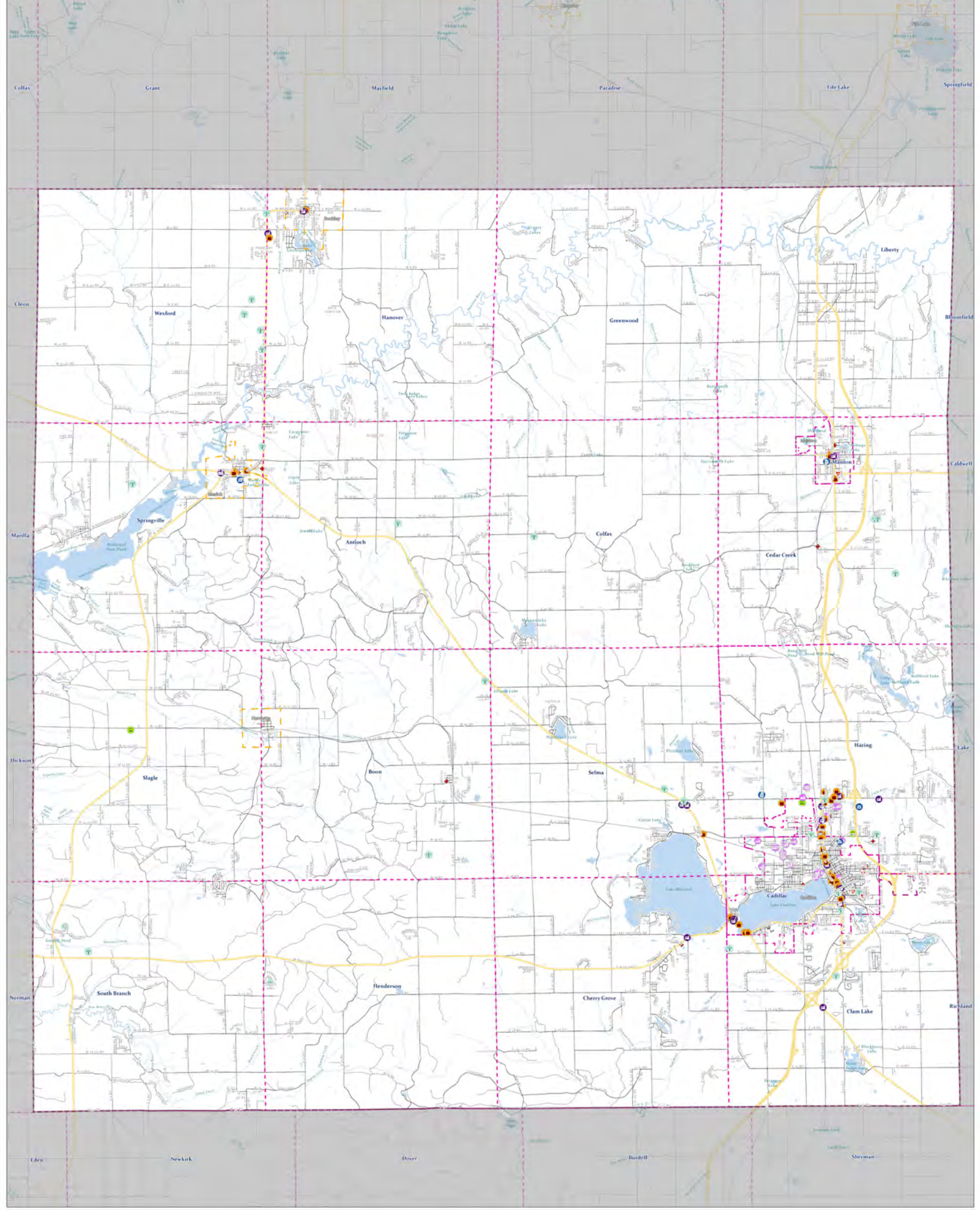
Villages
Cities
Township Boundaries
Wexford County

0 2,000 4,000 8,000 12,000 16,000 Feet

N W E S

Wexford County Hazard Mitigation Planning Process.
Map produced by Networks Northwest Community Development 2022.
Map data sources: State of Michigan, ESRI, NRCS, USDA, USGS, CRA, MDOT

Networks Northwest



Wexford County
Critical Infrastructure Points

2023 Hazard Mitigation Plan

Legend

Critical Infrastructure Points

Sector

- Commercial
- Communications
- Emergency Services
- Government Facilities
- Healthcare
- Industry
- Highways
- All Roads
- Roads
- Railroad
- Villages
- Cities
- Township Boundaries
- Wexford County
- Adjacent Counties

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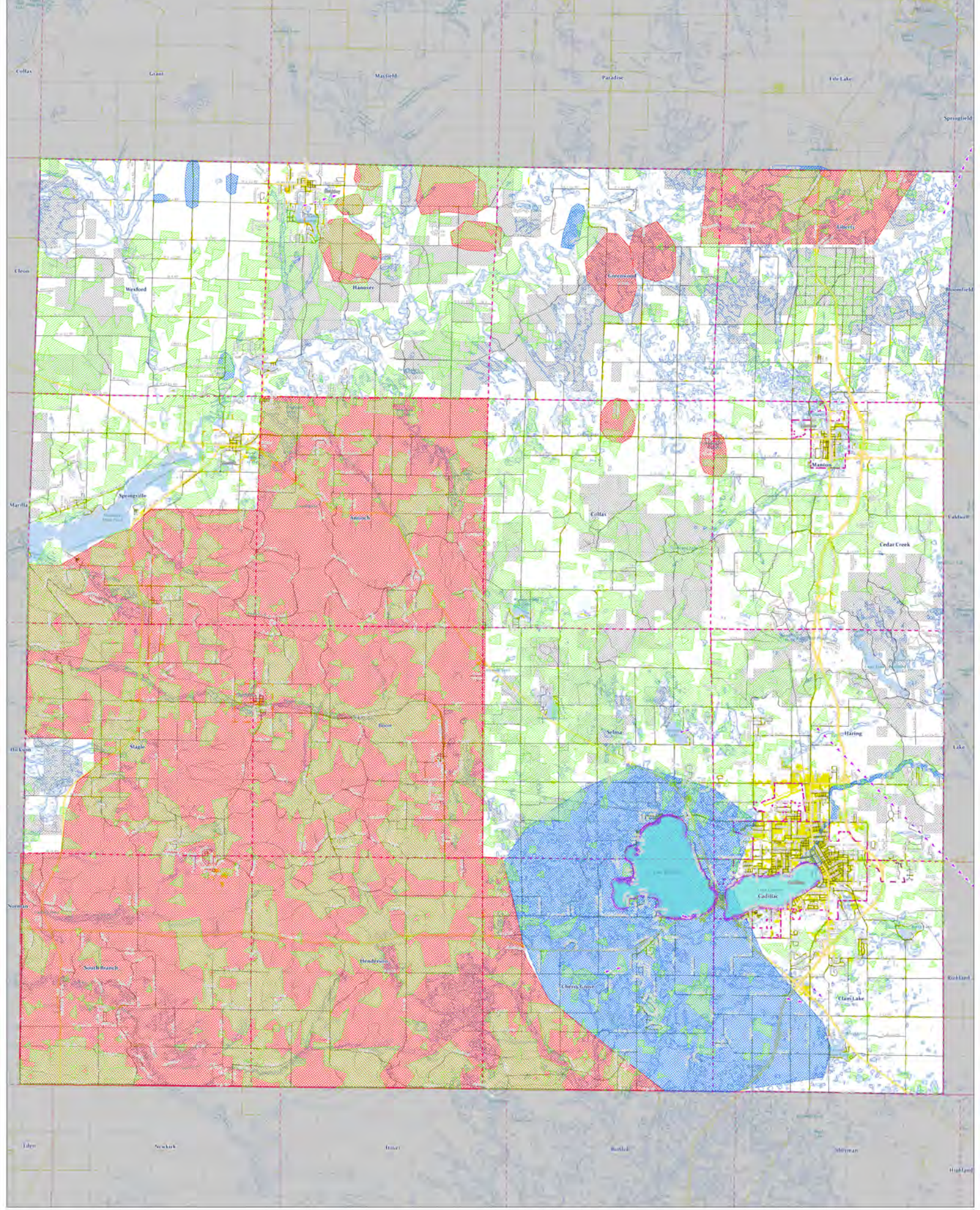
N W E S

Wexford County Hazard Mitigation Planning Process.
Map produced by Networks Northwest Community Development 2022.
Map data sources: State of Michigan, ESRI, NRCS, USDA, USGS, CRA, MDOT
Wexford County Emergency Management

Networks Northwest



Wexford County Hazard Areas

2023 Hazard Mitigation Plan

Hazard Areas

Type

Fire

Flood

Shoreline Erosion

Map Period Hazard Area

Legend

Highways

Roads

Railroad

Rivers/Streams

Water Bodies

Hart (83) Wetlands

Public Lands

Developed Land

High, Medium & Low Intensity

Villages

Cities

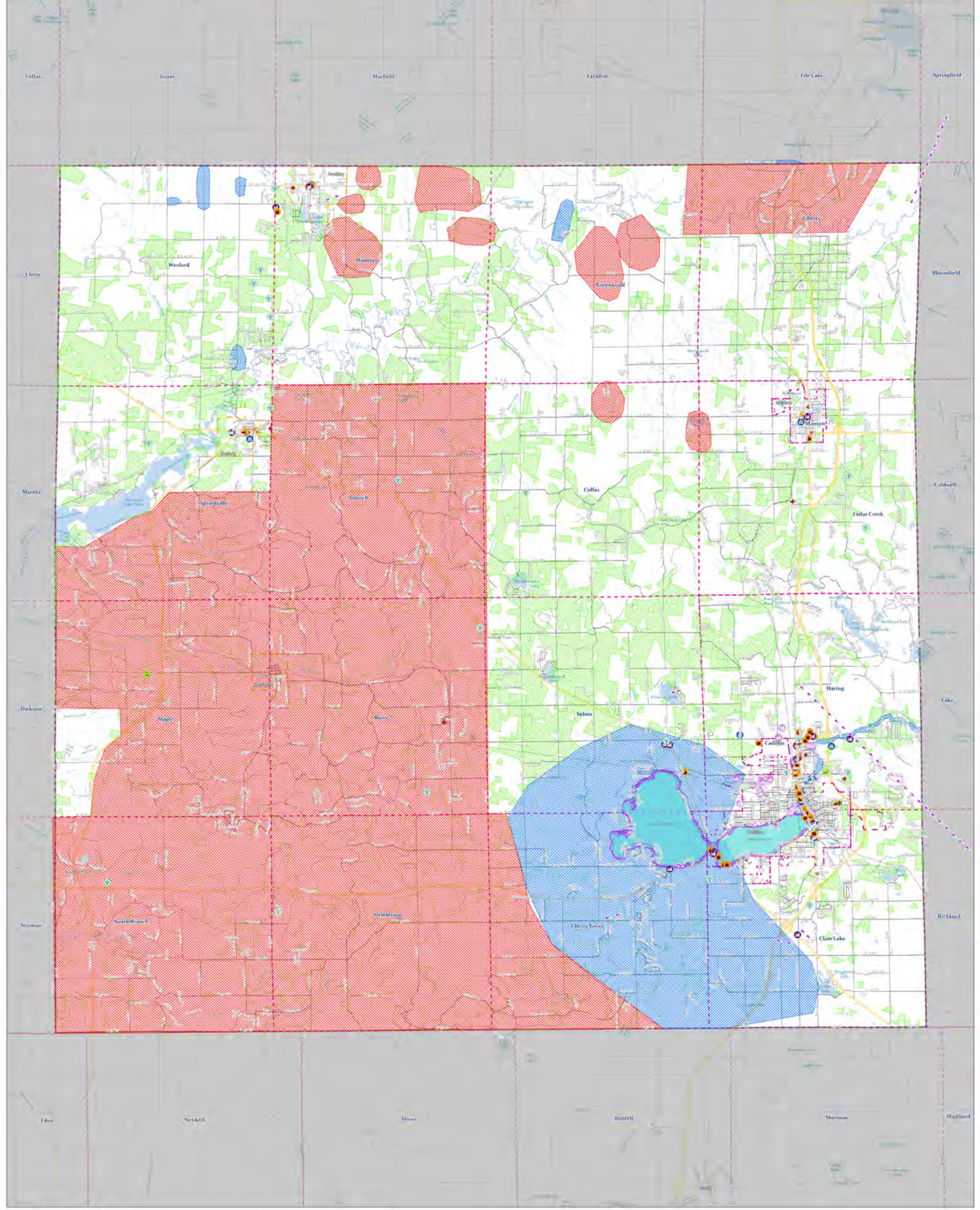
Township Boundaries

Wexford County

Adjacent Counties

Wexford County Hazard Mitigation Planning Process.
Map produced by Networks Northwest Community Development 2022.
Map data sources: State of Michigan, ESRI, NRCS, USDA, USGS, CRA, MDOT
Wexford County Emergency Management

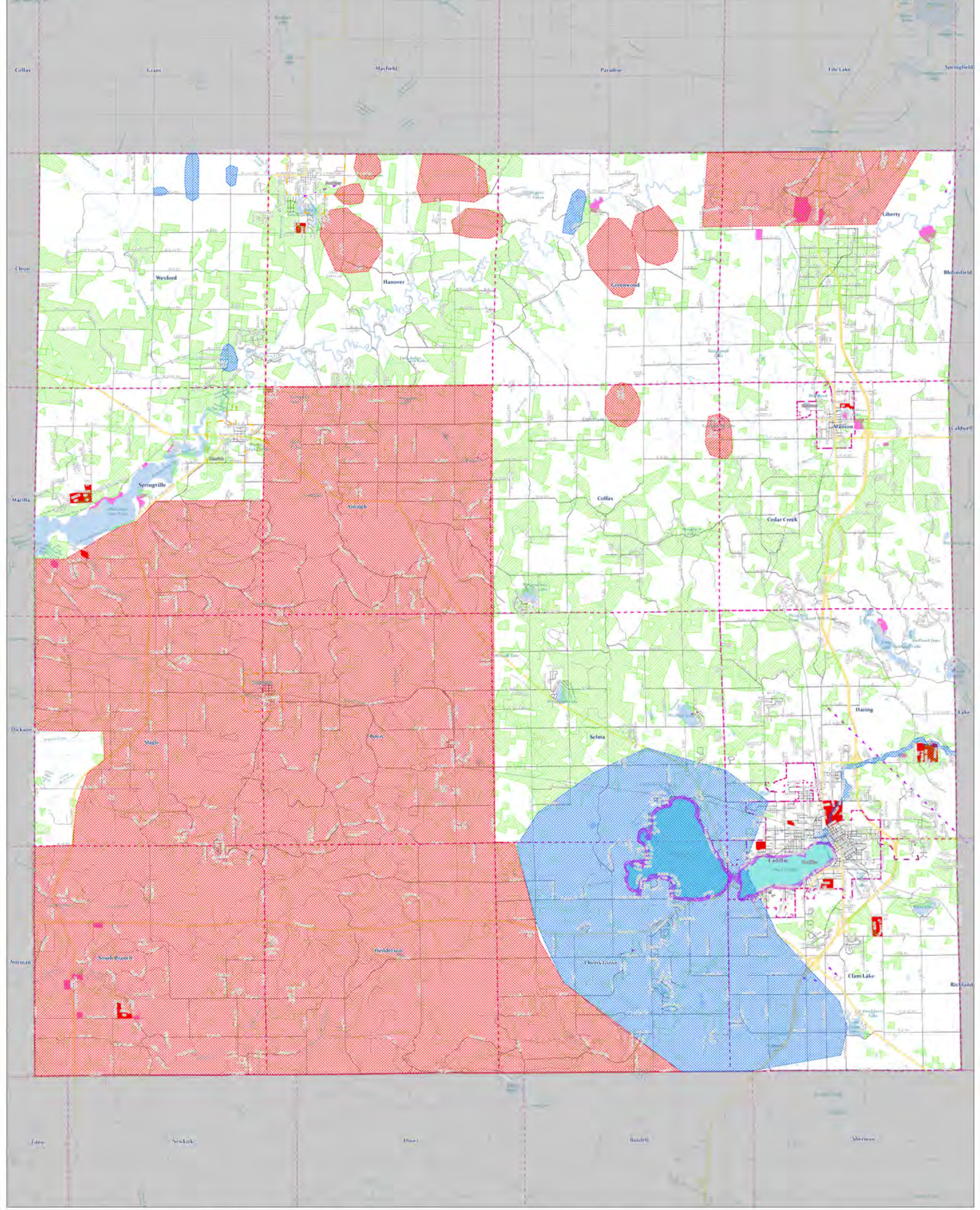
Networks Northwest



Wexford County Critical Infrastructure Points & Hazard Areas

Wexford County Hazard Mitigation Planning Process.
Map produced by Networks Northwest Community Development 2022.
Map data sources: State of Michigan, ESRI, NRCS, USDA, USGS, CRA, MDOT
Wexford County Emergency Management

Networks Northwest



Wexford County Vulnerable Populations & Hazard Areas

Vulnerable Populations
- Campground
- Mobile Home

Hazard Areas
Type
- Streamline Erosion
- Fire
- Flood
- Pine Forest

Legend
- Highways
- Roads
- Railroad
- Rivers/Streams
- Water Bodies
- Villages
- Cities
- Township Boundaries
- Wexford County
- Adjacent Counties

0 2,000 4,000 8,000 12,000 16,000 Feet

N W E S

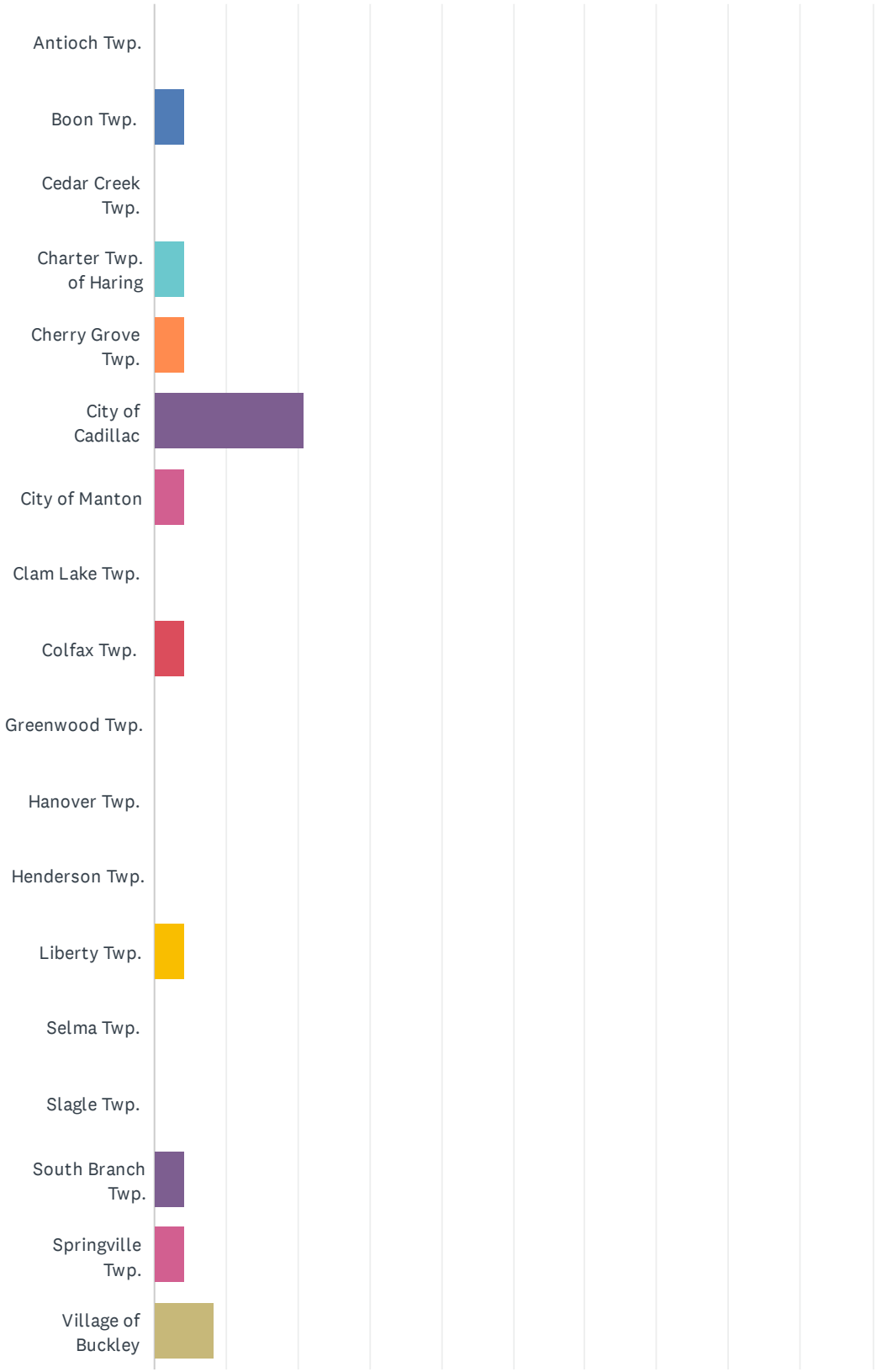
Wexford County Hazard Mitigation Planning Process.
Map produced by Networks Northwest Community Development 2022.
Map data sources: State of Michigan, ESRI, NRCS, USDA, USGS, CRA, MDOT Wexford County Emergency Management

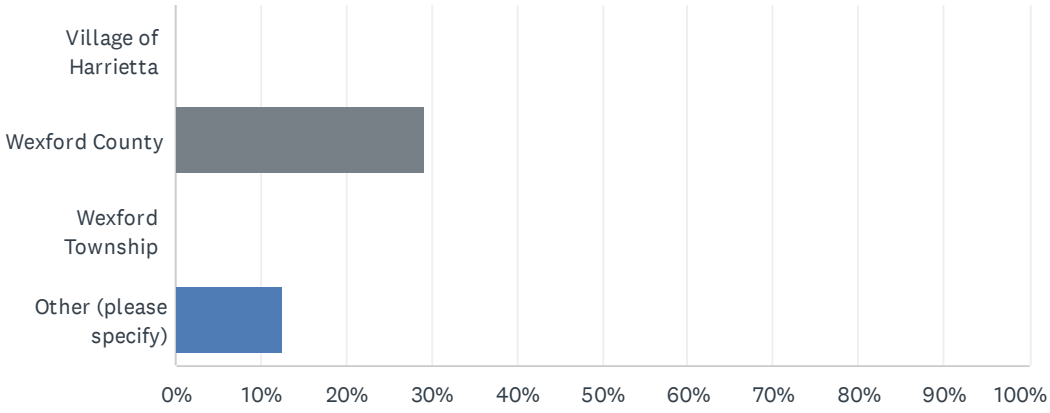
Networks Northwest

APPENDIX B. COMMUNITY SURVEY RESULTS

Q1 Please identify the jurisdiction you represent in Wexford County (may select more than one).

Answered: 24 Skipped: 0





ANSWER CHOICES	RESPONSES	
Antioch Twp.	0.00%	0
Boon Twp.	4.17%	1
Cedar Creek Twp.	0.00%	0
Charter Twp. of Haring	4.17%	1
Cherry Grove Twp.	4.17%	1
City of Cadillac	20.83%	5
City of Manton	4.17%	1
Clam Lake Twp.	0.00%	0
Colfax Twp.	4.17%	1
Greenwood Twp.	0.00%	0
Hanover Twp.	0.00%	0
Henderson Twp.	0.00%	0
Liberty Twp.	4.17%	1
Selma Twp.	0.00%	0
Slagle Twp.	0.00%	0
South Branch Twp.	4.17%	1
Springville Twp.	4.17%	1
Village of Buckley	8.33%	2
Village of Harrietta	0.00%	0
Wexford County	29.17%	7
Wexford Township	0.00%	0
Other (please specify)	12.50%	3
Total Respondents: 24		

#	OTHER (PLEASE SPECIFY)	DATE
1	MMR EMS service	1/26/2022 1:39 PM
2	Entire County	1/18/2022 3:55 PM
3	All, State of Michigan coverage	12/6/2021 3:34 PM

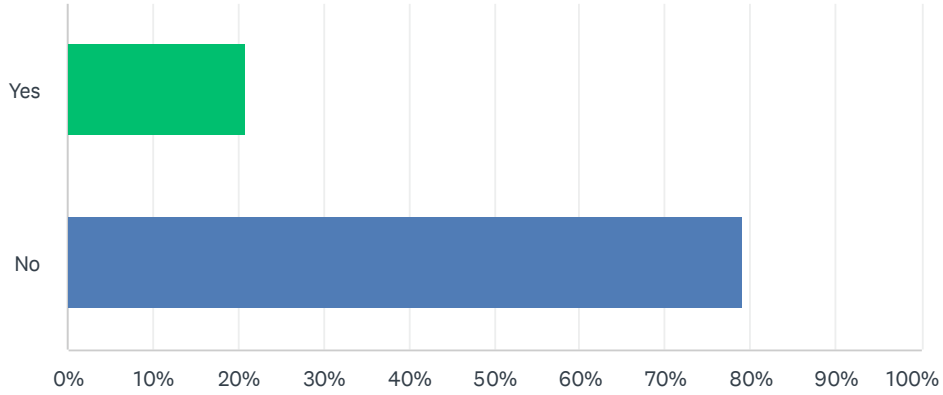
Q2 What is your role/organizational representation within Wexford County (i.e., citizen, type of local government employee, elected official, etc.)?

Answered: 24 Skipped: 0

#	RESPONSES	DATE
1	Wexford County Council on Aging	1/28/2022 10:11 AM
2	I am the engineer manager of the road commission	1/27/2022 7:00 AM
3	elected offical	1/26/2022 2:38 PM
4	Township Supervisor	1/26/2022 2:32 PM
5	EMS service	1/26/2022 1:39 PM
6	Public school administrator. I work in Wexford, but live in Benzie County.	1/26/2022 1:09 PM
7	Clerk, elected	1/26/2022 1:05 PM
8	Sheriff	1/18/2022 10:34 PM
9	Fire chief/DPW supervisor	1/18/2022 4:14 PM
10	Local Government Employee	1/18/2022 3:55 PM
11	Employee	12/14/2021 2:43 PM
12	Public Safety Director	12/9/2021 7:06 AM
13	District Health Dept. #10	12/8/2021 1:00 PM
14	Michigan State Police	12/6/2021 3:34 PM
15	CLERK	12/5/2021 4:56 PM
16	Mayor Pro Tem	12/4/2021 12:00 PM
17	County Administrator	12/2/2021 12:17 PM
18	Superintendent of Buckley Schools	12/2/2021 7:29 AM
19	City Clerk	12/1/2021 6:15 PM
20	township supervisor	12/1/2021 4:32 PM
21	Zoning Administrator	12/1/2021 3:30 PM
22	Community Development Director	12/1/2021 2:04 PM
23	City Manager	12/1/2021 12:35 PM
24	WJPC, citizen	12/1/2021 12:24 PM

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

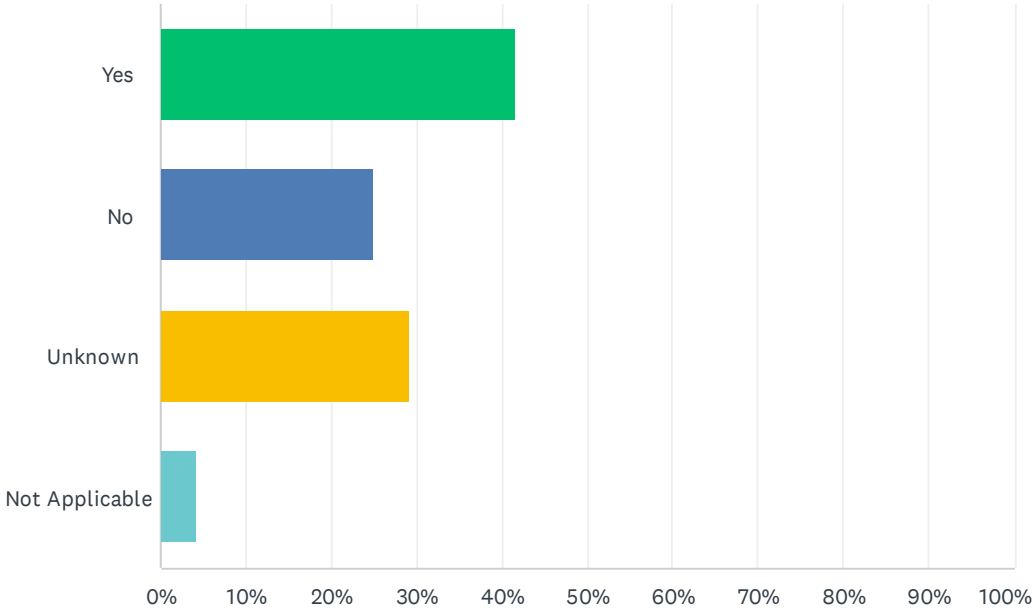
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	20.83%	5
No	79.17%	19
TOTAL		24

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

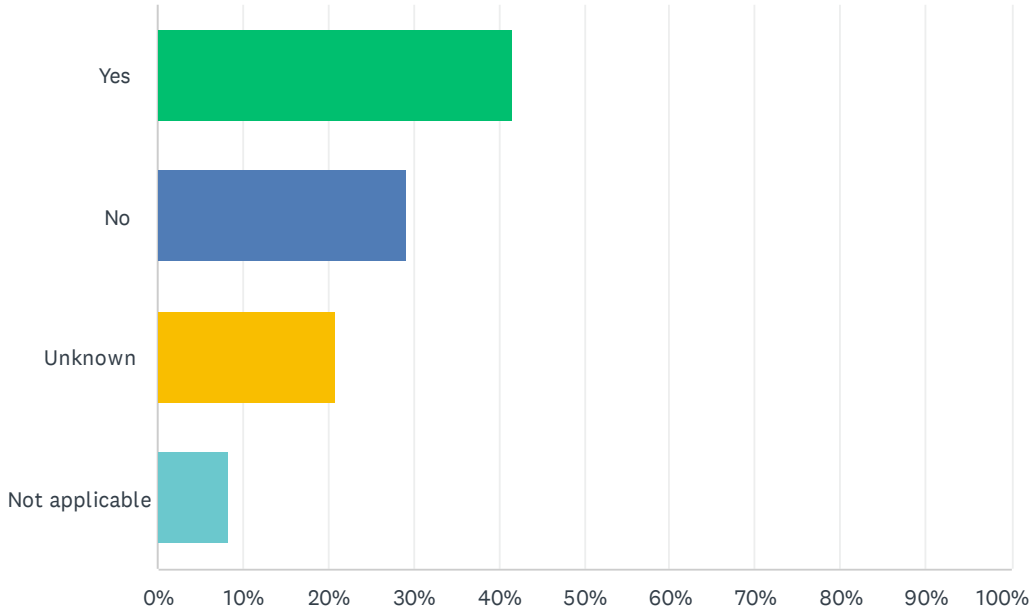
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	41.67%	10
No	25.00%	6
Unknown	29.17%	7
Not Applicable	4.17%	1
TOTAL		24

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

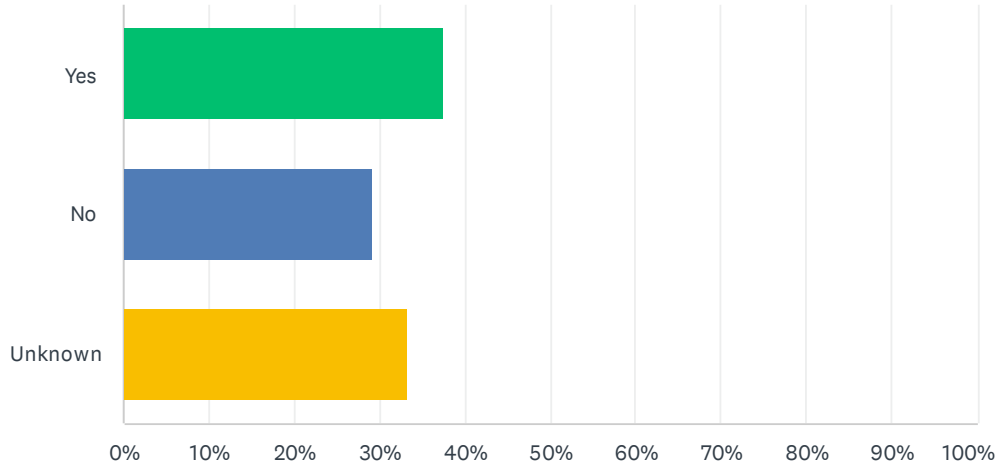
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	41.67%	10
No	29.17%	7
Unknown	20.83%	5
Not applicable	8.33%	2
TOTAL		24

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

Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	37.50%	9
No	29.17%	7
Unknown	33.33%	8
TOTAL		24

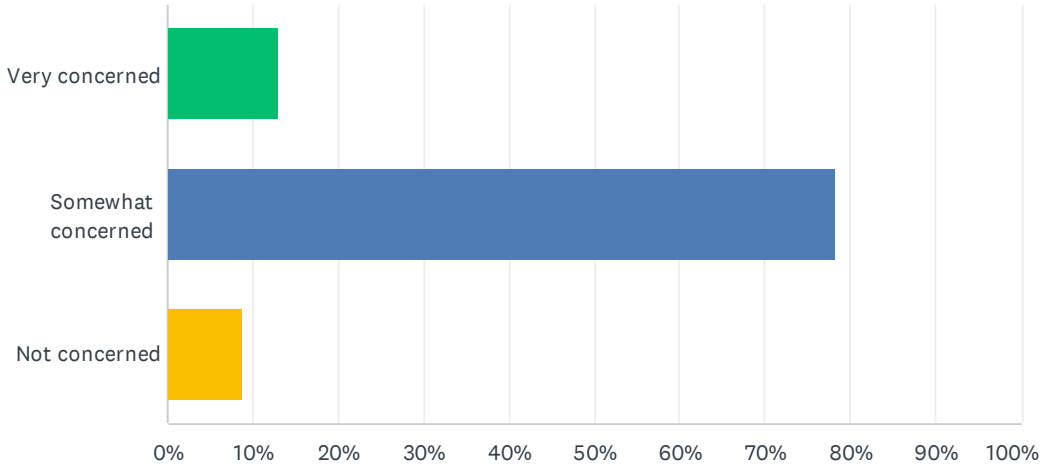
Q7 If so, what was the nature of the event?

Answered: 15 Skipped: 9

#	RESPONSES	DATE
1	n/a	1/28/2022 10:11 AM
2	Heavy rainfall and storms that knocked down many thousands of trees.	1/27/2022 7:00 AM
3	Windstorm/tornados, knocked out power with down powerlines for multiple days and caused lots of property damage.	1/26/2022 2:32 PM
4	Flooding / Fire	1/26/2022 1:39 PM
5	Wild fire	1/18/2022 10:34 PM
6	N/A	1/18/2022 4:14 PM
7	Severe Storms with substantial wind damage	1/18/2022 3:55 PM
8	Flooding, I think	12/14/2021 2:43 PM
9	Unknown	12/9/2021 7:06 AM
10	Covid 19	12/8/2021 1:00 PM
11	Flooding due to torrential rain Pandemic	12/4/2021 12:00 PM
12	High wind (or tornado) event. Wildfire.	12/2/2021 12:17 PM
13	none	12/2/2021 7:29 AM
14	Fire in the neighboring township woods	12/1/2021 4:32 PM
15	Unknown	12/1/2021 12:35 PM

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

Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Very concerned	13.04%	3
Somewhat concerned	78.26%	18
Not concerned	8.70%	2
TOTAL		23

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

Answered: 22 Skipped: 2

#	RESPONSES	DATE
1	illness breakout, high winds	1/28/2022 10:11 AM
2	highwinds, flood and illness outbreak	1/27/2022 7:00 AM
3	high winds, fire	1/26/2022 2:38 PM
4	Fire, high winds, local flooding.	1/26/2022 2:32 PM
5	Flooding / Wind and fire events	1/26/2022 1:39 PM
6	Flood, fire, or illness outbreak.	1/26/2022 1:09 PM
7	High wind, power outage and fire	1/26/2022 1:05 PM
8	All of the above	1/18/2022 10:34 PM
9	Fire and High winds	1/18/2022 4:14 PM
10	either fire or flooding with dam failure	1/18/2022 3:55 PM
11	Flooding, Snow storm, High Winds	12/14/2021 2:43 PM
12	Flooding, Tornados, Fire and illness.	12/9/2021 7:06 AM
13	Power Outage/Winter storm Illness Outbreak	12/8/2021 1:00 PM
14	Extreme winter weather	12/6/2021 3:34 PM
15	Weather such as storms out ice	12/4/2021 12:00 PM
16	High winds, freezing rain, fire.	12/2/2021 12:17 PM
17	fire, illness outbreak, school intruder	12/2/2021 7:29 AM
18	Illness outbreak, fire, and economic.	12/1/2021 6:15 PM
19	All of the above. Fire, wind, some areas of flooding. we are in a pandemic now.	12/1/2021 4:32 PM
20	Flooding	12/1/2021 2:04 PM
21	High winds, floods, illness outbreak (i.e. pandemic)	12/1/2021 12:35 PM
22	Illness, Fire, Flood, Drought	12/1/2021 12:24 PM

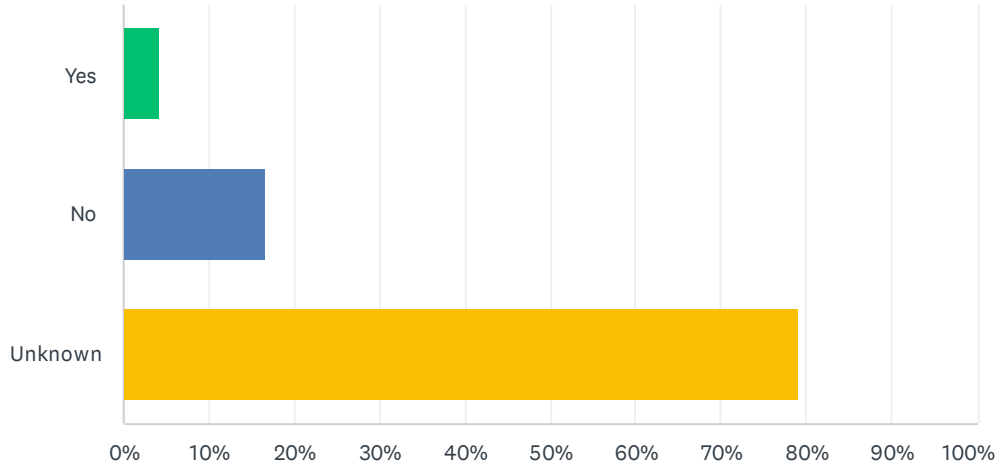
Q10 Does your community have concerns about infrastructure (dams, bridges, utilities, etc.) withstanding a natural hazard event in the future? Please describe.

Answered: 20 Skipped: 4

#	RESPONSES	DATE
1	possible utility outage	1/28/2022 10:11 AM
2	Yes in flooding events there is always concerns about failing bridges, culverts, and dams.	1/27/2022 7:00 AM
3	water contamination, I'm sure there are others as well.	1/26/2022 2:38 PM
4	utilities, mostly electricity. However if the electricity is out the sewer system around Lake Mitchell can overflow.	1/26/2022 2:32 PM
5	Yes utilities power poles from wind damage	1/26/2022 1:39 PM
6	I don't know.	1/26/2022 1:09 PM
7	Loss of electricity	1/26/2022 1:05 PM
8	Unknown	1/18/2022 10:34 PM
9	Bridge	1/18/2022 4:14 PM
10	Yes we do have a hydro Electric Dam in our county	1/18/2022 3:55 PM
11	probably...	12/14/2021 2:43 PM
12	I am concerned	12/9/2021 7:06 AM
13	Yes	12/8/2021 1:00 PM
14	No	12/4/2021 12:00 PM
15	none	12/2/2021 7:29 AM
16	no	12/1/2021 6:15 PM
17	Yes, we have some old bridges and utilities.	12/1/2021 4:32 PM
18	Yes, infrastructure of our bridges, dam, utilities, and primary roads.	12/1/2021 3:30 PM
19	No	12/1/2021 2:04 PM
20	Certainly. Natural disasters may cause damage to infrastructure. Roads can become unpassable, telecommunications can be cut, etc.	12/1/2021 12:35 PM

Q11 Has your community requested assistance for mitigation projects in the past?

Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	4.17%	1
No	16.67%	4
Unknown	79.17%	19
TOTAL		24

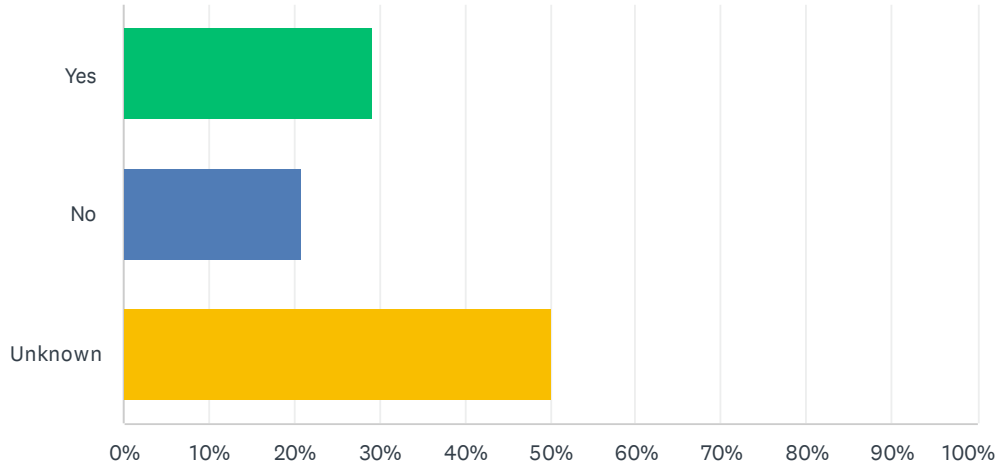
Q12 If so, was your request granted and what type of project did the request include?

Answered: 10 Skipped: 14

#	RESPONSES	DATE
1	n/a	1/28/2022 10:11 AM
2	na	1/26/2022 2:32 PM
3	Unknown	1/26/2022 1:39 PM
4	Unknown	1/18/2022 10:34 PM
5	unknown	12/14/2021 2:43 PM
6	Unknown	12/9/2021 7:06 AM
7	na	12/2/2021 7:29 AM
8	na	12/1/2021 4:32 PM
9	This is a question for our public works and utilities departments.	12/1/2021 3:30 PM
10	Unknown	12/1/2021 12:35 PM

Q13 Has your community considered mitigation strategies for potential or current hazards?

Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	29.17%	7
No	20.83%	5
Unknown	50.00%	12
TOTAL		24

Q14 If so, please identify potential strategies you would like to explore in the near future.

Answered: 11 Skipped: 13

#	RESPONSES	DATE
1	n/a	1/28/2022 10:11 AM
2	We are trying to incorporate more resistant infrastructure by increasing the size of our culverts and making them more resistant to flooding in the design and construction or our replacements.	1/27/2022 7:00 AM
3	Sewer was pumped and hauled with pump trucks on the last power outage due to high winds. Would explore backup generators on larger pump chambers. Also large parcels of federal lands are forested in our township and could create a large fire.	1/26/2022 2:32 PM
4	Unknown	1/18/2022 10:34 PM
5	unknown	12/14/2021 2:43 PM
6	Security and structural integrity of the current critical infrastructure	12/9/2021 7:06 AM
7	Safety drills for school lock down drills	12/2/2021 7:29 AM
8	na	12/1/2021 4:32 PM
9	Better infrastructure of our lake Cadillac shoreline, Clam River Dam, burying more utilities underground, and a long term plan for the US-131 business loop through our downtown.	12/1/2021 3:30 PM
10	We will be addressing in our next master plan update.	12/1/2021 2:04 PM
11	Unknown	12/1/2021 12:35 PM

Q15 Is there any additional information you would like us to consider as we update the county's Natural Hazard Mitigation Plan?

Answered: 14 Skipped: 10

#	RESPONSES	DATE
1	no	1/28/2022 10:11 AM
2	no	1/27/2022 7:00 AM
3	unknown	1/26/2022 2:32 PM
4	none	1/26/2022 1:39 PM
5	No	1/26/2022 1:09 PM
6	No	1/18/2022 10:34 PM
7	no	12/14/2021 2:43 PM
8	N/A	12/9/2021 7:06 AM
9	No	12/8/2021 1:00 PM
10	none	12/2/2021 7:29 AM
11	We are trying to form a better source of EMS service.	12/1/2021 4:32 PM
12	Many of the natural features that need to be included would be for example the Clam River which flows through our surrounding townships.	12/1/2021 3:30 PM
13	No	12/1/2021 2:04 PM
14	Coordination between the County Emergency Management Department and local units of government public safety departments.	12/1/2021 12:35 PM

APPENDIX C. CURRENT STATUS OF 2015 HM PLAN STRATEGIES

2015 Wexford County Natural Hazard Mitigation Plan Action Strategies and 2023 Status				
2015 Action Strategies	**2015 Responsible Parties**	**2015 Timeframe**	**2023 Status/EM Comments**	**2023 Related Strategies & Priority Level**
Priority Area 1: Extreme Winter Weather Mitigation Strategies (Countywide)				
a. Improve the ability of public buildings to shed, or hold, snow load	County Planning, County Building Inspector, Emergency Management Coordinator, School Administrators and Staff	1-3 years from adoption of the plan	No known issues. Ongoing assessments of the conditions of public buildings.	#40 (Medium)
b. Work with utility companies to clear vegetation near power lines and infrastructure	County Building Inspector, Emergency Management Coordinator	1-5 years from adoption of the plan	Ongoing regular vegetation management efforts amongst utility companies and Wexford County Road Commission and MDOT.	#47 (Medium)
c. Continue enforcement of building code regarding snow limits through the permitting process	County Building Inspector	Ongoing	Ongoing; the Wexford County Building Department enforcement of existing/current building codes for all communities in Wexford County, except: Cedar Creek Township, the City of Manton, and The City of Cadillac, which issue their own building permits. Non-conformities are identified during the permitting process for new construction or renovations.	#39 (Medium)
Priority Area 2: Wildfire Mitigation Strategies for potential wildfire/urban interface (Countywide)				
a. Acquire appropriate fire suppression equipment for response	Emergency Management Coordinator, Fire & Emergency Departments, MI Department of Natural Resources	1-3 years from adoption of the plan	Updated Equipment and trucks. Added UTV type vehicles for brush fires and rescue applications.	#20 (High)
b. Prescribed burns and surface fuels management projects	Emergency Management Coordinator, County Planning, Fire and Emergency Departments, MDNR	1-5 years from adoption of the plan	MDNR regularly assesses and initiates prescribed burns.	#61 (Medium), #23 (Medium)
c. Public education utilizing programs such as the National Fire Protection Association's Firewise program, and MDNR resources	County Planning, County Building Inspector, Emergency Management Coordinator, Townships, Cities, Villages	1-3 years from adoption of the plan	Localized public education through local fire departments, news media, social media, etc.…	#22-24 (Medium)
d. Consider wildland fire hazard reduction in building and zoning requirements	County Building Inspector	Ongoing	Article 10 General Regulations, Section 104 Parcel and Setback Regulations of the Wexford Joint Zoning Ordinance of 2017 includes High-Forest Fire Urban Interface Regulations	#38 (Medium)

2015 Action Strategies	2015 Responsible Parties	2015 Timeframe	2023 Status/EM Comments	2023 Related Strategies & Priority Level
Priority Area 3: Severe Weather Strategies (Thunderstorm, High Winds, Tornado; Countywide)				
a. Establish additional sirens for early warning weather systems	Emergency Management Coordinator, Townships, Cities, Villages	1-3 years from adoption of the plan	No progress; this strategy was deemed no longer feasible from a cost perspective (to maintain and install new severe weather sirens in communities) and an efficacy perspective (audible sirens do not warn enough people over a large geographic area; or the meaning of the siren is not understood).	This strategy is no longer included in the 2023 Hazard Mitigation Plan.
b. Establish storm shelters, especially at campgrounds, trailer parks, modular homes	Emergency Management Coordinator, County Planning, County Building Inspector, Villages, Townships	1-5 years from adoption of the plan	Storm shelter info is posted at most locations.	#29 (Low)
c. Promote the anchoring of trailers and modular homes	County Building Inspector, Emergency Management Coordinator	Ongoing	Wexford County's Building Department Manufactured Home Setup Requirements indicate: the foundation of a manufactured home must be built in compliance with current Michigan Residential Code or built to manufactured installation requirements; and tie downs must be installed to manufacturer's installation requirements.	#41 (Medium)
d. Work with utility companies regarding: tree management; promotion of burying utility lines in new construction; burying power lines in high outage areas; and increasing utility right-of-ways	County Building Inspector, Emergency Management Coordinator, County Planning	1-5 years from adoption of the plan	Ultimate decision and implementation is driven by the Utility, Road Commission and the consumer.	#47 (Medium), #49 (Low)

2015 Action Strategies	2015 Responsible Parties	2015 Timeframe	2023 Status/EM Comments	2023 Related Strategies & Priority Level
Priority Area 4: Flooding Mitigation Strategies (Potential Flooding in the Lake Mitchell, Muskegon River, and Manistee River watersheds)				
a. Drainage improvements such as larger culverts, clean up of river debris	Road Commission, County Planning, County Conservation Department, County Drain Commissioner, MDNR	1-5 years from adoption of the plan	Ongoing; culvert maintenance and improvements are conducted by WCRC, MDNR and USFS as funding allows. The Cadillac Area Land Conservancy has hosted cleanup events on the Clam River.	#37 (Low), #46 (Medium), #62 (Medium), #63 (Medium)
b. Continue enforcement of building codes and soil erosion regulations	Building Inspector, County Soil Erosion Officer, County Drain Commissioner, MI Department of Environmental Quality	Ongoing	Ongoing; the Wexford County Building Department enforcement of existing/current building codes for all communities in Wexford County, except: Cedar Creek Township, the City of Manton, and The City of Cadillac, which issue their own building permits. Non-conformities are identified during the permitting process for new construction or renovations. The County Building Dept. also administers and enforces the Soil Erosion and Sedimentation Control program for all of Wexford County, except for the City of Cadillac.	#39 (Medium)
c. Promote flood proofing of structures and damage reduction techniques	Building Inspector, County Soil Erosion Officer, County Drain Commissioner, MI Department of Environmental Quality	Ongoing	Promotion is ongoing, though consumer costs can be prohibitive for some.	#33 (Medium), #34 (High)

2016 Action Strategies	2023 Status/EM Comments	2023 Related Strategies & Priority Level
Other Strategies		
Incorporate Natural Hazard Mitigation concepts, strategies and policies into existing elements of the County Master Plan	No progress. Wexford County repealed it's planning and zoning capabilities in 2016 and has not updated the County Master Plan since it was created in 2004.	#19 (High)
Public education and awareness activities	The County now participates in the CodeRED Emergency Communications Networks, an electronic phone notification service available to the local public. The program is being regularly through news media, social media, newspapers and local events by banner and face to face interaction.	#1-12, 14-16, 19, 22-26, 30-32, 41, 43, 55-56
Work with other governmental entities, organizations, business and the public	The County Emergency Manager serves as a liaison to State and Local Law Enforcement, Courts, Critical Infrastructure, Public and Private Businesses. The EM also works with governmental units (local fire/EMS, USFS, MDNR) regarding emergency operation plans and evacuation plans. All local fire department stations in the county have been identified as secondary shelters if needed.	Just about every strategy in the 2023 plan relies on collaboration for implementation.

APPENDIX D. CONSIDERATION OF ALTERNATIVE MITIGATION STRATEGIES

Hazard Mitigation Alternatives Considered for Wexford County – 2023 HM Plan

A check mark indicates it was included in the list of 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, Dense Fog, 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.
	Installing lightning protection devices on the community's communications infrastructure and critical structures. More widespread use of lightning protection devices might also occur.
	Purchase of insurance that includes coverage for hail damage.
	Using surge protectors on critical electronic equipment.

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.
✓	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 Considered for Wexford County – 2023 HM Plan

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

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

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 Considered for Wexford County – 2023 HM Plan

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

	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.
✓	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

Hazard Mitigation Alternatives Considered for Wexford County – 2023 HM Plan

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

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 *(Note: Many of these actions are included in the Firewise USA public education program on wildfire preparedness)*	
✓	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. *(Advice to be provided in public outreach efforts).*
	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.

Hazard Mitigation Alternatives Considered for Wexford County – 2023 HM Plan

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

✓	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.)
✓	Have adequate water supplies for emergency fire-fighting (in accordance with NFPA standards).
✓	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).
	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.
✓	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.

Hazard Mitigation Alternatives Considered for Wexford County – 2023 HM Plan

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

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

Hazard Mitigation Alternatives for Subsidence	
	Identifying and mapping old mining areas and geologically unstable terrain, and limiting or preventing development in high-risk areas.
	Filling or buttressing subterranean open spaces (such as abandoned mines) to discourage their collapse.
	Hydrological monitoring of groundwater levels in subsidence-prone areas.
	Insurance coverage for subsidence hazards.
	Real estate disclosure laws.

APPENDIX E. ALIGNMENT OF LOCAL PLANNING AND ZONING WITH HM STRATEGIES

Local Community Planning and Zoning in Wexford County: Alignment with 2023 Hazard Mitigation Plan Strategies

- Wexford Joint Planning Commission (WJPC) - Townships of Antioch, Boon ,Cherry Grove, Hanover, Liberty, Selma, Slagle, South Branch, Springville, and Wexford

- Clam Lake Township

- Haring Charter Township

- City of Manton

- City of Cadillac

Hazard Mitigation Plan Strategy Themes:

AP: Awareness & Preparation

S: Shelters

BI: Buildings and Infrastructure

UT: Utilities and Technology

ENR: Environment & Natural Resources

WJPC

WJPC Master Plan (2023)
http://www.wexfordjpc.org/uploads/9/7/9/9/97992734/wjpc_master_plan_2023_-_final_edited.pdf
ENR

p. 37 "This Master Plan emphasizes the development of a "greenbelt" of natural vegetation and topographical features around Lake Mitchell and other lakes in the WJPC area, which will naturally preserve the water quality and keep chemicals from degrading the lake. Since this "greenbelt" would extend [from Selma Township] into Cherry Grove Township, cooperation between the two townships and their residents for the development of this "greenbelt" is highly recommended."

Fundamental Principles p. 83

2. Natural resources of the WJPC area should be protected from inappropriate use or conversion. Forested hillsides, farmlands, wetlands, rivers, and lakes provide a natural landscape background across most of the WJPC. These land qualities attract thousands of seasonal residents and tourists. Much of this land—almost 50% of it—is in public ownership and offers outstanding hunting, fishing, hiking, along with a wide range of other recreational activities. Managed harvests of forests contribute lumber, fiber, and fuel to support our rural culture. Agricultural land is principally row crops, cattle, or dairy production. Forestry, agriculture, tree farms, tourism, and recreation have historical roots in the WJPC area and contribute to its economic base. Each of these industries requires a substantial amount of land. Preserving these industries means preserving the land where these industries grow.

3. The natural environment of the WJPC area should be protected. The natural cleanness of the air, water, and soil of the WJPC area is a natural asset of great importance. The lakes, rivers, streams, wetlands, and flood plains are important parts of this natural environment supporting abundant fish and wildlife populations, and contributing greatly to the scenic quality of the landscape. This environment must be protected to sustain the scenic quality and economic potential of this area.

4. The economy of the WJPC area should be built on renewable natural resources. A renewable natural resource is a source that cannot be depleted and is able to supply a continuous source of energy. Agriculture, forestry, recreation, and tourism are a significant part of the local quality of life, and are tied to renewable resources. Maintaining this local economy requires maintaining the renewable natural resources of the area.

WJPC Zoning Ordinance (2023)
http://www.wexfordjpc.org/uploads/9/7/9/9/97992734/wexford_joint_zoning_ord_feb_2021-web_copy_updated_1-25-23.pdf
BI UT ENR

Article 10 General Regulations, Section 1042. High-Forest Fire Urban Interface Regulations
Any structure constructed or altered after the effective date of this Ordinance which is located in a highly combustible vegetation area shall comply with the requirements of this section. "Highly combustible vegetation area" means an area which has predominantly evergreen tree species with lower branches which do not die and are near to the ground, such as, but not limited to, Jack Pine or Scrub Pine (*Pinus banksiana*), Scotch Pine or Scotch Fir (*Pinus Sylvestris*), Red Pine or Norway Pine (*Pinus resinosa*), Spruces (*Picea*), Hemlock (*Tsuga candensis*), and Cedars or Junipers (*Pinaceae)*; and other situations where structures encroach into wildlands.

A. Defensible space.
   1. A three (3) foot primary fire-defensible space shall be established on all sides of each structure. Primary fire-defensible space shall:
      a. not have any combustible materials.
      b. have landscaping which includes, but is not limited to, non-combustible materials such as gravel, marble chips, concrete, or mineral soil.
      c. Not have a cluster of combustible trees, and no Jack Pine or Scrub Pine (*Pinus banksiana*), and Scotch Pine or Scotch Fir (*Pinus Sylvestris*) species.
   2. A thirty (30) foot secondary fire-defensible space within the parcel shall be established on all sides of each structure. The thirty (30) foot secondary fire-defensible space shall be increased by one (1) foot for each one (1) foot where the ground slopes more than 15% down from the structure. Secondary fire-defensible space shall have:
      a. tree branches below six (6) to ten (10), or more, feet pruned and removed.

b. trees spaced so the edges of crowns are ten (10) to sixteen (16), or more, feet apart.
c. household and other debris, brush, ground fuels (leaves and pine needles) removed.
d. landscaping which includes, fire-resistant plants such as those listed in Michigan State University Extension bulletin E-2948 "Wildfire-Resistant Landscape Plants for Michigan" of 2005 or a manicured lawn or garden.

3. A tertiary space beyond the thirty (30) to one hundred (100) foot secondary fire-defensible space within the parcel shall be established on all sides of each structure. Tertiary space shall have:
   a. trees spaced so the edges of crowns are ten (10), or more feet apart and distance from power lines.
   b. trees spaced so trunks are twenty (20), or more feet from other trees.
   c. tree branches below six (6), or more, feet shall be pruned and removed.
   d. household and other debris, brush, ground fuels (leaves and pine needles) removed.

B. At minimum of ten (10) feet shall be between each structure, firewood storage pile, fuel storage, and storage of other flammable items; or shall be situated outside of the secondary fire-defensible space.

C. Chimneys and flues shall be provided with an approved spark arrester made of 12-gauge welded or woven wire mesh with holes no larger than ½ inch. A ten (10) foot secondary fire-defensible space shall be established on all sides of each chimney, flue, grille or similar structure.

D. In addition to requirements of P.A. 230 of 1972, as amended, (being the Stille-Derossett-Hale Single State Construction Code Act of 1972, M.C.L. 125.1501 *et seq.*) the following design features are recommended:

1. Roofs are designed and constructed to minimize the possibility of ignition from a wildfire and to minimize the spread of a structural fire to the wildland by use of National Fire Protection Association class A standards (metal, fiberglass shingle, clay, or tile).
2. Exterior walls are constructed of at least ½ inch sheathing or an equivalent material. Exterior sheathing shall extend from the roof line to ground level. Preferred siding should be non-flammable materials (such as brick, stone, stucco, or metal).
3. Foundations, crawl spaces enclosures, space under mobile homes; areas under porches, decks, or similar areas are provided with full enclosure skirting constructed of ½ inch nominal sheathing or the equivalent and made of non-combustible material (such as metal, block, cement, stone, stucco). Crawl spaces which have vents through the foundation and other similar openings are enclosed with metal screening with less than ⅛ inch openings.
4. Vents, eaves, fascias, soffits and other similar openings are enclosed with metal screening with less than ⅛ inch openings.
5. Windows are double pane glass. All windows, window wells in the foundation wall, and glazed openings within thirty (30) feet of concentrations of vegetative fuels should be provided with closeable, solid, exterior shutters, especially in areas of highly hazardous fuels, such as pine or spruce. Window wells in the foundation are enclosed with fire-resistant screening or other fire-resistant material to prevent collection of flammable debris in the window well.
6. Space under decks is enclosed with fire-resistant screening or other fire-resistant material to prevent collection of flammable debris under the deck.

Article 12, Section 1204, Subsection A.2.e(3): Development Standards, Parcel Divisions for Open Space Development – A site plan for a Conservation Planned Unit Development must show that the site maintains or creates an upland buffer of natural native species vegetation of at least one hundred (100) feet in depth adjacent to wetlands and surface waters.

Article 16, Section 1609 G: Special Use Specific Standards for A Utility Grid Wind Energy System, On-site Use Wind Energy System over 20 meters high, and Anemometer Towers over 20 meters high shall meet the following standards in addition to the general special use standards (section 8601 of this Ordinance): Utilities: **Power lines should be placed underground, when feasible, to prevent avian collisions and electrocutions**. All above-ground lines, transformers, or conductors should comply with the Avian Power Line Interaction Committee (APLIC, http://www.aplic.org/) published standards to prevent avian mortality.

Article 72: **The Lake Mitchell Overlay Zone** is established for the purpose of achieving specific land management objectives and to avert specific land use problems as identified in the Lake Mitchell Environmental Development Plan. It is, furthermore, the purpose of this Overlay Zone to: Protect wetlands and other sensitive environmental areas important to the maintenance of Lake Mitchell's water quality; protect existing and natural drainage ways, waterways, and drains running into the lake; control development in areas where unhealthful conditions and damages to structures, buildings and land uses may occur; and protect the property investments and value of present and future property owners.

Article 73: T**he Lake Shoreline Overlay District** protects the shoreline of lakes in the County from erosion, prevention of runoff-laden pollutants, preservation of plant materials necessary for removal of nutrients prior to their entering the lake or surface water, preserving the aesthetics of a vegetated shoreline and providing for shoreline maintenance, while at the same time providing for development and continued use of developed parcels of land uses which are in compliance with the Master Plan.

Article 74: **The River Overlay District** protects the shoreline of certain rivers in the County (Adams Creek, Slagle Creek, Arquilla Creek, Dowling Creek, Poplar Creek, Hoxey Creek, Manton (Cedar) Creek) from erosion, prevention of runoff-laden pollutants, preservation of plant materials necessary for removal of nutrients prior to their entering the lake or surface water, preserving the aesthetics of a vegetated shoreline and providing for shoreline maintenance, while at the same time providing for development and continued use of developed parcels of land uses which are in compliance with the Master Plan.

Article 10. General Regulations
Section 108. Dwelling/Residential Standards
1080. Dwellings
B. Dwelling or duplex shall comply in all respects with the Michigan State Construction Code as promulgated by the Michigan State Construction Code Commission under provisions of Public Act 230 of 1972, as amended, being M.C.L. 125.1501 *et. seq.*, including minimum heights for habitable rooms. Where a dwelling is required by law to comply with any federal or state standards or regulations for construction and where such standards or regulations for construction are different than those imposed by the Michigan building code, then and in that event such federal or state standard or regulation shall apply. In addition, it shall comply with the following:

> **1. Foundations:** It shall be firmly attached to a permanent foundation constructed on site in accordance with said State Construction Code and shall have the same perimeter dimensions of the dwelling, except cantilevers, and constructed of such materials and type as required in the said State Construction Code for dwellings, or, **in the case of mobile homes, that dwelling shall be installed pursuant to the manufacturer's set-up instructions and shall be secured to the foundation by an anchoring system or device complying with the rules and regulations of the Michigan Mobile Home Commission or said State Construction Code, whichever is stricter, and with the wheels removed and shall not have any exposed towing mechanism, undercarriage or chassis;**

Clam Lake Township

Zoning Ordinance, adopted 8/12/2019
http://www.clamlaketownship.org/uploads/2/7/6/1/2761255/clam_lake_zo_final_adopted_aug_2019[1535].pdf

BI UT ENR

Article 4 Clam Lake Overview District
The Clam Lake Corridor Overlay Zone is established for the purpose of allowing a planned office and commercial area to develop. **Section 4.9.C. Corridor Overlay Site Plan Review, Utilities: All utilities, including electric, telephone, and cable television shall be installed underground.** All utility installations shall be carried out in accordance with rules and standards promulgated by the Michigan Public Service commission. In the event that utilities cannot be installed underground they shall be located along the base of hill sides and long tree lines, all transformers or mechanical structure associated with the utilities that are ground mounted, shall be landscaped.

Article 7 Supplemental Site Development Standards
Section 7.9.2h2. **A special land use permit for a proposed solar energy farm shall include a landscape plan** that includes a twenty-five (25) foot wide landscape buffer that include**s native grasses, wildflowers, or plants** which will provide wildlife and pollinator habitat, soil erosion protection, and/or aid in strengthening the soil structure.

Section 7.10.10 – Utility Grid Wind Energy System and Anemometer Towers, Utilities: **Power lines should be placed underground, when feasible**, to prevent avian collisions and electrocutions. All above-ground lines, transformers, or conductors should comply with the Avian Power Line Interaction Committee published standards to prevent avian mortality.

Article 5 General Provisions
Section 5.8 – **Greenbelt** 1. To preserve natural resources, water quality and community scenic and recreational values, a **greenbelt shall be established and maintained on all waterfront property.** The greenbelt shall include all the land area located within fifty (50) feet of the ordinary high water mark of a lake or a stream abutting or traversing the property in question. Within the greenbelt, the following development or use restrictions shall apply:

A. No dredging or filling shall be allowed except for reasonable sanding of beaches where permitted by state or federal law.
B. Pesticides and herbicides shall not be used, except as required to manage invasive species.
C. Fertilizer use shall be avoided and if necessary, any fertilizers applied shall be lake friendly (e.g. phosphorus free and/or organic).
D. Neither septic tanks nor septic system filtration fields may be located within the greenbelt.
E. The greenbelt shall be shown on any plot plan or site plan submitted for approval during the process of developing a water frontage parcel.
F. No invasive species shall be planted in the greenbelt. Existing invasive species shall be identified and managed using appropriate best management practices as determined by the appropriate state or federal agency.
G. No more than 15% of the greenbelt may be impervious surface.
H. Seawalls require appropriate permits from the Michigan Department of Natural Resources - Engineered natural seawalls are preferred.

Section 5.13 – **Manufactured Home Setup Specifications** The following regulations shall apply to all manufactured homes intended for either permanent or seasonal housing:

A. **All manufactured homes shall be placed upon a permanent foundation**. The foundation may be in the form of piers of concrete blocks or poured concrete; blocks shall be 8"x16" and poured concrete piers shall be not less than 8"x8" reinforced concrete, each pier on a concrete footing not less than 4 square feet in area and 6 inches thick, or a concrete slab 3 inches thick, or two concrete ribbons six inches thick and 24 inches wide, both running the length of the unit and extending to the outside perimeter of the unit. In the case of ribbons or slab-type foundations, the foundation shall be equal to the length and width of the unit being placed.

B. **Piers shall not be spaced more than ten (10) feet on center and all units shall have tie down facilities installed at each corner of the unit**; all units shall be skirted with material such as steel, vinyl, aluminum, masonry, or fiberglass and there shall be provided one square inch of ventilation for each square foot of floor space in the skirting, an access door for inspection and maintenance shall be provided also.

Section 5.15 – **Wetland Provisions** Pursuant to provisions of the state Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), **a permit must be acquired from the Michigan Department of Natural Resources** to:

- Deposit or permit the placing of fill material in a wetland. • Dredge, remove, or permit the removal of soil or minerals from a wetland.
- Construct, operate, or maintain any use or development in a wetland.
- Drain surface water from a wetland. In accordance with the state act, all wetlands that have a permanent or intermittent surface water connection to a lake, pond, river, or stream, or are located within 500 feet of any lake, pond, river, or stream in the Township are regulated by the Department of Natural Resources.

No activity or development may commence in any regulated wetland in the Township prior to the acquisition of a permit from the Department of Natural Resources which authorizes the activity or development. All newly-created lots in the Township must have sufficient upland (i.e.: non-wetland) area to meet minimum size, setback, parking, and accessory use requirements.

Haring Charter Township

2009 Comprehensive Plan, Updated in 2014

http://twpofharing.org/LinkClick.aspx?fileticket=fBPh-xEC3vY%3d&tabid=951&portalid=24&mid=2185

AP S BI UT ENR

Chapter G2 Ground and Surface Water Protection Strategies, p.57-59

1.2.1. Groundwater protection regulations for site plan review and wellhead protection should be developed for Haring Township and be made a part of the zoning ordinance

1.2.2. Haring Township should have a groundwater protection plan.

1.2.3. Support the amendment of the Wexford County Health Code to provide for performance-based standards for on-site (and cluster) septic systems in areas of the county where large scale high density development is planned and for any development on waterfront.

2.2.1. High-density urban development should be directed away from wetlands and surface water features. Development should be in compliance with state regulation of wetlands.

2.2.2. Local zoning should require greater setbacks from any surface water features and utilize vegetative buffer strips.

3.2.1. Minimum parcel sizes throughout Haring Township should be based on the safe and environmental responsible quality of discharge of on-site sewage effluent, water runoff, water infiltration and other similar considerations.

3.2.2. Waterfront parcels should have minimum parcel sizes which include minimum width. (See recommendation details in Appendix K4.)

3.2.3. There should be uniform water protection standards, with adjacent counties and jurisdictions, for the protection of Muskegon River tributaries (e.g., Clam River). These standards should provide water quality, habitat protection, shade, and aesthetic quality to the river environments. (See recommendation details in Appendix K4)

3.2.4. Encourage an education program for developed lake parcels which provide setbacks for nutrient sources, and maintaining a vegetation belt. (See recommendation details in Appendix K4)

3.2.5. Encourage a program for undeveloped lake parcels which provides setbacks for buildings, nutrient sources, and maintaining a vegetation belt. (See recommendation details in Appendix K4.)

3.2.6. Consider establishing maximum number of mooring places and docks per distance of shoreline based on a lake's carrying capacity. Maintain some shoreline in a natural vegetated state. (See recommendation details in Appendix K4.)

3.2.7. Encourage lake management plans to be prepared for Long and Round Lakes following the procedure similar to Protecting Inland Lakes: A Watershed Management Guidebook; (Wyckoff, Warbach, Williams) Michigan Department of Natural Resources; February 1990. Issues to focus on include housing density, number of boats on the lakes and road ends.

3.3.1. Develop stormwater ordinance and guidelines for, at a minimum, non-residential/non-agricultural development in Haring Township.

3.3.2. Zoning in the township should include approval, of a stormwater management plan prepared for non-single family residential/non-agricultural sites.

3.3.3. Request the County Drain Commissioner to review and comment on stormwater management plans for new development.

3.3.4. Consider reviewing number of parking spaces required in all zoning, to attempt to reduce the required size of parking lots (impervious surface) and requiring parking lot design to include islands of pervious surface.

Chapter I2 Housing Strategies, p. 69

1.1.1. Promote and encourage property maintenance. This may include ordinance regulation in residential, commercial and industrial areas as shown on the future land use map.

1.1.2. Encourage the use of grant funds to support low-income, disabled, and elderly housing.

1.1.3. Encourage community plans for the construction of affordable homes, and maintenance of affordable homes for low income persons.

1.1.8. Support existing agencies for needs of the elderly and the homeless.

1.1.9. Encourage an adequate number of well-maintained rental properties.

Chapter J1: Transportation Strategies, p. 71

1.1.1. For primary roads:

a. Review and actively participate with the Road Commission's creation and updating of its revolving five-year plan for Primary Road Construction and Heavy maintenance;

b. Review and actively participate with implementation of the Road Commission's prioritized list of surface maintenance locations, while working within annual budget constraints; and

c. Support bi-annual bridge inspections and subsequent funding applications.

1.1.2. Subdivision and plat development, and road upgrades are in accordance with the road commission policies.

1.1.3. For local road systems:

d. Consider developing and maintaining a Township revolving five-year plan for local road improvement;

e. Review and actively participate in the development of the Road Commission's revolving five-year plan for local road improvement, (the Road Commission Five Year Plan is incorporated as part of this *Plan*);

f. Consider exploring millages for road improvement,

g. Continue road commission local road maintenance, procedures for road surfaces, bridges and culverts while working within annual budget constraints;

h. Support bi-annual bridge inspections and subsequent funding applications; and

i. If a paved road is returned to a gravel state, it should be re-paved as soon as possible.

1.1.4. Consider using township and private funds, county and township road millages, and maximize funds through participation to maintain local roads.

Chapter J3: Water and Sewer Strategies, p. 77

1.4.1. Support modification of the county health code to allow the option of use of performance standards for on-site sewage treatment to allow alternative designs.

1.4.2. Encourage or require performance-based septic systems in waterfront and high ground water areas.

3.1.1. Proactive research of grants, loans, donations, technology advances, and inclusion of future sinking fund (capital improvement) for future improvements to water and sewer systems, as well as technology advances.

City of Manton

Zoning Ordinance (August 16, 2022)
https://library.municode.com/mi/manton/codes/code_of_ordinances?nodeId=13464

BI UT

ARTICLE VII. - SPECIAL USES, Sec. 38-429. - Special uses requiring additional standards.

(2) *Mobile home parks.*

d. No mobile home pads shall be located within any 100-year floodplain boundary.

f. Each mobile home shall be anchored in accordance with the requirements set forth for anchoring in the mobile home commission rules of current adoption.

i. All private and public utilities shall be placed underground.

City of Cadillac

Master Plan (2015)
https://www.cadillac-mi.net/DocumentCenter/View/1136

BI UT ENR

Housing and Neighborhood Plan Objectives – Single Family

- Conduct periodic field inventories of residential neighborhoods for purposes of identifying and mitigating blighting conditions.
- Encourage the rehabilitation of neighborhoods through on-going code enforcement, housing rehabilitation, public infrastructure improvements, and the prompt removal of condemned structures. Activate the city's participation in state and federally funded housing rehabilitation grant programs such as the Community Development Block Program for purposes of housing rehabilitation, blight control, and neighborhood enhancement.
- Maintain comprehensive zoning/site plan review standards for home occupations to ensure that the residential integrity of neighborhoods is not compromised. Periodically, monitoring sites approved for home occupations to ascertain compliance with ordinance standards.
- Initiate an annual neighborhood clean-up in the spring prompting residents to dispose of accumulated trash and debris.
- To advance the efficiency of administering the Cadillac Rental Housing Inspection Program, to promote the welfare of tenants reliant on the rental home owner's adherence to the requirements of the program, and to provide a relevant data base for assessing housing needs and the appropriateness of existing codes, maintain a computerized data base of the city's rental housing stock detailing information associated with the issuance of housing inspection certificates, rental inspection reports, code violations, code compliance, and related matters. The data base should be readily available to all city personnel involved in the administration of local zoning, building, and property maintenance codes.

Central Business District Plan Objectives

- Bury overhead wires exhibiting high pedestrian visibility and those impacting the expansion potential of businesses.
- Implement an aggressive revitalization and blight control program for the residential neighborhoods abutting the downtown. Of particular concern are the neighborhoods directly north and south of the downtown.

Mitchell Street Corridor Plan Objectives

- Investigate the potential for assembling smaller frontage parcels possessing blighted and/or non-conforming structures to create lots of sufficient size to improve their potential for commercial redevelopment.
- Actively enforce property maintenance codes to minimize the occurrence of blighting conditions.

Parks and Open Space Objectives

- In collaboration with the Lake Mitchell Improvement Board conduct a long-range management plan for Lakes Cadillac and Mitchell to address invasive species management, shoreline development and protection, water quality, and related environmental and lake and shoreline factors.
- Develop a long-term funding program for the management of invasive species.
- Investigate opportunities for returning portions of the Lake Cadillac shoreline to a natural environment

APPENDIX F. PARTICIPATION TABLE

Wexford County 2023 Hazard Mitigation Plan Participation Table														
Jurisdiction/Organization	**Representative**	**Title**	**Survey Participant**	**HM Kick-Off Meeting 07/01/21**	**LPT Meeting 01/20/22**	**Public Input Session - Hazard ID 04/21/22**	**LPT Meeting 09/15/22**	**WJPC Meeting 10/24/22**	**LPT Meeting 11/17/22**	**Community Input Session 12/6/2022**	**LPT Meeting 1/19/23**	**Public Hearing 4/19/2023**	**Phone call with Networks NW April 2023**	**Plan Review /Feedback 2023**
Antioch Township	Paul Osborne	WJPC						X						
Boon Township	Richard Harvey	WJPC	X			X		X	X					
Cherry Grove Township	Ben Pearson	Supervisor	X											
City of Cadillac	Adam Ottjepka	Director of Public Safety	X		X		X							
City of Cadillac	Marcus Peccia	City Manger	X							X				
City of Cadillac	Antoinette (Tiyi) Schippers	Mayor Pro-Tem								X				
City of Cadillac	John Wallace	Community Development Director	X											
City of Cadillac	Mike Coy	Zoning Administrator	X											
City of Manton	Sam Cronkhite	Mayor								X				
City of Manton	Bill Bates	City Commissioner								X				
City of Manton	Jake Paddock	DPW Supervisor				X								
City of Manton	Jessica Schisser	Clerk				X				X				
Colfax Township	Rebecca Stoddard	Clerk	X											
Colfax and Greenwood Townships	Jason Nelson	Fire Chief				X								
Greenwood Township	Alan Mohler	Supervisor								X				
Hanover Township	Christina Vipond	WJPC						X						
Haring Charter Township	Duane Alworden	Fire Chief					X		X					
Liberty Township	Beverly Monroe	WJPC	X					X						
Selma Township	Mike Boyd	Supervisor; WJPC				X								
Slagle Township	Marli Wendel	WJPC						X						
South Branch Township	Donna Taylor	WJPC						X						
South Branch Township	Julie Cieslak	Clerk	X											
Springville Township	Randy Brewer	WJPC						X						
Village of Buckley	Michael Guernsey	Fire Chief				X								
Village of Mesick	Deborah Stanton	Clerk											X	
Wexford Township	David Fox	Treasurer				X								
Wexford Township	Benedict Fleis	WJPC						X						
WJPC	Robert Hall	Planner						X						X
WJPC	Heather O'Connor	Recording Secretary						X						
Wexford County Board of Commissioners	Jason Mitchell	District 1										X		
Wexford County Board of Commissioners	Michael Musta	District 2										X		
Wexford County Board of Commissioners	Ben Townsend	District 3										X		
Wexford County Board of Commissioners	Kathleen Adams	District 4 (current)										X		
Wexford County Board of Commissioners	Mike Bengelink	District 4 (former)			X									

Wexford County 2023 Hazard Mitigation Plan Participation Table														
Jurisdiction/Organization	**Representative**	**Title**	**Survey Participant**	**HM Kick-Off Meeting 07/01/21**	**LPT Meeting 01/20/22**	**Public Input Session - Hazard ID 04/21/22**	**LPT Meeting 09/15/22**	**WJPC Meeting 10/24/22**	**LPT Meeting 11/17/22**	**Community Input Session 12/6/2022**	**LPT Meeting 1/19/23**	**Public Hearing 4/19/2023**	**Phone call with Networks NW April 2023**	**Plan Review /Feedback 2023**
Wexford County Board of Commissioners	Michael Bush	BOC Vice Chair, District 5					X		X	X	X	X		
Wexford County Board of Commissioners	Julie Theobald	District 6										X		
Wexford County Board of Commissioners	Gary Taylor	BOC Chair, District 7			X	X	X		X	X	X	X		
Wexford County Board of Commissioners	Jason Baughan	District 8										X		
Wexford County Board of Commissioners	Brian Potter	District 9										X		
Wexford County	Joe Porterfield	County Administrator/Equalization Director			X		X		X	X	X			
Wexford County	Jami Bigger	Deputy County Administrator					X		X	X				
Wexford County	Travis Baker	Former EM		X	X	X	X		X	X	X			
Wexford County	Randy Boike	Current EM							X	X	X	X		
Wexford County	Duane Alworden	911 Director					X		X					
Wexford County	Sarah Merz	GIS Analyst			X									X
Wexford County	Trent Taylor	Sheriff			X		X							
Wexford County	Richard Doehring	Undersheriff							X					
Wexford County	Brian Draper	Wex-Express Transportation					X							
Wexford County Road Commission	Karl Hanson	Engineer/Manager	X			X					X			
Wexford County Council on Aging	Erin Brotherton	Supervisor of Health Care Services	X			X								
Wexford-Missaukee ISD	Dave Cox	Superintendent				X								
Buckley Community Schools	Jessica Harrand	Superintendent	X											
District Health Dept. #10	Bret Haner	Emergency Preparedness Coordinator	X			X	X		X					
Wexford Conservation District	Tiffany Jones	District Manager				X								
NC-CISMA	Vicki Sawicki	Program Coordinator										X		X
Cadillac Area Land Conservancy	Chris Gentry	Executive Director												X
MDNR	Breton Baker	Forest Fire Supervisor - Cadillac Mgmt. Unit												X
USFS - Huron Manistee National Forest	Ben Wagner	Deputy Fire Staff Officer												X
USFS - Huron Manistee National Forest	Scott Peedle	USFS District Ranger, Cadillac/Manistee Ranger District												X

Wexford County 2023 Hazard Mitigation Plan Participation Table														
Jurisdiction/Organization	**Representative**	**Title**	**Survey Participant**	**HM Kick-Off Meeting 07/01/21**	**LPT Meeting 01/20/22**	**Public Input Session - Hazard ID 04/21/22**	**LPT Meeting 09/15/22**	**WJPC Meeting 10/24/22**	**LPT Meeting 11/17/22**	**Community Input Session 12/6/2022**	**LPT Meeting 1/19/23**	**Public Hearing 4/19/2023**	**Phone call with Networks NW April 2023**	**Plan Review /Feedback 2023**
Michigan State Police	Mike Sobocinski	Hazard Mitigation Planning Analyst		**X**										
Michigan State Police	Tpr. Travis Thenikl					**X**								
Michigan State Police	F/Lt. Matthew McCaul	Cadillac Post			**X**									
Missaukee County	Linda Hartshorne-Shafer	Emergency Management Coordinator		**X**										
Kalkaska County	Mike Thompson	Emergency Preparedness Coordinator		**X**										
Manistee County	Mike Machen	Emergency Management Coordinator		**X**										

APPENDIX G. MEETING AND PUBLIC INPUT 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/u/kbKc4W10Ib

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@wexfordcounty.org	231-306-2170	Yes	37 47	37 47
2	Brandy Martin	Incident Commander Little River Band	brandymartin clrboi-nsn.gov	231-89 398-6818	no	60	60
3	Matt Mansor	EM/911 Leelanau	mansorm@leelanau.gov	231 256-8715	Yes	25	25
4	Zach Vega	comm. planner NWNW	zach.vega@networksnorthwest.org	231.			
5	Rob Carson	Networks Northwest	rob.carson@networksnorthwest.org	2	Yes.	45	45
6	Frank Post		Frank.Post@live.com	231-383-0558		64	64
7							
8							
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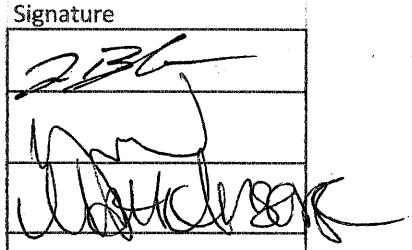
15							

Signature



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

Wexford County LPT Meeting

Agenda

Wexford County Court House Board of Commissioners Room

Thursday 1/20/2022 10:00am

1. Old Business
   a. Updating Wildfire Emergency Ops Plan
   b. Fire Department Box Alarm planning/discussion

2. New Business
   a. Hazard Mitigation Plan update
   b. Networks Northwest Hazard Mitigation Plan update - *Stephanie Loria*

3. Next Meeting Date

   April 21st, 2022 - 10am

Wexford County LPT Meeting
Sign-in Sheet
1-20-2022 10:00 AM

Name	Email
Travis Baker	tbaker@wexfordcounty.org
Adam Ostojeka	aostojeka@cadillac-mi.net
Gary Taylor	GTaylor@wexfordcounty.org
Mike Bengelink	mbengelink@wexfordcounty.org
Matthew McCaul	mccaulm@michigan.gov
Sarah Merz	Smerz@wexfordcounty.org
Trent Taylor	Ttaylor@wexfordcounty.org
Joe Porterfield	jporterfield@wexfordcounty.org

WEXFORD COUNTY

LOCAL PLANNING TEAM (LPT)

MEETING MINUTES

January 20, 2022

The meeting was called to order by Emergency Management Director Travis Baker at 10:04 a.m in the Commissioners' Room, Historic Courthouse, 437 E. Division St Cadillac, Michigan.

Members Present: Travis Baker, Adam Ottjepka, Gary Taylor, Mike Bengelink, Matthew McCaul, Sarah Merz, Trent Taylor, Joe Porterfield.
Also Present: Stephanie Loria

AGENDA ITEMS

1.A Updating Wildfire Emergency Ops Plan

Emergency Manager Baker discussed he was updating the current basic wildfire operations plan that he created back in 2021. This plan will detail specific radio talkgroups for communications and highlight key areas within the county that are more of a threat than others. He will be meeting with the Michigan DNR and US Forest Service to review the plan in the coming months.

1.B Fire Department Box Alarm planning/discussion

EM Baker is going to be working with local fire chiefs on the creation of a box alarm type system for dispatching fire agencies within Wexford County. This is due to the fact that many departments are short staffed and when any incident is dispatched fire agencies are relying on neighboring departments to assist. Creating a box alarm system will help relieve the stress from the dispatch center as well as the fire departments. There is a fire chiefs meeting being scheduled in the coming weeks to discuss this with the local agencies.

2.A Hazard Mitigation Plan update

EM Baker advised that the county is still in the process of updating its Hazard Mitigation Plan with the help of Networks Northwest. He has been collecting information for the plan update and has sent out the community survey again to all LPT members for their input. He introduced Stephanie Loria from Networks Northwest who will be doing a presentation on the plan update.

2.B Networks Northwest Hazard Mitigation Plan update – Stephanie Loria

Stephanie Loria gave a presentation on the Wexford Hazard Plan and gave detailed information about demographics of Wexford County and how we compare to the surrounding areas. Copy of the presentation is available from the Emergency Management Office if requested.

ADJOURN 11:08 a.m

Wexford County LPT Meeting

Agenda

Wexford County Sheriff's Office

Training Room

Thursday 4/21/2022 10:00am

1. Old Business
   a. Fire Department Box Alarm planning/discussion

2. New Business
   a. Hazard Mitigation Plan update
   b. Networks Northwest Hazard Mitigation Plan update - *Stephanie Loria, Zach Vega*

3. Next Meeting Date

   July 21st, 2022

MEETING SIGN-IN SHEET

Project:	Wexford County HM Plan	**Meeting Date:**	4.21.2022
Facilitator:	Networks Northwest	**Place/Room:**	Wexford Cty Sheriff's Office – Training Rm

Name	Organization	E-Mail
Gary Taylor	WEXFORD COUNTY	GTaylor@WexfordCounty.org
MICHAEL GUENTHER	BUCKLEY FIRE DEPARTMENT	~~BUCKLEYFIRE DEPARTMENT~~ BUCKLEYFIRECHIEF@GMAIL.COM
RICHARD HARVEY	WJPC	RHHARV@GMAIL.COM
Dave Cox	Wexford-Missaukee ISD	dcox@wmisd.org
MIKE BOYD	SELMA TWP	mjboyd56@yahoo.com
Jason Nelson	Fire chief Colfax-Greenwood	Nelson528fire@yaLoo.com
Travis Thenikl	MSP	thenikltc michigan.gov

MEETING SIGN-IN SHEET

Project:	Wexford County	Meeting Date:	4.21.22
Facilitator:	Networks Northwest	Place/Room:	City Sheriffs Office Training Rm

Name	Organization	E-Mail
Jake Paddock	City of Manton	dpw@mantonmichigan.us
Jessica Schisler	City of Manton	clerk@mantonmichigan.us
Travis Baker	Wexford 911 / EM	tbaker@wexfordcounty.org
MIKE BOYD	SCLMA	mjboyd576@yahoo.com
Bret Haner	DHD #10	
Tpr Travis Thentel	MSP	
David Fox	Wexford Twp.	zipfox@acegroup.cc
Karl Hamson	Wexford CRC	engineer@wexfordcrc.org
Evan Brotherton	Wexford CoA	ebrotherton@wexfordco.org
Tiffany Jones	Wexford Conservation District	wexford@macd.org

Wexford LPT Meeting Agenda
9/15/2022 10:00am
BOC Room

Agenda Items:

- **Networks Northwest- Hazard Mitigation Plan Update/Discussion**

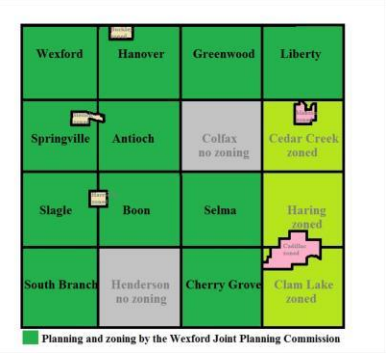
- **Next Meeting- November 17th, 2022. 10:00am BOC Room**
  (unless noted otherwise)

Wexford County LPT Meeting

Sign-in Sheet

9-15-2022 10:00 AM

Name	Email
Gary TAYLOR	GTaylor@wexfordCounty.ORG
Duane Alverden	Alverden@wexfordcounty.ORG
Travis Baker	tbaker@wexfordcounty.org
Stephanie Loria	stephanie.loria@nethwoods northwest.org
Brian Draper	draper@wexexpress.us
Bret Haar	
Michael Bush	MBush@wexfordcounty.ORG
Trent Taylor	ttaylor@wexfordcounty.org
ADAM OSIEPKA	aosiepka@cadillac-mi.net
Jami Bigger	jbigger@wexfordcounty.org
Joe Porterfield	



Wexford Joint Planning Commission

c/o Cherry Grove Township 4830 E. M-55
Cadillac, Michigan 49601
(231)775-1138x6
planningandzoning@wexfordjpc.org | www.wexfordjpc.org

DRAFT Meeting Minutes

Time & Date: 6:30pm, Monday, October 24, 2022
Meeting location: Wexford County Road Commission Meeting Room, 85 West Highway M-115, Boon, Michigan.
Coordinates: 44° 19' 32.5" N, 85° 34' 53.4" W (44.325685, -85.581500)

A. Call to Order@630pm, Pledge of Allegiance, Roll Call

Members Present: (See Attendance Sheet)
Paul Osborne, Chairman (Antioch)
Randy Brewer, Vice Chairman (Springville)
Donna Taylor, Treasurer (South Branch)
Beverly Monroe, Secretary (Liberty)
Richard Harvey (Boon)
Christina Vipond (Hanover)
Marli Wendel (Slagle)
Ben Fleis (Wexford)

Members Absent: *Dan Prince (Selma)
*Marty Dahlstrom (Cherry Grove)

Others Present: Robert Hall, Zoning Administrator
Heather O'Connor, Recording Secretary

B. Set/Amend/Approve the Agenda: Motion to Approve the Agenda as presented made by Beverly Monroe supported by Donna Taylor and passed via voice vote.

C. Matters pertaining to citizens, in the following order:

1. **Networks Northwest / Stephanie Marchbanks – Community Planner**
   a. Natural Hazard Mitigation Plan Presentation

D. Public Comment – Chair recognized four members of the public present. None offered

E. Housekeeping Business

1. **Consent Business**
   a. Approval of September 26, 2022, Meeting Minutes - Motion to approve Meeting Minutes as presented made by Randy Brewer supported by Beverly Monroe and passed via voice vote. See (Proposed Minutes)
   b. Approval of Commission's expense report (pay the bills OCTOBER 2022) - Motion to pay bills ($10,990.63) as presented made by Marli Wendel supported by Richard Harvey and passed via voice vote. See (Bills and Support Docs)

2. **Treasurer's Budget Report** – **Donna Taylor** – Presented the Budget Report. Motion to approve the Treasurer's Budget report as presented made by Richard Harvey supported by Randy Brewer and passed via voice vote. See (Bills and Support Docs)

3. **Planning & Zoning Report** – **Robert Hall** – See (Staff Report) – Mr. Hall presented the Staff report with the following excerpt:

Ordinance Enforcement

Update: Staff will be pursing enforcement action in court on behalf of Cherry Grove Township regarding the mud bog issue. The intent will be to obtain a compliance order wherein the court ***retains jurisdiction*** over the matter in case issues arise in the future.

AND –

ACTION REQUEST:
** Staff is asking the WJPC to approve a resolution (very similar to that of last year) authorizing us to pursue grant funding within the confines of our established budget. **

Motion to approve **Resolution To Authorize Staff of the Wexford Joint Planning Commission to Pursue Grant Funding** made by Richard Harvey, supported by Ben Fleis and passed via voice vote. See (Grant Resolution)

F. Unfinished Business & Reports - (items considered here are taken up in the same order as established by the Commission to fix a priority for consideration and work done in the planning office)

1. Grant Resolution – Training – Michigan Township Participating Plan (Fall Cycle: October 1 – Nov 30) Notification: Feb 2 (see above)

2. Master Plan – Future Land Use update from Staff Report below:

Master Plan

Good News - Map corrections have been received but still need to be reviewed and determined how to integrate into our 'draft' Master Plan. Discussions with the planner have determined that the best strategy moving forward would be to eliminate the single FLU map and replace it with individual Township FLU maps.

Draft copy will be sent with a certificate letter to municipalities then the sixty-three-day waiting time period begins.

G. New Business – None

H. Public Comment – Richard Harvey noted the need for an occupancy limit in the meeting room at the Wexford County Road Commission where WJPC meets. Mr. Hall will report back with data. Chair noted need for training opportunities. For those present tonight, one hour of training is Noted for Record.

I. Adjournment – Motion to adjourn by Richard Harvey supported and adjourned at 8:03pm.

Prepared by Heather A. O'Connor, Recording Secretary, for Secretary

Respectfully submitted:

Beverly Monroe

Beverly Monroe, (elected) Secretary

Wexford County LPT Meeting

Agenda

Wexford County Court House Board of Commissioners Room

Thursday 11/17/2022 10:00am

1. Old Business
   a. Fire Department Box Alarm planning/discussion
   b. Michigan MABAS

2. New Business
   a. Hazard Mitigation Plan update
   b. Hazard Plan Strategies Review
   c. Emergency Management Position

3. Next Meeting Date

   January 19th, 2023

Wexford County LPT Meeting
Sign-in Sheet
11-17-2022 10:00 AM

Name	Email
Michael Bush	MBush@wexfordcounty.com
GARY TAYLOR	GTaylor@WexfordCounty.ORG
RICHARD HARVEY	RHHARV@GMAIL.COM
RICK DOEHRING	RDOEHRING@WEXFORDCOUNTY.ORG
RANDY BOIKE	RBOIKE@WEXFORDCOUNTY.ORG
Duane Alwordon	dalwordon@wexfordcounty.org
Bret Haner	
Joe Porterfield	jporterfield@wexfordcountymi.org

Networks Northwest
Talent / Business / Community

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Save the Date: 12/6/2022 Wexford County Hazard Mitigation Strategies - Public Input Session

10 messages

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org> Mon, Nov 28, 2022 at 4:40 PM
To: Travis Baker <tbaker@wexfordcounty.org>, Jennifer Neal <jennifer.neal@networksnorthwest.org>
Bcc: Linda Sours <lindasourss30@hotmail.com>, Elizabeth Edwards <cedarcreekclerk@gmail.com>, Paula Dewey <clerk@twpofharing.org>, Michael Green <zoning@twpofharing.org>, Steven Kitler <supervisor@clamlaketownship.org>, Amy Peterson <clerk@clamlaketownship.org>, Deborah Stanton <mesick@acegroup.cc>, Village of Mesick <mesickvillage@villageofmesick.com>, Al Mohler <alanmohler501@gmail.com>, Joann Cerka <treasurer@gwtownship.org>, Ronda Jonas <gwtclerk@outlook.com>, Shelly Bigelow <shellybigelow21@yahoo.com>, Carol Perrin <clerk@selmatownship-mi.org>, Mike Boyd <supervisor@selmatownship-mi.org>, Sara Hettich <treasurer@selmatownship-mi.org>, Dan Prince <dprince1982m@gmail.com>, Kerry Keith <klk257@hotmail.com>, Catherine Gouge <cgouge01@hotmail.com>, Jeff Norman <jnorman@mantonschools.org>, Robert MacCord <rpmac55@yahoo.com>, Scott DeYoung <ssd1979@yahoo.com>, Ben Pearson <supervisor@cherrygrovetwp.org>, Kari Hanus <treasurer@cherrygrovetwp.org>, "Maria (Lynn) Nixon" <clerk@cherrygrovetwp.org>, Bruce Howell <brucehowell@acegroup.cc>, Jack Smith <smithbuilt68@gmail.com>, James Schaefer <jsgs@acegroup.cc>, Joe Hollenbeck <hollenbeckj@mesick.org>, Lorene McLeod <lmcleod11@hotmail.com>, Penny Carlsen <pennycarlsen@aol.com>, Michael Mix <colfaxtwp@gmail.com>, Jessica Harrand <jharrand@buckleyschools.com>, Jessica Schisser- City Clerk <clerk@mantonmichigan.us>, Justin Runyon <buckleyfirechief@gmail.com>, Mike Guernsey <guernseybull@yahoo.com>, Todd Kulawiak <tkulawiak@buckleyschools.com>, Eric Wilkins <wilkins_55_00@yahoo.com>, Leonard Morrow <lmorrow@mantonschools.org>, Rick Rayment <rickr.4312@yahoo.com>, Sam Cronkhite <mayor@mantonmichigan.us>, Sue Fullerton <sfullerton75@yahoo.com>, "Antoinette (Tiyi) Schippers" <aschippers@cadillac-mi.net>, Bruce Dewitt <bdewitt@cadillac-mi.net>, Carla Filkins <cfilkins@cadillac-mi.net>, Cindy Cornell <ccornell@cadillac-mi.net>, Jeff Dietlin <utilities@cadillac-mi.net>, John Wallace <jwallace@cadillac-mi.net>, Ken Payne <kpayne@cadillac-mi.net>, Keri Smith <ksmith@cadillac-mi.net>, Marcus Peccia <citymanager@cadillac-mi.net>, Mike Coy <mcoy@cadillac-mi.net>, Robert J Engels <rengels@cadillac-mi.net>, Sandra Wasson <clerk@cadillac-mi.net>, Stephan King <sking@cadillac-mi.net>, Ben Townsend <btownsend@wexfordcounty.org>, Karl Hanson <engineer@wexfordcrc.org>, Sarah Merz <smerz@wexfordcounty.org>, Alan Cooper <manager@wexfordcrc.org>, Brian Potter <bpotter@wexfordcounty.org>, Joseph Hurlburt <jhurlburt@wexfordcounty.org>, Michael Musta <mmusta@wexfordcounty.org>, Michael Bush <mbush@wexfordcounty.org>, Julie Theobald <theobaldjulie@yahoo.com>, Gary Taylor <gtaylor@wexfordcounty.org>, Mike Solomon <draincom@wexfordcounty.org>, Jani Bigger <administration@wexfordcounty.org>

Dear Wexford County Community Representative,

Please join Networks Northwest staff and the Wexford County Emergency Management Coordinator on **December 6, 2022 from 10 am - 12pm!** We will discuss identified natural hazards of concern and obtain your input on hazard mitigation strategies that would apply county-wide or to your specific community.

Location: Wexford County Sheriff's Office - Training Room, 1015 Lincoln St., Cadillac

Background: Networks Northwest Community Development staff planners are in the process of assisting the Wexford County Office of Emergency Management with updating the County's 5-Year Natural Hazard Mitigation Plan. In order for a local community to be eligible to apply for various types of FEMA Hazard Mitigation Grants, it must be documented in the current hazard mitigation plan that representatives from the community participated in the plan development process, identified potential mitigation strategies/future projects, and then adopted the plan (once approved by FEMA) by their local government. Refer to this link for FEMA's most common hazard mitigation project types: https://www.fema.gov/grants/mitigation/applying/project-types

Wexford County Hazard Mitigation Strategies - Public Input Session

Tuesday Dec 6, 2022 · 10am – 12pm (Eastern Time - New York)

Meeting is in the Sheriff's Office Training Room

Location

Wexford County Sheriff's Office, 1015 Lincoln St, Cadillac, MI 49601, USA
View map

Organizer

stephanie.marchbanks@networksnorthwest.org

Guests

Stephanie Marchbanks
Community Planner
Networks Northwest

Desk: 231.439.5247
Mobile: 231.590.0930
stephanie.marchbanks@networksnorthwest.org

Networks Northwest
Talent / Business / Community
2240 Mitchell Park Dr., Suite B
Petoskey MI 49770

Wexford County

Hazard Mitigation Plan Update

Sign-in Sheet 12-6-2022 10:00 AM

Name	Email
Sam Cronkhite	BIGSAMlawDog@yahoo.com
Jessica Schisser	clerk@mantonmichigan.us
William Baker	WilliamBaker0361@yahoo.com
Alan Mohler	alanmohler501@gmail.com
Tiyi Schippers	aschippers@cadillac-mi.net
Marcus Peccia	mpeccia@cadillac-mi.net
GARY TAYLOR	GTaylor@wexfordCOUNTY.ORG
Mike Bush	MBush@wexfordCounty.org
Jami Bigger	jbigger@wexfordcounty.org
Joe Porterfield	jporterfield@wexfordcounty.org
Randy Boike	RBOIKE@WEXFORDCOUNTY.ORG
Travis Baker	tbaker@wexfordcounty.org

Networks Northwest
Talent / Business / Community

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Draft Wexford County Hazard Mitigation Plan and Strategies Available for review

Bob Hall <planningandzoning@wexfordjpc.org> Fri, Jan 27, 2023 at 11:29 AM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Good Friday, Stephanie –

This info has been forwarded as appropriate.

Thank you,

Bob

From: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>
Sent: Tuesday, January 24, 2023 6:17 PM
To: Aaron Stahl <aaron@cwta.us>; Adam Ottjepka <aottjepka@cadillac-mi.net>; Alaina Nyman <clerk@wexfordcounty.org>; Alan Cooper <manager@wexfordcrc.org>; Alan Mohler <supervisor@gwtownship.org>; Amanda Kimbel <askimbel.libertytwp@gmail.com>; Amy Beyer <amy@rivercare.org>; Amy Peterson <clerk@clamlaketownship.org>; Andrea Herman <finance@wexfordcrc.org>; Antoinette (Tiyi) Schippers <aschippers@cadillac-mi.net>; Ben Pearson <supervisor@cherrygrovetwp.org>; Ben Townsend <btownsend@wexfordcounty.org>; Ben Wagner <benjamin.wagner1@usda.gov>; Beverly Monroe <monroeachers@yahoo.com>; Bill Benson <bensonfarm8@gmail.com>; Bret Haner <bhaner@dhd10.org>; Brian Potter <bpotter@wexfordcounty.org>; Bruce Dewitt <bdewitt@cadillac-mi.net>; Bruce Howell <brucehowell@acegroup.cc>; Bruce Tower <towerb@michigan.gov>; Carla Filkins <cfilkins@cadillac-mi.net>; Carol A Haase <clhaase@att.net>; Carol Perrin <clerk@selmatownship-mi.org>; Carolyn Henne <carolyn.henne@usda.gov>; Carrie Thompson <carrie@cwta.us>; Catherine Gouge <cgouge01@hotmail.com>; Cathy Kelbey <cathy.kelbey@cmsenergy.com>; Cindy Cornell <ccornell@cadillac-mi.net>; Cindy Warda <zoningadmin@clamlaketownship.org>; Dan Prince <dprince1982m@gmail.com>; Dave Cox <dcox@wmisd.org>; Dave Williams <davewms@acegroup.cc>; David Fox <wexford.twp.treasurer@gmail.com>; David Schroeder <daschroeder@acegroup.cc>; Deborah Stanton <mesick@acegroup.cc>; Donna Taylor <southbranchdtaylor@yahoo.com>; Draper Brian <draper@cwta.us>; Duane Alworden <alworden@wexfordcounty.org>; Elizabeth Edwards <cedarcreekclerk@gmail.com>; Elizabeth McCain <beth_mccain@yahoo.com>; Eric Wilkins <wilkins_55_00@yahoo.com>; Erin Brotherton <ebrotherton@wexfordcoa.org>; Gary Taylor <gtaylor@wexfordcounty.org>; Jack Smith <smithbuilt68@gmail.com>; James Schaefer <jsgs@acegroup.cc>; Jami Bigger <administration@wexfordcounty.org>; Jason Baughan <jasonbaughan@wexfordcounty.org>; Jason Mitchell <jmitchell@wexfordcounty.org>; Jason Nelson <cgfd08312@gmail.com>; Jeff Dietlin <utilities@cadillac-mi.net>; Jeff Norman <jnorman@mantonschools.org>; Jennifer Brown <jennifer.brown@cadillacschools.org>; Jessica Harrand <jharrand@buckleyschools.com>; Jessica Schisser <jschisser@mantonmichigan.us>; Jim Westbrook <trustee2@gwtownship.org>; Jim Williams <jim.williams@mi.usda.gov>; Joann Cerka <treasurer@gwtownship.org>; Joe Hollenbeck <hollenbeckj@mesick.org>; Joe Porterfield <jporterfield@wexfordcounty.org>; John Wallace <jwallace@cadillac-mi.net>; Joseph Hurlburt <jhurlburt@wexfordcounty.org>; Judy Nichols <jnichols@wexfordcounty.org>; Julie Cieslak <thecieslaks@yahoo.com>; Julie Theobald <theobaldjulie@yahoo.com>; Justin Runyon <buckleyfirechief@gmail.com>; Kari Hanus <treasurer@cherrygrovetwp.org>; Karl Hanson <engineer@wexfordcrc.org>; Kathleen Adams <kadams@wexfordcounty.org>; Ken Payne <kpayne@cadillac-mi.net>; Keri Smith <ksmith@cadillac-mi.net>; Kerry Keith <klk257@hotmail.com>; Larry Czelusta <Larry.Czelusta@macd.org>; Leonard Morrow <lmorrow@mantonschools.org>; Lesa Wade <treasurer@clamlaketownship.org>; Linda Sours <lindasourss30@hotmail.com>; Linda Stahl <trustee2@clamlaketownship.org>; Lisa Douglas <lisa.douglas@cmsenergy.com>; Lorene McLeod <lmcleod11@hotmail.com>; Marcus Peccia <citymanager@cadillac-mi.net>; Maria (Lynn) Nixon <clerk@cherrygrovetwp.org>; Marlene (Molly) Whetstone <tdryrock@yahoo.com>; Marty Dahlstrom <mzpdahl@gmail.com>; Matt McCaul <mccaulm@michigan.gov>; MDNR Forest Resource Division <DNR-Forestry@michigan.gov>; MDNR Parks and Rec Division <DNR-ParksAndRecreation@michigan.gov>; Michael Bush <mbush@wexfordcounty.org>; Michael Green <zoning@twpofharing.org>; Michael Mix <colfaxtwp@gmail.com>; Michael Musta <mmusta@wexfordcounty.org>; Michelle Bigelow <shellybigelow21@yahoo.com>; Michelle Wing <mlwing@gmail.com>; Mike Boyd <mjboyd56@yahoo.com>; Mike Boyd <supervisor@selmatownship-mi.org>; Mike Coy <mcoy@cadillac-mi.net>; Mike Guernsey <guernseybull@yahoo.com>; Mike Solomon <draincom@wexfordcounty.org>; MSUE Wexford County <msue.wexford@county.msu.edu>; Muskegon River Watershed Assembly <mrwa@ferris.edu>; Nicole Glunt <admin@wexfordcrc.org>; Paul Osborne <paulo@acegroup.cc>; Paul Owens <powens@mobilemedical.org>; Paula Dewey <clerk@twpofharing.org>; Penny Carlsen <pennycarlsen@aol.com>; Peter Hansen <info@hanovertsp.com>; Randy Boike <EMD@wexfordcounty.org>; Richard Doehring <wcsd@wexfordcounty.org>; Richard Harvey <rhharv@gmail.com>; Rick Rayment <rickr.4312@yahoo.com>; Bob Hall <planningandzoning@wexfordjpc.org>; Robert J Engels <rengels@cadillac-mi.net>; Robert MacCord <rpmac55@yahoo.com>; Ronda Jonas <gwtclerk@outlook.com>; Ruth Mitchell

<rabshi01@gmail.com>; Ryan Caro <ryan.caro@macd.org>; Sam Cronkhite <mayor@mantonmichigan.us>; Sandra Wasson <clerk@cadillac-mi.net>; Sara Hettich <treasurer@selmatownship-mi.org>; Sarah Merz <smerz@wexfordcounty.org>; Scott DeYoung <ssd1979@yahoo.com>; Shari Spoelman <spoelma4@msu.edu>; Sharon Ream Girard <sharonr@acegroup.cc>; Shiela Pratt <pratts765@gmail.com>; Stephan King <sking@cadillac-mi.net>; Steven Kitler <supervisor@clamlaketownship.org>; Sue Fullerton <sfullerton75@yahoo.com>; Tammy Porterfield <slagletwpclerk@gmail.com>; Teresa Hankins <wexfordtwpclerk@acegroup.cc>; Tiffany Jones <Wexford@macd.org>; Todd Kulawiak <tkulawiak@buckleyschools.com>; Trent Taylor <ttaylor@wexfordcounty.org>; Upper Manistee River Association <umra@umrasite.org>; Vicki Sawicki <vicki.sawicki@macd.org>; Village of Mesick <mesickvillage@villageofmesick.com>; Wendy Floury <springvilletreasurer@goacentek.net>; Zach Peklo <zach.peklo@macd.org>; Travis Baker <tbaker@wexfordcounty.org>
Cc: Jennifer Neal <jennifer.neal@networksnorthwest.org>
Subject: Draft Wexford County Hazard Mitigation Plan and Strategies Available for review

Dear Wexford County Stakeholder,

The draft 2023 Wexford County Natural Hazard Mitigation Plan is now available for your review and comment! Below are links and attachments to PDFs of draft maps, plan, and strategies & resources tables. (The strategies are meant to be printed on 11x17 size paper.) Highlighted text indicates information that still needs to be obtained/confirmed.

Please review the suggested mitigation strategies in particular, as some strategies may pertain to your particular community or organization! A public hearing will be held on the draft plan at the April 19, 2023 Wexford County Board of Commissioners' meeting at 4 pm. Comments, suggestions and questions are welcomed until then - please send them to me: stephanie.marchbanks@networksnorthwest.org.

Wexford_Draft Environmental Features 36 x 48.pdf

Wexford_Draft Hazard Areas 36 x 48.pdf

Wexford_Draft Infrastructure 36 x 48.pdf

Wexford_Draft Vulnerable Populations & Hazard A...

Stephanie Marchbanks

Community Planner

Networks Northwest

Desk: 231.439.5247

Mobile: 231.590.0930

stephanie.marchbanks@networksnorthwest.org

Networks Northwest
Talent / Business / Community

2240 Mitchell Park Dr., Suite B

Petoskey MI 49770

Networks Northwest
Talent / Business / Community

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Re: Item shared with you: "Wexford_Draft Environmental Features 36 x 48.pdf"

Chris Gentry <chris.gentry@calc-landtrust.org> Thu, Jan 26, 2023 at 11:04 AM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Thank you!
Chris

On Thu, Jan 26, 2023 at 10:54 AM Stephanie Marchbanks (via Google Drive) <drive-shares-dm-noreply@google.com> wrote:

Stephanie Marchbanks shared an item

Stephanie Marchbanks (stephanie.marchbanks@networksnorthwest.org) has shared the following item:

PDF Wexford_Draft Environmental Features 36 x 48.pdf

Stephanie Marchbanks is outside your organization.

Open

If you don't want to receive files from this person, block the sender from Drive

Google LLC, 1600 Amphitheatre Parkway, Mountain View, CA 94043, USA
You have received this email because stephanie.marchbanks@networksnorthwest.org shared a file or folder located in Google Drive with you.

Google Workspace

--
Chris Gentry
Executive Director
Cadillac Area Land Conservancy
231-468-9264 (mobile)

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.

Networks Northwest
Talent / Business / Community

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Re: Item shared with you: "Wexford_Draft Infrastructure 36 x 48.pdf"

Baker, Breton (DNR) <BakerB7@michigan.gov> Wed, Jan 25, 2023 at 11:49 AM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Thank you, Stephanie.

Bret.

Breton Baker
Forest Fire Supervisor MDNR
Cadillac Management Unit
8015 Mackinaw Trail
Cadillac, MI 49601
231-775-9727
Cell: 989-329-9944

From: Stephanie Marchbanks (via Google Drive) <drive-shares-dm-noreply@google.com>
Sent: Wednesday, January 25, 2023 11:39 AM
To: Baker, Breton (DNR) <BakerB7@michigan.gov>
Subject: Item shared with you: "Wexford_Draft Infrastructure 36 x 48.pdf"

Stephanie Marchbanks shared an item

Stephanie Marchbanks (stephanie.marchbanks@networksnorthwest.org) has shared the following item:

Wexford_Draft Infrastructure 36 x 48.pdf

Open

If you don't want to receive files from this person, block the sender from Drive

Networks Northwest
Talent / Business / Community

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Draft Wexford County Hazard Mitigation Plan and Strategies Available for review

Sarah Merz <smerz@wexfordcounty.org> Tue, Jan 31, 2023 at 2:49 PM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

I was just wondering about the list of organizations on page 5-6. They appear to be all from Antrim County. Are they supped to be there? It looks like an error…

~ Sarah

From: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>
Sent: Tuesday, January 24, 2023 6:17 PM
To:
Cc: Jennifer Neal <jennifer.neal@networksnorthwest.org>

[Quoted text hidden]

[Quoted text hidden]

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Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Draft Wexford County Hazard Mitigation Plan and Strategies Available for review

Wagner, Ben - FS, MI <Benjamin.Wagner1@usda.gov> Fri, Jan 27, 2023 at 12:18 PM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>
Cc: "Peedle, Scott - FS, MI" <scott.peedle@usda.gov>, "Moore, Todd - FS, ID" <todd.moore@usda.gov>, "Chambers, Dean - FS, MT" <Dean.Chambers@usda.gov>

Thank you for reaching out Stephanie!

Will you please include Gentleman I've cc'd on this message in your future correspondence/link access regarding the hazard mitigation plan development? They currently are not able to review the maps/pdfs that were shared in the last message. Scott Peedle is the District Ranger for the Cadillac-Manistee Ranger District, Todd Moore is the Fire Management Officer, and Dean Chambers is the Assistant Fire Management Officer. Thanks!

Ben Wagner
Deputy Fire Staff Officer
Forest Service

Huron-Manistee National Forests
c: 231-342-8004
Benjamin.wagner1@usda.gov
1755 S. Mitchell St.
Cadillac, MI 49601
www.fs.fed.us

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Share request for "Wexford_Draft Hazard Areas 36 x 48.pdf"

STP (via Google Drive) <drive-shares-dm-noreply@google.com> Fri, Jan 27, 2023 at 12:03 PM
Reply-To: STP <scottpeedle@hotmail.com>
To: stephanie.marchbanks@networksnorthwest.org

Share an item?

STP (scottpeedle@hotmail.com) is **requesting access** to the following item:

would like to request access to files. Scott Peedle, USFS District Ranger, Cadillac/Manistee Ranger District

PDF Wexford_Draft Hazard Areas 36 x 48.pdf

STP is outside your organization.

Open sharing settings

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Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Draft Wexford County Hazard Mitigation Plan and Strategies Available for review

Vicki Sawicki <vicki.sawicki@macd.org> Fri, Jan 27, 2023 at 10:41 AM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>
Cc: Zach Peklo <zach.peklo@macd.org>, Wexford CD <wexford@macd.org>, Larry Czelusta <larry.czelusta@macd.org>

Hey Stephanie!
So glad to see the threat of invasive species mentioned. It would be devastating to this area's economy if we don't keep invasives in check!
Since you talk about agricultural pests also, I wonder if you want to mention MSU Extension as well? They are the better source for pest management in agriculture.
Also, while the Huron-Manistee National Forest will help people that come into their office, I think that NCCISMA is really the source for identification and treatment options of invasive species (they actually pay us to do a good amount of the invasive control on the forest), and the Wexford Conservation District employs a forester that is probably a more available source for citizens to learn about forest insects and diseases.
Thanks for allowing me to review!
Vicki

On Tue, Jan 24, 2023 at 6:17 PM Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org> wrote:
[Quoted text hidden]

--
Vicki Sawicki
North Country CISMA
Program Coordinator
231-429-5072

Networks Northwest
Talent / Business / Community

Interim Board Chair: **Bill Kennis**

Chief Executive Officer: **Terry Vandercook**

March 20, 2023

Dear Wexford County Local Government Representative,

The Wexford County Emergency Management Department, with assistance from Networks Northwest, has prepared a draft of the County's updated 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, villages 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 by visiting https://nwm.org/hazardplan and then clicking on “Wexford County” on the right hand side of the page.

Your participation in the review of this plan is also a Federal Emergency Management Agency (FEMA) requirement to be eligible for federally-funded pre- and post-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. Each community must have a representative listed in the *Acknowledgements* section of the plan (pp. 3-4) to be eligible to apply for FEMA pre-disaster (mitigation) grant funding. Your community can become a participant by providing acknowledgement of reviewing the draft plan and any comments you may have.

A public hearing for the plan will be held on April 19, 2023 at 4:00 PM as part of the Wexford County Board of Commissioners Meeting. The meeting location is the Historic Wexford County Courthouse 3rd Floor, Board of Commissioners Room at 437 E. Division St, Cadillac, MI. Upon review of the plan, and the public hearing, the County Board of Commissioners shall decide if they approve the draft plan to be sent to Michigan State Police 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 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; via postal mail to PO Box 506, Traverse City MI 49685; or by email to stephanie.marchbanks@networksnorthwest.org

Sincerely,

Stephanie Marchbanks
Community Planner, Networks Northwest

Networks Northwest
Talent / Business / Community

WEXFORD 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 April 19, 2023 at 4:00 PM as part of the Wexford County Board of Commissioners Meeting. The meeting location is in the Historic Wexford County Courthouse, 3rd Floor, Board of Commissioners Room at 437 E. Division St., Cadillac, MI 49601. Upon review of the plan, the Board of Commissioners shall recommend it be sent to Michigan State Police 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 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 stephanie.marchbanks@networksnorthwest.org .

2023 Wexford County Hazard Mitigation Plan Current Drafts for Review:

2/6/2023 Draft Plan and **Strategies Table**

Full Size Hazard Maps (Appx. A of the plan)

- **Hazard Areas**
- **Vulnerable Populations and Hazard Areas**
- **Environmental Features**
- **Infrastructure**

Meetings and Documentation

Natural Hazard Mitigation work meetings and documentation will be posted here as they become available. All meetings are open to the public.

Unleess otherwise indicated, the Wexford County Local Planning Team (LPT) meets in person at the County Commissioners' Room, Historic Courthouse, 437 E. Division St., Cadillac, Michigan.

- January 20, 2022 LPT at 10:00 am
- April 21, 2022 10:00 am at the Wexford County Sheriff's Office Training Room: Public Input Session/LPT on Hazard Identification
    - Presentation, Notes, and Hazard ID Mapping
- September 15, 2022 LPT at 10:00 am
- October 24, 2022 Wexford Joint Planning Commission - presentation and public input session on draft strategies - at 6:30 pm at the Wexford County Road Commission Bldg., 85 M-115, Boon, MI 49618
- December 6, 2022 at 10:00 am: public input session on draft strategies at Wexford County Sheriff's Office Training Room, 1015 Lincoln St., Cadillac
- January 19, 2023 LPT at 10:00 am

Update Process

Phase I: Data collection and community survey

- The results of the community survey were utilized to inform the direction of the updated Natural Hazard Mitigation Plan.

Phase II: Hazard identification and risk assessment

Phase III: Review and update hazard mitigation goals, priority areas, and implementation strategies.

Phase IV: Draft plan public comment period. Post the plan electronically and meet with the public for comments. Incorporate feedback from the public review period and make final edits to the plan.

Phase V: Plan Adoption. Facilitate the plan adoption process with the County Board of Commissioners and local officials.

ABOUT US

GOVERNMENTS

FRAMEWORK FOR OUR FUTURE

PROJECTS

GROWTH & INVESTMENT

TRANSPORTATION

RECREATION

NATURAL HAZARD MITIGATION

Antrim County

Benzie County

Charlevoix County

Emmet County

Grand Traverse County

Kalkaska County

Leelanau County

Manistee County

Missaukee County

Wexford County

Grand Traverse Band of Ottawa and Chippewa Indians

Wexford County

BOARD OF COMMISSIONERS

Gary Taylor, Chair

NOTICE OF MEETING

The Wexford County Board of Commissioners will hold a regular meeting on Wednesday, April 19, 2023, beginning at 4:00 p.m. in the Commissioners Room, third floor of the Historic Courthouse, located at 437 E. Division St., Cadillac, Michigan.

TENTATIVE AGENDA

A. CALL TO ORDER
B. ROLL CALL
C. PLEDGE OF ALLIEGIANCE
D. ADDITIONS/DELETIONS TO THE AGENDA
E. APPROVAL OF THE AGENDA
F. PUBLIC COMMENT

Designated for topics on the agenda only.

G. EMPLOYEE RECOGNITION
H. PRESENTATION AND REPORTS

1. Michigan Association of Counties – Steve Currie, Executive Director 1

I. CONSENT AGENDA

The purpose of the consent agenda is to expedite business by grouping non-controversial items together to be dealt with by one Commission motion without discussion. Any member of the Commission may ask that any item on the consent agenda be removed therefrom and placed elsewhere for full discussion. Such requests will be automatically respected. If any item is not removed from the consent agenda, the action noted on the agenda is approved by motion of the Commission to adopt the consent agenda.

1. Approval of the April 05, 2023 Regular Meeting Minutes
2. Approval of the April 11, 2023 Special Meeting Minutes.....18

J. AGENDA ITEMS

1. Public Hearing 20
   a. Wexford County Hazard Mitigation Plan 21
2. Northern Lakes Community Mental Health Authority Enabling Agreement *(Executive 04/11/2023)*.....109
3. AT&T Completelink Renewal *(Executive 04/11/2023)*.....147

K. ADMINISTRATOR'S REPORT
L. CORRESPONDENCE

1. Prosecuting Attorney Monthly Report *(March 2023)*.....152

M. PUBLIC COMMENT

Open for any public comments.

N. LIAISON REPORT
O. BOARD COMMENTS
P. CHAIR COMMENTS
Q. ADJOURN

In compliance with the Americans with Disabilities Act, persons with physical limitations that may tend to restrict access to or participation in this meeting should contact the County Administrator's office (231-779-9453) at least twelve (12) hours prior to the scheduled start of the meeting.

WEXFORD COUNTY BOARD OF COMMISSIONERS
Regular Meeting * Wednesday, April 19, 2023

Meeting called to order at 4:00 p.m. by Chairman Taylor.

Roll Call: Present- Commissioners Jason Mitchell, Michael Musta, Ben Townsend, Kathy Adams, Michael Bush, Julie Theobald, Jason Baughan, Brian Potter and Gary Taylor.

Absent- None

Pledge of Allegiance.

Additions/Deletions to the Agenda-None

Approval of the Agenda

MOTION by Comm. Theobald, seconded by Comm. Potter to approve the agenda, as amended.

All in Favor.

Public Comment-*None*

Employee Recognition- *None.*

Presentation and Reports-

1. Michigan Association of Counties (MAC)-Steve Currie, Executive Director, presented the board with packet and outline that included the following:
   a. MAC: 125th Birthday, Formed on February 1, 1898 as State Association of Supervisors of Michigan.
   b. MAC: Purpose, to be the voice of Michigan Counties at the state and federal levels. To provide educational opportunities to county commissioners to ensure they can do their jobs to the best of their abilities.
   c. MAC: Leadership, Board of 16 members elected by commissioners. Two seats from each of six regions ensure broad representation. MAC Board meets four times a year. Elections held in August/September at Annual Conference.
   d. MAC: Policy Development, Internal Committees, Appointed by the President. Member participation from across the state.
   e. Legislative Update: 2023 Priorities;
      Revising the Open Meetings Act to meet the demands of the 21st Century;
      Creating a Fair Revenue Sharing System for Counties;
      Enacting Reforms to Ensure Proper Funding of Local Courts;
      Increasing Resources for Juvenile Justice Services;
      Compensating Local Governments for Funds Diverted by the Veterans Property Tax Exemption;

Revamping the PPT Exemption to Provide Annual Reimbursement to Locals.

f. MAC: Advocacy, provides financial support to incumbent state legislators who are friends of county government. 24 former county commissioners now serving in the Michigan Legislature (MAC County Caucus).
g. MAC: Events, Conferences; Legislative Conference (spring) April 24-26, 2023. Annual Conference (summer/fall) October 1-3, 2023

Consent Agenda

1. Approval of the April 05, 2023 Regular Meeting Minutes.....
2. Approval of the April 11, 2023 Special Meeting Minutes.....

MOTION by Comm. Theobald, seconded by Comm. Bush to approve the Consent Agenda.

All in favor.

Agenda Items

1. **MOTION by Comm. Theobald, seconded by Comm. Musta to open public hearing.**

Wexford County Hazard Mitigation Plan
Stephanie March from Networks Northwest discussed the outline of the Draft Wexford County Hazard Mitigation Plan.
MOTION by Comm. Theobald, seconded by Comm Adams, to close public hearing.

All in favor.

2. Northern Lakes Community Mental Health Authority Enabling Agreement
MOTION by Comm.to approve the presented Northern Lakes Community Mental Health Authority Enabling Agreement.

Roll Call: Motion Passed 9-0.

3. AT&T Completelink Renewal
MOTION by Comm. Theobald, seconded by Comm. Potter to approve the two year AT&T Complete Link Agreement Renewal and authorize the Chairman to sign on behalf of the County.

Roll Call: Motion Passed 9-0

Administrator's Report-
Thank you for passing the Northern Lakes Community Mental Health Authority. The County closed on last two lots by the jail, a little over 4 acres. Several will be at the MAC Conference next week. Starting to look at budget numbers for 2024 and getting ready for upcoming audit in May.

Correspondence-

1. Prosecuting Attorney Monthly Report *(March 2023)*.....

All in favor.

Public Comments- *None*

Liaison Reports-

Comm Musta-Alliance for Economics & Success still looking for a director. CWTA, Mark Howie, this will be his last month.

Comm Townsend-Library meeting last Monday went very well.

Comm Bush-The CAMA meeting toured the Biewer Sawmill in McBain.

Comm Baughan-Attended the Wexford County School Safety meeting. A presenter From 3-M was also there and talked about added protection for doors and windows. A school resource officer has been hired and will be starting sometime this month.

Comm Potter-Clam Lake DEA got renewed for 30 years. Pioneer Apartments will be taken down in the next three weeks, final notices have gone out, approximately 7 acres will then be put on the market. MAC Judicial has a lot going on, just waiting for the legislators to get caught up, hopefully get some changes and more money for the County.

Comm Taylor-Attended the MAC Environmental Committee meeting, staring to rewrite the platforms to be ready for the September meeting.

Board Comments-

Comm Townsend-Thank you to the Wexford County Administrators for being so involved with the Northern Lakes Community Mental Health agreement.

Comm Adams-Thank you to the Wexford County Administrators, Comm Townsend, and Comm Taylor for going to bat for our County at the meetings for Northern Lakes Community Mental Health.

Comm Theobald-Thank you to everyone involved with Northern Lakes Community Mental Health agreement, the hard work is appreciated.

Comm Potter-Thank you to everyone involved in Northern Lakes Community Mental Health and coming to an agreement. I realize how important the services are.

Chairman's Comments-

Chair Taylor, thanked Stephanie, from Northern Lakes Community Mental Health and everyone for coming to the meeting.

Adjourn

MOTION by Comm. Potter, seconded by Comm. Theobald to adjourn at 4:43 p.m.

All in favor.

Gary Taylor, Chairperson

Karen S. Maury, Chief Deputy Clerk

Networks Northwest
Talent / Business / Community

Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Hazard Mitigation Plans - Invasive Species Section

Vicki Sawicki <vicki.sawicki@macd.org> Wed, Aug 9, 2023 at 12:08 PM
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>

Hi Stephanie,
Attached please find a copy of your document with comments (& some suggested added text).
I have also attached a copy of our Strategic Plan's section on priority and watch list species for this region.
Several of the species considered "lost-causes" statewide are still winnable battles for the region of NCCISMA. As such, I think it would be more suitable to use the regional list in the hazard mitigation plan.
Give me a call if you have any further questions, or if I can be of further help.
Thank you for letting me review this!
Vicki
[Quoted text hidden]

2 attachments

Invasive Species_Wexford_2024_04_24 - NCCISMA comments.docx
3793K

NCCISMA Priority & watch spp from strat plan.docx
19K

- (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. It's aggressive growth has been known to pull down awnings and fences. It overtops trees and girdles them, thus killing the trees, which creates the hazard of downed trees during wind events.
- 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.

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. It releases chemicals in the soil that interfere with the mycorrhizal fungus in the soil that our spring ephemerals require to survive. In this way it outcompetes native species and forms dense monocultures, not only eliminating native forbs on the forest floor, but also inhibiting tree regeneration.
- Eurasian watermilfoil 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. Once established in a lake, control of Eurasian watermilfoil becomes a regular/annual maintenance program.
- 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.

Commented [N1]: Cypress spurge is not a priority species in Wexford County. It is found primarily on roadsides with already degraded habitats. It is more widespread here than in Missaukee County, and also, Wexford does not have all of the dairy farms that Missaukee is known for.

Commented [N2]: Black swallow wort is a watch list species in Wexford County. There are no known occurrences of this here.

Commented [N3]: On a landscape scale, the fight against autumn olive has already been lost. While it is reccommended that people interested in habitat restoration objectives remove autumn olive on their property, I would play down its role in "causing significant harm", since it is already too well established, and overall we need to learn to live with it. my 2 cents on that.

Commented [N4]: There is a lot not know about rock snot. I might leave this out. It is technically native, and no one has yet figured out why it is producing bigger and more prevalant blooms than it has in the past.

Commented [N5]: I would probably leave purple loosestrife out of this as well. It is now well controlled by the imported gallerucella beetle. When they are introduced into large populations of purple loosestrife they provide effective control for about 5 years. After the loosestrife population crashes, then the beetle population crashes. When the loosestrife population rebounds, beetles need to be introduced again.

Commented [N6]: Garlic mustard is NOT an aquatic plant!

Commented [N7]: Another one I am not sure I would mention. There is no known control for this species. If it is mentioned it should be in the context of stopping its spread by decontaminating recreational equipment. Particularly with respect to fly fishermen (thought to be the main means of spread), by cleaning their waders between fishing trips with Formula 409.

Commented [N8]: No known occurences in Wexford County, but it is on the watch list. Spread by illegal use of the species as bait, and then dumping of unused bait.

E. NCCISMA Priority, Watch List and Other Species

The principle focus of the NCCISMA efforts is on invasive plant species, both in upland and wetland landscapes. However, cooperation with the efforts of DNR, the US Forest Service and other partners, like Trout Unlimited and the area Foresters, on target insect and aquatic invaders, is a secondary NCCISMA goal.

Based on its overall goal and goal elements, NCCISMA has identified lists of Priority Species, Watch List Plants, and Other Watch List Species. These are shown in Table I. Priority Species, Watch List Plants and Other Watch List Species. The parameters that suggest the groupings and how they fit into NCCISMA's action plans are as follows:

I. Priority Species are those invasive plants that have been shown elsewhere to have the potential for adverse landscape level impacts, but which NCCISMA and its partners believe can still be controlled in our region. While they have been observed in a number of locations throughout the NCCISMA region, by employing strategic targeted action that includes education, prevention and aggressive treatment, their further spread and adverse impacts can be largely prevented. Identifying and pursuing treatment of these plants sits at the top of the NCCISMA operations agenda.

II. Watch List Plants are invasive plants that have been observed in other locations, particularly southern Michigan and its bordering states. They either have not been observed in the NCCISMA geographic region, or their observation has been limited to a few isolated occurrences. For example, Chinese yam has spread to 16 southeastern states since its introduction in the 1800's and has been recorded in some locations in Michigan. It can grow up to 16 feet in height, engulfing surrounding vegetation along the way. While this vine dies back in the winter, it grows and reproduces quickly enough to reduce plant diversity and threaten native ecosystems. The management objectives for these species rests heavily on education and identification efforts that will hopefully prevent them from becoming established and spreading in our region. Finding a watch list species triggers an Early Detection Response (EDR)(see section G below).

III. The Other Watch List Species consists of those non-plant species that our organization and other partners have identified as being a priority in their invasive species efforts. The Asian long-horned beetle, for example, is currently found in Ohio, but has not been observed in Michigan. If the species were to gain a foothold in Michigan, the potential damage to Michigan's hardwood forest resource would be extensive and very expensive. Programs aimed at those species are being led by outside partnering agencies and

partners. NCCISMA performs as a supporter of those programs, in an effort to extend their reach, and increase citizen awareness of the need for prevention and control efforts.

Table II.1 Priority Species, Watch List Plants and Other Watch List Species

High Priority Species	Watch List Plants	Other Watch List Species
Phragmites	Flowering rush	Asian long-horned beetle
Japanese knotweed	European frogbit	Hemlock woolly adelgid
Giant knotweed	Pale swallow-wort	Red swamp crayfish
Glossy buckthorn	Black swallow-wort	New Zealand mudsnail
Common buckthorn	Chinese yam	Thousand cankers disease
Garlic mustard	Japanese stiltgrass	Asian crazy worm
Oriental bittersweet	Jetbead	Spotted lanternfly
Wild parsnip	Kudzu	Bighead carp
Tree of Heaven	Giant hogweed	Silver carp
Bristly locust	Water hyacinth	Black carp
	Water lettuce	
	Water soldier	
	Yellow floating heart	
	Lesser celandine	
	Japanese chaff flower	
	Himalayan balsam	

In addition to these targeted invasive species, NCCISMA also recognizes a number of invasive species as being Species of Local Concern. The Species of Local Concern group includes invasive plants that are already generally well established and fairly wide-spread in our region. Nevertheless, in specific locations and habitats many NCCISMA partners may want to pursue aggressive control efforts against these species to achieve specific management objectives. Examples include aggressively controlling spotted knapweed in areas where endangered Karner blue butterflies are being managed, or controlling autumn olive in areas that are being managed for public recreation use. NCCISMA can effectively support these efforts by providing information and equipment, and publicizing the need for, and success, of these projects.

The NCCISMA Species of Local Concern include:

- Autumn olive
- Spotted knapweed
- Oak wilt disease
- Purple loosestrife
- Multi-flora rose
- Japanese barberry
- Honeysuckle
- Baby's breath
- Burning bush
- Norway maple
- Bradford pear
- Black locust
- Oregon grape

Agricultural pests are not included in NCCISMA's high priority, watch list, or local concern species lists. Agricultural pests do not meet NCCISMA's criteria for being listed as an invasive species. A focus on agricultural pests may diminish the core message of NCCISMA regarding the threats associated with invasive species as important to all citizens of the region, as opposed to a niche group, such as farmers. This is not to imply that agricultural pests are not important, or that they could not have a serious negative impact on the economy of the region, but rather they are excluded since there are other entities in place that routinely work with farmers and are better situated to handle these issues. Questions received by NCCISMA regarding exotic agricultural pests, such as spotted wing drosophila, Asian chestnut gall wasp, and brown marmorated stink bug, will be referred to the appropriate MSU Extension professionals.