



Grand Traverse Band of Ottawa and Chippewa Indians Natural Hazard Mitigation Plan

2023



June 4, 2024

Chairman David M. Arroyo
Tribal Council of the Grand Traverse Band of Ottawa and Chippewa
Grand Traverse Band of Ottawa and Chippewa Indians
2605 N. West Bay Shore Dr.
Peshawbestown, MI 49682

Dear Chairman Arroyo:

The Grand Traverse Band Natural Hazard Mitigation Plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. The Grand Traverse Band Natural Hazard Mitigation Plan met the required criteria for a tribal hazard mitigation plan and the plan is now approved for the Grand Traverse Band of Ottawa and Chippewa Indians.

The expiration date of the Grand Traverse Band Natural Hazard Mitigation Plan is five years from the date of this letter.

An approved local mitigation plan, including adoption by the tribal council, is one of the conditions for applying for and/or receiving FEMA mitigation grants from the following programs:

- Hazard Mitigation Grant Program (HMGP)
- HMGP Post-Fire
- Building Resilient Infrastructure and Communities
- Flood Mitigation Assistance

Having an approved mitigation plan does not mean that mitigation grant funding will be awarded. Specific application and eligibility requirements for the programs listed above can be found in each FEMA grant program's respective policies and annual Notice of Funding Opportunities, as applicable.

To avoid a lapsed plan, the next plan update must be approved before the end of the approval period, including adoption by the tribe. Before the end of the approval period, please allow sufficient time to secure funding for the update, including the review and approval process. Please include time for any revisions, if needed, and for your tribe to formally adopt the plan after the review, if not adopted prior to submission. This will enable you to remain eligible to apply for and receive funding from FEMA's mitigation grant programs with a mitigation plan requirement. Tribes with a plan status of "Approvable Pending Adoption" are not eligible for FEMA's mitigation grant programs with a mitigation plan requirement.

We look forward to discussing options for implementing this mitigation plan. If there are any questions from either you or the communities, please contact Meghan Cuneo at (202) 615-5294 or Meghan.cuneo@fema.dhs.gov.

Sincerely,

A handwritten signature in black ink that reads "John Wethington".

John Wethington
Chief, Risk Analysis Branch
Mitigation Division



**The Grand Traverse Band of
Ottawa and Chippewa Indians**

2605 N. West Bay Shore Drive · Peshawbestown, MI 49682-9275 · (231) 534-7211

RESOLUTION
Number 24-42.3658

- WHEREAS:** The Grand Traverse Band of Ottawa and Chippewa Indians (GTB) became federally-recognized as an Indian Tribe having a government-to-government relationship with the United States effective May 27, 1980 (see 45 Fed. Reg. 18321-322 (March 25, 1980)); and
- WHEREAS:** GTB is organized under a Tribal Constitution approved by the Secretary of the Interior on March 29, 1988; and
- WHEREAS:** GTB has a full Tribal Council currently consisting of David Arroyo, Tribal Chairman; Robert Kewaygoshkum, Vice Chair; Donna Swallows, Treasurer; Theresa Marshall, Secretary; Jane A. Rohl, Councilor; Brian Napont, Councilor; and, Tina Frankenberger, Councilor; and
- WHEREAS:** Article IV, Section (1)(a) of the Tribal Constitution provides that a power of the Tribal Council is “[t]o promote and protect the health, education, and general welfare of the Band and its members;” and
- WHEREAS:** Article IV, Section (1) (c) of the Tribal Constitution provides that a power of the Tribal Council is “[t]o make all laws, not inconsistent with this Constitution, which shall be necessary and proper to carry out the sovereign powers of the Tribe, and to implement and enforce the same,” and
- WHEREAS:** Article IV, Section (1)(h) of the Tribal Constitution provides that a power of the Tribal Council is “[t]o manage and control the economic affairs, enterprises, property, and all other interests of the Band;” and
- WHEREAS:** Grand Traverse Band of Ottawa and Chippewa Indians has experienced risks that may damage commercial, residential and public properties, displacing citizens and businesses, close streets and impair infrastructure, and present general public health and safety concerns; and
- WHEREAS:** Grand Traverse Band has developed the 2023 Grand Traverse Band Natural Hazard Mitigation Plan that outlines the Tribe’s options to reduce damages and impacts from natural and technological hazards, in accordance with the Disaster Mitigation Act of 2000 and the requirements in Title 44 Code of Federal Regulations Section 201.7; and
- WHEREAS:** the 2023 Grand Traverse Band Natural Hazard Mitigation Plan specifically addresses hazard mitigation strategies and plan maintenance procedures for Grand Traverse Band with the effect of protecting people and property from loss associated with those hazards; and

Resolution No. 24-42.3658
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GRAND TRAVERSE CHARLEVOIX LEELANAU BENZIE MANISTEE ANTRIM

- WHEREAS:** adoption of this plan will make the Grand Traverse Band eligible for funding to alleviate the impacts of future hazards on tribal lands; and
- WHEREAS:** the Grand Traverse Band will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002; and will amend our plan whenever necessary to reflect applicable changes in Tribal or federal laws and statutes.
- WHEREAS:** the 2023 Grand Traverse Band Natural Hazard Mitigation Plan has been reviewed by residents, business owners, and federal, state and local agencies, and has been revised where appropriate to reflect their concerns, and;
- WHEREAS:** the 2023 Grand Traverse Band Natural Hazard Mitigation Plan will remain in effect for five years from the date of the FEMA Mitigation Division letter; and
- WHEREAS:** the Grand Traverse Band wants to adopt the 2023 Grand Traverse Band Natural Hazard Mitigation Plan to reduce damages and impacts from natural and technological hazards, and;
- NOW, THEREFORE BE IT RESOLVED:** that the Tribal Council of the Grand Traverse Band of Ottawa and Chippewa Indians by this Resolution adopts the 2023 Grand Traverse Band Natural Hazard Mitigation Plan as an official plan of Grand Traverse Band.
- BE IT FURTHER RESOLVED:** That the Tribal Chairman, David Arroyo, and the Tribal Manager, Rebecca Oien, are authorized to contract, negotiate, execute, and otherwise provide for the administration of projects as required during their tenure or until completion of the programs, whichever is earlier.
- APPROVED:** David M. Arroyo
David M. Arroyo
Tribal Chairman **ADOPTED:** Theresa Marshall
Theresa Marshall
Secretary

CERTIFICATION

As Secretary of the Grand Traverse Band of Ottawa and Chippewa Indians Tribal Council, I hereby certify that the above Resolution was approved and adopted at a Regular Session of the Tribal Council held on May 15, 2024 by a vote of 5 for, 0 against, 0 abstaining, and 1 absent.

ATTEST: Theresa Marshall
Theresa Marshall, Secretary

ACKNOWLEDGEMENTS

This Natural Hazard Mitigation Plan is prepared for the Grand Traverse Band of Ottawa and Chippewa Indians, a Native Sovereign Nation. This plan is a culmination of the interdisciplinary and interagency planning effort that required the assistance and expertise of the tribal and non-tribal entities listed below. Refer to Appendix G for a table of how and when the representatives of each participating entity contributed to the development of the plan.

Tribal Participation

Name	Title	Department
David Arroyo	Tribal Chairman	Tribal Council
Robert Kewaygoshkum	Tribal Vice Chair	Tribal Council
Ruth Dudley	Executive Assistant to Tribal Chairman	Tribal Council
Donna M. Swallows	Treasurer	Tribal Council
Theresa M. Marshall	Secretary	Tribal Council
Jane A. Rohl	Councilor	Tribal Council
Brian S. Napont	Councilor	Tribal Council
Tina A. Frankenberger	Councilor	Tribal Council
Michael Long	Associate Judge	Tribal Court
Dolores Wonegeshik	Manager	Elders Program
Jolanda Murphy	Manager/Emergency Manager	Public Safety – Emergency Management
David Crockett	Police Captain	Public Safety – Tribal Police
Russ Cavanaugh	Police Sergeant	Public Safety – Tribal Police
Suzanne McSawby	Law Enforcement Specialist	Public Safety – Tribal Police
Garrett Fairchild	Fire Chief	Public Safety - Fire & Rescue
Becky Oien	Tribal Manager	Tribal Management Office
Doris Winslow	Executive Assistant to the Tribal Manager	Tribal Management Office
George McClellan, II	Information Technology Director	Tribal Management – Communications
Victoria Alfonseca	Communications Coordinator/Editor	Tribal Management - Communications
Nicki Basch	Housing Mgr/Emergency Mgr 1st Deputy	Tribal Management – Housing; Public Safety - Emergency Management
Melissa Petoskey	Manager	Tribal Management - Human Resources
Jodi Lewis	Interim CFO	Tribal Management - OMB - Accounting
Jason Verheek	CFO, DA	Tribal Management - OMB - Accounting
Joe Huhn	Manager	Tribal Management - Public Works
Rob Kalbfleisch	Land Acquisition Manager	Legal - Land and Roads Management
Christy Parker	Gaming Officer	Regulatory – Gaming Commission
Lori Savaso	EDC Risk Manager & Safety Director	Regulatory - Risk Management
Deb Stojak	EDC Safety Officer	Regulatory – EDC Gaming Authority
Steve Feringa	Corporate Architect/ Manager	Regulatory - EDC Project Management
Carolan Sonderegger	Manager	Natural Resources
Jenna Scheub	Manager	Natural Resources - Environmental
Courtney Hessel	Environmental Specialist	Natural Resources - Environmental
Scott Mitchell	Environmental Response Specialist	Natural Resources - Environmental
Mari Raphael	Registered Nurse	Health Services
Soumit Pendharkar	Health Administrator	Health Services
Shirley Alpers	Registered Nurse	Health Services
Kathy Tahtinen	Department Manager	Human Services
Dawn Shenoskey	Manager	Education

Non-Tribal Participation

Name	Title	Agency
Matt Ansorge	Director	Leelanau County Emergency Management
Kelly LaCross	Deputy Director	Leelanau County Emergency Management
Trudy Galla	Planner	Leelanau County Planning Department
Andy Doornbos	Fire Chief	Cedar Area Fire and Rescue
Joe Mosher	Planning Commissioner	Centerville Township
Jim Schwantes	Supervisor	Centerville Township
Dana Boomer	Clerk	Kasson Township
Dan Besson	Fire Chief	Leland Township
Clint Mitchell	Planning Commissioner	Leland Township
Lt. James Kiessel	Undersheriff	Leelanau County Sheriff's Office
Jim Calhoun	Commissioner	Leelanau County Road Commission
Brendan Mullane	Managing Director	Leelanau County Road Commission
Hugh Cook	Fire Chief	Leelanau Township Fire and Rescue
Jim Porter	Fire Chief	Suttons Bay-Bingham Fire/Rescue
Mark Bowen	Captain	Suttons Bay-Bingham Fire/Rescue
Amy Fairchild	Operations Manager	Mobile Medical Response
Rebecca Hubers	Emergency Management Coordinator	Benzie County Emergency Management
Bobbi Scott	Emergency Preparedness Coordinator	Benzie-Leelanau District Health Department
Jason Tropsf	Trooper	Michigan State Police
Michael deCastro	Lieutenant, Michigan Critical Incident Management System Trainer	Michigan State Police EMHSD
Nick Florip	Farm Manager	Harbor Hill Fruit Farm, Leland Twp.

Prepared for the Grand Traverse Band of Ottawa and Chippewa Indians
with assistance from:



Networks Northwest
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Traverse City MI 49685-0506
Telephone: 231.929.5000
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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.

The fourth element of emergency management, mitigation, can lessen the need for a community to respond to subsequent hazard events, for some incidents may remain as mere incidents and not become disasters. 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 Grand Traverse Band of Ottawa and Chippewa Indians (GTB) Natural Hazard Mitigation Plan focuses on *natural* hazards such as extreme heat, drought, wildfires, flooding, shoreline erosion, dangerous shoreline currents, thunderstorms, high winds, hail, tornadoes, extreme winter weather, and invasive species within the GTB Tribal service area of Leelanau, Grand Traverse, Antrim, Charlevoix, Benzie and Manistee Counties. An exception is that it will also consider these technological and human-related hazards: dam failure and public illness outbreak.

The following natural hazards were not included in the analysis for this Hazard Mitigation Plan: earthquakes, subsidence, 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. Additionally, the GTB service area does not contain potential subsidence hazards such as active or abandoned coal mines, and sinkhole risks in the area range from "absent or likely absent" to "infrequent or likely infrequent". 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 Plan is to permanently eliminate or reduce long-term risks to people and property from natural hazards so that Tribal assets such as infrastructure, commerce, and housing can be sustained and strengthened. This can be accomplished through collaborative efforts/activities amongst agencies within the government to protect the health, safety, and economic interests of the residents and businesses through planning, awareness, and implementation.

This plan represents an update to the GTB's 2016 Hazard Mitigation Plan that meets the requirements of Title 44 of the Code of Federal Regulations, Section 201.7. A FEMA-approved hazard mitigation plan is required for receiving certain types of non-emergency disaster assistance, including funding for Hazard Mitigation Assistance projects and Public Assistance permanent work (categories C-G) for Tribal governments applying directly to FEMA for assistance. The Plan includes a description of the planning process, a description of the community, hazard identification and analysis, current mitigation capabilities, a strategy and action plan, and a process for incorporating the plan into other Tribal processes and updating the Hazard Mitigation Plan.

Through this Plan, a broad perspective was taken in examining multiple natural hazard mitigation activities and opportunities for protecting the GTB community from future hazard events. Each natural hazard was analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigation.

Section VII of this plan, "Mitigation Strategies and Priorities", provides a current list of hazard mitigation strategies for each natural hazard identified. Mitigation strategies were developed based on discussions with local officials and a review of FEMA/MSP best practices for hazard mitigation. (Refer to Appendix D for a list of Alternative Mitigation Strategies that were considered.) Strategies are grouped according to their purpose: Awareness and Preparation; Shelters; Buildings & Infrastructure; 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.

Appendix E provides a list of mitigation strategies included in the GTB 2016 Natural Hazards Mitigation Plan, along with their current status and how they may have been integrated into local planning mechanisms.

Recognizing the importance of reducing community vulnerability to natural hazards, GTB is actively addressing the issue through the development and implementation of this plan. This process will help ensure that Tribal community remains a vibrant, safe, enjoyable place in which to live, raise a family, continue to conduct business. The Plan serves as the foundation for natural hazard mitigation activities and actions on GTB lands within Leelanau County and other counties in the GTB service area, and will be a resource for building coordination and cooperation within the community for local control of future mitigation and community preparedness around the following GTB Natural Hazard Mitigation Goals:

1. Increase local awareness and participation in natural hazards mitigation strategies
2. Integrate natural hazards mitigation considerations into the community's comprehensive planning process
3. Utilize available resources to apply for future natural hazard mitigation grants or partnerships
4. Develop and complete natural hazards mitigation projects in a timely manner
5. Protect human life from the impacts of natural hazards through planning and preparedness efforts
6. Ensure uninterrupted government and emergency functions in a disaster
7. Increase public awareness on being prepared before, during and after a disaster, when essential services may not be available

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 Tribal nations to have a natural hazards mitigation plan in place and updated on a 5-year cycle as a condition for receiving grant money related to natural hazard remediation. The Grand Traverse Band of Ottawa and Chippewa Indians is adopting an updated Hazard Mitigation Plan that meets the requirements of Title 44 of the Code of Federal Regulations, Section 201.7 (44 CFR § 201.7). The adoption of a 2023 plan will affirm the Tribe's eligibility for federal funding.

The creation of the Tribe's plan was led by the Natural Hazards Task Force (Task Force) comprised of the Tribal Local Planning Team (LPT). Team members consist of Tribal Councilmembers, emergency response personnel, and government staff that ensure the readiness of the Tribe by recommending equipment purchases, training and exercises, and member education on preparedness issues. Networks Northwest assisted with the planning process and provided support to facilitate meetings and plan writing. The Task Force met regularly via Zoom and/or in-person at the GTB Tribal Police Department Conference Room in Peshawbestown (located in Suttons Bay Township, Leelanau County). The following is an outline of events for the development of the 2023 Natural Hazard Mitigation Plan:

- On July 1, 2021, Jolanda Murphy and Garrett Fairchild attended a project kick off meeting with regional county and tribal emergency managers.
- On October 21, 2021 Networks Northwest attended a LPT meeting and provided an introduction and timeline for the project. The meeting was held virtually.
- In October 2021, the Tribe released an online community survey; details about the survey are provided below.
- On January 14, 2022 Networks Northwest presented the community profile information and provided a summary of preliminary survey results. The meeting was held virtually.
- On March 11, 2022 Networks Northwest presented the final survey results and the hazard analysis including historic weather events. The meeting was held virtually.
- On April 14, 2022 a joint community meeting was held between Tribal officials and representatives from Leelanau County to discuss potential hazards. The meeting was held in person at the Leelanau County building.
- On August 18, 2022 the LPT met to discuss the partial draft plan, goals and objectives, and hazard mitigation strategies.
- On October 7, 2022 the LPT met to confirm the goals and objectives and the mitigation strategies and discuss implementation efforts.
- On December 20, 2022 the LPT met to provide clarification and edits to mitigation strategies.
- On February 9, 2023 the LPT reviewed updated mitigation strategies, which were consolidated by hazard type, and discussed next steps in the planning process.
- On May 3, 2023 Networks Northwest presented the draft hazard maps, plan, and strategies to the Tribal Council at a special Tribal Council Work Session meeting to obtain feedback. Members of the LPT were also present at the meeting to assist in feedback and answering questions from councilmembers.
- The final draft plan was released for public comment on October 19, 2023 via the following outreach/notification methods: posting on the GTB website, the GTB's "Regroup" mass electronic notification system, and the project page on Networks Northwest's website. Public comments and questions regarding the plan were requested either in person at the GTB Membership Meeting held at the Grand Traverse Resort on 10/28/2023, or via mail or email through 10/28/2023.
- Any comments received from the public input period were provided to Networks Northwest to incorporate into the plan before submittal to the Michigan State Police for plan review.

In terms of obtaining "public" input as a part of developing this plan update for the GTB, the term "public" can be described as persons who are GTB tribal members/citizens, residents on tribal land, tribal government employees, or participants in any of the County Local Planning Teams (LPTs) in the GTB service area (Antrim, Benzie, Charlevoix, Grand Traverse, Leelanau, and Manistee Counties).

Refer to the Acknowledgments section in the beginning of this plan for a list of participants; Appendix F for a detailed table showing how and when representatives participated in the planning process; and Appendix G for meeting and participation documentation.

Community Survey Results

The primary source of feedback was gathered through the Community Survey. The survey was shared electronically through GTB member email addresses, published as a notification in the GTB Tribal Newsletter, and was also available in

on the GTB website and Networks Northwest website. The survey asked 14 questions related to hazard mitigation and received 121 responses between October 5, 2021 and January 21, 2022. The first question asked participants to identify their role in the GTB community. The majority of participants were government employees and/or citizens.

Responses to Question 2 asked how familiar participants were with the existing Natural Hazard Mitigation Plan. The majority (73%) were not familiar with the plan. However, Question 3 asked how concerned participants were with natural hazard events impacting their community. 51.24% were “somewhat concerned” and 42.15% were “very concerned.” Responses to Question 4 largely represent the primary concern of the time, the COVID-19 Pandemic. For example, when asked what natural hazard event is likely to have the largest impact on your community, 80 of 120 responses were related to pandemic/illness outbreak or lack of outbreak resources. Other top concerns included snowstorms/winter storms/blizzards, and major or severe weather storms, especially those causing power outages (34 responses), flood (22 responses), and wildfire (17 responses). Tornado, drought, invasive species, and water contamination were mentioned less frequently.

Questions 5 asked about community concerns regarding the current condition of infrastructure and if it would be able to withstand a future natural hazard event.

- 47 of 118 respondents said “no” or were “unsure” if infrastructure was a concern. Of those who responded that infrastructure is a concern, many participants were concerned about power outages and the need for back-up power. For example, the survey received the following response, *“Power lines in weather events have shut things down for up to a week a few times in the last decade or so with no power.”*
- Bridges and dams were also frequently mentioned and the concern about flooding damages. One participant said, *“Yes. Many local dams and road stream crossings were designed and constructed decades ago and under hydrologic regimes that are now rapidly shifting towards more frequent and of higher intensity. Further, many stormwater and wastewater systems are also rapidly becoming outdated given these climate related hydrologic regime shifts. Much more funding needs to be directed towards assessment and re-design and construction of substandard infrastructure.”*

Similarly, Question 6 asked if the community has concerns that a future natural hazard would require investment in new/upgraded infrastructure and technology.

- 27 respondents said “no” or were “unsure” about needed infrastructure upgrades.
- 23 respondents indicated renewable energy is potential investment to upgrade infrastructure and reduce the impact of a natural hazard. Other infrastructure that was mentioned included roads, bridges, stormwater management, access to natural gas service, and increased and wireless and internet service coverage. For example, one person said, *“Yes, internet service needs to be improved in Peshawbestown as well as other rural areas. Renewable energy / energy independence would benefit the tribe. Existing buildings are older and may not be the most energy efficient.”* Another respondent indicated that *“there are a several areas within downtown Lake Leelanau that do not have cellular connection due to topography as well as along CR-204 and M-22”*.

Question 7 asked if there have been any negative impacts on the public health and/or natural environment of their community that they attributed climate change.

- 56 of the 118 participants who provided a response said “no” or were unsure if there have been. A few of those who responded they were unsure, did request additional information.
- Of those who responded in the affirmative, many associated climate change to public health concerns such as poor air quality, water quality, illness outbreaks, increased precipitation, high water levels, milder winters, hot summers, and the influx of invasive species. Several responses identified a connection between unusual or uncommon weather patterns and negative effects on native plant and animal species.

Questions 8-11 asked about participants’ familiarity with hazard mitigation planning.

- 89% said they were not involved in the previous planning process.
- 84% of respondents did not know if requests have been made by the Tribe for assistance with mitigation projects.
- Of the respondents who indicated that their community’s hazard mitigation project assistance was granted, most were not aware of that type of project was included.
- 83% of respondents were unaware if their community had considered mitigation strategies for potential hazards.

Question 12 asked participants to identify potential mitigation strategies they would like to explore in the future.

- 58 of 88 responses were, “unknown” or not applicable.
- However, several responses included ideas such as renewable energy opportunities, providing back up power sources, providing education and training, providing emergency shelters, improving infrastructure and installing underground power lines, and maintaining and increasing native habitats especially water draining areas such as wetlands, streams, and drainage paths.

Question 13 asked if there was any additional information to be considered for the Tribe’s Natural Hazard Mitigation Plan.

- First and foremost, participants requested transparency and information.
- Preparedness was also mentioned several times.
- Include all six county areas for inclusion in the plan.
- Consider age-related circumstances and current methods of communication such as the website.
- Several responses asked for the plan to reflect cultural appreciation of lands/property as well as Tribal values.
- Participants also suggested addressing Tribal needs and getting everyone the help they need.
- One respondent suggested considering community displacement from heavy snow storms.
- One respondent expressed concern about tornado siren coverage: “Addressing county tornado notification system. Unless you were standing outside in Lake Leelanau it couldn't be heard on the west side of town. I haven't heard the notification in near Suttons Bay.”

The final question, Question 14, asked survey-takers to respond with their contact information if they wish to be involved with the plan process. Several responses included a name, email address, and phone number to contact those who are interested. Many indicated no, they are not interested.

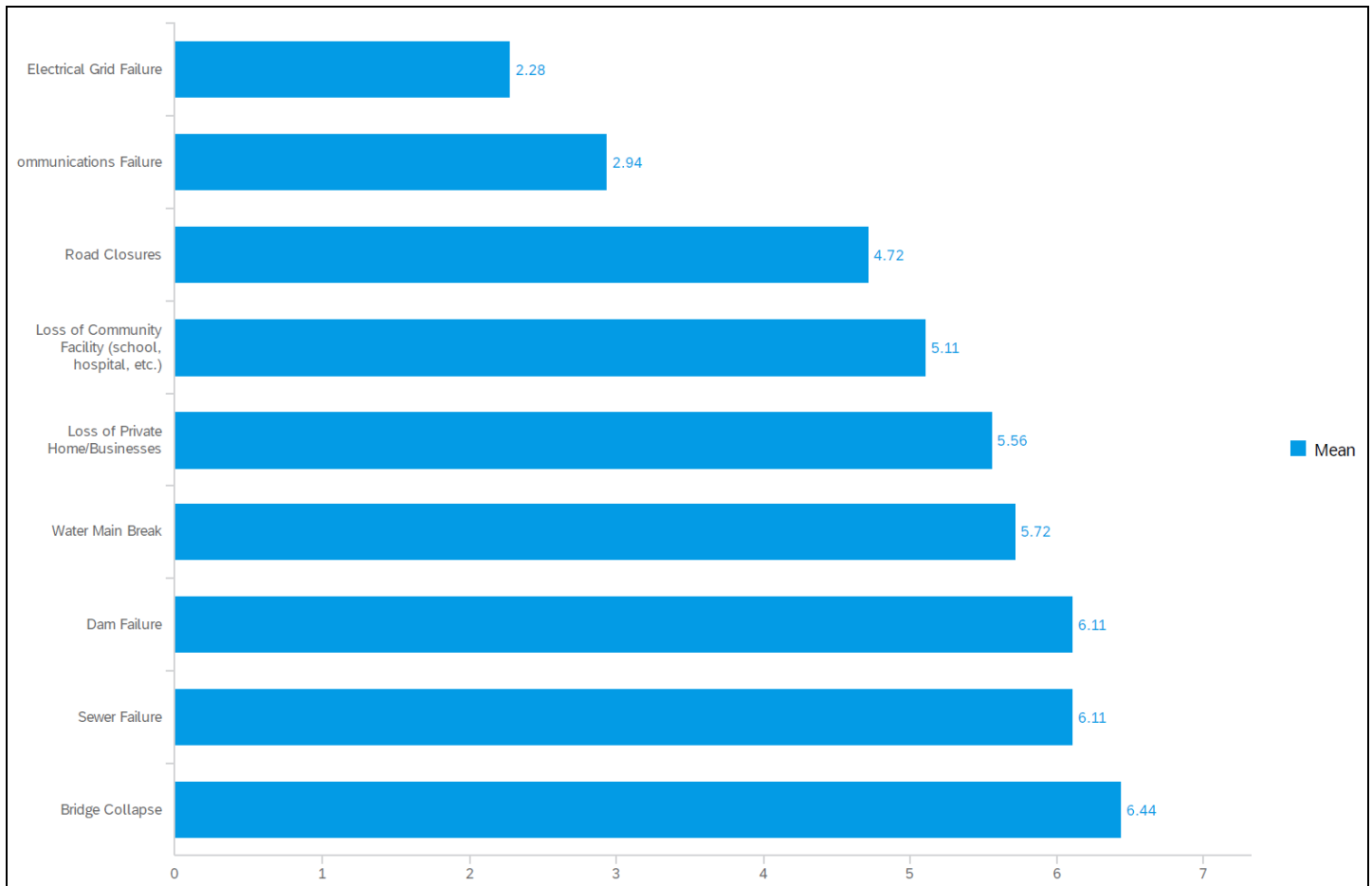
April 14, 2022 Combined Leelanau County and GTB Hazards Input Session Results

A “sticky note” exercise was performed at this meeting, asking attendees to indicate their top 3 hazards of concern (with the exception of public health emergency). The results are similar to the top hazards of concern identified in the Community Survey.

04/14/2022 Sticky Note Exercise – Top 3 Hazards of Concern

Natural Hazard Event or Impact	# of Times Indicated
High Winds	10
Heavy Snow/Snowstorm	8
Electrical Grid Failure	6
Wildfire	5
Thunderstorm/Severe Storm/Tornado	4
Flood	3
Dam Failure	2
Communications Failure	2
Road Closures	2
Agriculture Loss	1
Invasive Species	1
Loss of Community Facilities	1
Shoreline Erosion	1
Sewer Failure	1
Extreme Cold	1

In addition, participants were asked to rank the infrastructure failures that would most concern them, with 1 being the most concerning and 9 being the least concerning. The responses are listed below, in order from most concerning (electrical grid failure, followed by communications failure and road closures) to least concerning.



Other feedback obtained from this input session about particular hazard concerns is provided in the “Probability of Future Events and Vulnerability Assessment” sub-section of each hazard described in Section IV (Hazard Identification and Assessment) of this plan.

Draft Plan Review and Comment

Upon approval by the GTB Tribal Council, the draft plan was released for public comment on October 19, 2023 via the following outreach/notification methods: posting on the GTB website, the GTB’s “Regroup” mass electronic notification system, and the project page on Networks Northwest’s website. Figures 1 through 3 are images of the notifications. Input was requested until the end of 10/28/2023, via mail, email or in person at the GTB Annual Membership Meeting, held at the Grand Traverse Band Resort in Traverse City on 10/28/2023.

Additionally, other tribal, county and regional entities that share jurisdictional boundaries with the Grand Traverse Band of Ottawa and Chippewa Indians were provided the opportunity to formally comment on the draft plan and other related materials by accessing the plan via the notification methods listed above. Those agency staff members are:

- David Thom Jr., Safety/Emergency Management Coordinator, Little Traverse Bay Band of Odawa Indians
- Brandy Martin, Incident Commander, Little River Band of Ottawa Indians
- Matthew Adamek, Emergency Operations Director, Antrim County
- Rebecca Hubers, Emergency Management Coordinator, Benzie County
- Sienna Wenz, Emergency Management Coordinator, Charlevoix County
- Matt Ansorge, Emergency Management/911 Director, Leelanau County
- Kelly LaCross, Emergency Management/911 Deputy Director, Leelanau County
- Gregg Bird, Emergency Management Coordinator, Grand Traverse County
- Alvin Rischel, 911 Deputy Director, Manistee County
- Robert Carson, Regional Director of Community Development, Networks Northwest

One written comment was received during the public review period on the draft plan, which is included in Appendix H.

Figure 1. GTB "Regroup" Message and Flyer

From: gtbindians@regroupcloud.com <gtbindians@regroupcloud.com>

Sent: Thursday, October 19, 2023 12:28 PM

To: Murphy, Jolanda, A <Jolanda.Murphy@gtb-nsn.gov>

Subject: [GTB Message] Grand Traverse Band of Ottawa and Chippewa Indians (GTB) Natural Hazard Mitigation Plan 2023

Grand Traverse Band of Ottawa and Chippewa Indians (GTB) Natural Hazard Mitigation Plan 2023

The Grand Traverse Band of Ottawa and Chippewa Indians and Networks Northwest is updating the Natural Hazard Mitigation Plan, which must be updated every 5 years for communities to apply for pre-disaster, hazard mitigation grant funds from FEMA. The plan is in accordance with the Disaster Mitigation Act of 2000.

Hazards such as climate change, wildfires, severe weather, floods, invasive species, drought, and public health emergencies can have significant impacts on families and in the community. The natural hazard mitigation plan is to identify hazards and reduce long-term risks to people and property through mitigation strategies and build sustainability and resiliency in communities.

Public comments and questions regarding the plan are requested in person at the GTB Membership Meeting at the Grand Traverse Resort or by mail through Saturday, 10/28/2023 at Grand Traverse Band of Ottawa and Chippewa Indians, 2605 N. West Bay Shore Drive, Peshawbestown, MI 49682 or by email to Jolanda.Murphy@gtb-nsn.gov

GTB Natural Hazard Mitigation Plan 2023 - Northwest Networks Here: https://bit.ly/GTBHM_NN

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GTB Natural Hazard Mitigation Plan 2023 - Northwest Networks Here: https://bit.ly/GTBHM_NN

Grand Traverse Band of Ottawa and Chippewa Indians

Public Comments Welcome for the

GTB Natural Hazard Mitigation Plan 2023



The Grand Traverse Band of Ottawa and Chippewa Indians and Networks Northwest is updating the Natural Hazard Mitigation Plan, which must be updated every 5 years for communities to apply for pre-disaster, hazard mitigation grant funds from FEMA. The plan is in accordance with the Disaster Mitigation Act of 2000.

Hazards such as climate change, wildfires, severe weather, floods, invasive species, drought, and public health emergencies can have significant impacts on families and in the community. The natural hazard mitigation plan is to identify hazards and reduce long-term risks to people and property through mitigation strategies and build sustainability and resiliency in communities.



Public comments and questions regarding the plan are requested in person at the GTB Membership Meeting at the Grand Traverse Resort or by mail through Saturday, 10/28/2023 at Grand Traverse Band of Ottawa and Chippewa Indians, 2605 N. West Bay Shore Drive, Peshawbestown, MI 49682 or by email to Jolanda.Murphy@gtb-nsn.gov To view [GTB Natural Hazard Mitigation Plan 2023](#) [GTB Natural Hazard Mitigation Plan 2023 - Draft](#) For more information, go to

Networks Northwest:
https://bit.ly/GTBHM_NN

Hazard and Protective Actions icons are used courtesy of FEMA and are available at <https://community.fema.gov/protectiveactions&protectiveactions/knowledge> Please reach out to FEMA@fema.gov with questions.

Figure 2. GTB's Webpage Notification of the Draft Plan Available for Review

The screenshot shows the website for the Grand Traverse Band of Ottawa and Chippewa Indians. At the top, there is a navigation bar with links for Tribal Council, Tribal Manager, Departments, Public Information, Tribal Court, Eyaawing, and Member Login. Below the navigation bar is a decorative banner with a floral design. The main content area is titled "Emergency Management" and "Grand Traverse Band of Ottawa and Chippewa Indians Emergency Management". A prominent link reads "To sign up for Regroup Emergency Alerts [Click Here](#)". The main heading is "Grand Traverse Band of Ottawa and Chippewa Indians (GTB) Natural Hazard Mitigation Plan 2023". The text explains that the plan is being updated and must be updated every 5 years. It also provides information on how to view the plan and where to provide public comments. A sidebar on the left lists various services: Emergency Management, Fire and Rescue, Illness Prevention, SDVCJ Program, SORNA Information, Tribal Police, and Tribal Victims Assistance.

Grand Traverse Band of Ottawa and Chippewa Indians

Tribal Council Tribal Manager Departments Public Information Tribal Court Eyaawing Member Login

[Home](#) / [Public Safety](#) / [Emergency Management](#)

Emergency Management

Grand Traverse Band of Ottawa and Chippewa Indians

Emergency Management

To sign up for Regroup Emergency Alerts [Click Here](#)

**Grand Traverse Band of Ottawa and Chippewa Indians (GTB)
Natural Hazard Mitigation Plan 2023**

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To view **GTB Natural Hazard Mitigation Plan 2023** [GTB Natural Hazard Mitigation Plan 2023](#)

For more information, go to **Networks Northwest**: https://bit.ly/GTBHM_NN

Emergency Management

Fire and Rescue

Illness Prevention

SDVCJ Program

SORNA Information

Tribal Police

Tribal Victims Assistance


Source: Grand Traverse Band of Ottawa and Chippewa Indians' website, 10/19/2023

Figure 3. Networks Northwest's Project Webpage for the GTB Hazard Mitigation Plan

Networks Northwest
Talent / Business / Community

TALENT BUSINESS COMMUNITY DATA ABOUT US CAREERS

GRAND TRAVERSE BAND OF OTTAWA AND CHIPPEWA INDIANS



Grand Traverse Band of Ottawa and Chippewa Indians
Natural Hazard Mitigation Plan
2023

Notice of Availability of GTB 2023 Draft Hazard Mitigation Plan for Review and Input

The Grand Traverse Band of Ottawa and Chippewa Indians is in the process of updating its Natural Hazard Mitigation Plan in accordance with the Disaster Mitigation Act of 2000. The plan must be updated every 5 years for communities to apply for pre-disaster, hazard mitigation grant funds from FEMA.

Hazards such as climate change, wildfires, severe weather, floods, invasive species, drought, and public health emergencies can have significant impacts on the the built and natural environments, economy, and the health and wellbeing of community members. The natural hazard mitigation plan identifies and reduces the risks presented by these hazards through development of mitigation strategies that build sustainability and resiliency in communities.

Public comments and questions regarding the plan are requested either:

- In person at the GTB Membership Meeting at the Grand Traverse Resort on October 28, 2023, or
- By mail through Saturday, 10/28/2023, to Grand Traverse Band of Ottawa and Chippewa Indians, 2605 N. West Bay Shore Drive, Peshawbestown, MI 49682, or
- By email through Saturday, 10/28/2023 to Jolanda.Murphy@gtb-nsn.gov

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
 Little River Band of Ottawa Indians

HOUSING >
NATURAL RESOURCES >
HEALTHY COMMUNITIES >
FOOD & FARMING >
ARTS AND CULTURE >

Source: Networks Northwest's website 10/19/2023

III. COMMUNITY PROFILE

The Grand Traverse Band of Ottawa and Chippewa Indians (GTB or the “Tribe”) is a Federally-recognized Native Sovereign Nation. The Anishinaabek are the people of the Three Fires Confederacy, the Odawa (Ottawa), the Ojibwa (Chippewa), and the Bodowadomi (Pottawatomi) people. The GTB had its status as a federally recognized Indian tribe reaffirmed and restored by the United States in 1980. The Tribe has a government-to-government relationship with the United States by action of the Department of the Interior effective May 27, 1980.

Location

The Grand Traverse Band of Ottawa and Chippewa Indians Tribal lands are located in northwest lower Michigan, across six counties: Antrim, Benzie, Charlevoix, Grand Traverse, Leelanau, and Manistee. The GTB’s reservation and service area covers 2,562 acres. The GTB continues to purchase land within the service area for historical, spiritual, environmental, economic, and development purposes. Refer to Appendix A for maps of the GTB service area and “trust” and “non-trust” lands.¹

As the majority of Tribal facilities are in Peshawbestown, Leelanau County will be the primary geographic area considered in this hazard mitigation plan. Peshawbestown is located along M-22 in Suttons Bay Township, Leelanau County.

History of the Anishinaabek People²

“Our oral history traces us back to the Eastern Coast of Turtle Island where our spiritual leaders told us that we should travel to the west until we found the food growing on the water. Our people traveled until we found wild rice growing on the water and we knew we were home.

We were traders and established trade routes as far east as the Atlantic Ocean, as far west as the Rocky Mountains, as far North as Northern Canada, and as far South as the Gulf of Mexico. We were a wealthy nation respected by all our neighboring Nations. When the French arrived in our land we established trade with them and when the English came to our land they also sought us out as trading partners.

A great war broke out between France and England on our lands and the right to trade with our nation. Some of the people remained neutral in the war and some of the people sided with the French and fought against the Native Nations who sided with the English. The English won the war and the French moved north. The people continued to trade with the French to the north as well as the English on our lands.

A second war occurred on our lands when the Americans fought the English. When the war ended our people found a new government interested in our lands. This new United States government brought us a treaty to sign in 1836, and in 1837 the State of Michigan was established from lands ceded in this treaty. Two thirds of the land that is now the State of Michigan was ceded in that treaty. The people reserved lands for their own use and the use of the ceded lands. The people reserved their hunting, fishing, and gathering rights in this Treaty.

In 1855 the United States government brought another treaty to our people and asked that the remaining third of what is now Michigan be ceded to the United States Government. When this treaty was signed a reserve was established that included most of Leelanau County and a large tract of land in Antrim County. Almost all of this land was illegally taken from the people and had to be re-purchased.

The two treaties with the people were broken many times by the federal government. Services promised were not received and the people went without any federal or state assistance from a time period shortly after the treaty of 1855 until 1980 as the Bureau of Indian Affairs determined incorrectly that the Tribe had been terminated by signing the treaty. The Tribe applied for federal recognition under the Indian Reorganization Act under the leadership of Ben Peshaba in 1934. The Tribe was denied. The Tribe applied for federal recognition in 1943 under the leadership of Casper Ance. The Tribe was denied. The Tribe applied for federal recognition in 1978 under the leadership of Dodie Harris Chambers. On May 27, 1980 the Tribe was re-recognized by the federal government as the Grand Traverse Band of Ottawa and Chippewa Indians. The Tribe drafted a Constitution and formed a government.

Under the Indian Reorganization Act, the Tribe developed Tribal programs to serve the membership and in 1983 established an Economic Development Corporation and began to establish businesses for the Tribe. The Tribe has been very successful in business and today is able to provide many forms of assistance to the members of

¹ Tribal Trust Lands are lands that have been acquired by the secretary of the Department of the Interior and held “in trust” for a governance by a Native American tribe or members of a tribe. Trust Lands are exempt from certain state and local laws. Non-Trust lands are lands that are owned by the Tribe, but not held “in trust” and therefore may continue to be subject to state and local laws. (Suttons Bay Community Master Plan, 2011).

² Cited from <https://www.gtbindians.org/history.asp>

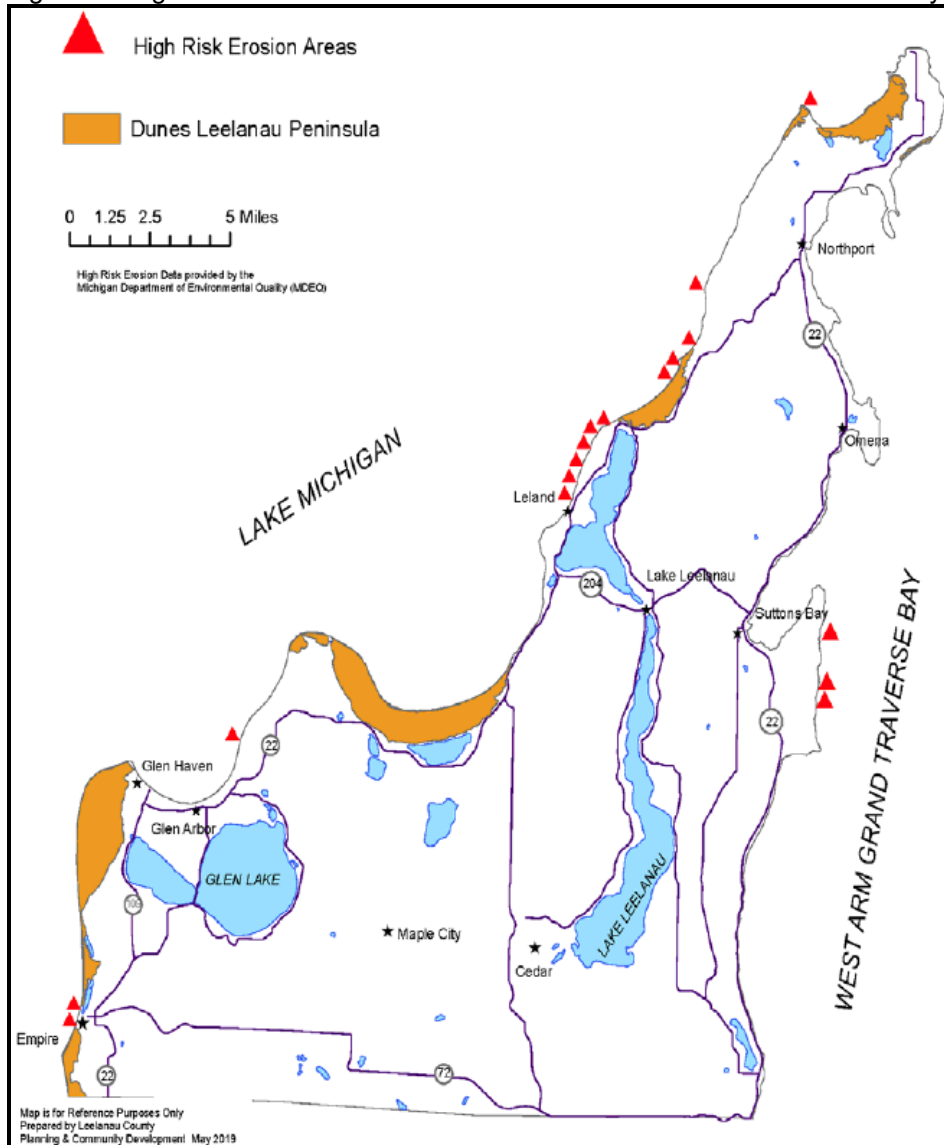
the Tribe. The Tribe, in the tradition of the people, honors our elders and gives respect and encouragement to our youth for they are our future.”

Land Use and Natural Features

Northwest Michigan is blessed with abundant and high quality natural resources: the Lake Michigan coastline, extensive river systems, vast forested areas, high value wetlands, productive soils, and fresh-water lakes. The GTB Reservation in Leelanau County is located within the North Central Hardwood Forest Ecoregion, a transitional region between the predominantly forested areas and lakes to the north and the agricultural ecoregions to the south. Land use/land cover in this ecoregion consists of mosaic forests, wetlands and lakes, cropland agriculture, pasture, and dairy operations. The GTB land base is designated as rural by the U.S. Department of Agriculture.³

Leelanau County has 151 miles of Lake Michigan shoreline including several State-designated Critical Dune Areas and some High-Risk Erosion Areas (Figure 4). The 1995 *Leelanau General Plan*, last amended in 2019, describes the major land features of the county as high dune and glacial ridges, which generally run north to south. There are small pocket valleys between the ridges, as well as broad slightly rolling plateaus in the center of the county. High points on the ridges are landmarks because of the striking views they provide to the inland lakes, Lake Michigan or Grand Traverse Bay. The area north of Northport is flat compared to the rest of the county, with large open fields and large conifer plantations. Sleeping Bear Dunes National Lakeshore is located along the southwest coast of the county, near Empire, and includes the North and South Manitou Islands. The National Lakeshore extends south into adjoining Benzie County.

Figure 4. High Risk Erosion Areas and Critical Dune Areas in Leelanau County



Source: Leelanau County General Plan, Updated 2019

³ 2010 GTB Forest Management Plan

The importance of fresh water and water bodies for providing sustenance is immeasurable. One such resource is wild rice, or manoomin. The word manoomin translates in Anishinaabemowin or Ojibwemowin, to 'the good berry,' a literal reflection of the cultural importance it has to Anishinaabek communities. Manoomin rice beds used to sit at the mouths of Michigan's rivers where it grows best in near-perfect shallow, slow moving waters. Some beds were thousands of acres in size. Today, only one large bed remains in Michigan.

Including the area of Lake Michigan within its jurisdiction, Leelanau County is a total 2,532.38 square miles or 1,620,723.2 acres in area. Approximately 347.20 square miles are land area, and 86% of the county area, or 2,183.91 square miles, is water. Additionally, the county has 151 miles of Lake Michigan shoreline. Excluding the area of Lake Michigan, the County has a total of 240,523 acres (Table 1). Land cover in Leelanau County is a checkerboard of woodlots, pastures or meadows, active crop fields, orchards and water. There are few routes where forest borders the roads for more than a half mile, nor where open fields stretch for more than a mile without encountering another woodlot. There is more wooded landscape than open fields. The predominant land cover type is "Forested," a combination of deciduous forest, evergreen forest, and mixed forest. The second most prevalent land cover type is "Agriculture," a combination of cultivated crops and hay/pasture lands. There are over 18,500 acres of wetlands in the county, some 7.71% of the total land area. These wetlands are primarily located along Lake Michigan and Grand Traverse Bay coastlines, along with the major lakes (Glen Lake and Lake Leelanau, various smaller inland lakes and the creeks that feed these lakes. Wetlands contribute significantly to water quality by acting as filters of storm water in addition to sustaining forest growth and providing habitat for wildlife. These areas generally are not suitable for development, but provide open space and recreational value as well as vital habitat for culturally significant animal and plant species.

Table 1. Land Cover by Type, Leelanau County

Classification	Acres	Percent
Developed, High Intensity	141.39	0.06%
Developed, Low Intensity	7,011.56	2.92%
Developed, Medium Intensity	762.60	0.32%
Developed, Open Space	9,980.24	4.15%
Agriculture (Cultivated Crops and Hay/Pasture)	42,423.31	17.64%
Forested (Deciduous, Evergreen and Mixed Forest)	105,084.07	43.69%
Wetlands (Emergent Herbaceous and Woody Wetlands)	18,550.13	7.71%
Herbaceous, Shrub/Scrub	30,295.98	12.60%
Open Water (does not include Lake Michigan)	18,573.95	7.72%
Barren Land	7,699.99	3.20%
TOTAL	240,523.22	100.00%

Source: Networks Northwest

The 1995 *Leelanau General Plan*, last amended in 2019, describes the major land features of the county as high dune and glacial ridges, which generally run north to south. There are small pocket valleys between the ridges, as well as broad slightly rolling plateaus in the center of the county. High points on the ridges are landmarks because of the striking views they provide to the inland lakes, Lake Michigan, and Grand Traverse Bay. Big and Little Glen Lakes and Lake Leelanau are the largest lakes in the county. Numerous smaller lakes and streams, usually associated with wetlands, are scattered throughout the county. The area north of Northport is flat compared to the rest of the county, with large open fields and large conifer plantations. Sleeping Bear Dunes National Lakeshore is located along the southwest coast of the county, near Empire, and includes the North and South Manitou Islands. The National Lakeshore extends south into adjoining Benzie County.

According to the 2017 Census of Agriculture, the county had 50,053 acres of land in farms for a total of 470 farms. This represents a 5% and 16% drop in the number of farms and acreage of farms, respectively, since the 2012 USDA Census of Agriculture. About 93.7% of the market value of agricultural products sold in the county is from crops. Fruits, tree nuts, and berries had the highest market value of agriculture products sold at \$35,292,000. Leelanau County ranks 5th in the State of Michigan for the sale of fruits, tree nuts, and berries overall.

Developed land cover is found predominantly in and around the city, townships, and villages in southeast and east Leelanau County. The City of Traverse City crosses the Leelanau-Grand Traverse County line north into Leelanau County and development extends into Elmwood Township, along state highway M-22, into Bingham Township, Suttons Bay

Township, the Village of Suttons Bay, and Peshawbestown. Due to close proximity to commercial centers in Grand Traverse County, downtown Traverse City and Garfield Township, areas within a manageable commute-time in Leelanau County will continue to develop. New development will largely be residential, support services, and agri-business or agri-tourism.

The 2016 Hazard Mitigation Plan indicated that 126,900 acres of the county was composed of forested lands. Based on the 2023 land cover data, there has been a decrease in forested areas by 21,815 acres, or 17.2 percent. While development in the county has remained fairly steady in the past decade, it has been noted that the type of new development is changing. Office and industrial development has largely stopped, commercial development has slowed, but residential development is occurring as quickly as plans can be approved. The Environmental Features Maps in Appendix A show the intensity of development in each county within the GTB service area, as well as these features:

- Waterbodies, rivers/streams, and State-regulated wetlands
- High Risk Erosion Areas
- Critical Dune Areas
- Slopes > 30%
- Eastern White Pine and Red Pine Forested Areas (medium fire risk)
- Jack Pine forested Areas (high fire risk)
- 1836 and 1855 Tribal Reservation Boundaries
- Non-Trust and In-Trust Tribal Parcels

Climate

Northwest Michigan experiences a four season climate with mild summers and cold, snowy winters. The GTB reservation lands are all located within a counties that have a Lake Michigan coastline. Lake Michigan keeps coastal areas warmer in the winter and cooler in the summer, with less rainfall than locations further inland. Since 1991, Leelanau County has experienced the most precipitation in October with 3.91 inches on average and an average annual total precipitation of 35.54 inches. June and July share the hottest month with a mean average temperature of 92°F, however, June has the highest temperature on record of 103°F. February is the coldest month with a mean average temperature of -11°F. The lowest temperature on record is -29°F in February 2015.

On any given day, coastal areas including Leelanau County, are highly susceptible to quick, sudden changes in the weather. Depending on the time of the year, the Great Lakes have a significant impact on temperatures, precipitation, and the strength of storms. In the spring when the lake water is colder than the air over them, they extract heat from the atmosphere. During the fall, the Great Lakes give off heat and moisture. In both cases, storms arrive on land stronger and more persistent than they might otherwise be. Thunderstorms, extreme winter weather events, and excessive rainfall are common natural hazards with the potential to cause loss of life and significant property damage. This plan identifies potential hazards and mitigation strategies to reduce the impact of those events.

Membership Demographics

Tribal membership is located throughout the six-county region as shown in Table 2. There are 4,189 members enrolled in the Grand Traverse Band Tribe, of which 1,942 members and their dependents reside on the reservation lands or within the GTB service area. Grand Traverse County has the greatest number of Tribal members followed by Leelanau County. Manistee County has the fewest number of members. Compared to enrollment numbers in the GTB’s 2016 Hazard Mitigation Plan, there has been an increase of 10 enrolled members, and an increase of 51 of those members who reside on the reservation lands or within the GTB service area.

Table 2: GTB Membership Population by County, 2021

County	2021 Membership	% of Total Enrolled (4,189 persons)
Manistee	42	2%
Antrim	97	5%
Benzie	144	7%
Charlevoix	203	10%
Leelanau	690	36%
Grand Traverse	766	39%
TOTAL	1,942	46%

Source: Grand Traverse Band of Ottawa and Chippewa Indians Membership Records

Additionally, the “Vulnerable Populations” map in Appendix A illustrates the density of GTB tribal members by their location of residence in the six county service area. The Peshawbestown area has the highest density of residents, followed by Blair and Garfield Townships in Grand Traverse County. Other concentrations of GTB members occur in/around these communities: Benzonia Township in Benzie County; Village of Thompsonville in Benzie and Manistee Counties; Elk Rapids, Milton Township, and Mancelona in Antrim County; and the Village of East Jordan and City of Charlevoix in Charlevoix County.

The age cohorts of tribal members is provided in Table 3. The GTB’s total 2021 population is broken into age cohorts (analyzing which proportions of the population are in which stages of life). The membership age is broken down into cohorts of members aged 0-19, 20-54, and Elders, those aged 55 and over. The table identifies the number of members within each cohort for each county. Understanding the age distribution and median age can help identify social, economic, and public service needs in the community.

Based on current membership ages overall, the Tribe is likely to increase membership due to the high percentage of persons in the family-forming age group (20-54). 53% of all members are aged 20-54. Grand Traverse County has the highest number of members and the highest number and proportion of members aged 20-54. This would indicate the membership in this county will grow in future years if persons in this family-forming age group decide to have children. Leelanau County has the second highest membership and the highest number and proportion of youth, persons aged 0-19. This is indicative of the high number of membership ages 20-54 and 55+. Persons in those age groups likely did have multiple children, thus the membership count increased. The youth cohort, persons aged 0-19, is the next highest membership category with 25% of the membership. Followed closely by Elders are those aged 55+ at 22% of the membership. While the Tribe is fairly young, there should be consideration and planning for the Elder membership in 10-20 years as those in the family-forming age group move into the Elder cohort. Members living in Benzie County are showing early signs of this as Benzie has the largest percentage of Elders and the second lowest number and percentage of youth.

Table 3: GTB Membership Age by Cohort, County, 2021

County	0-19	%	20-54	%	55+	%	TOTAL
Antrim	25	26%	55	57%	17	18%	97
Benzie	25	17%	70	49%	49	34%	144
Charlevoix	44	22%	95	47%	64	32%	203
Grand Traverse	178	23%	451	59%	137	18%	766
Leelanau	211	31%	340	49%	139	20%	690
Manistee	4	10%	24	57%	14	33%	42
TOTAL	487	25%	1,035	53%	420	22%	1,942

Source: Grand Traverse Band of Ottawa and Chippewa Indians Membership Records

Other GTB demographic information can be collected from the U.S. Census Bureau. In 2020, population, employment, household, income, education, and health-related information was collected via the Decennial Census and the American Community Survey 5-Year Estimates for GTB Reservation and Off-Reservation Trust Land in Michigan. The 2020 Decennial Census indicates that the tribe contains 595 persons (Figure 5).

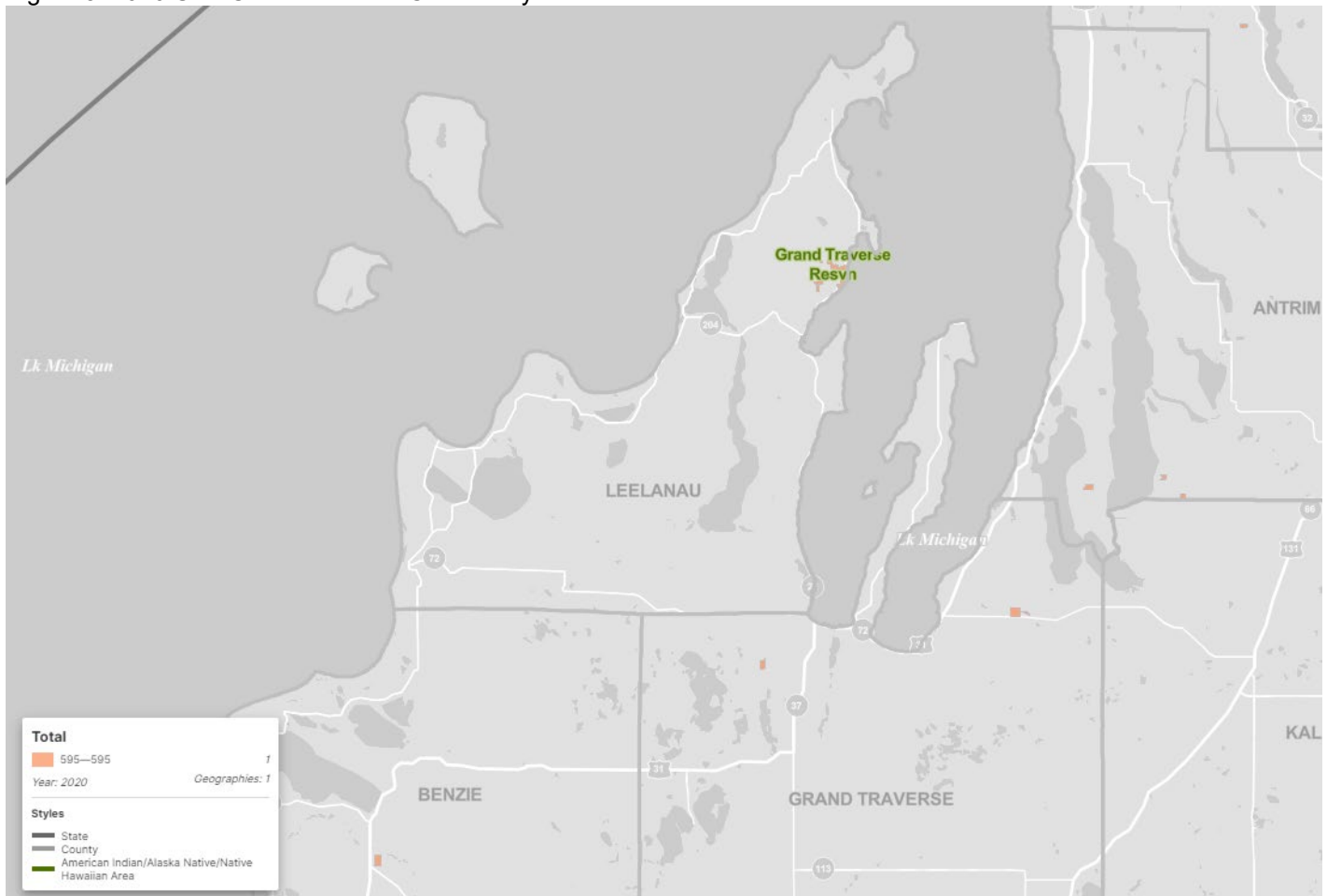
An estimated 17% of the GTB population has one or more type of disability. The majority of those persons are between 35 and 64 years of age, followed by those in the age 65+ cohort (Table 4).

Table 4. Estimated GTB Population with a Disability

Age Group	Total Population	With a Disability	% of Age Group with a Disability
0 to 17 years	203	20	9.9%
18 to 34 years	104	1	1.0%
35 to 64 years	197	56	28.4%
65 years and over	90	24	26.7%
Total	594	101	17.0%

Source: US Census Bureau, 2020 ACS 5-year Estimates

Figure 5: 2020 U.S. Census Bureau Community Profile



Source: U.S. Census Bureau, 2020 Decennial Census, Grand Traverse Reservation & Off-Reservation Trust Land, MI, an American Indian Area/Alaska Native Area/Hawaiian Home Land

Housing

According to the U.S. Decennial Census, in 2020, there were 206 estimated total housing units⁴ on GTB Reservation and Off-Reservation Trust Land in Michigan. Of these, 190 were occupied, and 16 were vacant. A total of 94 of these units were owner-occupied, while 96 units were renter-occupied.

According to the U.S. Census Bureau's 2020 ACS 5-Year Estimates, there were an estimated 195 households⁵ on GTB Reservation and Off-Reservation Trust Land in Michigan, with an average household size of 3.05 persons. An estimated 77.4% of households were living in a 1-unit structure; 13.8% were living in a 2-or-more-unit structure, and 8.7% were living in a mobile home or other type of housing unit. An estimated 50.3% of households were owner-occupied units, while an estimated 49.7% were renter-occupied.

Additionally, membership housing data and the number of building permits issued for the GTB on tribal lands are provided in Tables 5 and 6.

⁴ The US Census Bureau defines a housing unit as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live separately from any other people in the building and which have direct access from the outside of the building or through a common hall.

⁵ A household includes all the people who occupy a housing unit, regardless of their relationship to one another. (People not living in households are classified as living in group quarters.)

Table 5: Membership Housing Units on Tribal Land by County, 2023

County	2023 Member Housing Units	Percent of 2023 Total
Antrim County	7	4.4%
Benzie County	18	11.3%
Charlevoix County	12	7.5%
Grand Traverse County	16	10.0%
Leelanau County	107	66.9%
Manistee County	0	0%
TOTAL	160	100%

Source: Grand Traverse Band of Ottawa and Chippewa Indians Membership Records

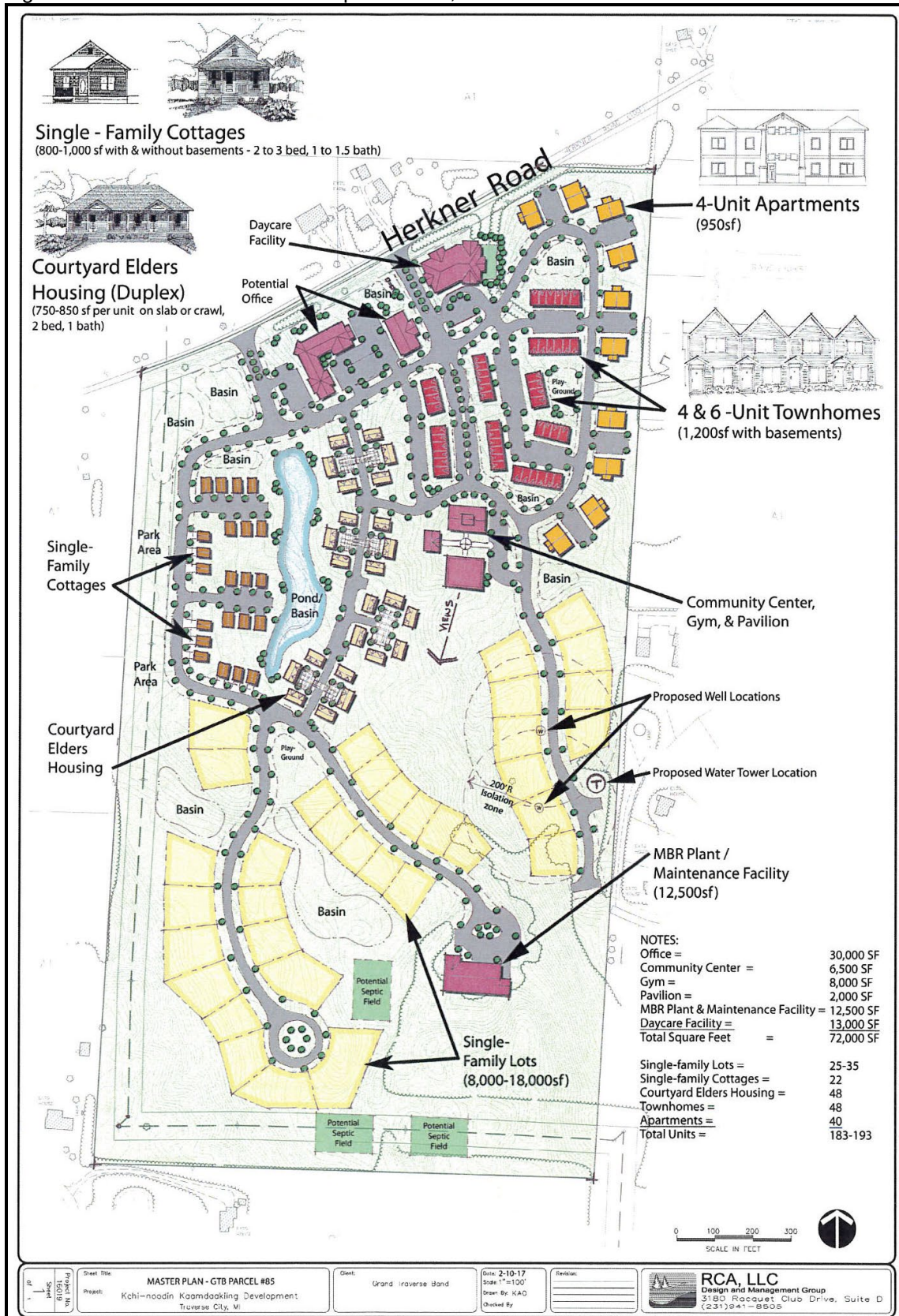
Table 6: Housing Units by Permit, 2010-2019

Year	# of Permits
2010	6
2011	12
2012	4
2013	7
2014	0
2015	0
2016	2
2017	8
2018	2
2019	0
TOTAL	41

Source: Grand Traverse Band of Ottawa and Chippewa Indians Planning Department

Residential development for members continues to be a main priority for the Tribe. The Herkner Road property located in Garfield Township, Grand Traverse County, is currently under development with an anticipated completion date in 2024. The site is planned for up to 193 residential units including 4 one-bedroom apartments, 4 two bedroom apartments, 4 one-bedroom townhouses, 8 three to four bedroom townhouses, 4 single family homes, and 12 two bedroom elder duplexes and a community center.

Figure 6. Herkner Road Site Development Plan, 2017



The social-economic profile for the GTB members includes employment and income characteristics reported to the U.S. Census Bureau as shown in the following tables. Table 7 indicates that the largest number of workers are employed in the “arts, entertainment, & recreation” and “accommodation & food services” industries, followed by those in “public administration”, “educational services”, “health care”, “social assistance”, and “retail trade” industries.

Table 7: GTB Member Occupation by Industry, 2020

Industry	Estimate	% of Employed Population
Arts, entertainment, and recreation, and accommodation and food services	61	37.9%
Public administration	26	16.1%
Educational services, and health care and social assistance	25	15.5%
Retail trade	21	13.0%
Professional, scientific, and management, and administrative and waste management services	8	5.0%
Construction	7	4.3%
Manufacturing	6	3.7%
Other services, except public administration	3	1.9%
Agriculture, forestry, fishing and hunting, and mining	2	1.2%
Transportation and warehousing, and utilities	2	1.2%
Finance and insurance, and real estate and rental and leasing	0	0.0%
Information	0	0.0%
Wholesale trade	0	0.0%
Total civilian employed population 16 years and over	161	161

Source: U.S. Census Bureau, 2020 ACS 5-Year Estimates

The estimated income and benefit information for GTB households is shown in Table 7. Of the estimated 195 total households, largest number of households reported an income between \$25,000 and \$34,999, followed by those who reported an income level between \$15,000 and 24,999. The median household income for GTB residents is \$32,583, compared to \$67,330 for Leelanau County as a whole.

An estimated 21% of households collect supplemental security income; 16.4% collect food stamp/SNAP benefits, and 6.2% collect cash public assistance income. Table 8 presents the poverty level estimates for GTB residents compared to Leelanau County residents. An estimated 42.8% (247 persons) in the GTB Tribe live below the poverty level, compared to 6.4% (1,361 persons) within Leelanau County.

Based on the available demographic data, a significant amount of GTB members have limited financial resources, and/or may be physically unable to prepare or evacuate for a hazard event. These households may have more of a need for social/public services - such as assistance with transportation, food, water, medical care, or shelter - before, during or after a hazard event.

Table 8: Estimated GTB Household Income and Benefits, 2020

Household Income	Estimate	Percent
Less than \$10,000	26	13.3%
\$10,000 to \$14,999	25	12.8%
\$15,000 to \$24,999	30	15.4%
\$25,000 to \$34,999	31	15.9%
\$35,000 to \$49,999	29	14.9%
\$50,000 to \$74,999	28	14.4%
\$75,000 to \$99,999	7	3.6%
\$100,000 to \$149,999	6	3.1%
\$150,000 to \$199,999	11	5.6%
\$200,000 or more	2	1.0%
Median household income	\$32,583	(X)
Mean household income	\$43,533	(X)
Households with earnings	113	57.90%
Mean earnings	\$50,573	(X)
Households with Social Security	72	36.90%
Mean Social Security income	\$14,578	(X)
With retirement income	39	20.00%
Mean retirement income	\$10,790	(X)
With Supplemental Security Income	41	21.00%
Mean Supplemental Security Income	\$10,990	(X)
With cash public assistance income	12	6.20%
Mean cash public assistance income	\$2,192	(X)
With Food Stamp/SNAP benefits in the past 12 months	32	16.40%

Source: U.S. Census 2020 ACS 5-Year Estimates

The following tables describe the population with the lowest incomes. It is estimated, in 2019, that 6.4% of all people in Leelanau County lived at or below the poverty level, compared to 42.8% of people in the GTB Tribe living on reservation and off-reservation trust land (Table 10). 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 9 below.

Table 9. 2019 Federal Poverty Level Guidelines

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

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

Table 10. Estimated Population Living Below Poverty Level, 2020

	Leelanau County			GTB Population on Reservation and off Reservation Trust Land		
	Total	Below Poverty Level	Percentage	Total	Below Poverty Level	Percentage
Population for whom poverty status is determined	21,431	1,361	6.4%	577	247	42.8%

Source: U.S. Census 2020 ACS 5-Year Estimates

Transportation

The GTB service area is crossed by several national and state highways: U.S. 31, U.S. 131, and state highways M-22, M-72, and M-66. U.S. 31 is a north-south route that follows the Lake Michigan coastline and connects Charlevoix and Antrim County with Grand Traverse County. U.S. 131 is another north-south route that is more inland and connects Petoskey to Kalkaska. M-22 is a north-south corridor which runs from Northport in the north to Traverse City in the south. M-72 is an east-west corridor which runs from Empire in the west and traverses the state to end in Harrisville in the east. M-66 is north-south corridor through Charlevoix County. It follows Lake Charlevoix in the north and then meets with Mancelona in the south. Traverse City is a transportation hub where U.S. 31, M-22, and M-72 intersect. The remainder of the GTB service area is accessed via numerous county roads and MDNR forest roads. The area also contains many miles of seasonal roads with a number in Leelanau County being built and maintained by the National Parks Service for Sleeping Bear Dunes National Lakeshore. Local County Road Commissions are the primary owners of the local street network and maintains roads within township jurisdictions.

There is currently no passenger rail service available in this region. Traverse City's Cherry Capital Airport is the main hub for air travel, but the region also has access to Manistee County Blacker Airport in Manistee and the Charlevoix Municipal Airport in Charlevoix. Ferry travel to Beaver Island is available from Charlevoix, and ferry travel to the Manitou Islands is available from Leland. Members rely on the Arthur Duhamel Marina (land owned by the GTB) at 3410 N West Bayshore Drive in Suttons Bay Township, Leelanau County, for access to Lake Michigan waters for fishing and recreation.

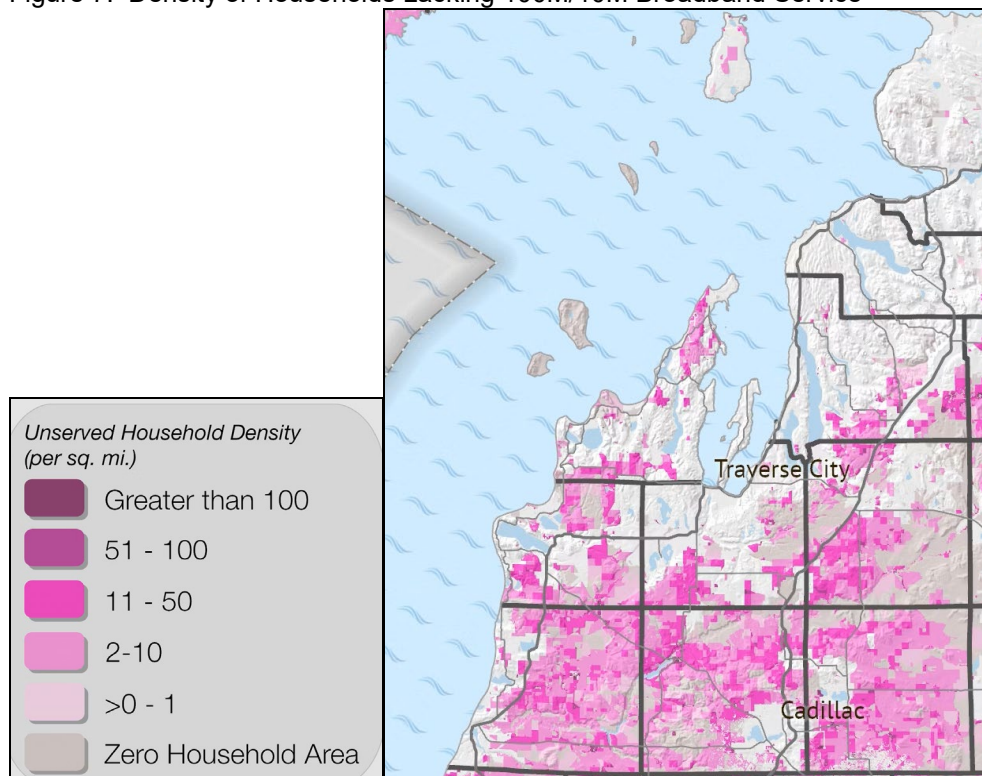
Utilities and Energy

The GTB operate water and wastewater utility services in portions of Leelanau County. The Utility Department, led by the Utility Director, was created to manage the water and wastewater systems. GTB utilities are considered critical infrastructure, listed as "government facilities" in Table 9. Recently, the Tribal Council expressed an interest in leveraging the successful self-managing wastewater system and explore a similar expansion into renewable energy, such as solar technology, to assist with achieving energy sovereignty.

Natural gas service is provided by Consumers Energy throughout portions of the GTB service area; outlying rural areas often rely on propane fuel. Electric service is provided by Cherryland Electric, Consumer's Energy, Traverse City Light and Power, or Great Lakes Energy.

High-speed broadband internet is available in some areas throughout the GTB service area, primarily near cities or villages. However, many areas remain underserved. Figure 7 is an excerpt of a map showing the household density of areas of the state that are estimated to be unserved by broadband service with a speed of at least 100/10 Mbps.

Figure 7. Density of Households Lacking 100M/10M Broadband Service



Source: Connected Nation Michigan, published September 30, 2021

Site and Building Guidelines

Per the Peshawbestown 2012 Master Plan:

“Because its sovereign status exempts the Tribe from state zoning and planning enabling legislation, the preparation of a site and building guidelines code should be considered to regulate development activity in the future. This action would ensure that as properties are developed that the same site amenities (lighting, parking, signage, landscaping, etc.) and architectural details would be followed. This will provide some uniformity and consistency when build-out occurs. It is suggested that separate guidelines be prepared for the business and entertainment district, residential neighborhoods, and the commercial district at Putnam and M-22.

To encourage the use of sustainable design techniques the guidelines should include provisions for low impact stormwater design, dark-sky lighting, reduction of heat islands (parking lots), convenient transit stops, and non-motorized connections.”

Future Land Use

The Leelanau County General Plan, last updated in 2019, states the following vision for future land use in Leelanau County:

“The **General Plan** proposes a compact land development pattern that protects renewable resource lands (such as orchard land and forests) as well as sensitive natural resources (like wetlands and dunes). It proposes policies to encourage location of future land development in and near existing villages, as well as near Traverse City. It proposes infrastructure management policies to achieve and reinforce this land use pattern. It encourages open space protection, while simultaneously permitting large landowners an opportunity to capture the development value of their land. Open space zoning and rural clustering techniques are also proposed to encourage new development in rural areas to be sited so as to minimize visual impacts on the landscape and to minimize public service costs.

The plan proposes measures to protect the small-town, rural character of County villages and the scenic qualities of the major road corridors. Using naturally occurring vegetation for landscaping, minimizing signs, burying utilities, placing parking at the side or behind commercial buildings are all measures proposed to retain the existing character in the County.

More specifically, the plan proposes an environmental protection strategy that also:

- Identifies and avoids development near sensitive environments.
- Protects water quality of surface water and ground water.
- Minimizes land fragmentation of large parcels.
- Links open spaces.
- Restricts keyhole development.
- Protects renewable resources.

The plan proposes widespread acceptance by citizens of a stewardship ethic that views land not as an asset to be exploited, but rather as a resource held in trust for future generations for use by the present generation.

The **General Plan** is neither a slow growth nor an anti-growth plan. It calls for balanced growth that is carefully guided to protect and enhance the quality of life in the County. It accepts the principle that environmental protection and economic development are not incompatible objectives.”

The Peshawbestown Master Plan, completed in 2012 for the GTB, provides the following description for Peshawbestown’s envisioned future land use:

“The Consensus Conceptual Framework Plan addresses the overall guiding principles for Peshawbestown: walkability and compactness; creating a sense of place on M-22; slowing traffic along M-22; clustering new land and water-based development to create a synergy conducive for economic development; establishing traditional neighborhoods for tribal members; providing a diversity of housing types for all age groups, including tribal Elders; and providing defined areas for agriculture and vineyards. It provides a vision for the Peshawbestown community: a blueprint for land use and development decisions.

The future land use arrangement for the Peshawbestown study area consolidates commercial development on M-22 just north of the present day Leelanau Sands Casino and Eagletown Market Gas Station and at the southwest corner of M-22 and Putnam Road. The commercial development north of the present day casino would form the core of the Peshawbestown community. This area would become Peshawbestown’s downtown with a connection

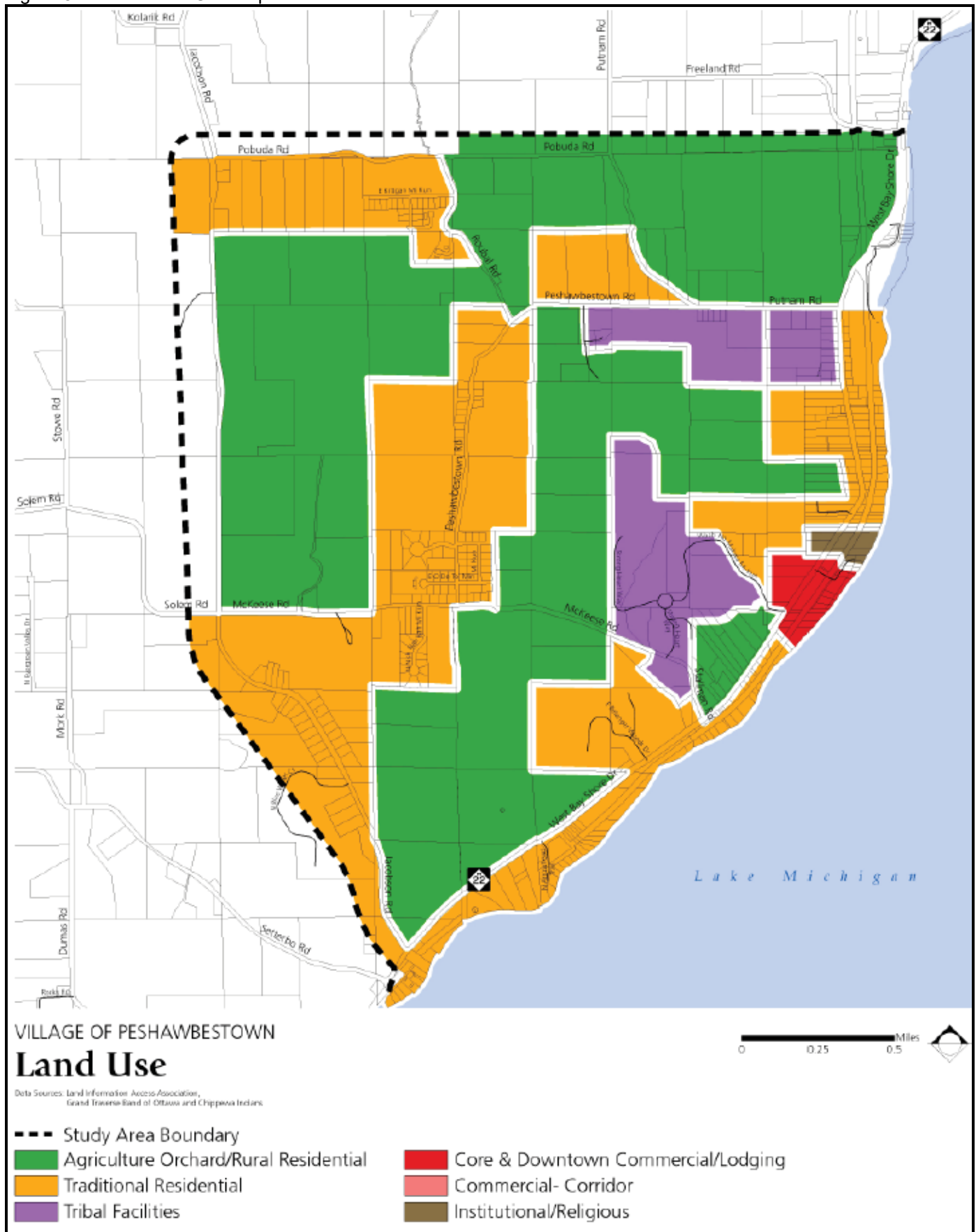
to a new governmental center and working waterfront and marina. The downtown commercial area would be anchored by a new casino and hotel and retail shops.

The commercial area north of the downtown located at the intersection of M-22 and Putnam Road would be a traditional shopping center with a gas station, small grocery store, laundry/dry cleaners, and small retail and food stores. This area would serve Peshawbestown, portions of Northport and the areas just south of Peshawbestown. Vineyards and/or orchards (agricultural) areas are proposed south and north of the downtown commercial area. It is envisioned that these areas will provide non-gaming opportunities for tribal members in the established northwest Michigan wine industry.

Existing and proposed residential areas are proposed surrounding the commercial core. These neighborhoods would provide detached and attached residential housing connected by new roads, walkways, and shared pathways throughout the Village. On Putnam Road a warehousing and distribution center is proposed. This would provide a centralized facility for all Tribal storage and distribution services, maintenance, and support services.”

The Future Land Use map (Figure 8) shows the location and relationship of these proposed land uses in Peshawbestown.

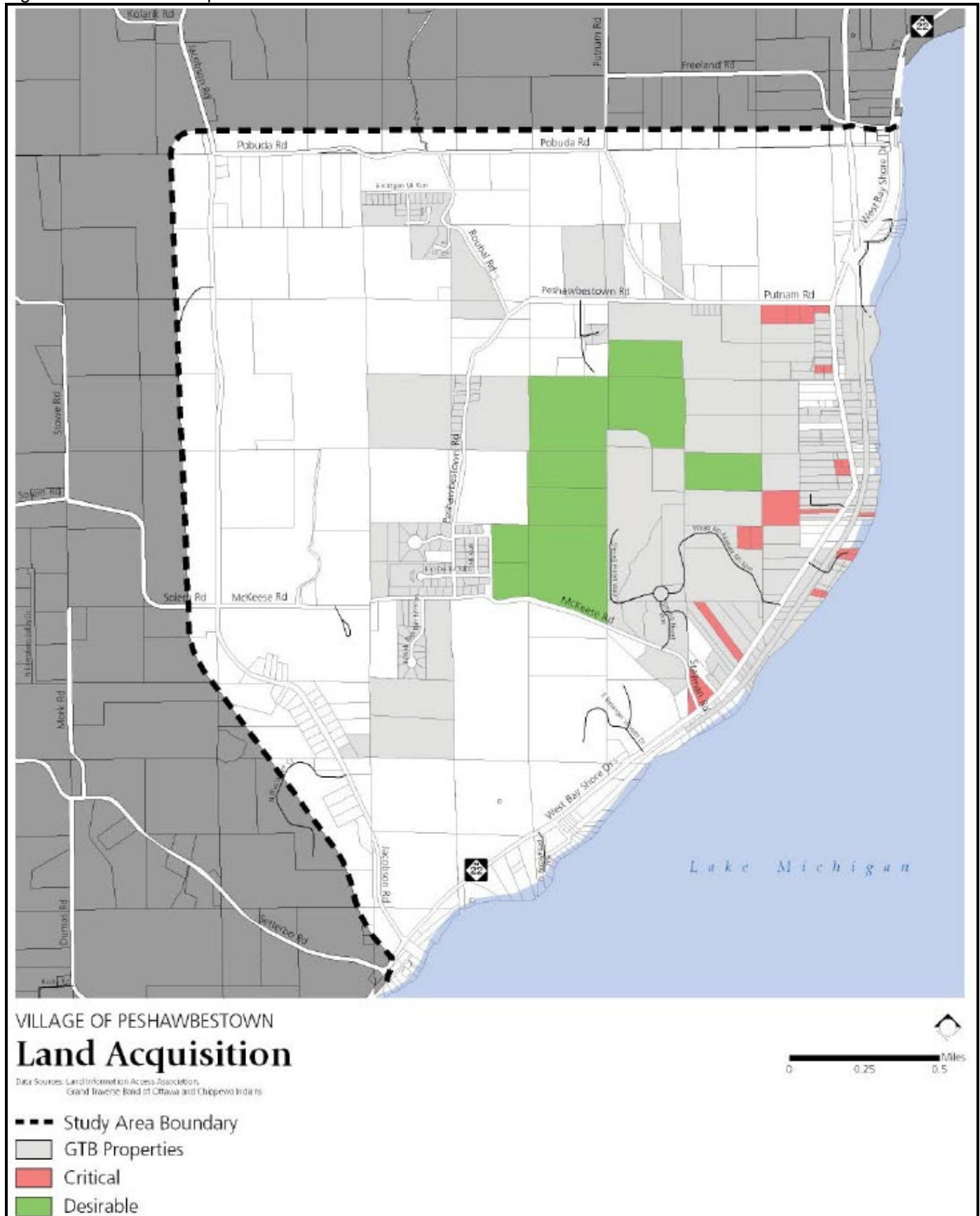
Figure 8. Future Land Use Map of Peshawbestown



Source: Village of Peshawbestown 2012 Master Plan, Figure 6.1

The Peshawbestown Master Plan also identified several parcels targeted for future land acquisition in order to serve the growth of the community (Figure 9).

Figure 9. GTB Land Acquisition Goals for Peshawbestown



Source: Village of Peshawbestown 2012 Master Plan, Figure 7.2

IV. Hazard Identification and Assessments

Vulnerability Assessment

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

- People
- Economy
- Built environment
- Natural environment

Vulnerable populations include persons of racial/ethnic minority groups, the economically disadvantaged, elderly, homeless, and persons with a disability. Those that live unsheltered or in homeless encampments, assisted living facilities, mobile home parks, or isolated residences are also more susceptible to hazardous events. For the purpose of this Plan, the density of GTB tribal members by their residential address is illustrated the "Vulnerable Populations" and "Vulnerable Populations and Hazard Areas" maps in Appendix A.

As shown in Table 11, the primary economic generators for the GTB are Tribal government, Grand Traverse Economic Development, and the Hotels, Resort and Casinos. Leelanau Sands Casino and Lodge is located in Peshawbestown, Leelanau County). Turtle Creek Casino & Hotel is located in Williamsburg, Grand Traverse County, and Grand Traverse Resort and Spa is located inn Acme, Grand Traverse County. Government facilities are located in Peshawbestown while Grand Traverse Economic Development is located in the City of Traverse City. These resources are all located along the Grand Traverse Bay and within relatively close proximity to each other. Grand Traverse Resort & Spa and Turtle Creek Casino & Hotel are located within four miles of each other; both are within a 45 minute drive from GTB facilities in Peshawbestown. This concentration of population and resources make the Grand Traverse Bay area critically important economically and as a resource for community members. It is vulnerable to all countywide hazards and shoreline hazards which is further detailed in the hazard analysis.

Infrastructure points (stream crossings, bridge conditions, and dams) and their ratings for the six-county GTB service area are illustrated on the Infrastructure Map in Appendix A. GTB-owned critical infrastructure (per Table 11) is represented on the Critical Infrastructure Maps in Appendix A.

The natural environment is one of the primary features of GTB culture and traditions. Its significance shows up in different aspects of daily life and Tribal celebrations and festivals. The forest lands, water features, and Lake Michigan shorelines and all of the native plants and animals within them are integral to the identity of the community. While natural resources are abundant, they are vulnerable to all types of hazards. Northwest Lower Michigan is also home to many sensitive plant and animal populations that require specific climates and habitats to survive. Damaged, destroyed, or changing environments may decrease the chances for certain species' survival.

GTB critical infrastructure is represented in Table 11. While a total of 50 critical facilities are listed in the table and mapped (see the Critical Infrastructure Points Map in Appendix A), it should be noted that several of the locations listed contain more than one type of facility sector. For example, the satellite offices and casinos also provide emergency services and communications (IT) operations.

Table 11: Critical Facilities and Infrastructure

Facility Name	City	County	# of Facilities per Sector Type
Grand Traverse Resort and Hotel	Acme	Grand Traverse	6 Commercial
Turtle Creek Casino and Hotel	Williamsburg	Grand Traverse	
Eyaawing Museum	Peshawbestown	Leelanau	
Leelanau Sands Casino	Peshawbestown	Leelanau	
GTB The Lodge Hotel	Peshawbestown	Leelanau	
The Ridge Microbrewery	Peshawbestown	Leelanau	
GTB Medicine Lodge EOC	Peshawbestown	Leelanau	4 Communications
Grand Traverse Band COLO	Peshawbestown	Leelanau	
Grand Traverse Band COLO	Traverse City	Grand Traverse	
Grand Traverse Band North Tower	Peshawbestown	Leelanau	2 Emergency Services
Grand Traverse Band Strongheart Center	Peshawbestown	Leelanau	
Grand Traverse Band Fire and Rescue	Peshawbestown	Leelanau	4 Energy
Grand Traverse Resort Charge Point Charging Station	Acme	Grand Traverse	
Eagletown Market Mobil Gas Station	Peshawbestown	Leelanau	
Grand Traverse Band Solar Energy	Peshawbestown	Leelanau	
Turtle Creek Market Mobil Gas Station	Williamsburg	Grand Traverse	26 Government Facilities
Grand Traverse Band Sewage Lift Station Antrim County	Rapid City	Antrim	
GTB Benzie Satellite Office	Benzonia	Benzie	
GTB Charlevoix Satellite Office	East Jordan	Charlevoix	
GTB Sewage Lift Station Herkner Rd	Traverse City	Grand Traverse	
Hammersmith Building	Williamsburg	Grand Traverse	
Grand Traverse Resort Water Tower	Acme	Grand Traverse	
GTB Water-Sewer SBR Billing Office	Williamsburg	Grand Traverse	
Grand Traverse Band Water Tower Peshawbestown	Suttons Bay	Leelanau	
GTB Elders Complex	Peshawbestown	Leelanau	
GTB Housing Billing Office	Peshawbestown	Leelanau	
GTB EDC Administration Building Billing Office	Peshawbestown	Leelanau	
GTB Benodjenh Daycare Billing Office	Peshawbestown	Leelanau	
GTB Human Resource Building	Peshawbestown	Leelanau	
GTN Sewage Lift Station Peshawbestown	Suttons Bay	Leelanau	
Grand Traverse Band Water Main Peshawbestown	Suttons Bay	Leelanau	
GTB Administration Building	Peshawbestown	Leelanau	
GTB Automotive Repair	Peshawbestown	Leelanau	
GTB Accounting Shipping and Receiving Warehouse	Peshawbestown	Leelanau	

GTB Library M22 Building	Peshawbestown	Leelanau	
Grand Traverse Band Public Works	Peshawbestown	Leelanau	
GTB Tribal Court Building	Peshawbestown	Leelanau	
Grand Traverse Band SBR West	Suttons Bay	Leelanau	
GTB Natural Resource Department	Peshawbestown	Leelanau	
Grand Traverse Band Sewage Lift Station TCC	Williamsburg	Grand Traverse	
Grand Traverse Band Water Tower TCC	Williamsburg	Grand Traverse	
GTB Traverse City Office	Traverse City	Grand Traverse	
GTB Medicine Lodge	Peshawbestown	Leelanau	1 Healthcare
GTB Arthur Duhamel Marina Cold Storage	Peshawbestown	Leelanau	
GTB Arthur Duhamel Marina Fish Processing Building	Peshawbestown	Leelanau	3 Industry
Bay Shore Steel Works	Charlevoix	Charlevoix	
GTB Lifelong Learning	Peshawbestown	Leelanau	2 School
GTB Benodjenh Headstart	Peshawbestown	Leelanau	
GTB Arthur Duhamel Marina	Peshawbestown	Leelanau	2 Transportation
GTB Tribal Dock in Saint James Harbor	Beaver Island	Charlevoix	

Source: GTB Emergency Management

On April 10, 2022 members of the GTB Hazard Mitigation Advisory Team and members of the Leelanau County Hazard Mitigation Advisory Team held a joint meeting to discuss potential hazards in the community and specific concerns with those hazards. Participants in the meeting were asked about each known hazard to the community and asked to identify their top three hazards. Table 12 represents the tally of sticky notes gathered at the meeting. The number one hazard of concern is high winds, followed by heavy snow or snowstorms, and electrical grid failure.

Table 12: Sticky Note Exercise, Top Hazard Concerns

Natural Hazard Event or Impact	# of Times Indicated
High Winds	10
Heavy Snow/Snowstorm	8
Electrical Grid Failure	6
Wildfire	5
Thunderstorm/Severe Storm/Tornado	4
Flood	3
Dam Failure	2
Communications Failure	2
Road Closures	2
Agriculture Loss	1
Invasive Species	1
Loss of Community Facilities	1
Shoreline Erosion	1
Sewer Failure	1
Extreme Cold	1

Historical Analysis

The Historical Analysis of weather-related hazards for the GTB Tribal service area uses information on impacts and losses from previous hazard events to predict potential impacts and losses during a similar event. Based on the history and of the frequency of these events, communities are more likely to have experience with and data on impacts and losses. These events are included in the hazard analysis for individual event types. Table 13 lists emergency and disaster declarations at the federal, state and tribal governmental levels for the GTB Service Area. Entities indicated in bold font fall within the GTB Tribal service area.

Table 13: Presidential, Governor, or Tribal Disasters/ Emergency Declarations for the GTB Service Area

Date of Incident	Type of Incident	Affected Area (Bold entries indicate GTB Tribal Service Area)	Type of Declaration
3/27/2020	Pandemic	All 83 Counties and GTB Tribe	Gov. and Tribal Emergency
1/29/2019	Extreme Cold	All 83 counties	Gov. Emergency
8/2/2015	Thunderstorms	City of Traverse City (Grand Traverse Co.), Township of Acme (Grand Traverse Co.), Township of East Bay (Grand Traverse Co.), Township of Garfield (Grand Traverse Co.), Township of Long Lake (Grand Traverse Co.), Township of Peninsula (Grand Traverse Co.), and Township of Whitewater (Grand Traverse Co.); Grand Traverse, and Leelanau Co.	Gov. Disaster
2/13/2014	Deep frost	Charlevoix , Cheboygan, Chippewa, Delta, Emmet, Gogebic, Luce, Mackinac, and Marquette Co.	Gov. Emergency
6/18/2013 5/7/13	Flooding	Allegan, Baraga, Barry, Benzie , Genesee, Gogebic, Gratiot, Houghton, Ionia, Iron, Kent, Keweenaw, Marquette, Mecosta, Midland, Muskegon, Newaygo, Ontonagon, Osceola, Ottawa and Saginaw Co.; City of Grand Rapids (Kent Co.); City of Ionia (Ionia Co.)	Gov. Disaster
7/14/2008	Thunderstorms, flooding	12 counties: Allegan, Barry, Eaton, Ingham, Lake, Manistee , Mason, Missaukee, Osceola, Ottawa, Saginaw, and Wexford Co.	Pres. Major Disaster (1777)
9/7/2005	Hurricane evacuation	All 83 counties	Emergency (3225)
9/4/2005	Hurricane evacuation	All 83 counties	Gov. Disaster
3/10/94 3/4/94 2/23/94, 2/25/94	Underground freeze	Charlevoix , Cheboygan, Chippewa, Delta, Gogebic, Houghton, Mackinac, Marquette, Ontonagon, and Schoolcraft Co.	Gov. Emergency
12/93-5/94	Underground freeze	10 counties: Charlevoix , Cheboygan, Chippewa, Delta, Gogebic, Houghton, Mackinac, Marquette, Ontonagon, and Schoolcraft Co.	Pres. Major Disaster (1028)
10/28/86 9/15/86 9/12/86	Flooding, heavy rain	Allegan, Arenac, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Huron, Ionia, Isabella, Kent, Lake, Lapeer, Macomb, Manistee , Mason, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, Shiawassee, Tuscola, and Van Buren Co.	Gov. Disaster
9/10-19/86	Flooding	30 counties: Allegan, Arenac, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Huron, Ionia, Isabella, Kent, Lake, Lapeer, Macomb, Manistee , Mason, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, Sanilac, Shiawassee, Tuscola, and Van Buren Co.	Pres. Major Disaster (774)
2/21/1986	Great Lakes flooding, wave action	Allegan, Arenac, Bay, Berrien, Grand Traverse , Iosco, Macomb, Marquette, Menominee, Monroe, Muskegon, Ottawa, Saginaw, St. Clair, Tuscola, Van Buren, and Wayne Co.	Gov. Disaster
1/26-27/78	Blizzard, snowstorm	Statewide	Pres. Emergency (3057)
1/26/1978	Blizzard, snowstorm	Statewide	Gov. Disaster
3/2/1977	Drought	44 counties: Alcona, Alger, Alpena, Antrim , Arenac, Baraga, Benzie , Charlevoix , Cheboygan, Chippewa, Clare, Crawford, Delta, Dickinson, Emmet, Gladwin, Gogebic, Grand Traverse , Houghton, Iosco, Iron, Isabella, Kalkaska, Lake, Leelanau , Luce, Mackinac, Manistee , Marquette, Mason, Mecosta, Menominee, Missaukee, Montmorency, Oceana, Ogemaw, Ontonagon, Osceola, Oscoda, Otsego, Presque Isle, Roscommon, Schoolcraft, and Wexford Co.	Pres. Emergency (3035)
4/5/1956	Tornado	4 counties: Benzie , Leelanau , Manistee , and Ottawa Co.	Pres. Major Disaster (53)

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

Hazard Descriptions

The GTB lands and service area is vulnerable to a wide range of natural hazards. Hazard events have the potential to impact members, economic drivers in the community, critical infrastructure and the built environment, and the natural environment. The Grand Traverse Band of Ottawa and Chippewa Indian's Emergency Management is challenged with managing these threats to protect life and property. This plan includes a profile for each natural hazard event the GTB is likely to encounter. Since the greatest concentration of GTB facilities and members is within Leelanau County, the primary focus of the hazard analysis pertains to Leelanau County, which is complemented with a more general analysis of historic events occurring in other counties in the GTB Tribe's service area. A snapshot of severe weather events for the entire Tribal service area is provided in Table 15. 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. Severe weather event 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 Leelanau 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 was referenced for the most up-to-date data on Presidential-, Governor-, and Tribal-declared emergencies and disasters pertaining to Leelanau County (Table 13).
- 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 for Leelanau County include the following (the event types in italics are as these types of events are listed in the Storm Events Database):
 - Dangerous Currents (i.e., *Rip Current*)
 - Dense Fog (*Dense Fog*)
 - Drought (*Drought*)
 - Extreme Temperatures (*Cold/Wind Chill, Extreme Cold/Wind Chill, Heat, Excessive Heat*)
 - Extreme Winter Weather (*Blizzard, Freezing Fog, Frost/Freeze, Heavy Snow, Ice Storm, Lake-Effect Snow, Sleet, Winter Storm, Winter Weather*)
 - Flooding (*Flash Flood, Flood*)
 - Hail (*Hail*)
 - Seiche (Seiche)
 - Shoreline Flood (*Lakeshore Flood*)
 - Thunderstorm and High Wind (*Heavy Rain, Lightning, High Wind, Strong Wind, Thunderstorm Wind*)
 - Tornado (*Tornado, Funnel Cloud, Waterspout*)
 - Wildfire (*Wildfire*)
- The [Michigan Hazard Analysis](#), completed by the Michigan Department of State Police in 2019, was referenced to collect data on wildfires that occurred on State of Michigan owned land between 1981 and 2018 (as reported by the MDNR).
- 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.

- The Great Lakes Current Incident Database <https://www.michiganseagrant.org/dcd/dcdsearch.php> provided by the National Weather Service and Michigan Sea Grant provides a list of all types of dangerous current-related fatalities and rescues on the Great Lakes from 2002 to 2020.

The NOAA – NCEI Storm Events Database is updated on a rolling basis, and thus the database is always being added to. The most up to date information was added to Table 20, but as events occur the database will change. There were 257 events were reported between 01/01/1950 and 12/31/2022 (26,663 days). However, it is important to note that the earliest date of an event recorded in the database for Leelanau County is 1996. There were a total of 214 days with an event, 2 days with an event and death, 2 days with an event and death or injury, 35 days with an event and property damage, and 6 days with an event and crop damage. Those events, as well as any wildfires on MDNR land, and State and Federal emergency or disaster declarations, are included in the hazard analysis. The hazard analysis groups the events into the following categories:

Table 14: Leelanau County – Number of Events by Type

Type of Event	# of Events	Event Location	Time Interval/ Year Event Recorded
Extreme Winter Weather	139	Countywide	1978*, 1996-2016, 2018-2022
Thunderstorm/Wind; High/Strong Winds	65	Countywide	1975, 1982, 1987, 1995, 1999-2003, 2005, 2007-2011, 2013, 2015, 2017-2022
Hail	35	Countywide	1998, 2000-2009, 2011, 2013, 2015-2017, 2021
Shoreline Hazards (Lakeshore Flooding, Seiche, Rip Current)	5	Empire Township, Glen Arbor Township, Cleveland Township, Centerville Township, Leland Township, Leelanau Township, Suttons Bay Township, Bingham Township, Elmwood Township, Village of Northport, Village of Suttons Bay, Village of Empire	2012, 2019 (3), 2020
Flash Flood	4	Countywide; Empire & Solon Townships	1999, 2000, 2021 (2)
Tornado	3	Glen Arbor Township, Cleveland Township, Leland Township, Suttons Bay Township	1977, 1978, 2011
Extreme Temperatures (Cold / Heat)	3 / 2	Countywide	2007, 2008; 2019* / 2001, 2018
Drought	2	Countywide	1977*, 2001
Lightning	2	Countywide; Solon Township	2000, 2007
Wildfire	60	MDNR Lands	1981-2018
Public Health Emergency (COVID-19 Pandemic)	1	Tribal-Designated and Statewide	2020 – 2023*
Invasive Species	Ongoing	Countywide	Ongoing

Sources: NOAA National Centers for Environmental Information Storm Events Database; MDNR; Michigan State Police-Dept. of Homeland Security; FEMA; Great Lakes Current Incident Database; GTB Emergency Management.

Note: * indicates a state, federal, or tribal emergency or disaster event designation

Table 15 provides a summary of all natural hazard events in the six county service area of the GTB. Many of the events reported occurred in multiple locations, and therefore may be duplicated in one or more counties. However, based on frequency of events, some areas of the region are more susceptible to certain hazards. For example, Antrim County has had the most tornadoes (11) of all of the counties, and therefore, it can be expected that a tornado would most likely occur in Antrim County compared to the other five counties.

Table 15: Natural Hazard Events, 1950-2022, GTB Service Area

		Antrim	Benzie	Charlevoix	Grand Traverse	Leelanau	Manistee	Total Events
Occasionally Occurring Events (1950-2022)	Wildfire*	0	0	0	0	0	0	0
	Dense Fog	0	0	0	0	0	1	1
	Drought	2	1	1	2	2	1	9
	Extreme Heat	2	2	2	2	2	2	12
	Lightning	2	1	1	6	2	2	14
	Extreme Cold	2	3	3	3	3	3	17
	Dangerous Current	0	3 deaths, 11 rescues	0	0	1 death; 2 rescues	1 death; 2 rescues	20
	Tornado	11	4	4	4	3	2	28
	Flooding (inland and coastal)	3	4	4	14	7	14	46
Frequently Occurring Events (1950-2022)	Hailstorm	36	18	34	41	35	35	199
	High Wind/T-Storm Wind	83	41	51	91	65	65	396
	Winter Weather	165	108	148	132	139	103	795
Total Events		306	196	248	295	261	231	1,537

Sources: NOAA National Centers for Environmental Information Storm Events Database; Michigan State Police-Dept. of Homeland Security; FEMA; Great Lakes Current Incident Database. *Note: only wildfires reported as events in the NOAA NCEI Storm Events database; not those reported by the MDNR.

Economic Impact Analysis

Table 16 presents the *reported* deaths, injuries, property damages, and crop damages from hazard events in Leelanau County from 1950-2022. There have been 65 deaths and 4,173 illnesses, which were mostly related to the COVID-19 pandemic. The economic impact of NOAA-recorded hazard events for Leelanau County is \$25,576,000 in property damages and \$53,563,000 in crop damages. It should be noted that many events likely cause numerous small amounts of property damage, but these often go unreported.

Table 16. Extent of Damage by Event Type, Leelanau County

Leelanau County	Deaths	Injuries / Illness	Property Damages	Crop Damages
Thunderstorm/Wind; High Winds	0	0	\$24,269,000	\$8,000
Extreme Winter Weather	0	0	\$832,000	\$50,500,000
Hail	0	0	\$85,000	\$3,055,000
Shoreline Hazards (Lakeshore Flooding, Seiche, Rip Current)	1	0	\$184,000	\$0
Flash Flood	0	0	\$50,000	\$0
Tornadoes	0	0	\$295,000	\$0
Extreme Temperatures (Cold / Heat)	1	0	\$0	\$0
Drought	0	0	\$0	\$0
Lightning	0	0	\$40,000	\$0
Wildfire	0	0	\$0	\$0
Public Health Emergency (COVID-19 Pandemic)	63	4,173*	n/a	n/a
TOTALS	65	4,173	\$25,576,000	\$53,563,000

Sources: NOAA's National Centers for Environmental Information; <https://www.michigan.gov/coronavirus/stats>

* According to the State of Michigan, this is the total of confirmed and probable deaths and illnesses for COVID-19 in Leelanau County as of October 4, 2022.

Table 17 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). The SEV is equal to half of the True Value of the property. Population data is collected from the US Census, 2019 ACS data. According to the 2022 *Seasonal Population Study for Northwest Lower Michigan*, assume a 169% increase from the base population of permanent residents to account for the highest estimated annual average seasonal population within the county (which occurs in July).

Table 17: Geographic 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	These hazards have the potential to impact all communities in Leelanau County	21,652	\$4,219,402,702.00
Flooding	Bingham Township, Centerville Township, Cleveland Township, Glen Arbor Township, Kasson Township, Leelanau Township, Solon Township, Leland Township, Suttons Bay Township, Elmwood Township, City of Traverse City, Village of Suttons Bay, Village of Northport	20,491	\$514,117,893.58
Shoreline Erosion/Flooding & other Shoreline Hazards	Empire Township, Glen Arbor Township, Cleveland Township, Centerville Township, Leland Township, Leelanau Township, Suttons Bay Township, Bingham Township, Elmwood Township, Village of Northport, Village of Suttons Bay, Village of Empire, and City of Traverse City	18,448	\$687,023,270.39
Wildfire	Pine Forest Areas Countywide (White, Red, and Jack Pine)	21,652	\$271,192,557.90
Wildfire	Fire Prone Areas: Leland Township, Leelanau Township, Centerville Township, Cleveland Township, Glen Arbor Township, Elmwood Township, Solon Township, Kasson Township, Empire Township, Village of Empire	15,939	\$140,911,313.88

Sources: 2019 ACS 5-Year Estimates from the US Census Bureau; Leelanau County Equalization

Extreme Winter Weather

The National Weather Service defines a winter weather event as: *a winter weather 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 Extreme 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

Extreme winter weather events are regional events that are not confined to geographic boundaries and can affect several areas at one time with varying severity depending on factors such as elevation and wind patterns. All of Leelanau County and other GTB lands in the service area are at risk from impacts related to extreme winter weather. All counties in the GTB service area are coastal communities, and therefore, are more susceptible to lake-effect snow due to proximity to Lake Michigan.

Extent

Snowstorms can be measured based on snowfall accumulations or damages. Leelanau County receives the most snowfall in January with a normal amount of 26.3 inches, followed by December with 21.2 inches, and February with 19 inches. Snowfall in March, April, and November are each 12.6 inches or less.

Table 18 provides a summary of historic recorded extreme winter weather events in Leelanau County, including recorded property damages and crop damages. Since 1996 (excluding the statewide blizzard event in 1978), there have been 138 extreme winter weather events, including heavy snowstorms, lake effect snow, ice storms, frost/freeze, blizzards, and winter storms. These events are associated with \$653,000 in property damages and \$50,500,000 in crop damages in Leelanau County. As indicated previously in Table 16, severe winter weather events have been the most costly type of natural hazard event to occur in Leelanau County.

Previous Occurrences

Table 18: Leelanau County Extreme Winter Weather Events

Event Type	Number of Events	Property Damage	Crop Damage	Event Year(s)
Winter Weather	1	\$ 0	\$ 0	2006
Winter Storm	55	\$ 3,000	\$ 0	1997-1999, 2003-2010, 2012-2016, 2018-2022
Ice Storm	4	\$ 0	\$ 0	2001, 2002, 2005, 2008
Heavy Snow	51	\$ 650,000	\$ 13,000,000	1996-2009, 2011, 2012, 2014, 2016, 2018, 2020
Blizzard	6	\$ 0	\$ 0	1978*, 1997, 1998, 1999, 2002, 2019
Frost/Freeze	1	\$ 0	\$ 37,500,000	2012
Lake-Effect Snow	21	\$ 0	\$ 0	2006-2013, 2016, 2019
TOTAL	139	\$ 653,000	\$ 50,500,000	

Sources: NOAA NCEI Storm Events Database; MSP's 2019 Michigan Hazard Analysis

Table 19. Extreme Winter Weather Events in GTB Service Area, by County

	Antrim County	Benzie County	Charlevoix County	Grand Traverse County	Leelanau County	Manistee County
Winter Storm	66	49	64	57	55	51
Heavy Snow	60	35	50	44	51	30
Lake-Effect Snow	27	12	22	19	21	9
Blizzard	7	6	7	6	6	6
Ice Storm	3	4	3	4	4	5
Frost/Freeze	1	1	1	1	1	1
Winter Weather	1	1	1	1	1	1
Total	165	108	148	132	139	103
Property Damages	\$270,000	\$600,000	\$295,000	\$618,000	\$653,000	\$350,000
Crop Damages	\$10,000,000	\$17,000,000	\$7,500,000	\$20,000,000	\$50,500,000	\$10,000,000
Deaths	0	0	0	0	0	0
Injuries	0	0	0	0	0	0

Sources: NOAA NCEI Storm Events Database; MSP's 2019 Michigan Hazard Analysis

Notes: NOAA NCEI Storm Events contains records of these events from 1996-2022 for all counties except Manistee County, which has extreme winter weather events on record between 1997 and 2022. The 1978 statewide blizzard event, which is not indicated in the NOAA Storm Events database, was included in the total events.

In 1978, the 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 most frequently recorded type of severe weather event for every county in the GTB service area, with the potential to cause widespread damage. As indicated in Table 19, the most common types of extreme winter weather events throughout the GTB service area are winter storms, followed by heavy snow, and lake-effect snow. Blizzards, ice storms, frost/freeze and winter weather events are least frequently occurring. Many of these events affected multiple counties, or in some cases were state-wide events. For example, the frost/freeze event in April 2012 and the heavy snow event on March 2, 2012 (both described in detail below) resulted in property and/or crop damages in every county in the GTB service area.

The following are episode narratives from the NOAA NCEI Storm Events Database for two of the most high-impact, severe winter weather events in the region:

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. This event accounts for \$650,000 in reported damages and \$13,000,000 in reported crop damages.

The frost/freeze event listed in Table 18 took place on April 27, 2012 across Northwest Lower Michigan. A killing freeze caused extreme damage to agriculture, particularly in the fruit belt of Northwest Lower Michigan. Traverse City saw low temperatures of 25 degrees on the 27th, 31 degrees on the 28th, and 26 degrees on the 29th. These values were not exceptionally colder than normal lows, which are in the middle 30s. Ultimately, the main culprit was a stretch of unprecedented warmth in mid-March, which included five consecutive 80-degree days (17th-21st). This caused fruit trees to bud out far, far ahead of schedule, and left them vulnerable to even relatively normal weather as the spring progressed. The tart cherry crop was a total loss, while other orchard fruits such as sweet cherries, apples, pears, and peaches saw losses in excess of 90% of the expected crop. Crop damages were reported to be \$37,500,000.

Probability of Future Events and Vulnerability Assessment

Between 2022 and 1996, Leelanau County has had 138 extreme winter weather events. This averages to about 5.5 events every year. Additionally, every county in the GTB service area has had documented extreme winter weather events ranging from 102 to 164 occurrences between 1996-1997 and 2022. The probability of an extreme winter weather event occurring in a future year is 100 percent.

Heavy snow events have the potential of shutting down towns and businesses for a significant period of time. Blowing and drifting snow with blizzard conditions cause driving hazards. Ice damage may occur when high winds push lake water and ice past the shoreline, causing damage to public infrastructure and residential property. Due to major agriculture losses in the past, farmers and agriculture producers should be aware of the potential for damage from an extreme winter weather event.

GTB members are generally considered a vulnerable population during winter weather-related events. The reasons for member vulnerability include: the high percentage of Elder members in some communities, the high percentage of members within poverty level, members who live in remote areas, limited access to technology including cellular phone service and broadband internet, and minimal access to backup power sources. The Community Survey results specifically mentioned that internet and cell access was an issue and there were concerns about access to power in the event of a natural hazard. Ice storms have the capability to take out power, and cold temperatures can be fatal for members without a backup power source. Providing help and assistance to members in remote locations can be treacherous when combined with icy or snowy roads.

Comments from April 2022 Leelanau County/GTB Hazards Input Session

- Ice dams along rivers/lakes can damage adjoining properties
- Food pantry can lose their supplies if the power is out.
- Agricultural products (vineyards, cropland) can be impacted if there is a late spring heavy frost, ice or hail storm. This can negatively impact the local agriculture economy and people's personal property.
- People who aren't aware of storm damage to their seasonal homes and return in the spring/summer to find and report damaged property (perhaps they had a roof leak or water lines that froze)
- More vulnerable residents whose homes are not well insulated could have more problems with roof damage and frozen pipes.
- 2012 storms left businesses, government and roads closed for 5 days
- Have a lack of community shelters
- Winds and ice can pull electrical lines down
- Increased potential for car accidents
- Gas stations down if they don't have back up power
- Cell towers down causes challenges with communications
- Many people rely on wood/propane fuel to heat their homes and often live in rural areas that are difficult to access in an emergency to provide their fuel source if needed.

- Population stranded on rural properties; can't be accessed by emergency vehicles with heavy/drifting snow or ice.
- Erratic winter weather patterns recently – less consistent.
- Extra burden and cost placed on the Road Commission and emergency services.
- 1977 Blizzard MSP/Corp of Engineers – road closures
- GTB Tribe added generators to their critical infrastructure since the 2012 winter storms

Thunderstorms and Severe Winds

The National Weather Service defines a severe thunderstorm as: *a thunderstorm that produces a tornado, winds of at least 58 mph (50 knots or ~93 km/h), and/or hail at least 1" in diameter*. These storms can also produce lightning or heavy rain (that could cause flash flooding). Severe thunderstorms can occur at any time in Michigan, although they are most frequent during the warm spring and summer months from May through September.

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

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

Location

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

Extent

Thunderstorms can be measured based on wind speed or damages. The average wind speed for events thunderstorm/wind and high wind or strong wind events in Leelanau County is 52 knots. There have been a total of \$24,269,000 in property damages and \$8,000 in reported crop damages since 1975 (Table 20).

Previous Occurrences

Since 1975, there have been a total of 65 thunderstorm/wind and high wind events reported in Leelanau County. This is the second most frequently occurring type of severe weather event in all counties in the GTB service area. Additionally, a thunderstorm event on 8/2/2015 resulted in a Governor-declared Disaster for Grand Traverse and Leelanau counties, and a 7/14/2008 thunderstorm and flooding event resulted in a Presidential Major Disaster Declaration that included Manistee County.

Tables 20 and 21 list the events on record with NOAA for the GTB Tribal Service Area. Antrim County has had the most recorded thunderstorm/wind events, while Leelanau County has the highest amount of damages incurred from these events. Leelanau County has the greatest number of recorded high wind/strong wind events, while Grand Traverse County has had the greatest amount of associated property damages.

Table 20. Thunderstorm/Wind Events and Impacts, GTB Tribal Service Area

County	# of Events	Event Years	Property Damage	Crop Damage	Deaths	Injuries
Antrim County	70	1965, 1973, 1982, 1983, 1985, 1987, 1991, 1992, 1995, 1996, 1998, 1999, 2001-2008, 2011, 2013-2016, 2018, 2019, 2021, 2022	\$900,500	0	0	1
Benzie County	33	1975, 1983, 1985, 1987, 1991, 1995, 1998, 1999, 2001-06, 2010, 2013, 2016, 2019, 2021	\$188,000	0	0	6
Charlevoix County	40	1962, 1971, 1982, 1985, 1988, 1991, 1996, 1998-99, 2001-07, 2011, 2013, 2016-18, 2020-21	\$224,000	0	0	0
Grand Traverse County	63	1955, 1956, 1963, 1966, 1968-76, 1979, 1982, 1983, 1987, 1989, 1990, 1994, 1995, 1997-2007, 2009-19, 2021-22	\$13,307,000	\$1,000	0	2
Leelanau County	50	1975, 1982, 1987, 1995, 1999, 2001-03, 2005, 2007, 2008, 2010, 2011, 2013, 2015, 2017-19, 2021-22	\$24,200,000	\$8,000	0	0
Manistee County	56	1964, 1966, 1973, 1975, 1980, 1985, 1987, 1989, 1991, 1997-2003, 2005-09, 2011-13, 2015, 2017-19, 2021	\$510,500	0	2	0

Source: NOAA NCEI Storm Events Database

Table 21. High Wind/Strong Wind Events and Impacts, GTB Tribal Service Area

County	# of Events	Event Years	Property Damage	Crop Damage	Deaths	Injuries
Antrim County	13	1998, 2000, 2001, 2003, 2005, 2009, 2010, 2015, 2020, 2021	\$70,000	0	0	0
Benzie County	8	1998, 2001, 2003, 2005, 2010, 2015, 2021	\$49,000	0	0	0
Charlevoix County	11	1998, 2000, 2001, 2003, 2005, 2009, 2010, 2015, 2021	\$99,000	0	0	0
Grand Traverse County	9	1998, 2001, 2003, 2010, 2020, 2021	\$165,000	0	0	0
Leelanau County	15	1998, 2000, 2001, 2003, 2005, 2007, 2009, 2010, 2015, 2020-21	\$69,000	0	0	0
Manistee County	9	1998, 2001, 2003, 2005, 2010, 2015, 2021	\$90,000	0	0	0

Source: NOAA NCEI Storm Events Database

The most damaging thunderstorm/wind event occurred on August 2, 2015. Per the NOAA Storm Events Database Event Narrative: *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.* Winds speeds during this event were reported to be 78 knots. This event resulted in \$42,000,000 in property damages in the communities of Lake Leelanau, Glen Haven and Leland in Leelanau County.

Probability of Future Events and Vulnerability Assessment

Leelanau County has had 65 thunderstorm/wind and high wind events on record since 1975 as recorded by NOAA. This averages to a 1.4 events every year. As shown in Table 22, the Antrim County has a similar probability of 1.4 events per year, followed by Grand Traverse and Manistee counties at 1.1 events per year, and Benzie and Charlevoix counties at a 0.8% chance of an event occurring in a future year.

Table 22. History of Thunderstorm/Wind, High Wind and Strong Wind Events in the GTB Service Area

County	Total # of Events	Recorded Timeframe	Annual Probability
Antrim	83	1965-2022 (58 years)	1.4
Benzie	41	1975-2022 (48 years)	0.8
Charlevoix	51	1962-2022 (61 years)	0.8
Grand Traverse	72	1955-2022 (68 years)	1.1
Leelanau	65	1975-2022 (47 years)	1.4
Manistee	65	1964-2022 (59 years)	1.1

Source: NOAA NCEI Storm Events Database

Damage from straight line winds usually affects multiple counties with the loss of electricity from trees/tree limbs downing power lines; widespread property damage; and potentially exposing people to severe injury or fatality due to flying debris. The magnitude of the impact of a thunderstorm/high wind event is dependent on the seasonal population, seasonal activities, and the spread of development.

During the warm or summer months, the area’s population expands to include both the permanent population and visitors. The seasonal population is attracted to both rural, sparsely populated rural areas and urban activity centers. Impoverished persons living in substandard housing and the elderly and/or disabled persons are also vulnerable to impacts from high wind events, such as encountering damage to their structural residence or power outages. Additionally, the Tribe holds festivals and events such as the Annual Pow Wow during the third weekend of August, and the Annual Language Camp, taking place over 3 days in mid-August. Both events are held at the Peshawbestown Pow Wow Grounds, which offers rustic camping accommodations. In general, those without permanent shelter or are caught outside in a quickly moving storm are vulnerable to hazardous conditions.

Comments from April 2022 Input Session

- Power outages, trees down, wires down
 - Gas stations are closed; impacts commerce. Gas is needed to fuel generators!
 - Road closures due to downed trees, etc. prohibits EMS timely response to incidents; people can be stuck in their homes/neighborhoods. Also impacts local commerce if the roads are not able to be used to transport goods and services.
 - People living on oxygen or who have a low food supply or primarily perishable food supply are directly impacted
 - Glen Arbor, Peshawbestown and other areas of the County in 2015 – 5-day stretch without power after a thunderstorm. GTB had downed lines (they have a lot of overhead lines). Their sewer stations had pump failures at the main lift and had to supply generators to power them. Many negative impacts to commerce and transportation. Debris management is a cost to the county and to contract out at the State level.
 - Only have 1 power company in the County, which limits their ability to respond quickly to all outages in a wide-spread event.
 - Power outages are costly to emergency services and residents.
- Can result in big floods
- Lightning strikes can cause fires, impacting homes, woodlands
- Money and time spent on the extreme demand placed on local responders – pay overtime for increased personnel
- Cost to pay for debris cleanup
- Leelanau County receives 1-2 events per year that meet the criteria of a severe thunderstorm, windstorm, hail, lightning, tornado... Given our seasonal influx of tourists and the high potential for these storms at the same time of the year this could have devastating impacts to the economy, infrastructure and environment.

Hail

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

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

According to the 2012 Michigan Hazard Analysis, the National Weather Service began recording hail activity in Michigan in 1967. 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 Leelanau County and the GTB Tribal service area are at risk from hailstorm impacts. According to the National Weather Service, Leelanau County is in an area of the United States that has on average two days of hailstorm events per year.

Extent

According to the NOAA National Centers for Environmental Information, the approximate size of hail is described as follows in Table 23. If a thunderstorm produces hail that is 1 inch in diameter (quarter size) or larger, it is considered to be a severe thunderstorm.

Table 23. 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 (Severe)
Walnut/Ping Pong	1.50 inch
Golf Ball	1.75 inch
Hen Egg	2.00 inch
Tennis Ball	2.50 inch
Baseball	2.75 inch
Tea Cup	3.00 inch
Grapefruit	4.00 inch
Softball	4.50 inch

The greatest extent hail reported in Leelanau County was 3 inches on July 8, 2016 in Empire (Table 24). According to the scale, hailstones of this size are equivalent to a tea cup. Hail can damage aircraft, homes and cars, and can be deadly to livestock and people. Hailstorms have caused no deaths or injuries, \$85,000 in property damages and \$3,055,000 in crop damages in Leelanau County.

Previous Occurrences

Between 1998 and 2022, Leelanau County had 35 hailstorms reported to NOAA (Table 24).

Table 24: Hail Events, Leelanau County, 1998-2022

BEGIN LOCATION	BEGIN DATE	MAGNITUDE
SUTTONS BAY	6/24/1998	0.75
LELAND	5/12/2000	1
SUTTONS BAY	5/12/2000	1
MAPLE CITY	5/12/2000	1
NORTHPORT	6/9/2000	0.88
LELAND	5/15/2001	1
SUTTONS BAY	5/15/2001	1.75
SUTTONS BAY	5/15/2001	1
LELAND	5/30/2002	0.75
GREILICKVILLE	8/28/2003	0.88
LELAND	6/13/2004	1
GLEN HAVEN	8/9/2004	0.75
CEDAR	9/7/2005	0.88
LELAND	7/17/2006	1
EMPIRE ARPT	10/18/2007	1
EMPIRE	6/15/2008	0.88
HATCHS	6/15/2008	1
CEDAR	7/2/2008	0.88
SUTTONS BAY	7/2/2008	0.75
LELAND	9/7/2008	0.88
SUTTONS BAY	4/25/2009	0.75
MAPLE CITY	4/10/2011	0.88
EMPIRE	4/10/2011	1
MAPLE CITY	4/10/2011	1
LAKE LEELANAU	6/8/2011	1
SUTTONS BAY	6/8/2011	0.88
GREILICKVILLE	5/20/2013	1
NORTHPORT	5/20/2013	1
NORTHPORT	8/30/2013	1.5
LAKE LEELANAU	8/2/2015	1
EMPIRE	7/8/2016	3
BOCUS	7/8/2016	1.5
SUTTONS BAY	7/8/2016	1
LELAND	4/10/2017	0.88
GREILICKVILLE	8/10/2021	0.75

Source: NOAA National Centers for Environmental Information

Table 25. History of Hail Events in the GTB Service Area

County	# of Events	Years	Avg. # Events Per Year	Damages	Hail Diameter
Antrim	36	1979, 1989, 1996, 1998, 2000-01, 2004-2008, 2011, 2012, 2013, 2015, 2016, 2019, 2021-22	1.9	\$95,000 in property damages; \$1.03 million in crop damages	0.75" to 3"
Benzie	19	1955, 1982, 1987, 1993, 2002-03, 2005-07, 2016, 2019, 2021 (12 years)	1.6	None	0.75" to 3.25"
Charlevoix	31	1962, 1963, 1985, 1996-98, 2000, 2002-04, 2007-08, 2011-14, 2016-17 (18 years)	1.7	\$45,000 in property damages	0.75" to 3"
Grand Traverse	33	1958, 1970-71, 1975, 1980, 1982, 1991, 1993, 1999, 2000, 2003, 2005-06, 2008, 2010-2012, 2014-17, 2019-20, 2022 (24 years)	1.4	None	0.75" to 2"
Leelanau	35	1998, 2000-09, 2011, 2013, 2015-17, 2021 (17 years)	2.1	\$85,000 in property damages; \$3.055 million in crop damages	0.75" to 3"
Manistee	35	1973, 1985, 1998-2000, 2003, 2005-06, 2008, 2011-12, 2017, 2019, 2020-22 (16 years)	2.2	\$35,000 in crop damages	0.75" to 2"

Source: NOAA National Centers for Environmental Information

NOAA storm narratives for particularly impactful hail events are provided below in italic font.

During one particularly strong event on July 17, 2006, hail damage was significant within Leelanau County and the region. *A strong cold front ran headlong into warm and humid air in place over Michigan. Thunderstorms ignited by midday in Eastern Upper Michigan, and became widespread by late afternoon in Northern Lower Michigan. A large number of storms became severe, as this became the largest severe weather outbreak in Northern Michigan in several years. Millions of pounds of fruit crops were destroyed by hail and wind. The reported hail size in Kewadin was 1", roughly the size of a quarter.*

Another strong event occurred on July 8, 2016 in Empire and Glen Arbor Township. *Powerful thunderstorms developed over Lake Michigan late in morning of the 8th, ahead of an incoming cold front. These storms produced very large hail, and some damaging winds, as they swept across northern Michigan. Approximately 60 percent of the cherry crop in northwest lower Michigan was damaged by the severe thunderstorms. Golf ball-sized hail was reported in Empire, and up to three inches in diameter in Glen Arbor. Some vehicles were damaged, and a few homes lost windows and skylights. Considerable damage was done to orchards and vineyards in the area. This storm system resulted 3" size hail causing significant property/crop damage to properties in Leelanau, Charlevoix and Antrim counties.*

Probability of Future Events and Vulnerability Assessment

There have been 35 hail events reported in 17 years in Leelanau County (Table 25). This averages to 2.1 hail events per year. Other counties in the GTB service area have annual average occurrences of hail storms ranging from 2.2 events per year (Manistee) to 1.4 (Grand Traverse).

All existing and future buildings, exposed infrastructure, and populations are at risk from hailstorms since hail causes damage to roofs, brick walls, glass, landscaping, crops, and cars. Manufactured homes and campground populations located throughout the county and are more susceptible to impacts from hail. Hail can also damage roads, sidewalks, bridges, and above ground utilities. Although no there are no reported deaths or injuries associated with hail in the NOAA Storm Events Database for the GTB region, hail has the potential to cause injury and death, and populations are advised to take shelter when an event occurs.

Riverine and Urban Flooding

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

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

Dam failure is also a potential source of flooding. Infrastructure in the state is aging and costly to maintain. FEMA provides Federal Guidelines for Dam Safety. These guidelines encourage strict safety standards in the practices and procedures employed by federal agencies or required of dam owners regulated by the federal agencies (2004). The National Inventory of Dams provides a catalogue of dams in the nation with a profile of each. Each profile lists the Hazard Potential Classification. This is a system that categorizes dams according to the degree of adverse incremental consequences of a failure or 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.

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

Urbanized areas or areas with higher concentrations of impervious surface and low-lying areas are most likely to flood in Leelanau County. Heavy rainfall can oftentimes overwhelm a city stormwater system causing backups and ponding or flooding. There are few instances of flooding in Peshawbestown. The County's hilly terrain will cause water to cascade oftentimes bringing sediment with it. Water and sediment will congregate in the low lying areas. Enough rain will cause erosion of the road bed and eventually cause road washouts. Cherry Bend Rd, Tumble Rd, and N West Bay Shore Drive (M-22) have been known to flood.

According to the National Inventory of Dams, Leelanau County has four major dams listed including: Belanger Dam, Cedar Lake Dam, Leland Dam, and Meeuwenberg Dam (Table 26, Figure 10). The Belanger Dam, which is located within Peshawbestown but is not located on GTB tribal land, has a Hazard Potential Classification of "Low". Low hazard potential dams are not required to have an Emergency Action Plan on file with the State of Michigan/ Leelanau County Emergency Management. Additionally, there is no expected loss of human life or impact to lifeline interests if the dam were to fail, and economic losses and environmental damages would be low and generally limited to that of the dam owner.

The three remaining dams in Leelanau County – the Cedar Lake Dam, Leland Dam, and Meeuwenberg Dam - have a higher Hazard Potential Classifications of "Significant" or "High." "Significant" means that if the dam were to fail, there would be economic losses, environmental damages, and impacts to lifeline interests, but no expected loss of human life. "High" means that if the dam were to fail, there would be economic losses, environmental damages, impacts to lifeline interests, and probably cause loss of human life.

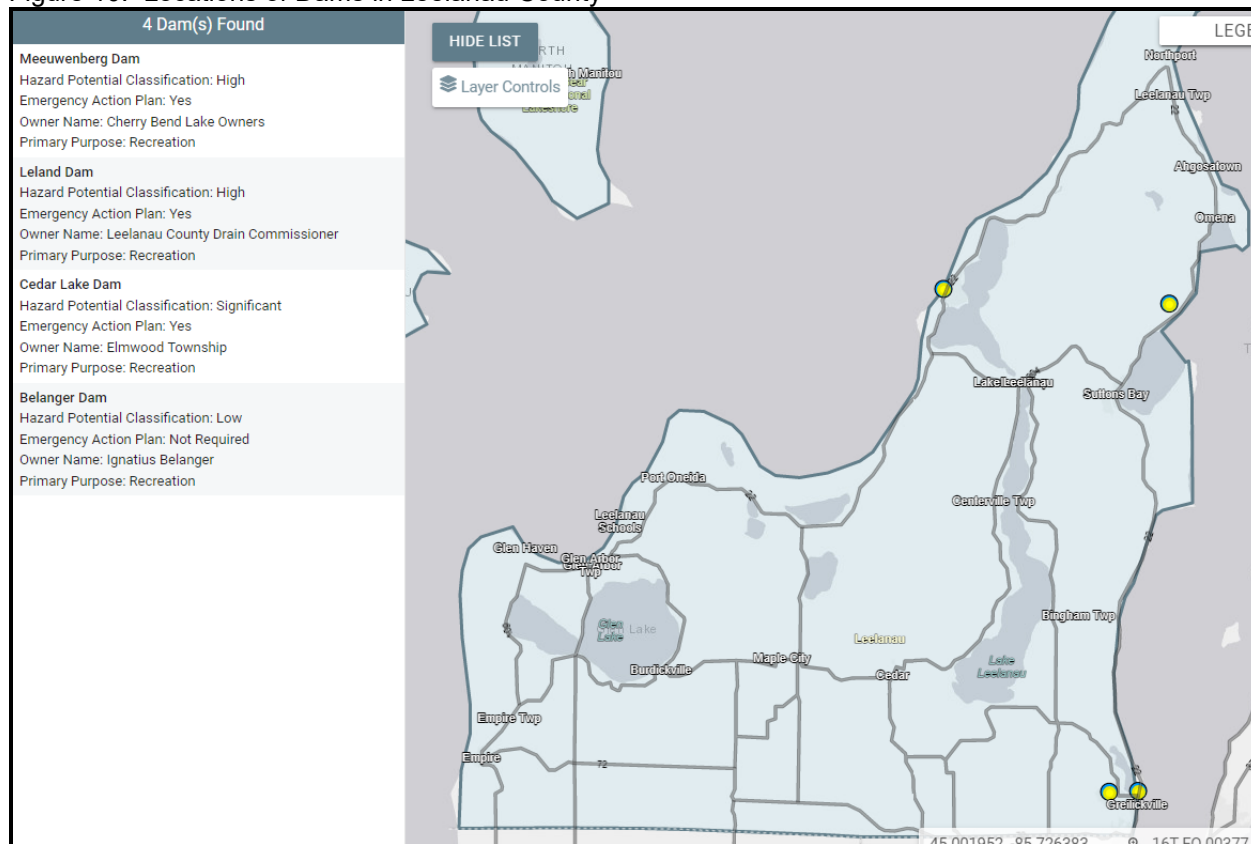
- The owner/operator of the Cedar Lake Dam is Elmwood Township. According to the Michigan Dam Inventory, it was last inspected October 11, 2021, receiving a “Satisfactory” condition rating, and is due for inspection again by December 30, 2025. It has an Emergency Action Plan on file as of March 14, 2001.
- The owner/operator of the Leland Dam is the Leelanau County Drain Commission. According to the Michigan Dam Inventory, it was inspected on September 29, 2019, inspected again on September 1, 2022, report dated October 2022, and received a “Satisfactory” condition rating. It has an Emergency Action Plan on file.
- The owner/operator of the Meeuwenberg Dam is the Cherry Bend Lake Owners. According to the Michigan Dam Inventory, it was last inspected August 11, 2019, receiving a “Satisfactory” condition rating, and is due for inspection again by December 30, 2022. It has an Emergency Action Plan on file as of January 5, 2011.

Table 26. Dams in Leelanau County

Name	Height (Ft)	Storage (Acre-Ft)	Location	City/Township	Owner	Year Completed	Hazard Potential
Belanger Dam	21	50	Belanger Creek	Peshawbestown (Suttons Bay Township)	Ignatius Belanger	1864	Low
Cedar Lake Dam	16	1,600	Cedar Lake Outlet	Elmwood Township	Elmwood Township	1856	Significant
Leland Dam	19	86,950	Lake Michigan Tributary	Leland Township	Leelanau County Drain Commission	1910	High
Meeuwenberg Dam	42	193	Cedar Lake Tributary	Elmwood Township	Cherry Bend Lake Owners	1968	High

Source: National Inventory of Dams

Figure 10. Locations of Dams in Leelanau County



Source: National Inventory of Dams

Appendix F provides a list of other dams located outside of Leelanau County, but within the four other counties in the GTB tribal service area where GTB owns property. If these dams were to fail, there would not or likely not be any significant damage to GTB-owned properties.

Extent

Flood extent can be measured by the amount of property damage and accumulation of rainfall. There have been four (4) flood events in Leelanau County (Table 27). In total, flood and flash flood events have caused \$50,000 in property damages, no crop damages, and no deaths or injuries in Leelanau County. Grand Traverse and Manistee counties have incurred the greatest amounts of property damage associated with inland flooding events in the GTB Tribal service area.

Previous Occurrences

Table 27 lists the flood and flash flood events for the counties within the GTB Tribal service area.

Table 27. Fluvial and Pluvial Flood Events in the GTB Tribal Service Area

COUNTY	LOCATION	DATE	EVENT TYPE	DAMAGES	FLOOD CAUSE
Antrim	Elk Rapids	7/5/1999	Flash Flood	\$0	Training echoes (thunderstorms continuously moving over the same general area)
	Alden	8/11/2021	Flash Flood	\$325,000; 1 injury	Heavy Rain
	Bellaire	8/11/2021	Flash Flood	\$0	Heavy Rain
Benzie	Countywide	9/1/2000	Flash Flood	\$0	Heavy Rain
Charlevoix	City of Charlevoix	6/8/2012	Flash Flood	\$2,000	Heavy Rain
Grand Traverse	Traverse City	7/6/1999	Flash Flood	\$0	Training echoes (thunderstorms continuously moving over the same general area)
	Traverse City	7/27/2000	Flash Flood	\$0	Heavy Rain
	Countywide	9/1/2000	Flash Flood	\$0	Continuous thunderstorms with heavy rain
	North central portion	4/12/2001	Flash Flood	\$0	Heavy Rain
	Grawn	10/6/2012	Flash Flood	\$1,800,000	Brown Bridge Dam break on Boardman River
	Traverse City	11/17/2013	Flash Flood	\$14,000	Heavy Rain
	Grawn	4/14/2014	Flood	\$75,000	Heavy Rain/Snow Melt
	Traverse City	5/8/2020	Flash Flood	\$310,000	Heavy Rain
	Traverse City	6/10/2020	Flash Flood	\$90,000	Heavy Rain
	Cherry Capital Airport	7/18/2020	Flash Flood	\$15,000	Heavy Rain
	Traverse City	10/22/2020	Flood	\$35,000	Heavy Rain
Traverse City	7/24/2021	Flash Flood	\$0	Heavy Rain	
Leelanau	Countywide	7/6/1999	Flash Flood	\$0	Heavy Rain
	Countywide	9/1/2000	Flash Flood	\$50,000	Heavy Rain
	Empire	8/10/2021	Flash Flood	\$0	Heavy Rain
	Solon	8/10/2021	Flash Flood	\$0	Heavy Rain
Manistee	Manistee	5/12/2000	Flash Flood	\$0	Heavy Rain
	Countywide	4/12/2001	Flash Flood	\$0	Heavy Rain
	South portion	5/19/2001	Flash Flood	\$0	Heavy Rain
	Manistee	7/24/2005	Flash Flood	\$500,000	Heavy Rain
	Oak Hill (Filer Charter Twp.)	6/12/2008	Flash Flood	\$970,000	Heavy Rain
	Harlan	6/13/2008	Flood	\$0	Heavy Rain
	Manistee	5/11/2011	Flash Flood	\$40,000	Heavy Rain
	Wellston	5/11/2011	Flash Flood	\$10,000	Heavy Rain
	Oak Hill (Filer Charter Twp.)	7/20/2019	Flash Flood	\$3,500,000	Heavy Rain
Oak Hill (Filer Charter Twp.)	7/20/2019	Flood	\$0	Heavy Rain	

Source: NOAA National Centers for Environmental Information

Probability of Future Events and Vulnerability Assessment

Since 1999, Leelanau County has had 4 flash flooding events, equating to a 16.7% annual chance of a flash flood.

While flash floods have occurred in every county in the GTB Tribal service area, the urbanized areas within Grand Traverse County (City of Traverse City and surrounding municipalities) and Manistee County (City of Manistee and surrounding municipalities) are more susceptible to flash floods due to the high amount of impervious surface area in those communities, along with the presence of the Boardman and Manistee Rivers and associated tributaries.

The magnitude and severity depend on the area of impact's population, seasonal activity, and the spread of development. During the warm or summer months, the population expands to include both the permanent population and visitors to the area. The seasonal population is attracted to both rural, sparsely populated rural areas and urban activity centers. Impoverished persons living in substandard housing those living in and elderly independent/assisted living facilities are also vulnerable to flooding that may occur from nearby rivers. The Tribe holds festivals and events such as the Annual Pow Wow during the third weekend of August, and the Annual Language Camp, taking place over 3 days in mid-August. Both events are held at the Peshawbestown Pow Wow Grounds, which offers rustic camping accommodations.

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

The seasonal nature of flooding will continue to occur. Years with exceptional snowfall levels will likely result in flooding events from snowmelt. Warmer Lake Michigan water temperatures will create more active storm systems and heavier rainfalls. Lake Michigan water levels will also increase flooding events inland as the water table rises. Furthermore, increased development, reduction in green space, and subsequent soil erosion cause sedimentation to accumulate in river and lake beds reduce the amount of water flow. Rivers and lakes with sedimentation buildup will experience water backups and flooding events unless mitigated.

Members of the task force identified the following sites for concern within Peshawbestown:

- The Belanger Creek Dam (at the end of Belanger Creek at the intersection with M-22; if this dam were to fail, it could affect the operability of M-22, the main connector between Peshawbestown and Traverse City.
- Belanger Creek, located southeast of Stallman Road to the outlet in the Bay – potential for overflow
- Stallman Road near the intersection with Belanger Creek, located SW of Strongheart Way.

Specific flood hazard areas were identified during public meetings and are identified on the Hazard Areas Map provided in Appendix A. Areas that are particularly vulnerable to flooding are areas adjacent to inland lakes (areas surrounding Lake Leelanau: Solon Township, Elmwood Township, Centerville Township, and Bingham Township), wetland areas (north of Glen Lake: Glen Arbor Township), and other generally recognized flood zone areas (Cleveland and Leelanau Townships).

Flood zone hazard information may be obtained from the Flood Rate Insurance Maps (FIRM) available for jurisdictions through FEMA's online Flood Map Service Center. Flood hazard zones are also labeled on the Environmental Features Maps in Appendix A.

Additionally, the Infrastructure Maps included in Appendix A illustrates the locations of road/stream crossings, bridges and dams with their currently available condition rating. The Townships of Bingham, Elmwood, Leelanau and Suttons Bay have road/stream crossings that are rated as having a moderate or severe condition.

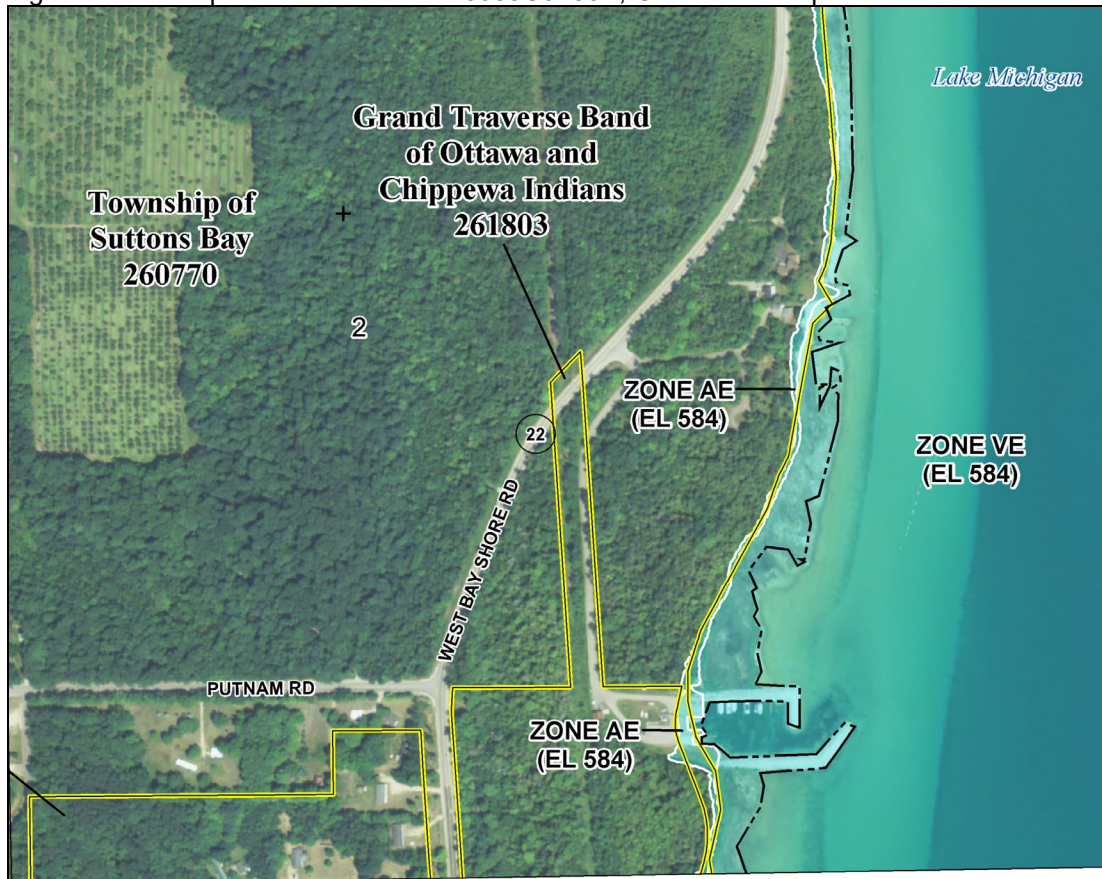
NFIP Participation Status

The Grand Traverse Band of Ottawa and Chippewa Indians is not a participant in the National Flood Insurance Program; however, information pertaining to NFIP mapped areas for counties in the GTB tribal service area is provided in Table 28.

Networks Northwest staff requested information on any NFIP “repetitive loss” properties in the six county GTB service area from the Regional Flood Insurance Liaison within FEMA’s Region 5 Mitigation Division. At the time this plan was completed, a response had not been received. Refer to Appendix H for documentation of this request.

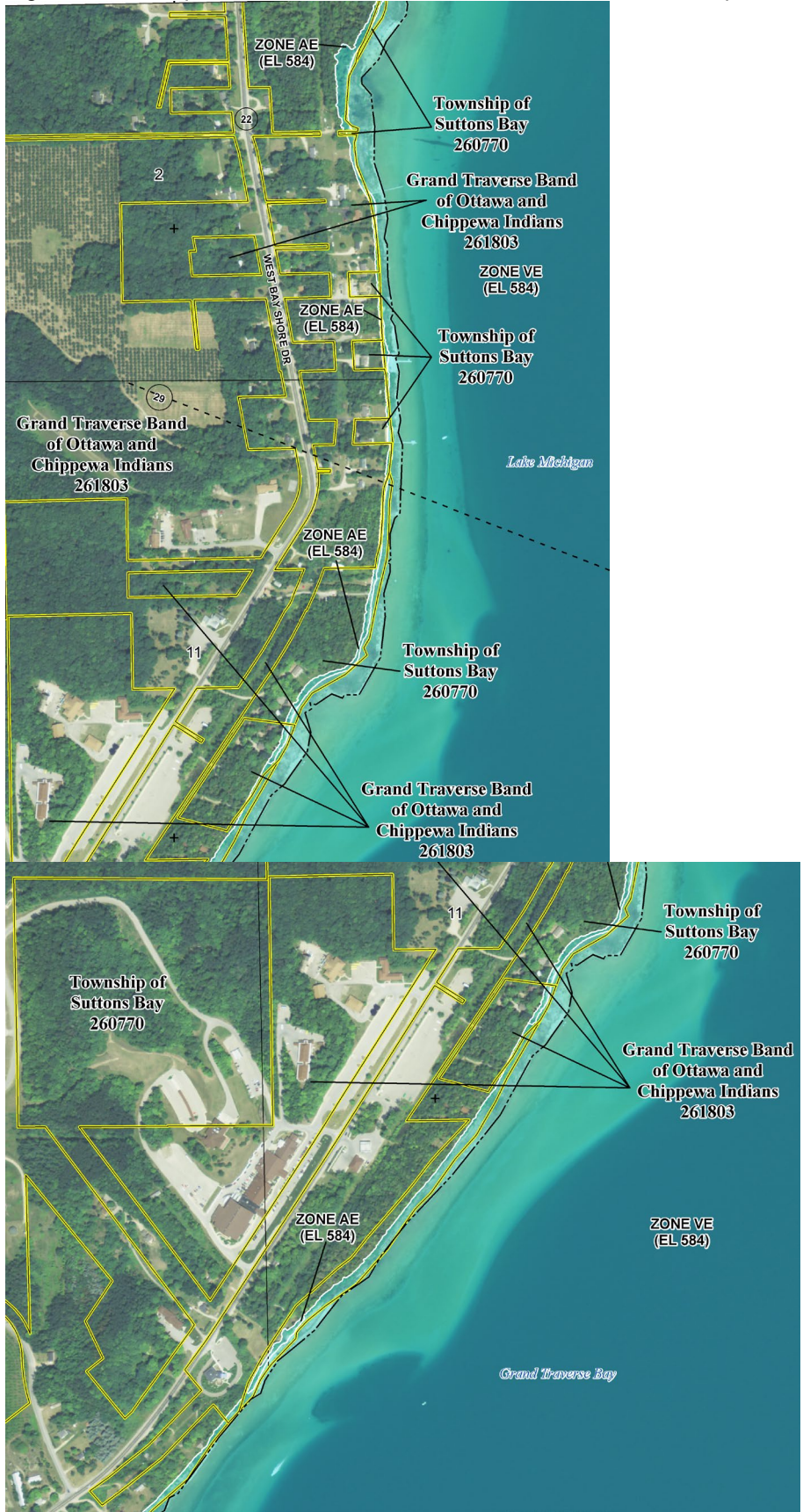
The Flood Insurance Rate Map (FIRM) panels 26089C0286E and 26089C0288E (Figures 11 and 12) for the area of Peshawbestown in Suttons Bay Township indicate that the Special Flood Hazard Area (SFHA) Zone AE is present on GTB tribal lands (that do not appear to contain any structures) adjoining the West Traverse Bay. SFHAs are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. There are other SFHAs overlapping GTB-owned lands on FIRMs in other counties (Table 29). The GTB Tribe will continue to monitor their properties and structures located in flood-prone areas.

Figure 11. Excerpt from FIRM Panel 26089C0286E, GTB Tribal Properties in Zone AE



Source: FEMA’s National Flood Hazard Layer ArcGIS Viewer <https://msc.fema.gov/nfhl>

Figure 12. Excerpts from FIRM Panel 26089C0288E, GTB Tribal Properties in Zone AE



Source: FEMA's National Flood Hazard Layer ArcGIS Viewer <https://msc.fema.gov/nfhl>

Table 28 lists available FIRMs for the communities within the GTB tribal service area. The highlighted/bolded entries in the list are communities with printed FIRMs that include lands under GTB Tribal ownership. Table 29 provides information pertaining to any overlap of flood zones and tribal-owned properties in those FIRMs (refer to the GTB Regional Service Area Map in Appendix A). Note that there are no GTB-owned properties in Manistee County.

Table 28. FEMA FIRM Information for all Counties in the GTB Service Area

CID	NFIP-Participating Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
260643#	BANKS, TOWNSHIP OF	ANTRIM	12/23/77	09/01/88	09/01/88(L)	09/01/88	No
260751	ELK RAPIDS, TOWNSHIP OF	ANTRIM			(NSFHA)	09/30/87	No
260699#	ELK RAPIDS, VILLAGE OF	ANTRIM	08/08/80	09/30/88	09/30/88(M)	09/30/88	No
260637#	MILTON, TOWNSHIP OF	ANTRIM	07/08/77	02/02/83	02/02/83	02/02/83	No
260414#	TORCH LAKE, TOWNSHIP OF	ANTRIM	05/24/74	06/16/92	01/17/97	06/16/92	No
261921	ALMIRA, TOWNSHIP OF	BENZIE				03/23/21	No
260027A	BLAINE, TOWNSHIP OF	BENZIE	09/20/74	11/20/00	03/23/21	10/21/09	No
260028A	CRYSTAL LAKE, TOWNSHIP OF	BENZIE	08/16/74	06/19/89	03/23/21	06/19/89	No
260029A	FRANKFORT, CITY OF	BENZIE	05/31/74	03/18/91	03/23/21	03/18/91	No
261920A	GILMORE, TOWNSHIP OF	BENZIE		03/23/21	03/23/21	04/28/21	No
260030A	LAKE, TOWNSHIP OF	BENZIE	01/03/75	06/05/89	03/23/21	06/05/89	No
260796B	BAY, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	09/18/87	No
260056C	BOYNE CITY, CITY OF	CHARLEVOIX	03/29/74	07/19/82	05/16/19	07/19/82	No
260057B	CHARLEVOIX, CITY OF	CHARLEVOIX	06/07/74	02/11/83	09/15/22	02/11/83	No
260790B	CHARLEVOIX, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	09/18/87	No
260372C	EAST JORDAN, CITY OF	CHARLEVOIX	07/11/75	07/19/82	05/16/19	07/19/82	No
260800B	EVANGELINE, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	09/18/87	No
260773B	EVELINE, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	09/18/87	No
260778B	HAYES, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	09/18/87	No
261295C	MELROSE, TOWNSHIP OF	CHARLEVOIX		05/16/19	05/16/19(M)	08/28/19	No
260769B	NORWOOD, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	09/18/87	No
261296B	PEAINE, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	11/01/19	No
260761C	SOUTH ARM, TOWNSHIP OF	CHARLEVOIX		05/16/19	05/16/19	03/18/87	No
261297B	ST. JAMES, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	08/28/19	No
261298C	WILSON, TOWNSHIP OF	CHARLEVOIX		05/16/19	(NSFHA)	11/18/19	No
260749B	ACME, TOWNSHIP OF	GRAND TRAVERSE		08/28/18	04/19/23	12/18/86	No
260780B	BLAIR, TOWNSHIP OF	GRAND TRAVERSE		08/28/18	04/19/23(M)	01/06/88	No
260746B	EAST BAY, CHARTER TOWNSHIP OF	GRAND TRAVERSE		08/28/18	04/19/23	12/18/86	No
260753B	GARFIELD, CHARTER TOWNSHIP OF	GRAND TRAVERSE		08/28/18	04/19/23(M)	12/18/86	No
260782B	LONG LAKE, TOWNSHIP OF	GRAND TRAVERSE		09/30/88	08/28/18(M)	09/30/88	No
260830B	PARADISE, TOWNSHIP OF	GRAND TRAVERSE		05/04/92	04/19/23(M)	05/04/92	No
260747B	PENINSULA, TOWNSHIP OF	GRAND TRAVERSE		08/28/18	04/19/23	12/18/86	No
260794B	WHITWATER, TOWNSHIP OF	GRAND TRAVERSE		09/30/88	04/19/23(M)	09/30/88	No
260082B	TRAVERSE CITY, CITY OF	LEELANAU /GRAND TRAVERSE	05/24/74	12/15/82	06/07/23	12/15/82	No
260772B	BINGHAM, TOWNSHIP OF	LEELANAU		08/28/18	06/07/23	09/18/87	No
260625B	CENTERVILLE, TOWNSHIP OF	LEELANAU	03/18/77	02/01/86	06/07/23	02/01/86	No
260302B	CLEVELAND, TOWNSHIP OF	LEELANAU	02/21/75	09/01/86	06/07/23	09/01/86	No
260113B	ELMWOOD, CHARTER TOWNSHIP OF	LEELANAU	9/20/74	02/02/83	06/07/23	02/02/83	No
260765B	EMPIRE, TOWNSHIP OF	LEELANAU		08/28/18	06/07/23	09/04/86	No
260605B	EMPIRE, VILLAGE OF	LEELANAU		08/28/18	06/07/23	11/15/85	No
260604B	GLEN ARBOR, TOWNSHIP OF	LEELANAU	12/30/77	09/01/86	06/07/23	09/01/86	No
260114B	LEELANAU, TOWNSHIP OF	LEELANAU	12/06/74	04/02/86	06/07/23	04/02/86	No
260760B	LELAND, TOWNSHIP OF	LEELANAU		08/28/18	06/07/23	03/18/87	No
260580B	NORTHPORT, VILLAGE OF	LEELANAU	10/28/77	03/02/89	06/07/23	03/02/89	No
261510B	SOLON, TOWNSHIP OF	LEELANAU		08/28/18	08/28/18	10/01/18	No

260770B	SUTTONS BAY, TOWNSHIP OF	LEELANAU		08/28/18	06/07/23	04/03/87	No
260283B	SUTTONS BAY, VILLAGE OF	LEELANAU	06/28/74	06/01/77	06/07/23	06/01/77	No
260306A	ARCADIA, TOWNSHIP OF	MANISTEE	01/31/75	09/01/86	06/02/21	09/01/86	No
260130A	FILER, CHARTER TOWNSHIP OF	MANISTEE	11/26/76	07/01/91	06/02/21	07/01/91	No
260131A	MANISTEE, CITY OF	MANISTEE	05/24/74	03/18/87	06/02/21	03/18/87	No
260132A	MANISTEE, TOWNSHIP OF	MANISTEE	05/14/76	11/15/89	06/02/21	11/15/89	No
260276A	ONEKAMA, TOWNSHIP OF	MANISTEE	06/28/74	05/01/78	06/02/21	05/01/78	No
261935A	ONEKAMA, VILLAGE OF	MANISTEE		06/02/21	06/02/21	05/25/21	No
260801A	STRONACH, TOWNSHIP OF	MANISTEE		09/30/88	06/02/21	09/30/88	No
CID	Non-NFIP Participating Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Sanction Date	Tribal
260553A	ELBERTA, VILLAGE OF	BENZIE COUNTY	09/19/75	03/23/21	03/23/21	09/19/76	No
261292C	BOYNE VALLEY, TOWNSHIP OF	CHARLEVOIX		05/16/19	05/16/19	05/16/20	No
260808B	MARION, TOWNSHIP OF	CHARLEVOIX		05/16/19	09/15/22	05/16/19(S)	No
261877B	GREEN LAKE, TOWNSHIP OF	GRAND TRAVERSE		08/28/18	08/28/18	08/28/19	No
261878B	KINGSLEY, VILLAGE OF	GRAND TRAVERSE		08/28/18	08/28/18	08/28/19	No
260805B	UNION, TOWNSHIP OF	GRAND TRAVERSE		09/30/88	08/28/18	08/29/18(S)	No
261934A	EASTLAKE, VILLAGE OF	MANISTEE		06/02/21	06/02/21	06/02/22	No

Sources: FEMA Community Status Book Report; FEMA Flood Map Service Center <https://msc.fema.gov/portal/home>

Note: Communities shown in **BOLD** font contain GTB Tribal-owned property

Table 29. Printed FIRM Panels Containing GTB Tribal-Owned Lands

County	Community	FIRM Panel #	Effective Date	Corresponding Inset # on GTB Regional Service Area Map	Description of Tribal Properties in a Flood Hazard Zone
Antrim	Milton Township	2606370015B and 2606370020B	2/1/1983	#13 and #14	Not in a SFHA; area is outside limits of FEMA Flood Study
Benzie	Village of Elberta	26019C0201C	3/22/2021	#5	GTB parcels along Bestie Lake in the Village are within or adjoining Zone AE; no structures.
Charlevoix	Evangeline Township	26029C0525C	5/15/2019	#19	Not in a SFHA; area is outside limits of FEMA Flood Study
Charlevoix	St. James Township	26029C0157D	9/14/2022	#21	Portions of GTB docks in St. James Harbor are located in Zones AE and VE.
Grand Traverse	Acme Township	26055C0119D	4/19/2023	#11	Some areas in Zone AE (1% annual chance flood hazard) and the 0.2% annual chance flood hazard zone along East Grand Traverse Bay. No buildings in these areas.
Grand Traverse	East Bay Charter Township	26055C0118D and 26055C0231D	4/19/2023	#9	Waterfront parcel along East Grand Traverse Bay; contains outlet of East Branch Mitchell Creek; portions are in Flood Zones AE and VE. There is a structure on the west end of the parcel (at 865 Munson Ave.) in the 0.2% annual chance flood hazard zone.
Grand Traverse	Garfield Charter Township	26055C0225C	8/27/2018	#8	Not in a SFHA; area is outside limits of FEMA Flood Study
Grand Traverse	Whitewater Township	26055C0150D	4/18/2023	#12	Small portion of undeveloped land in Zone A SFHA, located east of the Turtle Creek Casino and Resort
Grand Traverse	City of Traverse City	26055C0231D	4/18/2023	#10	Not in a SFHA; area is outside limits of FEMA Flood Study
Leelanau	Leelanau Township	26089C0256E and 26089C0257D	6/7/2023 and 8/28/2018	#1	Not in a SFHA; area is outside limits of FEMA Flood Study
Leelanau	Suttons Bay Township	26089C0286E, 26089C0288E	6/7/2023	#3	Some areas of tribal land are in Zone AE or VE along coast of West Grand Traverse Bay; no structures in these zones.
Leelanau	Suttons Bay Township	26089C0269E, 26089C0270E	6/7/2023	#3	Not in a SFHA; area is outside limits of FEMA Flood Study

Sources: FEMA Flood Map Service Center <https://msc.fema.gov/portal/home>; GTB Regional Service Area Map, 2020

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. The entire GTB tribal service area is susceptible to lightning events.

Extent

The impacts of lightning events can be measured in impacts such as deaths, injuries and property damage. A lightning event in 2007 in Solon Township, Leelanau County caused \$40,000 in property damage when lightning struck a residential garage. Other property damages, ranging from \$5,000 to \$125,000, have occurred from lightning strikes to residential or commercial structures in the GTB tribal service area outside of Leelanau County (Table 30). Lightning events in the GTB tribal service area are also associated with two deaths and one injury.

Previous Occurrences

There have been two lightning events reported to NOAA for Leelanau County, with no associated deaths or injuries. Table 30 is a record of lightning events in the GTB tribal service area. Grand Traverse County (the most urbanized county in the region) has the greatest number of lightning incidents and impacts.

Table 30. Lightning Events in GTB Tribal Service Area

County	Community	Date	Deaths	Injuries	Property Damage	Event Details
Antrim, Benzie, Charlevoix, Grand Traverse, Leelanau, Manistee	Countywide	9/1/2000	1	0	\$0	Lightning associated with several thunderstorms moving over the region that night was nearly continuous. 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.
Antrim	Ellsworth	6/18/2012	0	0	\$80,000	Lightning struck a home in Banks Township, igniting a fire that destroyed the home.
Grand Traverse	Countywide	3/8/2000	0	0	\$20,000	Lightning sparked a huge explosion at a Northern Michigan Oil Company. The explosion happened at KCS Oil Company in Blair Township. More than 70 fire fighters from seven fire departments rushed to the scene. Fire fighters believe the lightning bolt struck an oil tank holding more than four hundred gallons of residue oil in it. Crews evacuated nearby houses and contained the fire, thereby preventing it from spreading to other tanks.
	Traverse City	9/1/2000	1	1	\$0	One man was killed by the lightning 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. Emergency crews performed CPR on the father immediately and a police officer arrived quickly with a defibrillator. However, attempts to revive the man failed.
	Traverse City	9/1/2000	0	0	\$20,000	Lightning struck the garage of a residential home and set it on fire.

	Old Mission	4/18/2002	0	0	\$125,000	Home destroyed by fire caused by lightning strike.
	Williamsburg	7/17/2006	0	0	\$5,000	Home damaged by lightning strike.
Leelanau	Solon Township	8/12/2007	0	0	\$40,000	A small cluster of thunderstorms produced severe weather in Leelanau County. A lightning strike ignited a fire, which destroyed a three-car garage and a boat that was inside, and melted vinyl siding on an adjacent home.
Manistee	High Bridge	9/6/2016	1	0	\$0	A Texas man was struck and killed by lightning while on the North Country Trail in Dickson Township.

Source: NOAA National Centers for Environmental Information

Probability of Future Events and Vulnerability Assessment

There have been two impactful lightning events reported in the last 23 years for Leelanau County. This indicates there is an 8.7% chance of an impactful lightning strike occurring in a given year in that county. However, it is assumed that not all lightning events are recorded with NOAA since events with injuries, deaths, and extensive damages tend to be the only ones reported. Therefore, the number of lightning events and damages may be higher.

Grand Traverse County has the most impactful lightning events compared to other counties in the GTB service region; this may be associated with the fact that Grand Traverse County is the most urbanized and populated county in the region.

Vegetation (especially in dry soils), buildings and infrastructure are at risk from lightning events. Lightning strikes can cause structural and wildland fires, loss of electrical and telecommunications equipment, and damage to buildings or vehicles from falling trees struck by lightning. People that work outside or participate in outdoor recreation activities are also at a higher risk to be struck by lightning. Every community in the GTB service area has a variety of outdoor recreation areas.

Tornado

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

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

Between 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 Leelanau County and the GTB service area are at risk from tornadoes. 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 Vulnerable Populations and Hazard Areas Map in Appendix A.

Extent

The Fujita Scale (Table 31) categorizes tornado severity based on observed damage. The six-step scale ranges from F0 (light damage) to F5 (incredible damage). As of February 2007, the National Weather Service uses the Enhanced Fujita Scale (EF Scale). This new scale ranges from EF0 to EF5. Based on the Fujita Scale, Leelanau County's most damaging tornado occurred on August 15, 1978; wind speeds are unknown. It caused no injuries or deaths, but \$250,000 in property damages.

The April 3, 1956 tornado (an F4 magnitude) incident impacted Benzie, Grand Traverse, and Manistee counties, resulting a total of 2 deaths, 24 injuries and \$750,000 in property damages.

Table 31. 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

Between 1977 and 2022, Leelanau County has had three tornadoes touch down, causing a reported \$295,000 in property damage (Table 32). As a result of these tornadoes, there were no deaths, no injuries, and no reported crop damage. The tornado event on August 15, 1978 caused \$250,000 in damage, the most destructive of the three. The tornado touched down in Suttons Bay Township and proceeded northeast into Peshawbestown across E. McKeese Road. The NOAA event narrative is as follows: *A tornado touched down on M-22, south of Leland, and skipped ENE damaging four homes and two mobile homes and blocking roads with felled trees. Most of the damaged homes were on Dumas Road. Many small boats on Lake Leelanau broke loose from their moorings with several sail boats capsizing.*

Table 32. Tornado Events in the GTB Tribal Service Area

COUNTY	BEGIN LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
Antrim	ANTRIM CO.	7/16/1958	F1	0	0	\$30
	ANTRIM CO.	7/3/1974	F3	0	2	\$250,000
	ANTRIM CO.	7/31/1977	F2	0	0	\$250
	ANTRIM CO.	9/7/1985	F1	0	0	\$0
	ANTRIM CO.	7/8/1990	F1	0	0	\$0
	Elk Rapids	8/4/1995	F0	0	0	\$0
	TORCH LAKE	5/31/1998	F0	0	0	\$0
	ALDEN	7/10/2007	EF0	0	0	\$4,000
	KEWADIN	8/3/2017	EF0	0	0	\$55,000
	ALBA	8/28/2018	EF0	0	0	\$80,000
	ALBA	5/20/2022	EF1	0	0	\$175,000
Benzie	BENZIE CO.	4/3/1956	F4	2	24	\$250,000
	BENZIE CO.	7/21/1983	F1	0	0	\$250
	BENZIE CO.	6/26/1986	F1	0	0	\$2,500
	BENZIE CO.	10/15/1989	F1	0	0	\$25,000
Charlevoix	Boyne Valley Township	6/19/1955	F1	0	0	\$2,500
	Boyne Valley Township	7/31/1977	F2	0	0	\$250
	Wilson Township	8/21/1989	F0	0	0	\$250
	Wilson Township/City of Boyne City	8/1/2002	F1	0	0	\$0
Grand Traverse	GRAND TRAVERSE CO.	4/3/1956	F4	0	0	\$250,000
	GRAND TRAVERSE CO.	9/13/1961	F2	0	0	\$25,000
	GRAND TRAVERSE CO.	5/8/1964	F2	0	0	\$250,000
	GRAND TRAVERSE CO.	6/26/1969	F3	0	0	\$250,000
Leelanau	Glen Arbor Township	7/31/1977	F1	0	0	\$25,000
	Suttons Bay Township	8/15/1978		0	0	\$250,000
	Leland Township	6/22/2011	EF0	0	0	\$20,000
Manistee	MANISTEE CO.	4/3/1956	F4	0	0	\$250,000
	Stronach Township	6/12/2008	EF0	0	0	\$15,000
Totals				2	26	\$2,180,030

Source: NOAA - National Centers for Environmental Information

Probability of Future Events and Vulnerability Assessment

There have been three tornadoes events reported in the last 46 years in Leelanau County, which equates to a 6.5% chance that a tornado would occur in a future year in that county. Antrim County has had the greatest number of tornadoes (11), with Manistee County having the fewest (2).

While the chance for a tornado is low, if a tornado did occur, it would could cause significant impact to people and property, particularly in the highly developed areas of Grand Traverse and Leelanau counties. Persons with a disability, elderly persons, and those in campgrounds and mobile homes are also more vulnerable. Tornadoes can occur suddenly with very little warning, and it may be difficult for these populations to find adequate shelter in a hurry.

The GTB Department of Emergency Management offers GTB members the ability to sign up for “Regroup” emergency alert system, which allows members to receive SMS, email and voice emergency alerts. Leelanau County currently utilizes the “Rave” 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. Additionally, there are severe weather warning sirens located at fire stations throughout Leelanau County (Suttons Bay, Leland, Elmwood, Northport, Cedar, and Glen Lake), as well as one in Peshawbestown near the Pow-Wow grounds that serve as audible tornado warning systems. The Leelanau County Emergency Management Office Dispatch Center conducts monthly tests on the sirens from April 1st to October 1st every year. Annual community notifications of siren tests are placed in the GTB newsletter in March and October. The GTB Tribal Government conducts annual tornado, inclement weather and fire drills.

The new Herkner Road residential development on GTB land in Garfield Township, Grand Traverse County, is expected to be completed in 2024 with up to 193 residential units; some of those units will have basements; some will be constructed as slab-on-grade. With the expected increase in GTB residents in this area, a tornado mitigation strategy is to utilize the Community Center that will be built as part of the development as a designated storm shelter for residents.

In 2008, the GTB completed construction on six underground severe storm “safe rooms” (shelters) located on tribal lands in the counties of Leelanau, Antrim, Benzie and Charlevoix (Table 33). This \$76,800 project, funded in part by a FEMA hazard mitigation project grant, provides protection for 192 individuals. Each shelter can accommodate approximately 24 people. That number may be reduced, depending on pets or belongings carried. The shelters were designed and installed for the safety and protection of residents without basements in their homes during severe storms and tornadoes. The six shelters are located in close proximity to tribal residences, community centers, and recreational areas.

The shelters were prefabricated and lowered into excavated areas. The units were then covered with dirt, graded and planted with grass to stabilize the soil and blend the site into the surrounding landscape. The only noticeable features are the ingress and egress hatch and the ventilation nubs (see Figure 13). For this reason, signs have been installed advising residents of the location and operation of the shelters. Public meetings and instructional sessions were also held by the tribal fire department to advise residents of the locations and operation of the shelters and how to react during periods of severe weather. These public education sessions also stressed the need for each household to have an emergency kit readily available within their home that they could take with them to the designated shelter. This eliminates the need to stock large quantities of supplies within the shelters. The shelters are open during the severe weather months (April 1 to September 30) and are locked for the remainder of the year.

This project provided a unique and economical solution to the problem of providing shelter from severe weather for tribal members without basements or other adequate forms of protection. In addition, locating the shelters near areas where large numbers of people are likely to gather during the spring and summer months for tribal and/or recreational activities also maximizes the level of protection provided.

Table 33. GTB Severe Weather “Safe Room” Locations

#	Tornado Shelter	Location	Address	County
1	Elder’s Complex	West side of Elder’s Complex (behind complex)	11201 Ki-Dah-Keh Road – behind	Leelanau
2	Elder’s Complex	East side of Elder’s Complex (near cul-de-sac in front)	11201 Ki-Dah-Keh Road – front	Leelanau
3	Peshawbestown	Peshawbestown Road, near the Natural Resources weather monitoring station	2809 NW Bay Shore Drive	Leelanau
4	Antrim	Near playground area	Wiingash-Mi-kun, Rapid City	Antrim
5	Benzie	Near Pow-Wow grounds at the Benzie Satellite Office	7282 Hoadley Rd., Benzonia	Benzie
6	Charlevoix	Near playground area at the Charlevoix Satellite Office	10085 Wa-Ba-Noong Mi-Kun, East Jordan	Charlevoix

Source: GTB Emergency Management

Figure 13. GTB Storm Shelter Entrance in Benzie County



Source: *Michigan Hazard Mitigation Success Stories – October 2020*, Michigan State Police

Leelanau County Office of Emergency Management maintains contracts with six local fire stations and seven other facilities in the county so that they may be utilized as temporary shelters in the event of an emergency. A full list of temporary shelter locations is included in the Mitigation Strategies section of this plan. Additionally, the American Red Cross can set up temporary shelters within 12-24 hours after an emergency event occurs; usually this is done within an existing structure. Private and religious facilities, as well as local libraries, have been utilized during regular hours for temporary shelters to be used during the day. There are no homeless shelters located within Leelanau County.

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.

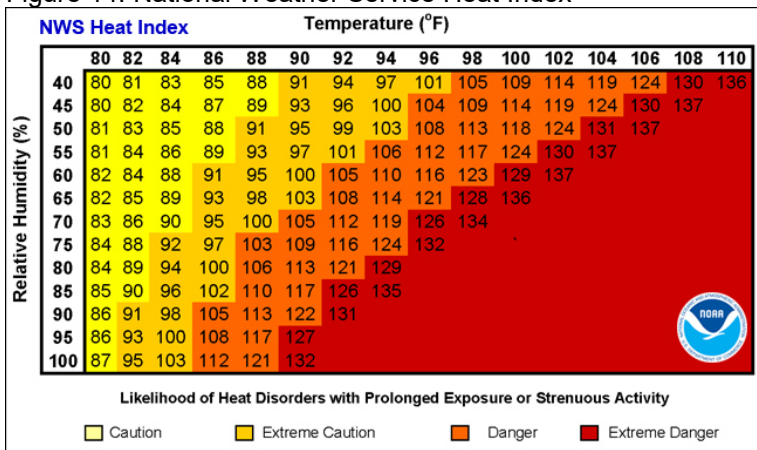
According to the 2019 Michigan Hazard Mitigation Plan, Michigan has 11 average annual extreme heat events with 0.4 average annual deaths and 41 average annual injuries.

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 14). 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.

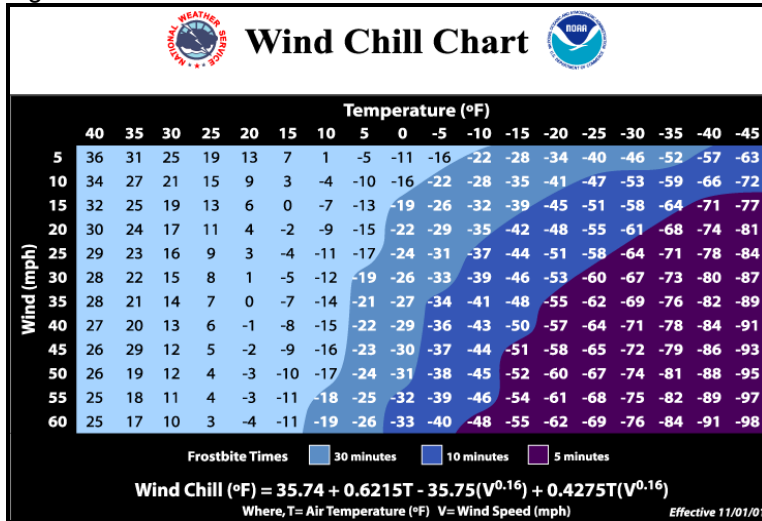
Figure 14: National Weather Service Heat Index



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

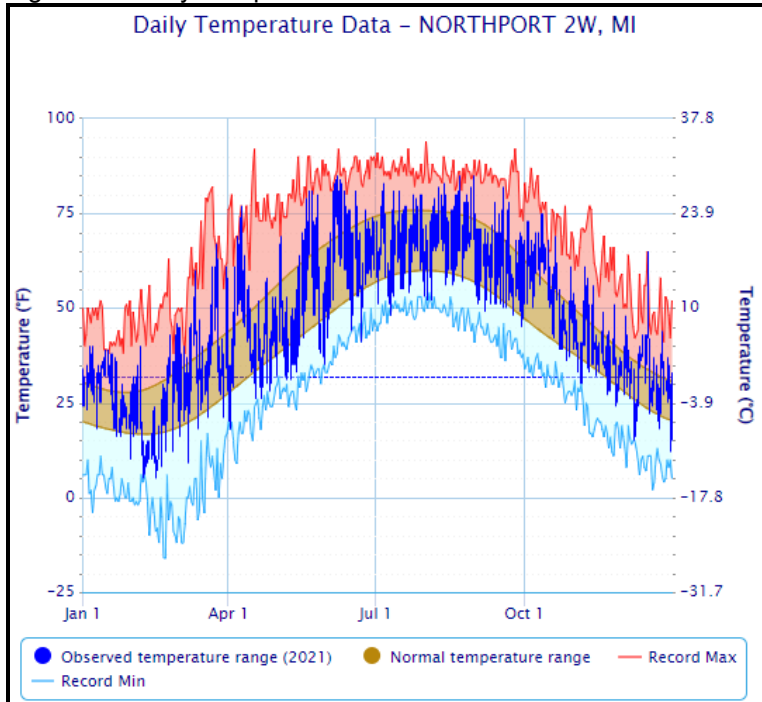
Figure 15: National Weather Service Wind Chill Chart



Source: National Weather Service

Figure 16 illustrates the observed temperatures in Northport 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.

Figure 16: 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 Leelanau County and the GTB service area are at risk from extreme temperature events.

Previous Occurrences

The counties within the GTB tribal service area have had two extreme heat events, in 2001 and 2018 (Table 34). The events were not associated with any reported deaths, injuries, or property/crop damages. The events consisted of hot and humid conditions that caused outdoor events to be modified and attendance at outdoor events to be lower than normal.

The counties within the GTB tribal service area have each experienced extreme cold incidents (Table 34). There have been three extreme cold events reported for Leelanau County, which included one death. Charlevoix County experienced an underground freeze in 1993-94 (part of a Presidential major disaster) as well as a Governor-declared emergency for deep frost in 2015. A Governor-declared emergency for extreme cold in the State was enacted in 2019.

Table 34. Extreme Heat and Extreme Cold Events, GTB Tribal Service Area

Event	Event Description	Antrim	Benzie	Charlevoix	Grand Traverse	Leelanau	Manistee
12/1993 - 5/1994 Presidential Major Disaster for Underground Freeze				X			
8/1/2001 Extreme Heat	Excessive Heat was 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.	X	X	X	X	X	X
2/4/2007 Extreme Cold/Wind Chill	High temperatures on the 4th 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 extreme cold and poor road conditions.	X	X	X	X	X	X
2/10/2008 Extreme Cold/Wind Chill	Polar air surged into the region behind the departing system, dropping temperatures to around zero. In Leland, an 87-year-old male Alzheimers patient was found dead five blocks from his home on the morning of the 10 th , dying from exposure to the cold. Several schools were closed on the 11th as the clean-up was still underway.					X (1 death)	
1/6/2014 Extreme Cold/Wind Chill	One of the most brutal cold air outbreaks in recent memory - the coldest since at least January 1994 - plunged into the Great Lakes region. 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. As a result, school closings were widespread across northern Michigan on the 7 th .						X
2/13/2015 Governor-Declared Emergency for Deep Frost; 2/14/2015 Extreme Cold/Wind Chill	The coldest air of the winter so far surged in behind the cold front, along with gusty northwest winds and lake effect snow. Considerable snowfall, blowing and drifting snow, and low wind chills were realized in northwest lower Michigan. Across the rest of northern Michigan, away from the temperature-mitigating effects of Lake Michigan, wind chills reached warning criteria; 30 to 40 below zero in the morning of the 15th.			X			
2/19/2015 Extreme Cold/Wind Chill	The second blast of extremely cold air into northern Michigan in about a week. 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.				X		
6/30/2018 Excessive Heat	Highs were well into the 90s, including 98 at Traverse City and Gaylord. The NWS office near Gaylord hit 98; that was the warmest reading recorded at that location since observations began there in the late 1990s.	X	X	X	X	X	X
1/29/2019 Extreme Cold Statewide Governor-Declared Emergency	Wind chills of 15 to 30 below zero were common in northern lower Michigan.	X	X	X	X	X	X

Sources: NOAA NCEI Storm Events Database; MSP's 2018 *Michigan Hazard Analysis*

Probability of Future Events and Vulnerability Assessment

There have been two extreme heat events on record with NOAA in Leelanau County over the past 22 years: one in 2001 and one 2018. This indicates that there is 9% chance of another extreme heat event occurring in a given year in Leelanau County.

Every county in the GTB tribal service area has experienced between two and four extreme cold events over the past three decades. Charlevoix County in particular has had deep frost and underground freeze emergency events. However, 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 there may have been more extreme cold events in the county.

Extreme heat and cold events are more likely to impact unsheltered populations, such as the homeless population and people working or recreating outside. Seasonal Emergency Shelters such as Safe Harbor (Grand Traverse County) are essential services for the community. Also, the Leelanau County Office of Emergency Management maintains contracts with six local fire stations and seven other facilities in the county so that they may be utilized as temporary heating or cooling shelters in the event of an extreme heat or extreme cold emergency. A full list of temporary shelter locations is included in the Mitigation Strategies section of this plan.

The *Northwest Lower Michigan Coastal Resilience Atlas*, written by the Land Information Access Association (LIAA), includes a Heat Vulnerability Assessment⁶ of Lake Michigan coastal communities. A community's vulnerability is defined as their exposure to the hazard (determined by tree canopy and impervious surface coverage) + their sensitivity. Sensitivity is determined by the following factors:

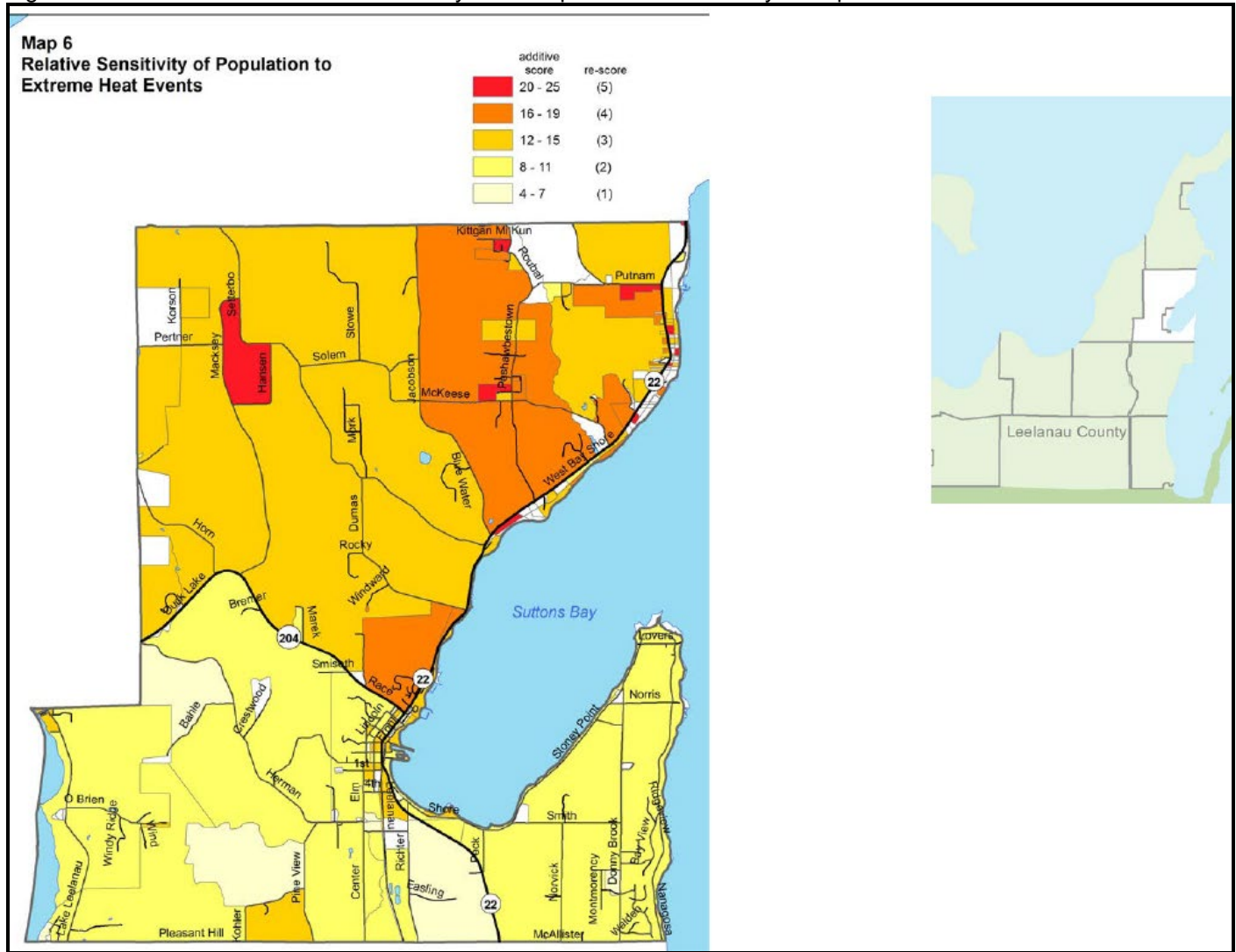
- Persons > 65 years
- Persons living alone
- Minority (non-white) persons
- Persons living below the poverty threshold
- People > age 25 with less than a high school education
- Disability status (i.e., ambulatory difficulty, mental disability)

Figure 17 indicates the Relative Sensitivity of the Population to Extreme Heat Events in Suttons Bay Township. Note that several areas in Peshawbestown score in the higher ratings for relative sensitivity to extreme heat events.

Anecdotally, emergency personnel see more fatalities during extreme temperature events. Vulnerable populations may not be able to find or access heating or cooling stations or are able to communicate their needs. In addition to human vulnerability to extreme temperatures, because heat is an additive, there are also environmental concerns when heat increases the risk of wildfire and drought.

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

Figure 17: Peshawbestown and Suttons Bay Township Relative Sensitivity of Population to Extreme Heat Events



Source: LIAA Northwest Lower Michigan Coastal Resilience Atlas, page 913

Feedback from April 2022 Input Session regarding Extreme Temperatures:

- GTB has the following groundwater wells that could be affected by excessive water usage during extreme heat or a drought: 3 at Turtle Creek Casino (Grand Traverse County); 3 in Peshawbestown; 2 at Grand Traverse Resort (Grand Traverse County); 2 for farmland irrigation use
- Crop and livestock impacts on agricultural properties
- Strain on power grid from high power demand from air conditioning use
- Provide shelters and welfare checks for vulnerable populations

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 loss; affects domestic water supply, energy production, public health, and wildlife; and contributes to wildfire risk.

Location

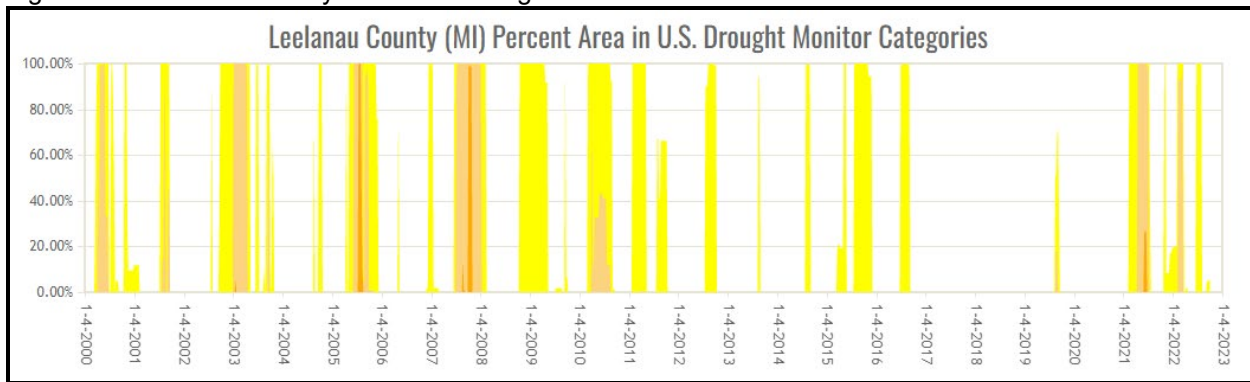
Drought is a regional event that is not confined to geographic boundaries and ranges in severity across the affected areas. All of Leelanau County and the GTB lands are at risk from drought.

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 18) 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 19).

Figure 18: Leelanau County Historical Drought Levels



Source: US Drought Monitor

Figure 19: 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

A Presidential-declared emergency was enacted in 1977 for drought in 44 Michigan counties, including those in the northwestern Lower Peninsula. Other drought events in the GTB tribal service area are listed in Table 35. No deaths, injuries, or damages are associated with these drought events.

Table 35. Drought Events in the GTB Tribal Service Area

Date	County	Event Description
8/1/2001 to 8/9/2001	Antrim, Grand Traverse, Leelanau	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.
8/28/2007 to 8/31/2007	Charlevoix	Drought conditions (severe, D2) expanded into the tip of Northern Michigan by the end of August. This was the result of a dry summer in the region. The dryness dated as far back as May, when only 1.09 inches of rain fell in Pellston. June rainfall was 1.92 inches. July rainfall was near normal and brought some respite, but August saw just 1.21 inches of rain at Pellston. A ban on burning was issued for most of the state in mid-August, the first such ban since 1998. Golf courses and farmers complained of very high utility bills, due to the need for near-constant irrigation. Corn and bean crops were severely impacted. Rains in September would partially alleviate drought conditions for a spell.
9/1/2007 to 9/3/2007	Charlevoix	Drought conditions (severe, or D2), which carried over from August, eased thanks to wet weather early in the month. Charlevoix County was removed from severe drought when around an inch of rain fell from the 3rd into the 4th.

Probability of Future Events and Vulnerability Assessment

Based on historic drought events on record dating back to 1977, the risk of an impactful drought event in the GTB tribal service area is relatively low. Drought can adversely impact residential water sources when well levels decline, agriculture including both crops and livestock, and some tourism and recreational enterprises. Even drought events in category D1 experience water well level decline. Drought events combined with excessive heat can have severe impacts on elderly and low income people.

Leelanau County’s economy is highly dependent on agriculture and agri-tourism. Drought may cause the following damages to crops and pastures:

- Agricultural production losses: crop failure and pasture losses
- Decreased water availability: water depletion from soils causes significant decline in crops and livestock productivity
- Pests and diseases: drought, coupled with high temperatures, may expand the distribution and incidence of pests and diseases that affect crops, forage, and livestock.
- Damage to specialty crops: most specialty crops (such as fruits, vegetables, tree nuts, and medicinal herbs) are more vulnerable to drought than field crops and have higher value per unit of land/water.

Interruption in agriculture production can also cause a drop in income, which impacts other economic sectors.

The biggest problem drought presents, however, is the increased threat of wildfire. Western and southern portions of Leelanau County (Cleveland Township, Empire Township, and Glen Arbor Township) are heavily forested and are therefore highly vulnerable to drought-related wildfire threats.

Input from April 2022 Input Session Regarding Drought:

- GTB has the following groundwater wells that could be affected by excessive water usage during extreme heat or a drought:
 - 3 at Turtle Creek Casino (Grand Traverse County)
 - 3 in Peshawbestown
 - 2 at Grand Traverse Resort (Grand Traverse County)
 - 2 for farmland irrigation use
- Crop and livestock impacts on agricultural properties

Wildfire

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

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

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

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

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

Location

All GTB lands and developed areas are vulnerable to wildfires, as land development continues to interface with the high risk forest types (e.g. Red Pine, Eastern White Pine, and Jack Pine). Over 105,000 acres, or 41%, of Leelanau County is forested. Jack Pine forests make up 645 acres of forested land while Red Pine makes up 13,083 acres, and Eastern White Pine makes up 1,062 acres. As shown on the Environmental Features Map in Appendix A, Jack Pine forests are minimal, located primarily in Leland, Leelanau, Glen Arbor, Cleveland, Solon, Bingham, and Elmwood Townships. Red Pine and Eastern White Pine forests are located countywide.

Extent and Previous Occurrences

Extent can be measured by the number of acres burned and the cost of property damage. Between 1996 and 2017 there were no wildfires reported outside of MDNR lands in Leelanau County. Between 1981 and 2018 there were 60 reported fires on lands under MDNR jurisdiction. This resulted in 267.6 acres burned and 7 acres burned per year. No property damages were recorded. Leelanau County has the fewest total number wildfires and acres burned on MDNR lands in the GTB tribal service area between 1981 and 2018 (Table 36), while Grand Traverse County has the greatest.

Table 36. Wildfire Data for MDNR Lands in GTB Tribal Service Area, 1981-2018

County	Total Wildfires	Total Acres Burned	Avg. Acres Burned/Yr.	Avg. Wildfires/Yr.
Antrim	256	285.3	7.5	6.7
Benzie	184	396.8	10.4	4.8
Charlevoix	173	522.2	13.7	4.6
Grand Traverse	435	1,484.2	39.1	11.4
Leelanau	60	267.6	7	1.6
Manistee	54	1,070.7	28.2	28.2

Source: MSP's 2018 Michigan Hazard Analysis

Probability of Future Events and Vulnerability Assessment

There is a 100% chance there will be a wildfire on MDNR lands in a future year, and a small chance there will be a wildfire on lands outside of MDNR jurisdiction in a future year. Forest types (Red Pine, Eastern White Pine, and Jack Pine) within Leelanau County are susceptible to wildfires. Western and southern portions of Leelanau County (Cleveland Township, Centerville Township, Empire Township, and Glen Arbor Township) are heavily forested and are therefore highly vulnerable to wildfire threats. Other counties in the GTB tribal service area that have concentrated areas of pine forest include the east/southeast portions of Antrim County, and much of Grand Traverse and Manistee Counties (refer to hazard maps in Appendix A).

Additional factors that increase fire risk include dead or dying Ash trees as a result of disease/invasive species, invasive species itself, lightning strikes, and human factors such as the number of persons residing, camping, or traveling through the County. Historically, Michigan's landscape has been shaped by wildfire; however, over the last several decades, the current landscape has transformed from wildland to residential development. With the increase in residential development in and around rural areas prone to wildfires, there is an increase in the potential for loss of life and property damage. 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 Leelanau 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. Concentrations of GTB member households that are located near pine forests and specific fire hazard areas (based on previous wildfire events) are identified on the Vulnerable Populations and Hazard Areas Map in Appendix A.

Comments from April 2022 Input Session related to Wildfire Concern Areas on GTB property:

- Putnam Road, east of Peshawbestown Rd., where the Natural Resources building, Fire Station and residences are located.

Coastal Hazards – Coastal Recession and Shoreline Flooding

Coastal recession (erosion) is the wearing away of land, such as loss of riverbank, beach, shoreline, or dune material. It is measured as the rate of change in the position or displacement of a riverbank or shoreline over a period of time. Short-term erosion typically results from periodic natural events, such as flooding, hurricanes, storm surge, and windstorms, but may be intensified by human activities. Long-term erosion is a result of multi-year impacts such as repetitive flooding, wave action, sea level rise, sediment loss, subsidence, and climate change. Death and injury are not typically associated with erosion; however, it can destroy buildings and infrastructure. Waters of the Great Lakes may cause shoreline hazards to occur making the entire northwest Michigan coastline is susceptible to shoreline hazards. As indicated in Figure 20, large portions of the Lake Michigan shoreline throughout west Michigan are identified as “High Risk Erosion Areas in 2019.”

Coastal (shoreline) flooding results when Great Lakes water levels rise and push inland, or when rainfall or snowmelt accumulates along the shoreline and is not able to drain properly. Shoreline flooding may also be caused during storms and wind events with high-energy waves.

The entire northwest Michigan coastline is susceptible to shoreline hazards.

Figure 20: Great Lakes Shorelines with High Risk Erosion Areas, 2019



Location

To reference the 2019 *Northwest Lower Michigan Coastal Resilience Atlas*, “Climate scientists predict that northwest Lower Michigan can expect more frequent storms of increasing severity in the decades ahead. The total amount of rainfall per year is also likely to increase. The potential for substantially larger rain events and severe storms raises concerns of harm to human health and damage to buildings and infrastructure, especially for areas along the Lake Michigan coastline.”

Jurisdictions located on the Lake Michigan and Grand Traverse Bay coast in Leelanau County are impacted by shoreline hazards: City of Traverse City, Village of Empire, Village of Northport, Village of Suttons Bay, and the following coastal townships: Elmwood, Bingham, Suttons Bay, Leelanau, Leland, Centerville, Cleveland, Glen Arbor, and Empire. The Land Information Access Association documented potential shoreline hazards for these communities in the *Northwest Lower Michigan Coastal Resilience Atlas*. Specific areas of shoreline hazards were also identified during the public input session for this plan. These are marked as a “shoreline erosion” type of hazard area on the Hazard Area Map in Appendix A.

In developing the *Northwest Lower Michigan Coastal Resilience Atlas*, scenario planning was used to determine the potential impact of three differing levels of storms combined with high waters. The three scenarios are described as follows:

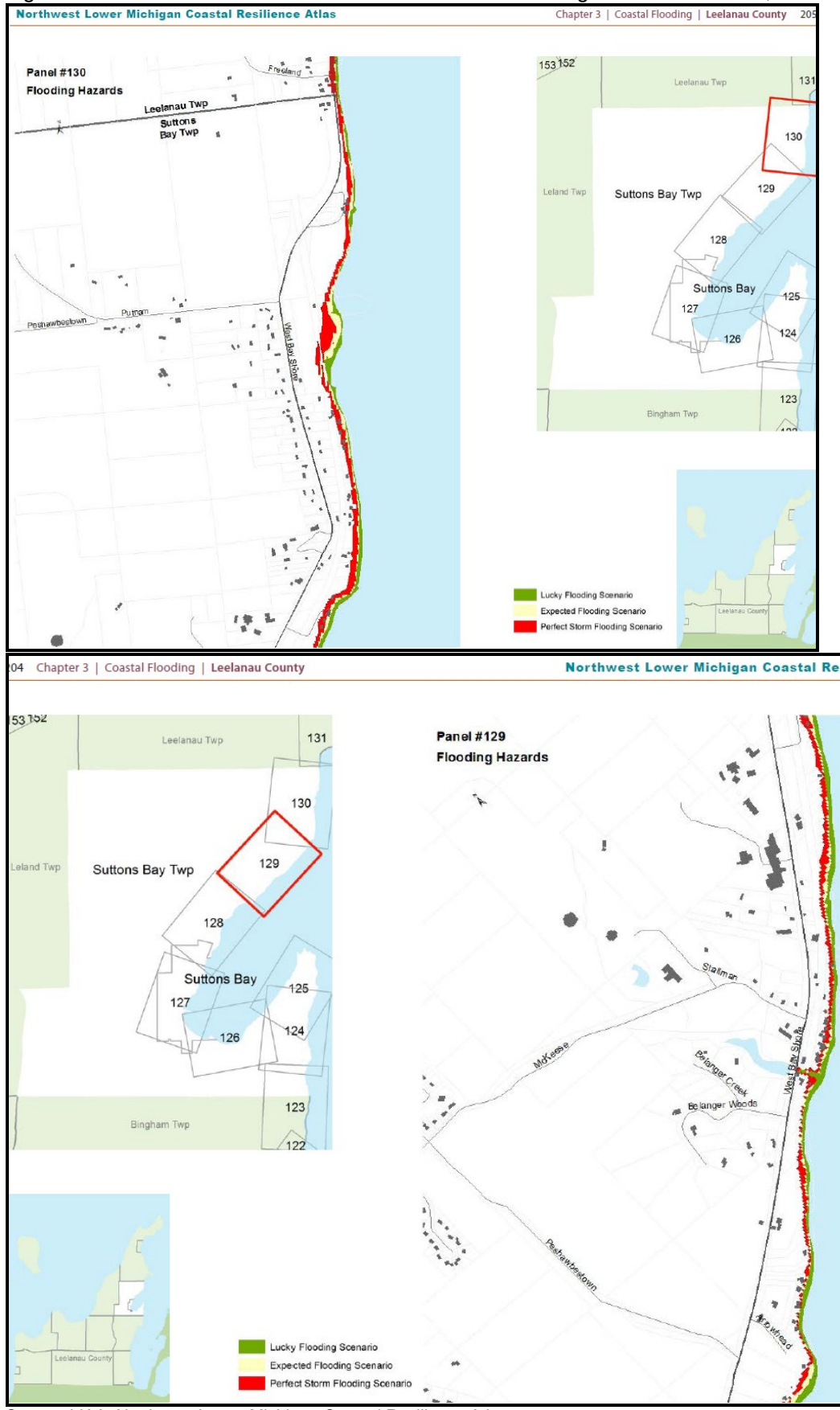
The first scenario, “**Lucky**” **Future**: Under the Lucky Climate Future, Great Lakes water levels will continue to stay relatively low. Although there will be wave and wind action, major storm events and wave impacts will not encroach on properties landward of current beaches. A Lucky Future projection, indicating the land areas that would be affected by high-energy waves along the shorefront and/or adjacent riverine flooding under these conditions, is shown in green on the maps.

“**Expected**” **Future**: Under the Expected Climate Future, Great Lakes water levels will continue to fluctuate according to long-term decadal patterns, including recent extreme storm events incorporated into the ongoing Great Lakes Coast Flood Study being conducted by the Federal Emergency Management Agency (FEMA). Given those ongoing fluctuations, this Climate Future accounts for periods when Great Lakes still-water elevations are closer to the long-term average. In addition, this Climate Future anticipates the so-called “100-year storm event” (or 1% storm) becoming more like a 20- or 50-year storm event (i.e., an expected storm within the normal community planning time horizon) because of increased storminess. The Expected Future projection is shown in yellow on the maps.

“**Perfect Storm**” **Future**: Under the Perfect Storm Climate Future, Great Lakes water levels will continue to fluctuate according to decadal patterns, consistent with assumptions made for the Expected Future. However, for this Perfect Storm Climate Future, the estimated still-water elevation is set higher than the long-term average and closer to the long-term high (583 feet). In addition, this Climate Future anticipates the occurrence of a so-called “500-year storm event” (or 0.2% storm) occurring within the planning time horizon while lake levels are high. The Perfect Storm Future projection is shown in red on the maps.

Figures 21 and 22 illustrate the three potential flooding scenarios in the Peshawbestown area. “Lucky” scenario flooding is shown in green, “Expected” flooding scenario is shown in yellow, and “Perfect Storm” future scenario is shown in red.

Figures 21 and 22: Panels #129 and #130 – Coastal Flooding Hazard Scenarios, Peshawbestown



Source: LIAA, Northwest Lower Michigan Coastal Resilience Atlas

Coastal recession, or erosion, to Lake Michigan communities is a constant, but very small wearing away of the shoreline. The Great Lakes are estimated to lose one foot of shoreline per year to normal wave and wind activity. However, storms and increased wave activity have caused increased coastal recession to varying degrees in Leelanau County's coastal communities. Chapter 4 of the *Northwest Lower Michigan Coastal Resilience Atlas* describes bluffline recession since its recorded shoreline in 1938. In Figures 23 and 24, the blue line indicates the shoreline in 1938; the green line indicates the bluffline in 1938; the yellow line is the bluffline in 2016; and the red line is the predicted 30 year bluffline.

Figure 23: Panel #129, Shoreline Recession, Peshawbestown

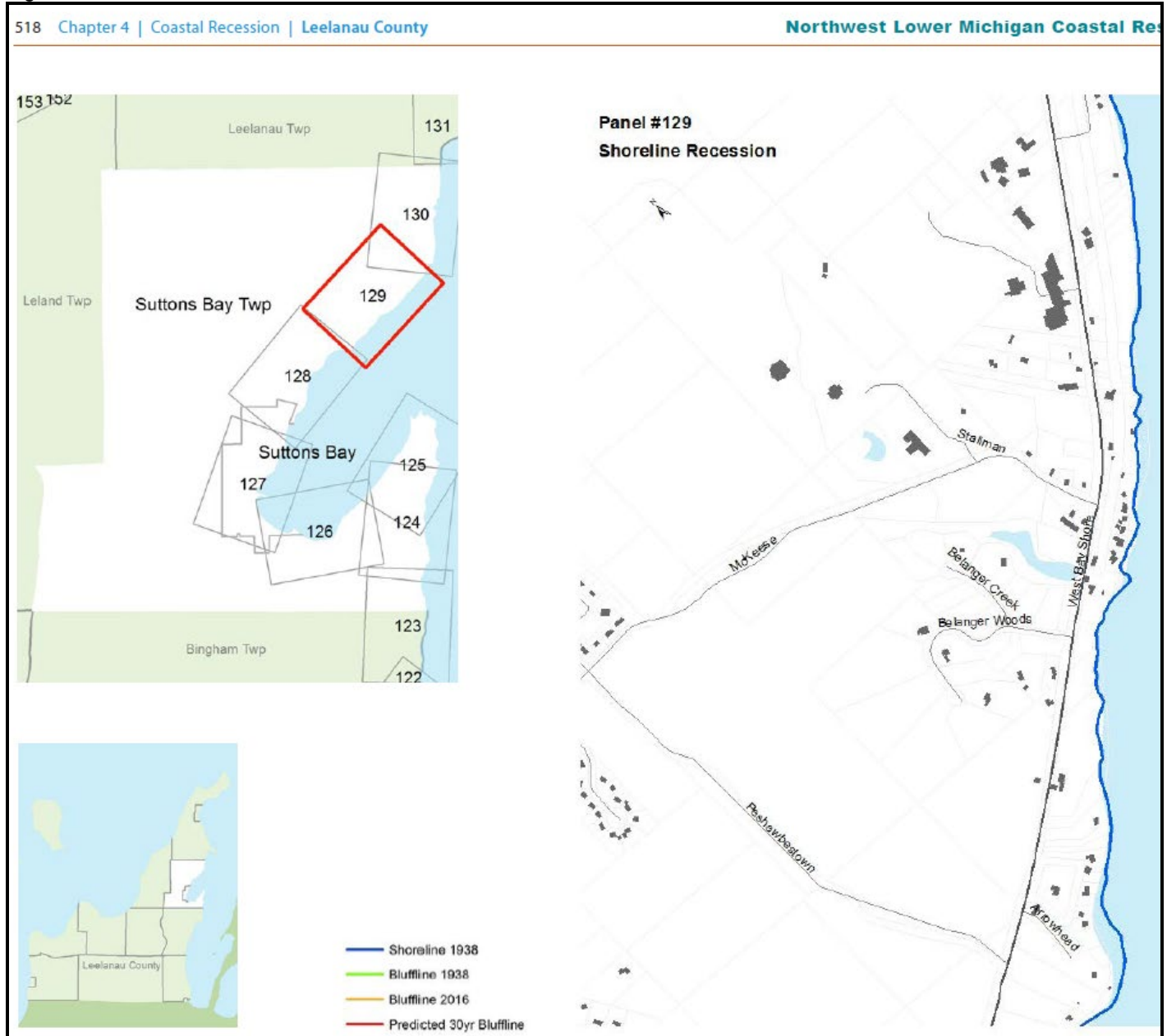
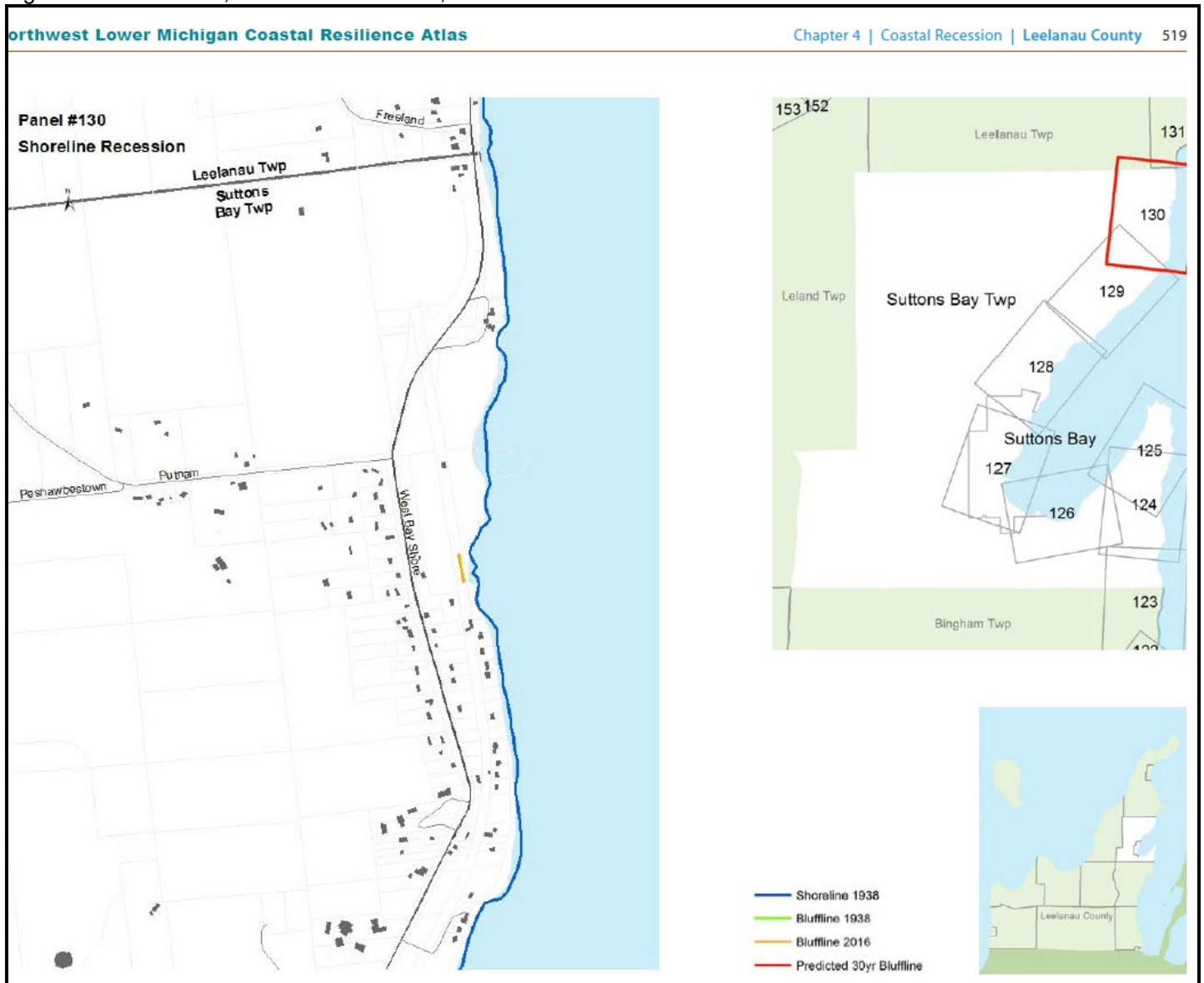


Figure 24: Panel #130, Shoreline Recession, Peshawbestown



Source: LIAA, Northwest Lower Michigan Coastal Resilience Atlas

The Leelanau County communities of Bingham Township, Glen Arbor Township, Leelanau Township, Leland Township, Suttons Bay Township, and the Village of Empire contain [“High Risk Erosion Areas”](#) (HREAs) as designated and regulated by the State of Michigan’s Department of EGLE. HREAs are shorelines of the Great Lakes where the land is receding at a rate of one foot or more per year for a minimum of 15 years. Recession rates change over time as water levels fluctuate and coastal conditions change. Along these shorelines, new structures are required to meet setbacks for their protection from a changing shoreline. When structures are not in danger, the shoreline does not need to be altered to protect the structure.

A permit is required for construction, movement, or enlargement of a structure on any portion of a designated HREA parcel regardless of how far the project is from the lakeshore. Common activities requiring a permit include construction of a house, garage, or addition, substantial reconstruction of an existing home, the installation of a septic system, covered porches, or a commercial building. HREAs are regulated by the Administrative Rules of Part 323, Shorelands Protection and Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Currently EGLE administers Part 323 for all HREAs in the county.

The communities of Centerville Township, Cleveland Township, Empire Township, Village of Empire, Glen Arbor Township, Leelanau Township and Leland Township contain State-designated “Critical Dune Areas” (CDAs), are a combination of coastal barrier dunes, land that has dune-like features, and unique plant communities along a Great Lakes shoreline. Regulatory authority goes to the water’s edge. The CDAs include public lands and private properties where developmental, silvicultural, and recreational activities are regulated and a permit is required under Part 353, Sand Dunes Protection and Management, of the Natural Resources and Environmental Protection Act for activities that significantly alter the CDA, such as the construction of a house or garage, building a road or driveway, installing a septic system, installing retaining walls, and sand removal. The law balances the benefits of protecting, preserving, restoring and enhancing the diversity, quality, functions, and value of the critical dunes with the benefits of economic development, multiple uses, and public access. Currently EGLE administers Part 353 for all CDAs in the county.

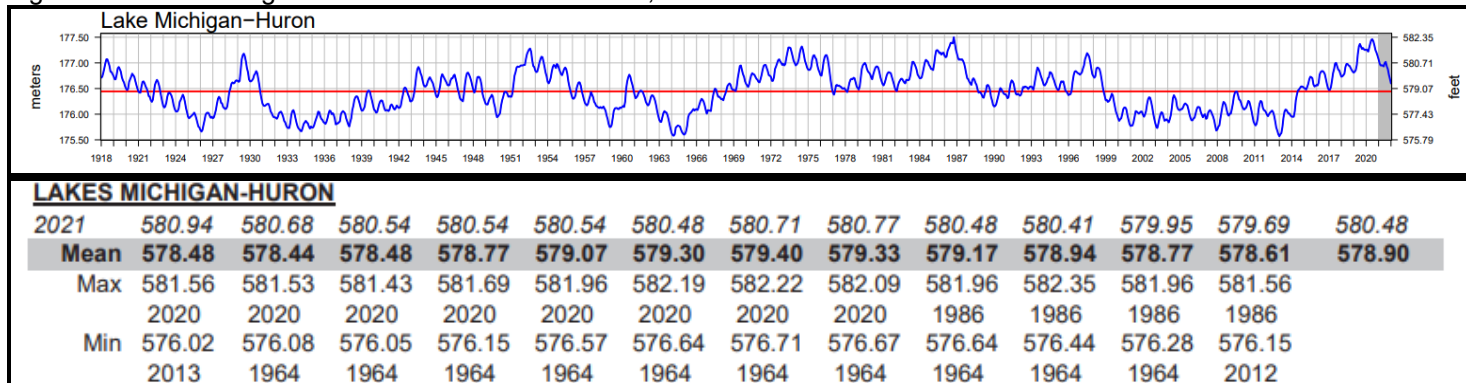
The HREAs and CDAs in Leelanau County are shown on the Environmental Features Map are included in Appendix A. There are no HREAs or CDAs on GTB-owned property within the six-county tribal service area.

Extent

Shoreline recession can be measured by feet of bluffline retreat and property damages. Bluffline retreat distances vary across the county and region, and there are no reported damages from bluffline recession. Shoreline flooding can be measured by flood water levels, inches of rainfall, lake water levels (shown in Figure 25), and damages. The three (3) lakeshore flooding events in Leelanau County during 2019 and 2020 caused \$179,000 in property damages.

In recent years, the swings in water levels have been unprecedented. In January 2013, Lake Michigan-Huron set an all-time record low of 576.02 feet, and seven years later in July of 2020 Lake Michigan-Huron reached a monthly record high of 582.22, only second to the October 1986 monthly record high of 582.35.

Figure 25: Lake Michigan-Huron Historic Water Levels, 1918-2021



Source: US Army Corps of Engineers

Previous Occurrences

In the approximately the past four decades, the Great Lakes experienced record high lake levels in 1985-86, 1997-98, and most recently in 2019-2020. Some shoreline erosion issues remain and high lake levels that caused rivers and tributaries to back up have caused infrastructure damage and failures throughout Leelanau County and the region. Despite not being recorded as a shoreline flood event in NOAA’s Storm Events Database, the first event occurred on February 21, 1986, when a Governor’s Disaster Declaration for shoreline problems in the State was enacted, and included Grand Traverse County. The NOAA NCEI Storm Events database contains lakeshore flood events pertaining to Benzie (4), Charlevoix (3), Grand Traverse (2), Leelanau (3) and Manistee (4) counties between 2019 and 2020 (Table 37).

Table 37. Lakeshore Flood Events in the GTB Tribal Service Area

County	Lakeshore Flood	Event Description	Property Damages
		Northwest to north winds produced high waves and elevated water levels along the northwest lower Michigan coastline. With Great Lakes water levels at near-record levels, significant coastal flooding and beach erosion resulted.	
Benzie	10/16/2019	Severe beach erosion threatened to destroy a home several miles north of Frankfort.	\$8,000
Grand Traverse		Peninsula Drive was closed between McKinley and Wilson Roads due to coastal flooding and beach erosion. The east end of Marina Drive in Traverse City was also closed.	\$10,000
Leelanau		The parking lot of the Grand Traverse Yacht Club was flooded.	\$4,000
Manistee		Flooding covered a portion of Lakeshore Drive at 5th Avenue Beach in Manistee. In Parkdale Township, the beach eroded up to the foundation of several homes, and a number of trees were washed into the lake.	\$350,000
	10/21 and 10/22/2019	Strong northerly to easterly winds resulted in another round of substantial coastal flooding and beach erosion, this time on both Lake Michigan and Lake Huron, for the 21st into the 22nd.	
Benzie	10/22/2019	A parking lot next to Betsie Lake in Frankfort flooded. A large field of debris, including entire trees and large tree limbs, was deposited along the beach at Point Betsie Lighthouse.	\$129,000
Charlevoix	10/21/2019	Just west of Bayshore, a portion of the Little Traverse Wheelway Bike Path was destroyed.	\$80,000
Grand Traverse	10/21/2019	On the Old Mission Peninsula, docks were washed out. Waves reached the parking lot at Haserot Beach.	\$22,000
Leelanau	10/21/2019	In Northport on the 21st, a dock was damaged and a boat house was flooded. Water levels rose over the docks at Northport Marina. On the 22nd in Empire, a part of the break wall at Empire Beach was destroyed. In Glen Haven, restoration efforts from flooding earlier in the month were eliminated, and shoreline fences were destroyed at Glen Haven Beach.	\$175,000
Manistee	10/22/2019	A dock, boardwalk, and beach signage were destroyed in Parkdale Township.	\$142,000
	4/13/2020	Strong low pressure passed just north of eastern upper Michigan on the morning of the 13th. Gusty west to northwest winds developed during the day, in the wake of the low. Gusts of 40 to 50 mph were common across northern Michigan, especially during the afternoon. The highest measured wind gust was 58 mph at the airport in Gaylord. Some localized power outages resulted. Lakeshore flooding also occurred along portions of the Lake Michigan coastline of northwest lower Michigan. And severe coastal erosion destroyed a portion of the Little Traverse Wheelway between Petoskey and Charlevoix.	
Benzie		The city boat launch in Frankfort experienced flooding of docks and the parking lot.	\$8,000
Charlevoix			\$150,000
Leelanau			\$0
Manistee			\$0
Benzie	6/10/2020	The remnants of Atlantic Tropical Cyclone Cristobal lifted across Lake Superior and into northern Ontario. Multiple rounds of showers and thunderstorms developed on the 10th. A line of severe thunderstorms brought damaging winds to places near Saginaw Bay. Later in the day, training thunderstorms brought heavy rain to Traverse City. And some lakeshore flooding also occurred on the northwest lower Michigan coastline, thanks to gusty onshore winds. M-22 was closed across the Betsie Lake Causeway near Elberta due to high water.	\$0
Manistee	11/1/2020	Strong low pressure crossing northern Ontario would drag a cold front across northern Michigan early on the 1st. Gusty southwest winds ahead of the front became even gustier out of the northwest behind the front. Peak measured wind gusts included 58 mph at Leland and Traverse City, 57 mph at Bay Mills, and 54 mph at Pellston. This resulted in spotty wind damage, as well as lakeshore flooding on parts of the Lake Michigan coastline.	\$7,000
Charlevoix	11/15/2020	Gusty winds increased on the 15th, as strong low pressure moved directly over northern Michigan before departing. Gusts of 50 to 55 mph were common along the Lake Michigan coastline. A peak gust of 59 mph was measured at Grand Traverse Light. Hunting activities were significantly disrupted (the 15th is opening day of the firearms season for deer in Michigan). Lakeshore flooding also developed along portions of Lake Charlevoix. Boyne City experienced flooding along the shore of Lake Charlevoix. Veterans Park and streets near the park flooded, resulting in a few vehicles being briefly stranded.	\$5,000

Source: NOAA NCEI Storm Events Database

Probability of Future Events and Vulnerability Assessment

Over the past 37 years, four shoreline flooding events have occurred in Leelanau County, which indicates there is a 10.8% annual chance of shoreline flooding and an equal chance erosion will cause shoreline damages. The shoreline hazards of 2019 and 2020 occurred under unique circumstances when the Great Lakes water levels were above average. Based on past water level measurements, similar levels are not likely to occur again for some time. On the contrary, the Great Lakes may experience low water levels with the ebb and flow of the lakes.

The GTB Tribe owns parcels of land that adjoin either Lake Michigan or water bodies directly connected to Lake Michigan within Leelanau County (Peshawbestown); Benzie County (Village of Elberta); Grand Traverse County (East Bay Township and Acme Township) and Charlevoix County (St. James Township). These properties are most at risk from shoreline flooding and erosion hazards.

Shoreline or soil erosion hazards involve the loss of property or necessitate the relocation of homes as sand or soil is removed by flowing water (lake, river, etc.) and carried away over time. The foundation of a structure, or underground utility pipes in the area, may become fully exposed and vulnerable to weather, extreme temperatures, water damage, or other sources of risk. Shoreline banks that support roadways may erode and cause the road surface to crack, become unstable, or more prone to deposits of sand, snow, water, and ice. This hazard is especially relevant to those municipalities that contain residential and commercial development along Lake Michigan and the Grand Traverse Bay (City of Traverse City, Village of Empire, Village of Northport, Village of Suttons Bay, and the following coastal townships: Elmwood, Bingham, Suttons Bay, Leelanau, Leland, Centerville, Cleveland, Glen Arbor, and Empire) that experience seasonal shifts in water levels and possible ice erosion hazards.

As lake water levels fluctuate and increased storminess occurs, shoreline recession and flooding will continue. In 2021 the levels of Lakes Michigan and Huron began to decline, however, as historic data shows us, the water will begin to rise again. Those communities that have already faced shoreline hazards are likely to experience issues in the future. Changes in land use practices and improvements to the shoreline such as natural vegetation plantings or shoreline armoring may reinforce the shoreline for a period of time, but is likely not a permanent solution. The following is an excerpt from the *Leelanau County Plan* (2019) describing the sensitivity and threats to the County's shorelines and dunes:

Seemingly endless shorelines and monumental dunal formations epitomize the grandeur of the area. While these resources serve as critical components of the County's tourism and recreation industry, they are particularly vulnerable to wind and wave action, as well as to any land use and development activities which disturb the stability of the dunes. The clearing of vegetation along shorelines and dunes seriously increases their susceptibility to erosion, shifting, and demise. Disturbance of their natural character by land use activities heightens their vulnerability to winds and waves, and other climatic forces. Many of the County's shoreline areas and dunal formations are considered "high risk erosion areas." The significance of these areas is highlighted by their inclusion for protection under the Michigan Natural Resources Act 451. This Act serves to protect designated "critical dune areas", including Sleeping Bear Dunes and Empire Bluffs as well as less prominent dune areas.

The Lake Michigan shoreline and dunal formations harbor yet another sensitive environmental resource - threatened and endangered plant and animal species. Inventories by the Michigan Department of Natural Resources have identified numerous unique plant and animal species in the County which rely largely upon shoreline and dune areas for their survival. Other threatened species which rely upon a more inland environment have also been identified. The fact that these plant and animal species are already considered unique due to their threatened survival emphasizes the need to prevent disturbances in the ecosystem in which they thrive.

Shorelines of inland lakes are also sensitive natural resources. The calmer waters and areas of interface between the land and water are particularly important habitats for wildlife and plant life. Understandably, these areas are also actively sought for development and recreational use. The resulting threat to these environments through soil erosion and sedimentation, disturbance of the natural shoreline and vegetation, and leachate from faulty septic systems is a concern today and will become more significant as the County's population grows.

Comments from April 2022 Input Session

- 3 areas of concern regarding flooding/erosion along the shoreline in Peshawbestown; one is near a gas station – possible contamination source if impacted by rising lake levels

Coastal Hazards - Dangerous Currents

Dangerous currents and breaking waves are common in the Great Lakes region. Rip currents and other currents found near piers are extremely dangerous for swimmers and can lead to drownings. Currents in the Great Lakes can form from any combination of wind, waves, bottom formation, beach slope, water temperature, man-made structures, and natural outlets. In the Great Lakes, swimmers are most likely to encounter one of five common currents: rip, longshore, structural, outlet, and channel.

During rip currents, the water “piles up” between a sandbar and the beach. It has to find a way back out to sea. After the pressure builds up, the water creates a pathway and gushes from the shore back out to open water. That’s a rip current: a narrow but powerful stream of water and sand moving (ripping) swiftly away from shore. Rip currents vary in size and speed and can be found on many beaches every day. They typically extend from the shoreline through the surf zone, and past the line of breaking waves. Typically, they form at breaks in sandbars, and also near structures, such as jetties and piers, as well as cliffs that jut into the water.

Rip currents carry swimmers into deeper water, where they may not be able to get their footing. These currents rarely extend far out, and will not pull a swimmer underwater. Rip currents vary in size from very narrow to more than 50 yards wide. Speeds can also vary. The average speed is 1-2 feet per second, but they have been measured as fast as 8 feet per second.

Longshore currents move parallel to or the “long” way along the shoreline. These currents will exert a force to move along shore, making it difficult to remain in front of a spot on the beach. They often happen between the first and second sandbars near the shore. Longshore currents become more dangerous when they combine with rip currents or structural currents since they can move a swimmer swiftly down a beach and into the path of another current or into a structure (pier or breakwall), making it more difficult to swim to shore.

Structural currents - the currents found alongside or as a result of structures like piers and breakwalls - are usually always present. Structural currents are dangerous on their own, but when paired with others like longshore or rip currents, the combination can create a washing machine effect, moving the swimmer from one dangerous current area to another with no clear path to safety.

Outlet currents can be found where rivers and streams empty into the Great Lakes. The flow of water from the river or stream can move quickly. As it enters the open water of a lake, it may take a while for that current to dissipate. Pair that with currents that are present in the lake and the situation can become dangerous.

Channel currents are like a river running parallel to shore. With a channel current, typically there is an island or structure such as a large group of rocks not far from shore. A channel current forms when the flow of water speeds up as it goes between the island and shore, like a bottleneck. This is made worse by the presence of a submerged or partially submerged sandbar connecting the beach to the island, which allows pressure to build behind the water and waves until it breaks through. When the wind speed increases, the waves also increase in intensity, and this causes the current to become stronger and faster.

According to the Great Lakes Current Incident Database, between 2002 and 2020, there have been 75 deaths and 274 persons rescued from dangerous current incidents along the Lake Michigan coastline of Michigan’s Lower Peninsula.

It is important to note that there are no “rip tides” or “undertows” in the Great Lakes. Since there are no tides in the Great Lakes, and rip currents don’t pull a person down under the water (it will carry them out to the open water, away from shore), “rip tides” or “undertows” are inaccurate coastal hazard terms.

Dangerous current-related incidents in the Great Lakes most often occur when:

- Winds are blowing towards the shore
- Wave heights reach 3 to 6 feet
- A cold weather front is passing through

Location

Dangerous currents are coastal events that are not confined to geographic boundaries and may occur anywhere in Lake Michigan waters.

Extent

The National Weather Service provides a Surf Zone Forecast to measure the risk level associated with rip current hazards. Surf Zone Forecasts contain three levels of Rip Current Outlooks:

- Low Risk: The risk for rip currents is low, however, life threatening rip currents often occur in the vicinity of groins, jetties, reefs, and piers.
- Moderate Risk: Life threatening rip currents are possible in the surf zone.
- High Risk: Life threatening rip currents are likely in the surf zone.

Dangerous currents can be measured by damages-caused including deaths and injuries. There have been ten days of dangerous current incidents on record in the GTB service area (Table 37), which include 5 deaths and 16 rescues.

Previous Occurrences

Within the GTB tribal service area. Benzie County has the highest number of dangerous current incident days (7), including deaths (3) and rescues (12) (Table 37). Manistee County has had two incident days with one death and two rescues, and Leelanau County has had one incident involving one death and two rescues. There are no incidents on record for Antrim, Charlevoix or Grand Traverse counties.

Table 37. Dangerous Current Incidents, GTB Tribal Service Area

County	Dangerous Current Incident Days	Incident Years	Deaths	Rescues	Location
Antrim	0	-	0	0	-
Benzie	7	2010, 2011, 2012, 2018, 2019, 2020	3	12	City of Frankfort; Peterson Beach in Sleeping Bear Dunes National Lakeshore
Charlevoix	0	-	0	0	-
Grand Traverse	0	-	0	0	-
Leelanau	1	-	1	2	Van's Beach in Leland Twp.
Manistee	2	2007, 2009	1	2	5 th Ave. Beach, City of Manistee; Pier at Douglas Park in City of Manistee

Sources: NOAA NCEI Storm Events Database; Great Lakes Current Incident Database https://www.weather.gov/greatlakes/beachhazards_stats

Probability of Future Events and Vulnerability Assessment

There have been ten days with recorded dangerous current incidents in the GTB tribal service area since the year 2007; this represents a very low probability of an event occurring. Events are most likely to occur during the summer months of the year.

Dangerous current events likely occur more frequently than what is on record, as they may go unreported if injuries or deaths do not occur. Lake Michigan currents are dangerous to all swimmers, especially those who are unprepared to be swept up in the current. Many Lake Michigan beaches do not have a lifeguard on duty who may identify potential hazardous swimming conditions. Swimmers who are caught unaware may panic when caught up in the fast-moving water, tire as they try to swim against the current, and drown.

The GTB Tribe owns properties adjoining Lake Michigan in the following locations where dangerous currents may impact swimmers:

- Peshawbestown (West Arm Grand Traverse Bay, Suttons Bay Township, Leelanau County)
- East Bay Township and Acme Township (East Arm GT Bay off of US-31, Grand Traverse County)
- St. James Township (St. James Harbor, Charlevoix County)

Coastal Hazards - Seiche

According to the National Weather Service, a seiche is a standing-wave oscillation in any enclosed lake that continues after a forcing mechanism has ceased and results in shoreline flooding and/or damage. In the Great Lakes and large inland lakes, large pressure differences, high winds, or fast-moving squall lines may act as the forcing mechanism. In addition, earthquakes or debris flows can initiate a seiche. When the forcing mechanism ends, the water sloshes back and forth from one end of the lake to the other, causing water level fluctuations of up to several feet before damping out.

Seiches are usually limited to partially or fully enclosed basins, such as Lake Erie. Lake Erie is known for seiches, especially when strong winds blow from southwest to northeast. In 1844, a 22-foot seiche breached a 14-foot-high sea wall killing 78 people and damming the ice to the extent that Niagara Falls temporarily stopped flowing. As recently as 2008, strong winds created waves 12 to 16 feet high in Lake Erie, leading to flooding near Buffalo, New York.

In some of the Great Lakes and other large bodies of water, the time period between the "high" and "low" of a seiche can be as much as four to seven hours. This is very similar to the time period between a high and low tide in the oceans, and is often mistaken as a tide.

According to the NOAA-NCEI Storm Events Database, there have been 15 seiche events in Michigan since 1998. There are no deaths, no injuries, and \$31,000 in property damages due to seiche events.

Location

Seiches are a coastal event that is not confined to geographic boundaries and may occur anywhere in Lake Michigan waters or on large inland lakes. All Lake Michigan coastal areas are at risk from a seiche hazard.

Extent

Seiche events can be measured by damages-caused including deaths, injuries, and property damages. There has been one significant seiche event in Leelanau County, with no deaths or injuries reported.

Previous Occurrences

Leelanau County has had one seiche event. The event occurred on May 9, 2019, affecting Leland Township, and caused \$5,000 in property damages. The NOAA NCEI Storm Events Database narrative for the event is as follows:

The sudden relaxation of a gusty east wind, and quick transition to a northwest wind, resulted in a seiche on Lake Michigan. With very high water levels already in place on all of the Great Lakes, localized flooding developed. Water entered some of the historic fishing shanties in the Fishtown section of Leland. Sandbags and other methods were deployed to attempt to keep the water out.

There are no seiche events on record for other counties in the GTB tribal service area.

Probability of Future Events and Vulnerability Assessment

One seiche event has occurred in Leelanau County in the past 25 years, indicating that there is a 4% of a seiche event happening in a future year. Seiche events are likely to occur more frequently, but go unreported as injuries, deaths, or damages do not occur. As noted in the May 9, 2019 event and others, watercraft, persons and property along the lake shore are also vulnerable to high waves caused by a seiche. Seiche events are also dangerous to all swimmers, especially those who are unprepared to be swept up in the current. Many Lake Michigan beaches do not have a lifeguard on duty who may identify potential hazardous swimming conditions. All communities in Leelanau County, with the exception of Kasson and Solon Townships, have public beach access to Lake Michigan or West Grand Traverse Bay.

The GTB also owns two commercial marinas on Lake Michigan: one in Peshawbestown (Leelanau County) and one on Beaver Island (Charlevoix County). The GTB also owns properties with beach access to Lake Michigan in Peshawbestown, as well as East Bay Township and Acme Township in Grand Traverse County.

Coastal Hazards - Waterspout

NOAA defines a waterspout as a "funnel which contains an intense vortex, sometimes destructive, of small horizontal extent and which occurs over a body of water." Tornadoic waterspouts generally begin as true tornadoes over land in association with a thunderstorm, and then move out over the water. They can be large and are capable of considerable destruction, and are often accompanied by high winds and seas, large hail, and frequent dangerous lightning.

Fair weather waterspouts, on the other hand, form only over open water. They develop at the surface of the water and climb skyward in association with warm water temperatures and high humidity in the lowest several thousand feet of the atmosphere. They are usually small, relatively brief, and less dangerous. The fair weather variety of waterspout is much more common than the tornadoic.

Waterspouts occur most frequently in northern Michigan during the months of August, September, and October, when the waters of the Great Lakes are near their warmest levels of the year. Waterspout formation typically occurs when cold air moves across the Great Lakes and results in large temperature differences between the warm water and the overriding cold air. They tend to last from about two to twenty minutes, and move along at speeds of 10 to 15 knots.

There are five stages of waterspout formation:

1. Dark spot. A prominent circular, light-colored disk appears on the surface of the water, surrounded by a larger dark area of indeterminate shape and with diffused edges.
2. Spiral pattern. A pattern of light and dark-colored surface bands spiraling out from the dark spot which develops on the water surface.
3. Spray ring. A dense swirling annulus (ring) of sea spray, called a cascade, appears around the dark spot with what appears to be an eye similar to that seen in hurricanes.
4. Mature vortex. The waterspout, now visible from water surface to the overhead cloud mass, achieves maximum organization and intensity. Its funnel often appears hollow, with a surrounding shell of turbulent condensate. The spray vortex can rise to a height of several hundred feet or more and often creates a visible wake and an associated wave train as it moves.
5. Decay. The funnel and spray vortex begin to dissipate as the inflow of warm air into the vortex weakens.

According to NOAA's National Weather Service, the best way to avoid a waterspout is to move at a 90-degree angle to its apparent movement.

Location, Extent and Previous Occurrences

Waterspouts are a common occurrence posing a great threat to marine traffic. According to the MSP's 2019 *Michigan Hazard Analysis*, Michigan waterspouts have been noted by National Climatic Data Center between 1993 and 2001. Many additional events have occurred since, which NCDC has classified according to the corresponding lake location rather than as part of Michigan itself. Waterspouts are less frequent on Lake Superior (8 events since 2001) than on Lakes Huron (23 events) or Michigan (51 events).

There are no Great Lakes waterspout events on record with NOAA's NCEI Storm Event Database for the six-county GTB service area.

Waterspouts typically last from about two to twenty minutes, and move along at speeds of 10 to 15 knots. They can overturn watercraft and cause damage to bridge structures and According to the MSP's 2019 *Michigan Hazard Analysis*, a waterspout caused \$200,000 in damage to a boat house and storage building at Drummond Island (Lake Huron) on July 3, 1999.

Probability of Future Events and Vulnerability Assessment

Despite the lack of a recorded Lake Michigan waterspout event with the NOAA NCEI Storm Event Database for the six-county GTB Tribal service area, it is likely that waterspouts have occurred in the past, but have not been officially documented.

The GTB operates two commercial marinas on Lake Michigan – the Arthur Duhamel Marina in Peshawbestown, and one on Beaver Island (Charlevoix County). Fishing boats, as well as Tribal government employees conducting work on the Lake Michigan (for natural resource management purposes, for example), may encounter waterspouts, particularly during the time of year they are most likely to occur (August through October).

The National Weather Service (NWS) meteorologists consider forecasting waterspouts during the late summer and fall whenever large, cool air masses overspread the waters of the Great Lakes. Once the NWS has determined that waterspouts are possible, the threat is outlined in the [Nearshore Marine Forecast](#) and [Hazardous Weather Outlook](#). The NWS strives to provide this information to the public 12 to 24 hours prior to waterspout occurrence.

When waterspouts have been detected by Doppler radar or reported by local law enforcement or spotters, the NWS issues a [Special Marine Warning](#). Since it is not uncommon for numerous waterspouts to occur simultaneously over a large area, these warnings tend to cover larger geographic areas than land-based tornado warnings which generally cover a single county.

In most cases, waterspouts which make landfall are much weaker than tornadoes, produce little or no damage, and dissipate quickly. Once on land, they tend not to be a great threat to life and property. In these instances, the NWS issues a [Tornado Warning](#).

A mitigation strategy for the GTB marine vessel operators on the Great Lakes includes education and awareness about the prevailing weather conditions, appearance and destructive potential related to waterspouts. When warnings are issued for waterspouts, boaters should be prepared to quickly seek safe harbor, or to find shelter out of the path of the waterspout. The best source for waterspout forecast information is [NOAA Weather Radio \(NWR\)](#). These continuous broadcasts from transmitters scattered around the Great Lakes provide forecasts and warnings 24 hours a day. The mobile emergency alert system service offered by GTB, "*Regroup*", can also be utilized as an informational source for waterspout forecasts and warnings.

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

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 persons are at risk from the occurrence and impacts of an infectious disease. Depending on the type of disease, different 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 Leelanau County, the Benzie-Leelanau Health Department works with local, state, and federal agencies to prepare for and respond to public health threats. It developed a comprehensive emergency preparedness program capable of responding to a variety of emergency situations with funds from the Centers for Disease Control. The State of Michigan reports, as of October 4, 2022, there are 4,173 cumulative cases of COVID-19 and 63 deaths in Leelanau County. Those 80 years and older have the most deaths of any age range at 31 deaths.

Previous Occurrences

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

GTB provides health services, such as immunizations, to Tribal members through the Health Clinic in Peshawbestown, as well as Community Health Representatives that perform home visits and transport clients to medical appointments. Vaccination clinics are also occasionally provided at tribal properties throughout the GTB service area.

Comments from April 2022 Input Session

- Shortcomings/ Problems in response to Pandemic
 - Located so far “up north” that they didn’t have the resources and equipment needed to service large populations of sick people
 - Exposed reliability on Munson Healthcare hospitals – limited capacity of beds
 - They typically do not stockpile resources because they do not have the funds to do so.
 - Munson – mental stress on workers, constantly changing COVID protocols.
 - Effects of isolation, work stress...increased behavioral health problems in the community. There is a lack of mental health resources to support everyone.
 - This was a long process and taxed EM/Healthcare workers with protocol changes; difficult to inform people of what recommendations and rules were as they changed frequently.

- The economic impact from reduced services/shutdown on businesses, housing, and EMS/healthcare. Need to plan for sustainability in these areas in a future scenario.
- Still dealing with supply chain issues – vehicles and equipment down in EMS/Fire/Road Commission fleet because can't get repair parts.
- What Worked Well in response to Pandemic
 - Benzie-Leelanau Health Dept. testing and vaccination clinics – set up and service delivery – positive feedback
 - GTB – Health Dept. – positive feedback on vaccination and testing clinics and case monitoring. Collaboration with local, state, and federal partners.
 - Specific fire/EMS teams were dispatched to handle emergencies that were COVID-related. Had ambulances set up to only handle COVID patients.
 - They had never gone through this public health scenario before but they got what they needed.
 - Had agreements and good coordination with other EMS departments for staffing – could share staff if one dept. was short staffed. Also coordinated with use and sharing of COVID-specific ambulances.
 - Municipalities managed to the election process with health protocols
 - Zoom meetings improved communication processes and will continue to be used in combination with in-person meetings

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.” Invasive species harmful to Michigan and GTB Tribal lands 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 (water-dwelling) species include non-native 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.

The GTB’s Natural Resources (NR) department strives to preserve, protect, and enhance native plant communities and wildlife populations important to the Tribe and its membership. To promote native plant species and protect the ecosystems they rely on, NR staff manage Tribal properties by removing invasive plant species, such as autumn olive, Russian olive, spotted knapweed, and honeysuckle, among others. Invasive plants may outcompete native vegetation for space and nutrients so removing them reduces their risk of establishing monocultures and frees up resources for native species. Invasive plants are very persistent and often require multiple treatments to eradicate them. Therefore, this has been an ongoing multi-year project for staff, but the table below highlights work done over the past year. GTB NR staff also plant native species to help restore natural ecosystems and promote biodiversity.

Location

Combined, terrestrial and aquatic invasive species may be present in the entire six county service area including forest, wetland, farmland, grassland, aquatic, shoreline, and urban environments. “A Field Guide to Invasive Plants of Aquatic and Wetland Habitats for Michigan” (Campbell, Higman, Slaughter, Schools) identifies the Lake Michigan coastline as particularly vulnerable. “Lake-moderated climates along the Lake Michigan shoreline, Saginaw Bay, the Thumb, Lake St. Clair, and western Lake Erie are much milder than those in the state’s interior... These areas have the potential to harbor species typically found far south of Michigan.”

Extent

According to the State of Michigan 2013 Aquatic Invasive Species State Management Plan, “Since the 1800s, at least 182 nonindigenous aquatic organisms have colonized habitats of the Great Lakes ecosystem. These species include: algae (27), vascular plants (55), invertebrates (66), fish (28), and bacteria and viruses (6) (National Oceanic and Atmospheric Administration 2011). Roughly 55% of these species are native to Eurasia; 13% are native to the Atlantic Coast.” The Great Lakes Regional Collaboration estimates that a new aquatic invasive species arrives in the Great Lakes at a rate of one every eight months.

Previous Occurrences

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. Top priority plants in the region include garlic mustard, Japanese knotweed, invasive phragmites, and Oriental bittersweet.

Probability of Future Events and Vulnerability Assessment

The Great Lakes and connecting channels and rivers form the largest surface freshwater system in the world. This freshwater system, along with Michigan’s inland lakes, streams, rivers, and wetlands represent an invaluable resource and are therefore justifiably a top natural resource management priority. The State of Michigan estimates 42% of threatened or endangered species are considered at risk due to non-native species. The Michigan Department of Environment, Great Lakes, and Energy produced the “Michigan Watch List Aquatic Invasive Plants: A Guide for

Identification” for those species that have been identified as posing an immediate or potential threat to Michigan’s economy, environment, or human health. Included in the watch list are ten species that have been found in limited parts of Michigan and surrounding states. The State TIS Management Plan provides a list of eleven terrestrial species on the watch list. GTB NR staff coordinate with the Northwest Michigan Invasive Species Network, Leelanau Conservation District and other land management partners “protect, enhance, and promote Northwest Michigan’s natural communities through terrestrial invasive plant management and outreach.”

While the Tribe and other conservation agencies work to remove and control invasive species, some species are pervasive and spread more quickly than can be managed. There is a maintenance cost for invasive species management, and there is also a cost to the native wildlife species. Much of northern Michigan’s native terrestrial and aquatic species have adapted to specific set of environmental conditions. Where invasive species out compete natural flora there may be a reduction in food sources for fauna.

Comments from April 2022 Input Session regarding Invasive Species:

- Crowding out forests – Woolly adelgid; pests and diseases that affect ash, beech, maple trees
- Aquatic invasives damaging the Great Lakes ecosystem/local fishing.
- Considering what trees from southern latitudes to plant up here because they are adapted to our current climate. ½ the plant species that were here 30 years ago are gone due to climate change.
- Fisheries – invasive mussels; algal bloom on lake bottom causes fish not being able to spawn.

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 and over many sectors of 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” (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*⁸, 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.⁹ 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).¹⁰

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.

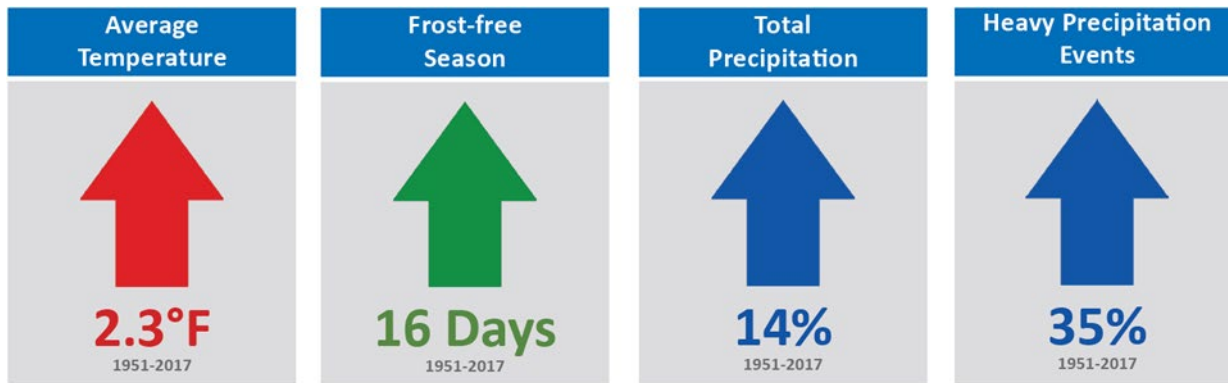
⁷ World Meteorological Organization. (2021, August 31). Retrieved from Weather-related disasters increase over past 50 years, causing more damage but fewer deaths: <https://public.wmo.int/en/media/press-release/weather-related-disasters-increase-over-past-50-years-causing-more-damage-fewer>

⁸ (2019, February 14). Retrieved from Climate Change in the Great Lakes Region: <https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Page1.pdf>

⁹ Vose, R. S., D. R. Easterling, K. E. Kunkel, A. N. LeGrande, and M. F. Wehner, 2017: Temperature Changes in the United States. *Climate Science Special Report: Fourth National Climate Assessment, Volume I*. Wuebbles, D. J., D. W. Fahey, K. A. Hibbard, D. J. Dokken, B. C. Stewart, and T. K. Maycock, Eds., U.S. Global Change Research Program, Washington, DC, USA, 185–206. doi:[10.7930/J0N29V45](https://doi.org/10.7930/J0N29V45).

¹⁰ Hibbard, K. A., F. M. Hoffman, D. Huntzinger, and T. O. West, 2017: Changes in Land Cover and Terrestrial Biogeochemistry. *Climate Science Special Report: Fourth National Climate Assessment, Volume I*. Wuebbles, D. J., D. W. Fahey, K. A. Hibbard, D. J. Dokken, B. C. Stewart, and T. K. Maycock, Eds., U.S. Global Change Research Program, Washington, DC, USA, 277–302. doi:[10.7930/J0416V6X](https://doi.org/10.7930/J0416V6X).

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



Snow, Ice Cover and Lake Temperature

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

Extreme Weather

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

The NCA *Fourth National Climate Assessment Volume II: Impacts Risks, and Adaptation in the United States* indicates: “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 can be found in the two-page report: [Climate Change in the Great Lakes Region](https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Page.pdf) by GLISA at <https://glisa.umich.edu/wp-content/uploads/2021/04/GLISA-2-Page.pdf>. The report identifies key challenges from climate change such as:

- **Public Health**
 - Increased risk of heat waves and increased humidity may amplify the number of heat-related deaths and illnesses.
 - More storm activity and flooding, resulting in increased point- and non-point source pollution, will likely increase watershed contamination and water-borne illnesses, while warmer surface waters amplify the risk of toxic algal blooms and fish contamination.
- **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.
- *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*.
- *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.

Responses from Community Survey

Question 7 asked if there have been any negative impacts on the public health and/or natural environment of their community that they attributed to climate change.

- 56 of the 118 participants who provided a response said “no” or were unsure if there have been. A few of those who responded they were unsure, did request additional information.
- Of those who responded in the affirmative, many associated climate change to public health concerns such as poor air quality, water quality, illness outbreaks, increased precipitation, high water levels, milder winters, hot summers, and the influx of invasive species. Several responses identified a connection between unusual or uncommon weather patterns and negative effects on native plant and animal species.

V. Tribal Vulnerability Summary

GTB Population Characteristics for Future Planning Considerations

Based on current membership ages overall, the Tribe is likely to increase membership due to the high percentage of persons in the family-forming age group (20-54). 53% of all members are aged 20-54. Grand Traverse County has the highest number of members and the highest number and proportion of members aged 20-54. This would indicate the membership in this Grand Traverse County will grow in future years if persons in this family-forming age group decide to have children. Furthermore, an increase in GTB tribal members is expected in Garfield Township with the upcoming completion of the Herkner Road residential development.

Leelanau County has the second highest membership and the highest number and proportion of youth, persons aged 0-19. This is indicative of the high number of membership ages 20-54 and 55+. Persons in those age groups likely did have multiple children, thus the membership count increased. The youth cohort, persons aged 0-19, is the next highest membership category with 25% of the membership. The Peshawbestown area has the highest density of GTB residents. Also, if re-development and new development occurs in the future per recommendations in the Peshawbestown Master Plan, there would be a resulting increase in residents and visitors to the GTB Reservation in Peshawbestown.

Followed closely by Elders are those aged 55+ at 22% of the membership. While the Tribe is fairly young, there should be consideration and planning for the Elder membership in 10-20 years as those in the family-forming age group move into the Elder cohort. Members living in Benzie County are showing early signs of this as Benzie has the largest percentage of Elders and the second lowest number and percentage of youth.

Based on the available demographic data from the US Census Bureau and GTB Administration, a significant amount of GTB members have limited financial resources, and/or may be physically unable to prepare or evacuate for a hazard event. These households likely would have more of a need for social/public services - such as assistance with transportation, food, water, medical care, or shelter - before, during or after a hazard event.

The following is a list of key issues related to hazard mitigation planning for the GTB's tribal service area. These issues are addressed in the mitigation strategies table provided in Section VII of this plan; note that each strategy in the table can mitigate more than one type of hazard.

Extreme Winter Weather; Thunderstorm/Severe Wind – most common events; can cause a large impact

- Power outages affects the operability of cell towers, gas stations (gas is also needed to fuel back up power generators), home heating, ability to pump water from wells; downed power lines are a hazard in themselves; sanitary sewer pump failures have occurred in the past (requiring generator power)
- Road accessibility for emergency vehicles; increased potential for car accidents
- Economic impact of multi-day business, governmental and road closures
- Those living in substandard housing in the winter may have roof/structural damage, frozen water pipes, lack of heat
- Only have 1 power company in the County, which limits their ability to respond quickly to all outages in a wide-spread event.
- Money and time spent on the extreme demand placed on local responders – pay overtime for increased personnel to clear roads, provide emergency response services, and maintain utility operations
- Community Survey Response: *Renewable energy / energy independence would benefit the tribe. Existing buildings are older and may not be the most energy efficient.*
- Community Survey Response: *“Internet service needs to be improved in Peshawbestown as well as other rural areas.”*

Hail, Lightning

- Lightning strikes can cause fires, impacting homes, woodlands
- Outdoor recreation areas are where people may be injured by hail stones or lightning strikes

Inland Flooding Concerns

- Intense rainstorms can result in riverine flooding, flash flooding on roads
- The Belanger Creek Dam (a privately owned dam at the end of Belanger Creek at the intersection with M-22; not on GTB owned property; not State-regulated); could impact the operability of M-22 (main connector) if the dam failed.

- Belanger Creek, located southeast of Stallman Road to the outlet in the Bay – potential for overflow (not on GTB-owned land)
- Stallman Road near the intersection with Belanger Creek, located SW of Strongheart Way (on GTB-owned land)
- There are four (4) road/stream crossings in Peshawbestown over Belanger Creek; near North Roubal Road/ E. Pobuda Road and N. Peshawbestown Road with “moderate” to “severe” condition ratings. If these road/stream crossings failed due to high creek levels, it would prevent access to tribal development/land along these roads.
- Community Survey response: *“Many local dams and road stream crossings were designed and constructed decades ago and under hydrologic regimes that are now rapidly shifting towards more frequent and of higher intensity. Further, many stormwater and wastewater systems are also rapidly becoming outdated given these climate related hydrologic regime shifts. Much more funding needs to be directed towards assessment and re-design and construction of substandard infrastructure.”*
- Acme Creek and surrounding GTB lands between railroad corridor and M-72 in Grand Traverse County was also identified as a flood concern area.
- While flash floods have occurred in every county in the GTB Tribal service area, the urbanized areas within Grand Traverse County (City of Traverse City and surrounding municipalities) and Manistee County (City of Manistee and surrounding municipalities) are more susceptible to flash floods due to the high amount of impervious surface area in those communities, along with the presence of the Boardman and Manistee Rivers and associated tributaries.
- GTB owns properties that overlap with FEMA-designated SFHAs, representing an inland flooding risk:

County	Community	FIRM Panel #	Effective Date	Corresponding Inset # on GTB Regional Service Area Map	Description of Tribal Properties in a Flood Hazard Zone
Benzie	Village of Elberta	26019C0201C	3/22/2021	#5	GTB parcels along Bestie Lake in the Village are within or adjoining Zone AE SFHA; no structures.
Grand Traverse	Whitewater Township	26055C0150D	4/18/2023	#12	Small portion of undeveloped land in Zone A SFHA, located east of the Turtle Creek Casino and Resort

Tornado

Antrim County has had the greatest number of tornadoes (11) in the GTB service area, with Manistee County having the fewest (2).

The new Herkner Road residential development on GTB land in Garfield Township, Grand Traverse County, is expected to be completed in 2024 with up to 193 residential units; some of those units will have basements; some will be constructed with slab-on-grade foundations. With the expected increase in GTB residents in this area, a tornado mitigation strategy is to utilize the Community Center that will be built as part of the development as a designated storm shelter for residents.

All other residential developments on GTB lands have designated tornado storm shelters. A tornado siren is located in Peshawbestown by the pow-wow grounds.

Extreme Heat/Cold; Drought; Wildfire

- Increased risk of wildfire or drought with extreme heat
- Damage to crops, forests; affects the health of livestock
- All GTB communities and developed areas are somewhat vulnerable to wildfires since GTB community/economic centers and rural residential developments interface with areas of pine forest, which are more vulnerable to fire than other tree species.
- Leelanau County has the fewest total number wildfires and acres burned on MDNR lands in the GTB tribal service area between 1981 and 2018 (Table 36), while Grand Traverse County has the greatest.
- Community Survey Response: *“Renewable energy / energy independence would benefit the tribe. Existing buildings are older and may not be the most energy efficient.”*

- GTB has the following groundwater wells that could be affected by excessive water usage during extreme heat or a drought: 3 at Turtle Creek Casino (Grand Traverse County); 3 in Peshawbestown; 2 at Grand Traverse Resort (Grand Traverse County; 2 for farmland irrigation use
- Strain on power grid from high power demand from air conditioning use
- Provide heating/cooling shelters and welfare checks for vulnerable populations

Coastal Hazards – Coastal Recession and Shoreline Flooding

- The GTB Tribe owns parcels of land that adjoin either Lake Michigan or water bodies directly connected to Lake Michigan within Leelanau County (Peshawbestown); Benzie County (Village of Elberta); Grand Traverse County (East Bay Township and Acme Township) and Charlevoix County (St. James Township). These properties are most at risk from shoreline flooding and erosion hazards.
- 3 areas of concern (GTB structures) regarding flooding/erosion along the shoreline in Peshawbestown; one is near a gas station – possible contamination source if impacted by rising lake levels
- GTB owns properties that overlap with FEMA-designated SFHAs, representing coastal flooding risk:

County	Community	FIRM Panel #	Effective Date	Corresponding Inset # on GTB Regional Service Area Map	Description of Tribal Properties in a Flood Hazard Zone
Charlevoix	St. James Township	26029C0157D	9/14/2022	#21	Portions of GTB docks in St. James Harbor are located in Zones AE and VE.
Grand Traverse	Acme Township	26055C0119D	4/19/2023	#11	Some areas in Zone AE (1% annual chance flood hazard) and the 0.2% annual chance flood hazard zone along East Grand Traverse Bay. No buildings in these areas.
Grand Traverse	East Bay Charter Township	26055C0118D and 26055C0231D	4/19/2023	#9	Waterfront parcel along East Grand Traverse Bay; contains outlet of East Branch Mitchell Creek; portions are in Flood Zones AE and VE. There is a structure on the west end of the parcel (at 865 Munson Ave.) in the 0.2% annual chance flood hazard zone.
Leelanau	Suttons Bay Township	26089C0286E, 26089C0288E	6/7/2023	#3	Some areas of tribal land are in Zone AE or VE along coast of West Grand Traverse Bay; no structures in these zones.

Coastal Hazards – Dangerous Currents, Seiche, Waterspout

The GTB operates two commercial marinas on Lake Michigan – the Arthur Duhamel Marina in Peshawbestown, and one on Beaver Island (Charlevoix County). Fishing boats, as well as Tribal government employees conducting work on the Lake Michigan (for natural resource management purposes, for example), may encounter waterspouts, particularly during the time of year they are most likely to occur (August through October). The GTB also owns properties with beach access to Lake Michigan in Peshawbestown, as well as East Bay Township and Acme Township in Grand Traverse County.

A mitigation strategy for the GTB marine operators and beach visitors on the Great Lakes includes education and awareness about the prevailing weather conditions, appearance and destructive potential related to waterspouts. When warnings are issued for waterspouts, boaters should be prepared to quickly seek safe harbor, or to find shelter out of the path of the waterspout. The best source for waterspout forecast information is [NOAA Weather Radio \(NWR\)](#). These continuous broadcasts from transmitters scattered around the Great Lakes provide forecasts and warnings 24 hours a day. The mobile emergency alert system service offered by GTB, “Regroup”, can also be utilized as an informational source for waterspout forecasts and warnings.

Public Health Emergency

- Shortcomings/ Problems in response to Pandemic
 - Located so far “up north” that they didn’t have the resources and equipment needed to service large populations of sick people
 - Exposed reliability on Munson Healthcare hospitals – limited capacity of beds
 - They typically do not stockpile resources because they do not have the funds to do so.
 - Munson – mental stress on workers, constantly changing COVID protocols.

- Effects of isolation, work stress...increased behavioral health problems in the community. There is a lack of mental health resources to support everyone.
 - This was a long process and taxed EM/Healthcare workers with protocol changes; difficult to inform people of what recommendations and rules were as they changed frequently.
 - The economic impact from reduced services/shutdown on businesses, housing, and EMS/healthcare. Need to plan for sustainability in these areas in a future scenario.
 - Still dealing with supply chain issues – vehicles and equipment down in EMS/Fire/Road Commission fleet because can't get repair parts.
- What Worked Well in response to Pandemic
 - Benzie-Leelanau Health Dept. testing and vaccination clinics – set up and service delivery – positive feedback
 - GTB – Health Dept. – positive feedback on vaccination and testing clinics and case monitoring. Collaboration with local, state, and federal partners.
 - Specific fire/EMS teams were dispatched to handle emergencies that were COVID-related. Had ambulances set up to only handle COVID patients.
 - They had never gone through this public health scenario before but they got what they needed.
 - Had agreements and good coordination with other EMS departments for staffing – could share staff if one dept. was short staffed. Also coordinated with use and sharing of COVID-specific ambulances.
 - Municipalities managed to the election process with health protocols
 - Zoom meetings improved communication processes and will continue to be used in combination with in-person meetings
 - Community Survey Response: *“Internet service needs to be improved in Peshawbestown as well as other rural areas.”*

Invasive Species

- Crowding out forests; Woolly adelgid is a threat to Eastern hemlock; other pests and diseases that affect ash, beech, maple trees
- Considering what trees from southern latitudes to plant up here because they are adapted to our current climate. Half of the native plant species that were here 30 years ago are gone due to climate change.
- Aquatic invasives damaging the Great Lakes ecosystem/local fishing.
- Fisheries – invasive mussels; algal bloom on lake bottom causes fish not being able to spawn.

VI. Goals and Objectives

The mission of the GTB Natural Hazards Mitigation Plan is to protect the health and safety of tribal members and the general public on tribal lands, and maintain or improve the quality of the natural environment and built environments within GTB owned and managed lands. This is done by taking actions to permanently eliminate or reduce the long-term risks from hazards in order to prevent injury, loss of life, property damage, and loss of vital services such as transportation and infrastructure.

Specific goals and objectives have been established based upon the community's natural hazards analysis, as well as input from the Task Force participants and the public through meetings, request for comments on the draft plan, and the presentation of the plan to the Local Emergency Planning Team. These goals remain essentially unchanged as compared to the goals listed in section IX of the Tribe's 2016 Natural Hazard Mitigation Plan.

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

- a. Encourage cooperation and communication between planning and emergency management officials
- b. Encourage additional local governmental agencies to participate in the natural hazards mitigation process
- c. Encourage public and private organizations to participate
- d. Encourage use of the "Firewise Communities Program" (www.firewise.org) which offers both workshops and web-based interactive training geared toward homeowners, forestry professionals, firefighters and others on a variety of wildfire safety topics.

Goal 2: Integrate natural hazards mitigation considerations into other community planning processes

- a. Enforce and/or incorporate natural hazards mitigation provisions in building code standards, ordinances, and procedures; and into the county's comprehensive master plan
- b. Incorporate natural hazards mitigation into basic land use regulation mechanisms
- c. Update or create zoning ordinances to reflect any new building codes, shoreline protection rules, etc.
- d. Incorporate natural hazard area classifications into standard zoning classifications
- e. Develop community education and warning systems
- f. Integrate natural hazards mitigation into the capital improvement planning process so that public infrastructure does not lead to development in natural hazard areas
- g. Encourage county agencies to review local roads, bridges, dams, and related transportation infrastructure for natural hazards vulnerability

Goal 3: Utilize available resources to apply for future natural hazard mitigation grants or partnerships

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

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

- a. Encourage public and business involvement in natural hazards mitigation projects

Goal 5: Protect human life from the impacts of natural hazards through planning and preparedness efforts

Goal 6: Ensure uninterrupted government and emergency functions in a disaster

Goal 7: Increase public awareness on being prepared before, during and after a disaster, when essential services may not be available

VII. Mitigation Strategies and Priorities

Types of Mitigation Actions

Mitigation strategies are agency-specific actions intended to reduce the risk to natural hazards and disasters. FEMA's standard tribal mitigation plan requirements include identifying and analyzing 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 Planning 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 for the GTB Tribe.

- 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 Tribe can reduce potential injury, structure losses, loss of utility services (such as power, telecommunications, electric, gas, and internet), and prevent wasteful public and private expenditures. The Tribal Infrastructure, Vulnerability, and Hazard Maps in Appendix A can assist with the determining future problem areas.

Existing Tribal Pre- and Post-Disaster Hazard Management Capabilities

Emergency Warning System Coverage

- The GTB Department of Emergency Management offers GTB members the ability to sign up for “Regroup” emergency alert system, which allows members to receive SMS, email and voice emergency alerts. Leelanau County currently utilizes the “Rave” 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.
- The GTB makes regular updates to their Tribal website and Facebook page.
- Leelanau County utilizes the RAVE Mobile Alert System and IPAWS (Integrated Public Alert and Warning System - 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.)
- Radio alert system: Leelanau County uses radio channels 580 AM and 103.5 FM for emergency weather alerts.
- Tornado/Severe Weather Systems: Manual severe weather warning sirens are located at fire departments: Suttons Bay, Leland, Elmwood, Northport, Cedar, and Glen Lake; there is also and one warning siren located in Peshawbestown at the Pow-Wow Grounds on Stallman Road for the Grand Traverse Band of Ottawa and Chippewa Indians. The Leelanau County Emergency Management Office Dispatch Center conducts monthly tests on the sirens between April 1st to October 1st every year. Annual community notifications of siren tests are placed in the GTB newsletter in March and October. The GTB Tribal Government conducts annual tornado, inclement weather and fire drills.
- Flood warning system: The Leland Dam has an alarm and monitoring system for dam failure/flooding; other dams in Leelanau County do not.

Shelters

Table 38. GTB Tornado/Severe Weather Shelter Sites

#	Tornado Shelter	Location	Address	County
1	Elder's Complex	West side of Elder's Complex (behind complex)	11201 Ki-Dah-Keh Road – behind	Leelanau
2	Elder's Complex	East side of Elder's Complex (near cul-de-sac in front)	11201 Ki-Dah-Keh Road – front	Leelanau
3	Peshawbestown	Peshawbestown Road, near the Natural Resources weather monitoring station	2809 NW Bay Shore Drive	Leelanau
4	Antrim	Near playground area	Wiingash-Mi-kun, Rapid City	Antrim
5	Benzie	Near the Pow-Wow grounds at the Benzie Satellite Office	7282 Hoadley Rd., Benzonia	Benzie
6	Charlevoix	Near playground area by the Charlevoix Satellite Office	10085 Wa-Ba-Noong Mi-Kun, East Jordan	Charlevoix

The Leelanau Sands Casino, located on the GTB Reservation in Peshawbestown, serves as an important larger-sized shelter location amongst the other 14 temporary shelter sites in Leelanau County (Table 39).

Table 39. Shelter Sites Coordinated by the Leelanau County Office of Emergency Management

Emergency Shelter Site Name	Street Address	City	ZIP	Generator (Y/N)	Overnight Accommodations (Y/N)
Cedar Area Fire & Rescue	8907 S. Railroad Avenue	Cedar	49621	Yes	No
Elmwood Township Fire & Rescue	10090 E. Lincoln Road	Traverse City	49684	Yes	No
Empire Township Hall	10088 W. Front St.	Empire	49630	Yes	No
Glen Lake Community Library	10115 W. Front St.	Empire	49630	Yes	No
Glen Lake Fire Department	6401 W. State Street	Glen Arbor	49636	Yes	No
Leland Township Fire & Rescue	503 S. Grand Avenue	Leland	49654	Yes	No
Leelanau Township Fire Department	100 W. 8 th Street	Northport	49670	Yes	No
Suttons Bay-Bingham Fire & Rescue	201 S. St. Mary's Street	Suttons Bay	49682	No	No
Leelanau Sands Casino	2521 N. West Bay Shore Drive	Peshawbestown	49682	Yes	No
Northport Public School	104 S. Wing Street	Northport	49670	Yes	No
Leland Public School	200 N. Grand Avenue	Leland	49654	Yes	No
Suttons Bay Public School	500 S. Elm Street	Suttons Bay	49682		No
Glen Lake Public School	3375 W. Burdickville Road	Maple City	49664	Yes	No
VFW Post 7731	7475 E. Duck Lake Road	Lake Leelanau	49653	No	No
Cedar/Maple City Lions Club	100 E. Bellinger Road	Maple City	49664	No	No

Tribal Law and Planning Mechanisms

The GTB Natural Resources Department issues Soil Erosion and Stormwater Runoff Control permits for construction on GTB lands. Earth changes requiring a soil erosion and stormwater runoff control permit from the enforcement officer(s) designated by the Tribal Council have the following requirements under the GTB Legal Code:

- (1) Earth changes connected with any of the following activities which disturb land within 500 feet of a lake or stream, except for normal maintenance:
 - (A) Transportation facilities, including streets, access roads, railroads, airports, common carrier pipelines, and mass transit facilities, except normal maintenance procedures such as earth or gravel road leveling and minor repairs or alterations to rights-of-way not affecting a lake or stream.
 - (B) Site preparation for a single-family residence and multiple family residential developments.
 - (C) Tribal buildings and service facilities, including but not limited to government buildings and facilities, commercial buildings, schools, vehicle maintenance facilities, and salt storage facilities.
 - (D) Recreational facilities, including but not limited to parks, golf courses, beaches above the ordinary high water mark, campgrounds or trails, including Tribal or private facilities.
 - (E) Utilities, including but not limited to underground pipelines or cables, except pole installation, service line and other earth changes of a minor nature, and emergency repairs.
 - (F) Oil, gas, and mineral wells. Access roads to well production sites shall be subject to permit requirements.
 - (G) Non-agricultural water impoundments and waterway construction or improvements.
 - (H) Logging activities including access roads, except the principal area where the trees are being cut.
 - (I) Mining activities including access roads, except the principal area where minerals are being removed.
 - (J) Earth changes on agricultural lands, including road construction and building construction, but not including plowing and tilling of soil for the purpose of crop production.
- (2) Earth changes for environmentally-sensitive residential sites.
- (3) Industrial or commercial use development sites, regardless of size, location, or environmental sensitivity.
- (4)
 - (A) All developments which includes housing, commercial, subsidiary enterprises, individual or other entity developments within the Tribe's jurisdiction regardless of size, location, or environmental sensitivity.
 - (B) All multi-family developments regardless of size, location or environmental sensitivity.
- (c) Identification of Environmentally-Sensitive Sites.
 - (1) Tribal land owners and lessees are responsible for determining whether their sites are environmentally-sensitive as defined in this ordinance (§ 302(u)).
 - (2) The Tribal administration and/or the county conservation district shall be requested to provide assistance to land owners and lessees in identifying earth changes and environmentally-sensitive sites subject to review by the enforcement officer(s) designated by the Tribal Council.

In March of 2020, the GTB enacted a Tribal Emergency Meetings Act. The purpose of this ordinance is to ensure that the Tribe's business can continue to be conducted by the Tribal Council in an open and public manner and subject to review by Tribal members in the case of a declared emergency. The Act defines the term "emergency" as "an emergency that is lawfully declared by the Tribal Chairperson pursuant to the Emergency Operation Guide, Basic Plan, as the Plan is established in accordance with the Tribe's Emergency Management Resolution, 02-20.1121, or its successor or by declaration of an emergency by the President of the United States."

The GTB Fire and Rescue Department issues directives to individuals employed by the GTB, its enterprises, businesses and subsidiaries to act in compliance of the National Fire Protection Association Code (adopted by the GTB) for all structures certified for occupancy.

2012 Peshawbestown Master Plan Recommendations:

- Because its sovereign status exempts the Tribe from state zoning and planning enabling legislation, the preparation of a site and building guidelines code should be considered to regulate development activity in the future. This action would ensure that as properties are developed that the same site amenities (lighting, parking, signage, landscaping, etc.) and architectural details would be followed. This will provide some uniformity and consistency when build-out occurs. It is suggested that separate guidelines be prepared for the business and entertainment district, residential neighborhoods, and the commercial district at Putnam and M-22.
- To encourage the use of sustainable design techniques the guidelines should include provisions for low impact stormwater design, dark-sky lighting, and reduction of heat islands (parking lots).
- The Master Plan includes a map of buildable areas for that are suitable future development. These include areas that have slopes less than 18%, and do not have the presence of wetlands.

2011 GTB Long-Range Transportation Plan Goals & Strategies:

- Ensure improvements will account for overall public safety for services such as EMS, school buses, snow plows, and police/fire, but at a scale that is not excessive.

- Minimize impacts to natural features such as woodlands, wetlands and steep slopes along transportation corridors.

2010 GTB Natural Resource Management Plan Recommendations and Guiding Principles:

- Use community knowledge in NRD Management.
 - Pursue land preservation, acquisition and preservation opportunities
- Collaborate and sustain inter-departmental relationships
 - Economics: Protect ecological and culturally important areas through zoning and planning
 - Elders/Culture: Utilize cultural guidance for management and planning of programs especially seed and harvest activities
 - Language: Integrate Anishinaabemowin and concepts into management and programs
 - Community Health: Involve in development of native seeds and community garden program.
- Collaborate and communicate with other tribes, units of governments, NGOs and public.
 - Partner with Federal Departments.
 - Approach State of Michigan for co-management and access to healthy lands.
 - Develop and implement management recommendations.
 - Restore stream banks.
 - Repair road stream crossings and in stream habitats.
 - Restore desirable pool, riffle, run ratios.
 - Install in stream structures such as Large Woody Debris and substrate hardening.
 - Change, restore and improve landscape features to benefit both flora and fauna that depend on each other to function properly.
 - Establish and maintain cool/cold water culture production facilities for species (e.g. walleye and native salmonids).

The 2008 Renewable Energy Feasibility Study in Wind, Biomass and Solar for the Grand Traverse Band of Ottawa and Chippewa Indians determined how to maximize renewable resources leading towards a path of energy sovereignty. The study concluded public facilities and housing districts provide the next best renewable energy opportunities where smaller biomass district heating plants can be installed in conjunction with home and neighborhood solar hot water heating systems. Peshawbestown residential areas and administrative facilities present opportunities for biomass heating plants. The tribe can generate electricity for self-supply but will require forming its own electric utility and establishing the basis for delivery, metering, billing and servicing its own facilities and contiguous residents. Unless GTB generated electricity has a lower cost than the market price, tribal facilities and residences will not economically benefit.

GTB Natural Resources Department – Inland Management Responsibilities Related to Hazard Mitigation

- Develop and foster working relationships with Federal and State agencies to improve management efficiency,
- Develop resource use agreements, and improve productive communication with other resource management agencies.
- Conduct wildlife harvest monitoring; including deer check stations, furbearer registrations, and other special inspections of harvested fish and game.
- Conduct fisheries and wildlife habitat surveys, inventories, and assessments.
- Maintenance of the Tribal Repository/Exercise of American Indian Religious Freedom Act
- GPS Mapping and Technical Assistance
- Plant, Insect, and Fish Identification
- Public Outreach and Education (including Natural Resources Fair and Feast, Kids Free Fishing Days, fishery survey reports to membership, lake associations, and watershed committees)
- Scuba Diving (Advanced Open Water) Underwater Search and Recovery
- Grant writing and administration for resource protection, restoration, and enhancement projects with particular emphasis on collaborative projects

County/State Statutory Hazard Prevention Mechanisms

Individual county building departments complete building and trade inspections for all GTB-owned building projects within the six-county service area. Permits related to water well and septic systems are issued by the Benzie-Leelanau District Health Department (Benzie and Leelanau Counties); Grand Traverse County Health Department; Health Department of Northwest Michigan (Charlevoix and Antrim Counties); or District Health Department #10 (Manistee County).

Mitigation Strategies

Strategies were developed based on discussions with the Task Force and the GTB Tribal Council, and a review of FEMA best practices for hazard mitigation. A list of alternative strategies considered is included as Appendix E. The strategies table is grouped according to purpose. Purpose types include: Awareness & Preparation, Shelters, Buildings & Development, Electric Service & Communications 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 D provides a review of mitigation strategies included in the 2016 plan, their current status, and how they have or have not been incorporated into the 2023 plan. The assigned priority levels for the 2016 strategies are also compared to what the 2023 plan has assigned for them. The 2016 plan identified the top four most significant priority areas based largely on local knowledge regarding tribal assets, lands, hazards, risks, and vulnerabilities. The general rationale used to determine the priority levels of strategies in the 2023 plan differs, and is described below.

Rationale for Prioritization of Mitigation Strategies

The GTB Emergency Manager and Natural Hazards Task Force considered factors like level of need, economic impact, ease of execution/level of effort, cost, and range of benefit (short term, long-term, small group/area, large group/area) when determining the level of priority for each strategy.

Strategies that provide comprehensive benefits for the community, focusing on issues such as human health, community safety, and protecting property and critical infrastructure, were prioritized as high priority strategies. High priority strategies are often action items that focus around education efforts and infrastructure improvements with potentially high costs associated with them, but the cost of those effort can be adequately addressed through sources such as available funds in the GTB budget and eligible grant or partnership opportunities. High priority strategies have an estimated benefit/cost ratio that is greater than one (1), assuring that the value of the action's benefits are estimated to be greater than the costs incurred.

Important, but ongoing efforts that provide a direct benefit to the Tribe and natural resources were also categorized as either high or medium priority strategies. Medium priority strategies can have a lower cost-benefit ratio than high priority strategies, with higher up-front costs and time needed to implement and a delayed future return on investment (i.e., pursuing renewable energy projects on tribal land.)

Strategies with minimal direct benefit to the Tribe or natural resources were marked as low priority. The resources needed to implement the strategy and the cost of the strategy was taken into account, but not above the need demonstrated.

PRIORITY LEVELS

HIGH
MEDIUM
LOW

In addition, each mitigation strategy is associated with a strategy type, as indicated in the key below:

STRATEGY TYPES

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

GRAND TRAVERSE BAND OF OTTAWA AND CHIPPEWA INDIANS HAZARD MITIGATION STRATEGIES		HAZARD TYPE										WHO - Responsible Parties (Lead Entities are indicated in Bold)	HOW - Resources and/or Partnerships	WHEN - Timeframe (Years)	PRIORITY TYPE (High, Medium, Low)	STRATEGY TYPE				
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Inland Flooding and Erosion	Extreme Temperatures	Drought	Shoreline Hazards: Flooding, Erosion, Dangerous Currents, Seiche, Waterspout	Invasive Species	Public Health	Emergency					Local Planning & Regulations	Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness Efforts	
1	Continue to proactively inform the public about hazard preparation/prevention and available shelter sites via utilization and promotion of the Regroup mass notification system; NWS weather radio; GTB social media; mailings; newsletter articles; or classes.	X	X	X	X	X	X	X	X	X	X	X	Emergency Manager, TMO, Communications, Human Services				X		X	X
1a	Provide education to GTB marina/beach users about severe weather awareness/preparation on Lake Michigan. Recommend utilization of NOAA Weather Radio, NWS beach hazard forecasts, and the Regroup mobile emergency alert system.	X	X		X						X		Emergency Manager; Public Safety ; Conservation; Natural Resources	A, AA, MM	1-3	H	X			X
1b	Coordinate shelter awareness and education efforts with Emergency Managers in service area	X	X		X	X							Emergency Manager, Public Safety	A, B-H, I	Ongoing	H	X			X
1c	Post signage conveying natural hazard/severe weather awareness and preparation at outdoor recreation and large gathering venues.	X	X	X	X	X				X		X	Public Safety, Facility Management	A, AA, V-Y, MM	1-3	H				X
1d	Continue the preparedness practice of conducting the annual statewide tornado drill.		X										Emergency Manager; Public Safety	A, B-G	Annually	H	X			X
1e	Teach school children about the dangers of natural hazards including hail, lightning, and tornadoes and how to take safety precautions.	X	X	X	X	X				X		X	Public Safety, Education, Youth Services	A, AA	1-3	M				X
1f	Promote awareness of vegetation management around structures to prevent structural fires.		X	X									Public Safety	V, W, Y	1-3	M				X
1g	Promote participation in the NWS "Skywarn" Storm Spotter Training		X							X			Emergency Manager, Public Safety	A, AA	Annually	M				X
1h	Mail informational brochures with monthly water bills.	X	X	X	X	X	X	X	X	X	X	X	Public Safety, Education, Natural Resources, Public Works	A, AA, MM, EEE-III	1-3	L	X		X	X
1i	Promote education about the benefits of shoreline and streambank restoration				X					X	X		Natural Resources, Education	XX, GGG-KKK	3-5	L			X	X
2	Continue to coordinate with county and local officials for tornado siren operation to notify the public of potential tornado activity in the GTB service area		X										Emergency Manager, Public Safety	A, B-G	As needed	H	X			X
3	Investigate the feasibility of installing additional tornado sirens on GTB-owned properties, including GTB's public safety/EM office in Peshawbestown.		X										Emergency Manager, Public Safety	PP, QQ	3-5 years	H		X		X
4	Continue to regularly assess fire suppression access points and equipment and pursue improvements as needed.			X		X							Public Safety, Public Works	I, X, OOO	Ongoing	H	X	X		
4a	Investigate funding sources for the purchase of a new fire truck.			X		X							Public Safety (Fire) , Tribal Management Office	I, X, OOO	1-3 years	H	X			
5	Review secondary water sources for all vulnerable populations and ecologically sensitive resources					X	X					X	Public Safety, Natural Resources	A, I, LL	Annually	H	X		X	
6	Annually update the Tribe's basic Wildfire Operations Plan (coordinate with MDNR)			X									Public Safety	I	Annually	H	X			
7	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			Public Safety, Health Services	B-G, I	1-3	H	X			X
8	Offer reduced cost snow plow program, meal delivery service, and "telephone reassurance" call service to check on rural area, homebound Elders during hazard events / weekly.	X	X	X	X	X						X	Public Safety, Elders	R, S	1-3	H	X			X
9	Continue to partner with/utilize the services of the local health departments and MDHHS				X							X	Public Safety, Health Services	M, N-Q	Ongoing	H	X	X	X	X
10	Continue to coordinate with the MDHHS for guidance via their State Pandemic Plan and information about new or emerging disease threats.											X	Public Safety, Health Services	M	Ongoing	H	X			X
11	Incorporate the Hazard Mitigation Plan's strategies into master plans and other community plans.	X	X	X	X	X	X	X	X	X	X	X	All departments	A - G	1-3	H	X	X	X	X

Awareness and Preparation

	GRAND TRAVERSE BAND OF OTTAWA AND CHIPPEWA INDIANS HAZARD MITIGATION STRATEGIES	HAZARD TYPE										WHO - Responsible Parties (Lead Entities are indicated in Bold)	HOW - Resources and/or Partnerships	WHEN - Timeframe (Years)	PRIORITY TYPE (High, Medium, Low)	STRATEGY TYPE					
		Severe Winter Weather	T-Storm, High Winds, Hail, Tornado, Lightning	Wildfire	Inland Flooding and Erosion	Extreme Temperatures	Drought	Shoreline Hazards: Flooding, Erosion, Dangerous Currents, Seiche, Waterspout	Invasive Species	Public Health Emergency	Local Planning & Regulations					Building & Infrastructure Projects	Natural Systems Protection	Education & Awareness Efforts			
Awareness and Preparation	12	Ensure that members, particularly vulnerable populations, have access to healthy, affordable food options.								X		X	X	Human Services, Agriculture, Elders, Health Services				X		X	X
	12a	Continue to provide and improve food assistance programs and emergency food programs to help communities prepare for unanticipated pandemics and emergencies.								X			X	Public Safety, Health Services, Elders, Agriculture, Human Services	J, R, S	Ongoing	H	X			X
Awareness and Preparation	12b	Create community gardens in residential areas and/or school locations to promote learning about growing local food and native pollinating plants.								X			X	Natural Resources, Health Services, Education, Agriculture	A, UU, MMM	3-5	M				X
	12c	Support 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			X	Public Safety, Human Services, Agriculture	LLL, MMM	1-3	M	X			X
	13	Maintain proper levels of PPE for first responders.	X	X	X	X	X				X		X	Public Safety, Health Services	A - I	Ongoing	M	X			
	14	Continue interdepartmental cooperation and coordination of police, fire and rescue services to achieve service area coverage availability.	X	X	X	X	X				X		X	Emergency Manager, Public Safety	A - I	Ongoing	M	X			
	15	Consider becoming a recognized Firewise USA® community.			X					X				Public Safety	V, W	3-5	M	X			X
	16	Maintain a GTB snow removal plan and coordinate with surrounding jurisdictions	X											Public Safety, Facility Mgmt., Housing	A, B-G	1-3	M	X			X
	17	Designate areas of refuge from imminent fire danger and create emergency evacuation plans for a potential flooding event			X	X					X			Public Safety	V, Y, JJ, LL, NN, HHH	1-3	M	X			
	18	Consider developing a drought communication plan and early warning system to facilitate timely communication of local drought conditions/outlook to officials, emergency responders, and the public.									X			Public Safety, Agriculture, Public Works	T, U	3-5	L	X			X
	19	Establish an irrigation scheduling program or process so that all agricultural land gets the required amount of water. Spacing the time of usage may also help with recharge of groundwater.			X					X				Public Safety, Agriculture, Public Works	T, U, WW, YY-DDD	3-5	L	X	X	X	
	20	Implement mosquito-spraying programs to preventing mosquito-borne diseases.										X	X	Public Works, Natural Resources	M - Q	1-3	L	X			
	21	Evaluate additional designated sites to temporarily store cleanup debris after storms.	X	X		X								Public Safety, Facility Mgmt, Housing	B-G, I	1-3	L	X			
	Shelters	22	Maintain an accurate inventory of emergency shelter sites in the service area; review annually and update as needed.	X	X	X	X	X			X		X	Public Safety, Human Services	A - H	Annually	H	X			
23		Designate the Community Center building at the Herkner Road development as the community's shelter site.	X	X	X	X	X			X		X	Housing, Tribal Manager Office	A	0 - 2	H	X	X			
24		Continue to establish areas of refuge and evacuation routes for community gathering sites	X	X	X	X	X			X		X	Public Safety	A	0-1	H	X				
25		Collaborate with local E.M.'s to provide adequate shelters to the public during emergency events.	X	X	X	X	X			X		X	Public Safety	A - H	Ongoing	M	X				
26		Consider constructing additional shelters or safe rooms at day camps, gathering grounds, etc.	X	X	X	X	X			X		X	Public Safety, Housing, Facility Mgmt	PP, QQ	1-3	M		X			
26a		Install generators to enable additional buildings to be used as emergency shelters.	X	X	X	X	X			X		X	Public Safety, Facility Mgmt, Housing	PP, QQ	3-5	M		X			
27		Organize outreach to vulnerable populations, including establishing and promoting accessible heating or cooling centers for tribal residents.	X	X	X	X	X			X		X	Public Safety, Health Services, Elders, Human Services	A, J, R	1-3	M	X			X	
28		Maintain procedures to create quarantine areas in group living quarters, such as overnight shelters or assisted living facilities.											X	Public Safety, Health Services, Housing	M - Q	1-3	L	X			

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29	Continue to maintain community water and/or sewer infrastructure at acceptable operating standards.		X		X			X			X	Public Safety, Public Works	A	Ongoing	H	X	X	X	
30	Pursue FEMA hazard mitigation assistance grants as appropriate (i.e., culvert/bridge replacement, storm sewer retrofitting, storm water management, dry flood-proofing of structures; structure elevation, property acquisition, for structure demolition or relocation; nature-based solutions.)	X	X	X	X	X		X	X	X	Public Safety, Natural Resources , Housing	PP, QQ	1-3	H	X	X	X		
30a	Replace undersized and/or aging culverts/bridges for improved river function and hydraulic activity				X			X		X	Public Safety, Public works, Natural Resources	PP, QQ	5-10	H	X	X	X		
30b	Complete drainage improvements in areas of high flooding potential, including upgrading aging stormwater abatement structures				X			X			Public Safety, Public works, Natural Resources	PP, QQ	5-10	H		X	X		
30c	Identify the locations of where backup generators on sewer pump chambers are needed to alleviate manual pumping/hauling in the event of a power outage, and apply for funding.	X	X		X			X		X	Public Safety, Public Works	PP, QQ	1-3	H		X			
30d	Install check valves on stormwater discharge locations as needed.		X		X			X		X	Public Safety, Public Works	PP, QQ	1-3	H		X			
30e	Separate storm and sanitary sewer systems where applicable.		X		X			X		X	Public Safety, Public Works	PP, QQ	3-5	H		X	X		
31	Continue enforcement of the BLDHD's Septic Inspection and Property Transfer Ordinance to protect public health and prevent or minimize the degradation of groundwater and surface water quality from malfunctioning sewage treatment and disposal systems.				X			X		X	Benzie-Leelanau District Health Department, Public Works	N	1-3	H	X	X	X		
32	Continue to enforce the GTB's Soil Erosion and Stormwater Runoff Control ordinance to ensure that proper measures are taken to protect the soil and water for any construction within 500 feet of a waterway or for earthwork done over one acre in size.				X			X			Natural Resources	A	Ongoing	M	X	X	X		
33	Continue to implement applicable local building code enforcement, including floodplain/shoreline setbacks.	X	X	X	X	X		X	X	X	Tribal Fire and Rescue (Public Safety); County Governments	A - G	Ongoing	M	X	X	X		
34	Consider joining the National Flood Insurance Program				X			X			Legal , Public Safety, Natural Resources	NN, OO	3-5	M	X	X			
34a	Maintain a record of areas that have reported repetitive loss damages due to flooding				X			X			Public Safety, Natural Resources	NN, OO	0-1	M	X	X			
35	Promote the availability of residential utility assistance and home improvement/weatherization programs.	X	X		X			X		X	Public Safety, Housing, Elders, Human Services	J- L, R, S, NNN	1-3	M		X		X	
36	Educate developers and property owners about best building practices to mitigation impacts of natural hazards	X	X	X	X	X		X	X	X	County Building Departments, Natural Resources , Architect	B - G	1-3	M	X			X	
37	As new buildings are built or buildings are modified, use new technology and/or natural techniques to create or increase structural stability; optimize stability for known site conditions	X	X	X	X	X		X	X	X	Tribal Council, Housing, Natural Resources , Architect	A	Ongoing	M	X	X	X		
38	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			X		X	Natural Resources ; County Brownfield Redevelopment Authorities, Housing	A - G	3-5	M	X	X	X		
39	Improve ventilation techniques in areas, facilities, or vehicles that are prone to crowding or that may involve exposure to contagion or noxious atmospheres.									X	Housing, Health Services	A	3-5	L	X	X			
40	Consider the development of a reduced-cost program to install air conditioning in the homes of Elders.		X		X					X	Elders, Health Services, Human Services	A, K, L, LLL	3-5	L		X			

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Electric Service & Communications Technology	41	Continue work amongst the utility companies and the County Road Commissions to clear vegetation (particularly diseased or dead trees, i.e., from Emerald Ash Borer infestations) along various road and utility right-of-ways to minimize power outages and road blockages from storms damage.	X	X	X	X			X	X		Public Safety, Natural Resources, Facility Management	B-G, BB, CC	Ongoing	H	X		X	
	42	Pursue renewable energy projects on GTB land.	X	X	X	X	X		X	X		Public Safety, Architect, TMO, Housing	Z	3-5	M	X	X	X	X
	43	Establish standards for tree pruning around power lines.	X	X	X	X						Public Safety, Facility Management , Natural Resources	V-Y, BB, CC	0-1	M	X		X	
	44	Continue to maintain effective communications practices between electric utility companies regarding power restoration after storms. Promote the online electrical outage maps provided by utility companies.	X	X	X	X	X		X			Public Safety, Facility Management , Natural Resources	BB, CC	Ongoing	M	X			X
	45	Investigate opportunities to bury overhead utilities, such as during new construction or in areas regularly prone to power outages.	X	X	X	X	X		X			Public Safety, Housing, Facility Management, Architect	PP, QQ	Ongoing	M		X		
	46	Expand availability and affordability of high-speed internet service to allow for widely available remote work/learning.	X	X	X	X	X		X	X		Public Safety, IT Dept, TMO	OO, GG	3-5	M	X	X	X	X
	47	Maintain Continuity of Operations (COOP) plans and alternative "remote work" schedules.	X	X	X	X	X		X	X		Public Safety, TMO	A	Ongoing	L	X			
Environment & Natural Resources	48	Continue and improve collaboration with natural protection agencies regarding technical assistance, outreach and education about aquatic and terrestrial invasive species management.									X	Natural Resources	AAA-FFF, XX-ZZ	Ongoing	H	X		X	X
	48a	Continue to conduct annual routine invasive species surveying and monitoring to identify new emergent invasive species before they get established and spread.									X	Natural Resources	RR	Ongoing	H	X		X	X
	48b	Prevent the introduction on new invasives and treat and remove existing ones by engaging the public in prevention practices to reduce 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									X	Natural Resources	SS - WW	Ongoing	H	X		X	X
	48c	Promote EGLE's "NotMiSpecies" webinars and resources on invasives control and management									X	Natural Resources	TT	Ongoing	H			X	X
	48d	Promote MSUE's "Clean Boats, Clean Waters" comprehensive aquatic invasive species boater outreach program resources; apply for grant funding to communicate aquatic invasive species prevention information through outreach materials and in-person educational events to boaters									X	Natural Resources	SS	Ongoing	H			X	X
	48e	Participate 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 properly Dispose of unwanted bait.									X	Natural Resources	VV, YY - DDD	Ongoing	H			X	X
	48f	Support invasive species management services with a cost-share option between property owners and invasive species management agencies									X	Natural Resources	EEE, FFF	Ongoing	M			X	X
	48g	Pursue alternative invasive species control measures, such as livestock grazing.									X	Natural Resources, Agriculture	RR, UU, WW	1-3	M			X	X

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49	Provide boat wash stations and signage at all public boat launch sites.								X	Natural Resources	RR, SS	1-3	H	X	X	X	X
49a	Acquire mobile boat washing stations								X	Natural Resources	RR, SS	0-1	H	X	X	X	X
50	Install boot-cleaning and/or equipment cleaning facilities at popular trailheads (non-motorized, equestrian, and ORV/Motorcycle) to reduce the spread of invasives species.								X	Natural Resources	RR	1-3	H		X	X	X
51	Consider adoption of tribal 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	Natural Resources, Legal	RR	1-3	H	X		X	X
52	Continue to identify and prioritize sites for open space protection/preservation, green infrastructure and/or stormwater management.			X	X	X	X	X	X	Public Safety, Natural Resources		1-3	H	X	X	X	X
52a	Maintain documentation of hydrologically sensitive environments, wetlands, coastal erosion problem areas on adjoining GTB owned lands			X	X	X	X	X	X	Natural Resources, Public Safety	HH - LL, XX, GGG, III	0-1	H	X		X	
52b	Implement nature-based solutions to mitigate stormwater runoff in infrastructure projects.				X			X	X	Public Safety, Public Works, Natural Resources, Housing	PP, QQ, GGG - KKK	3-5	H	X	X	X	
52c	Pursue the designation or acquisition of land, especially in flood prone or erosion areas, for open space/green infrastructure etc.	X	X	X	X	X	X	X	X	Public Safety, Natural Resources, Legal	XX	3-5	H	X		X	
52d	Partner with natural resources agencies to help restore natural shorelines				X			X	X	Public Safety, Natural Resources	HH - LL	Ongoing	H	X	X	X	
52e	Consider creating a natural shoreline preservation program				X			X	X	Public Safety, Natural Resources	HH - LL	3-5	H	X		X	X
52f	Identify priority shoreline and streambank restoration sites.				X			X	X	Natural Resources, Public Safety	XX, GGG - KKK	1-3	M	X		X	
52g	Identify low-impact development strategies to be applied in flood prone areas				X			X		Public Safety, Natural Resources, Housing	NN, XX, GGG - KKK	0-1	M	X	X	X	
53	Support implementation of Forestry Management Plans that include mitigation efforts for invasive species.			X	X	X		X	X	Public Safety, Natural Resources	RR, YY - DDD	Ongoing	M	X		X	
54	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 plants).			X	X	X		X	X	Public Safety, Natural Resources	I, EEE, FFF	As needed	M	X		X	
55	Continue efforts to regularly clean up river and lake debris.				X			X	X	Public Safety, Natural Resources	GGG - JJJ	As needed	M			X	X
56	Continue to regularly clean out plugged culverts (due to sediment deposits, invasive species, etc.)				X			X	X	Public Safety, Public Works, Natural Resources	A - G, KKK	As needed	M	X		X	

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 GTB Tribe 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.

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 GTB Tribal Council will lead the implementation of the Natural Hazards Mitigation Plan with assistance from the Emergency Management Department and the Tribal Manager. The Tribal Local Planning Team (LPT), organized by the Emergency Management Department, 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 implementing, monitoring, evaluating and updating the Plan. Staff support will be provided by the GTB Emergency Management Department and will coordinate with the GTB Tribal Management and Tribal Council.

Implementation of the Strategies

To assist with the funding and/or enacting of the proposed natural hazards mitigation strategies, the following pages contain a table of potential resources that can help fund, staff or 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.

Some of the funding sources and partnerships that have previously been utilized by the GTB for hazard mitigation actions/projects include:

- Partnered with the non-profit Conservation Resource Alliance, along with local, state and federal agencies, to remove dilapidated dams on the Boardman River (Grand Traverse County) and restore the river to its natural flow.
- Partnering with the Grand Traverse Regional Land Conservancy, The Watershed Center of Grand Traverse Bay, and Conservation Resource Alliance to continuously monitor and work to improve the water quality of Mitchell Creek on the nature preserve. The Mitchell Creek watershed is a critically important tool for safeguarding water quality in East Grand Traverse Bay.
- In 2018, local middle-schoolers planted 500 trees provided by the GTB's Natural Resources Department at the Leelanau Conservancy's DeYoung Natural Area. The collaboration was part of GTB's goal to plant native-to-Michigan nuts and fruits species to create landscapes that provide the opportunities for tribal citizens and the wider community to gather healthy foods, to benefit wildlife, to improve water quality, and to adapt to climate change.
- The GTB was awarded FEMA hazard mitigation grant program funding in May 2005 for the construction of storm shelters on tribal lands in Antrim, Benzie, Charlevoix and Leelanau counties. The project was completed in August 2008 with a total cost of \$76,500.

Resources List for GTB Tribe 2023 Hazard Mitigation Strategies

ID	Resource	Description	Website	Hazard Type
A	Grand Traverse Band of Ottawa and Chippewa Indians	Human resources include Tribal staff and members, including Emergency Manager. Monetary funding resources for tribal government operations discretionary programs include: the U.S Bureau of Indian Affairs (provides services directly or through contracts, grants, or compacts to 574 Federally recognized tribes); BIA Indian Health Service self-governance funding; federal ARPA funds; reimbursements from the GTB Economic Development Corporation; and internal tribal resources.	http://www.gtbindians.org/	All hazards
B	Antrim County Government	County staff including Emergency Management	https://www.antrimcounty.org/departments_services/_emergency_services/index.php	All hazards
C	Benzie County Government		https://www.benzieco.net/departments/emergency_operations_management/index.php	All hazards
D	Charlevoix County Government		https://www.charlevoixcounty.org/charlevoix_county_sheriff/emergency_management.php	All hazards
E	Grand Traverse County Government		https://www.gtcountymi.gov/278/Emergency-Management	All hazards
F	Leelanau County Government		https://www.leelanau.gov/emergencymgmt.asp	All hazards
G	Manistee County Government		https://www.manisteecountymi.gov/275/911-Dispatch	All hazards
H	Little River Band of Ottawa Indians		Tribal staff including Incident Commander	https://lrboi-nsn.gov/
I	Leelanau County Local Emergency Services and Fire Departments	GTB Fire & Rescue (Suttons Bay Twp.); Cedar Area Fire & Rescue (Solon Twp.); Elmwood Charter Township Fire & Rescue; Traverse City Fire Station (Elmwood Twp.), Glen Lake Fire & Rescue (Glen Arbor Twp.); Leland Township Fire & Rescue (Leland); Lake Leelanau Fire Station (Leland Twp.), Leelanau Township Fire Department; Suttons Bay-Bingham Township Fire & Rescue; Empire Fire Dept. (Village of Empire)	-	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Wildfire; Flooding; Extreme Temperatures; Public Health Emergency
J	GTB Human Services Department	Promotes community self-sufficiency, and physical and mental well-being for Tribal members residing within the six-county service area through direct service provision, education, and community involvement within the spirit of self-governance. Income-eligible GTB households receive financial assistance through LIHEAP, RAO, ARPA, and CSBG. Income-eligible Federally recognized tribal members are eligible for assistance through LIHEAP and CSBG. Emergency Heating Assistance Food purchase order to select stores Weatherization Emergency food pantry Community Food Rescue on Mondays	https://www.gtbindians.org/human_services.asp	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency
K	"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.	www.michigan.gov/mi-hope	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency
L	Northern Michigan Community Action Association (NMCAA)	Weatherization Assistance Program and Emergency Home Repair Program for low- to moderate- income households.	https://www.nmcaa.net	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency
M	GTB Health Services Department	Family Practice Medical Clinic; Virtual Care; Community Health Representatives; Dental Clinic; Optical Services; Immunizations; Special Diabetes Program for Indians	https://www.gtbindians.org/health_services.asp	Public Health Emergency

N	Benzie-Leelanau District Health Department	Provide programs and services in Benzie and Leelanau County: 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, point of sale (POS) evaluation, and the inspection and licensing of food service establishments.	https://www.bldhd.org/	Flooding; Extreme Temperatures; Public Health Emergency
O	Grand Traverse County Health Department	Services include immunizations; communicable disease case reporting, follow-up, prevention, and education in our community; dental health services; help with basic services like food, housing or transportation to medical appointments through the Northern Michigan Community Health Innovations Region's Community Connections program; On-site well and sewage disposal permits.	https://www.gtcountymi.gov/2211/Health	Flooding; Extreme Temperatures; Public Health Emergency
P	Health Department of Northwest Michigan (HDNW)	Provide programs and services in Charlevoix and Antrim Counties: 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.	https://www.nwhealth.org/	Flooding; Extreme Temperatures; Public Health Emergency
Q	District Health Department #10	Service area includes Manistee County. Provide programs and services such as: immunizations; infectious disease education and prevention; 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.	https://www.dhd10.org/	Flooding; Extreme Temperatures; Public Health Emergency
R	GTB Elders Program	Provides assistance to Tribal Elders so they can live independently and have a healthy lifestyle. Services include home delivery meals; farmer's market coupons; caregiver assistance program; Elders emergency fund program; technology education	https://www.gtbindians.org/elders.asp	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency
S	Leelanau County Senior Services (LCSS)	A person must be 60 years of age or older and a resident of Leelanau County to be eligible for services. LCSS offers an emergency pendant called the "Freedom Alert". A person wears a small pendant with an emergency call button on it. When there is an emergency, the button is pressed; 9-1-1 is dialed automatically. There is no monitoring fee, service charges or contract. There is a one-time cost to purchase the system. Please contact the LCSS office regarding cost, financial assistance may be available. LCSS also offers a File of Life and the Medical Equipment Loan Closet free of charge. Seniors may receive assistance in paying for snow removal from their driveways/walkways. Other services include: Personal Care; Respite Care; Medication Management; Homemaking; Dental, Eyeglass or Hearing Aid Assistance; Heating/Utility Bill Payment Assistance; Legal Assistance; Unmet Needs Assistance (assistance with unpaid medical, safety related repairs/house/car). Financial assistance for these programs is available to seniors who meet LCSS's income and asset guidelines.	https://www.leelanau.gov/lcssprograms.asp	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures; Public Health Emergency
T	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.	https://www.climatehubs.usda.gov/hubs/midwest/topic/midwest-agriculture-climate-team-mac-t	Drought, Extreme Temperatures, Flooding, Severe Winter Weather, High Winds, Hail
U	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).	https://www.cpc.ncep.noaa.gov/products/Drought/	Drought
V	National Fire Protection Association	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. Also training on Assessing Structure Ignition Potential from Wildfire.	https://www.nfpa.org/	Wildfire, Drought

W	NFPA Community Wildfire Defense Grants	<p>Communities can use these grants from the USFS in a variety of ways to reduce the wildfire risk to people and property. One key use is capacity building for wildfire mitigation. For example, communities can use the grants to support the implementation and enforcement of wildfire-related codes and standards; to train people to assess wildfire risk and implement effective mitigation measures; and to perform outreach to community members through programs like Firewise USA®. Communities that build these fundamentals—sound land use and building practices, a skilled workforce, and an educated public—will be better prepared for sustained and effective risk reduction and better equipped to take advantage of future federal grants that prioritize communities with codes in place.</p>	<p>https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire</p>	Wildfire, Drought
X	FEMA Assistance to Firefighters Grants Program	<p>Fire safety grants fund critically needed resources to equip and train emergency personnel, enhance efficiencies and support community resilience. Grants help firefighters and other first responders obtain critically needed resources necessary for protecting the public and emergency personnel from fire and related hazards. Staffing for Adequate Fire and Emergency Response (SAFER) grants fund fire departments and volunteer firefighter interest organizations directly to help them increase capacity in their communities. Fire Prevention & Safety (FP&S) grants support projects that enhance the safety of the public and firefighters from fire and related hazards</p>	<p>https://www.fema.gov/grants/preparedness/firefighters</p>	Wildfire
Y	US Department of the Interior (US DOI) Bureau of Indian Affairs (BIA) Division of Wildfire Management Programs	<p>Hazardous Fuels Reduction The Fuels Management Program works with the Bureau of Indian Affairs (BIA) 12 regional offices, local BIA agencies and Tribes to reduce wildfire risk through management of natural and invasive fuels. Hazardous fuels reduction treatments include prescribed fire, mechanical treatments (such as thinning, regeneration cuts, pruning, mastication, and chipping) and the careful use of natural fire.</p> <p>Traditional Ecological Knowledge TEK is a body of observations, oral and written knowledge, practices, and beliefs that promote environmental sustainability and the responsible stewardship of natural resources through relationships between humans and environmental systems, applied across biological, physical, and cultural systems. BIA staff work alongside Tribes to blend traditional ecological knowledge with a scientific approach in their fuels management efforts.</p> <p>Reserved Treaty Rights Lands Program The RTRL program facilitates collaborative projects between Tribal trust and non-Tribal land managers. The RTRL program's intent is to provide Tribes the opportunities to conduct Tribally-determined project work on ancestral lands regardless of ownership to enhance the health and resiliency of priority Tribal natural resources with high risks of wildland fire.</p>	<p>https://www.bia.gov/service/fuels-management</p>	Wildfire, Drought
Z	US DOI BIA Tribal Energy Development Capacity Grant	<p>Every year, the BIA's Division of Energy and Mineral Development provides the opportunity for Tribes to receive financial assistance to establish the legal framework for developing and regulating their energy resources.</p> <p>Development Activities Eligible for Funding Developing the legal infrastructure to create any type of Tribal energy business Establishing an energy-focused corporation under Tribal or state incorporation codes Establishing an energy-related Tribal business charter under federal law (IRA Section 17 corporation) Learn more about choosing a Tribal business structure</p> <p>Regulatory Activities Eligible for Funding Developing or enhancing tribal policies, codes, regulations, or ordinances related to energy resource, including land-lease regulations in accordance with the Helping Expedite and Advance Responsible Tribal Homeownership (HEARTH) Act for energy development purposes or for business purposes connected to an energy project Establishing a Tribal utility authority (TUA) Adopting secured transaction codes and a subsequent joint power agreement with a state government</p>	<p>https://www.bia.gov/service/grants/tedc</p>	Severe winter weather, thunderstorm, lightning, hail, high winds, tornado, flooding, extreme heat
AA	National Weather Service Education	<p>Outreach and education materials for school children and adults.</p>	<p>https://www.weather.gov/education/outreach</p>	Severe winter weather, thunderstorm, lightning, hail, high winds, tornado, flooding, extreme heat/cold, drought

BB	Cherryland Electric Cooperative	Cherryland Electric is a regional cooperative that provides electric service to the majority of Leelanau County. A power outage map is available to track outage locations.	https://cherrylandelectric.coop/outage/	All hazards
CC	Consumer's Energy Utility Service	Consumers Energy electrical and natural gas utility service. Energy through renewable energy sources is available. A power outage map is available to track outage locations.	https://www.consumersenergy.com/outage-map	Severe winter weather; Thunderstorm, High Winds, Hail, Tornado, Lightning; Flooding; Extreme Temperatures
DD	Michigan High Speed Internet Office	Information on plans and funding opportunities to increase high speed internet service in Michigan.	https://www.michigan.gov/leo/bureaus-agencies/mihi	All hazards.
EE	Connected Nation Michigan	Connected Nation develops and provides the tools, resources, and methods that help states and communities create and implement solutions to their broadband and digital technology gaps. They assess and plan for the expansion of broadband access, adoption, and use. They empower people with technology skills and resources to improve their quality of life, and we develop public-private partnerships to bring technology access to targeted geographies and population.	https://connectednation.org/michigan/	All hazards.
FF	The Federal Communication Commission's Affordable Connectivity Program	<p>An FCC program to help families and households struggling to afford internet service during the COVID-19 pandemic. This new benefit will connect eligible households to jobs, critical healthcare services, virtual classrooms, and so much more.</p> <p>The Emergency Broadband Benefit will provide a discount of up to \$50 per month towards broadband service for eligible households and up to \$75 per month for households on qualifying Tribal lands. Eligible households can also receive a one-time discount of up to \$100 to purchase a laptop, desktop computer, or tablet from participating providers if they contribute more than \$10 and less than \$50 toward the purchase price. The Emergency Broadband Benefit is limited to one monthly service discount and one device discount per household. A household is eligible if a member of the household meets one of the criteria:</p> <p>Has an income that is at or below 135% of the Federal Poverty Guidelines or participates in certain assistance programs, such as SNAP, Medicaid, or Lifeline; Approved to receive benefits under the free and reduced-price school lunch program or the school breakfast program, including through the USDA Community Eligibility Provision in the 2019-2020, 2020-2021, or 2021-2022 school year; Received a Federal Pell Grant during the current award year; Experienced a substantial loss of income due to job loss or furlough since February 29, 2020 and the household had a total income in 2020 at or below \$99,000 for single filers and \$198,000 for joint filers; or Meets the eligibility criteria for a participating provider's existing low-income or COVID-19 program.</p>	https://www.fcc.gov/broadbandbenefit	All hazards.
GG	"Lifeline" program provided by the Universal Service Administrative Co.	Lifeline is a federal program that offers a monthly benefit of up to \$9.25 towards phone or internet services for eligible subscribers (up to \$34.25 for those living on Tribal lands). A consumer can qualify for the Lifeline benefit if their income is 135% or less than the federal poverty guidelines, or if they participate in SNAP, Medicaid, or other federal programs.	https://www.usac.org/lifeline/	All hazards.
HH	Great Lakes Shoreviewer Tool	View aerial imagery of Lake MI shoreline and associated risk levels for coastline, infrastructure/roads, and buildings.	http://www.greatlakesshoreviewer.org/	Shoreline flooding and erosion
II	LIAA's Northwest Lower MI Coastal Resilience Atlas	Mapped coastal flooding and coastal erosion based on three future climate scenarios for communities adjoining Lake MI; areas of the shoreline population, by census tract, that are most vulnerable to extreme heat events.	http://www.resilientmichigan.org/nw_atlas.asp	Shoreline flooding and erosion, Extreme Heat
JJ	State-designated high-risk erosion areas: programs and maps	High risk erosion areas are those shorelands of the Great Lakes where recession of the landward edge of active erosion has been occurring at a long-term average rate of one foot or more per year, over a minimum period of 15 years.	https://www.michigan.gov/egle/about/organization/water-resources/shoreland-management/high-risk-erosion-areas	Shoreline erosion

KK	Michigan EGLE's Coastal Zone Management Program	A plethora of resources to improve coastal and climate resiliency through both planning and best management projects.	https://www.michigan.gov/egle/about/organization/water-resources/coastal-management	Shoreline flooding and erosion
LL	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.	https://www.mcgi.state.mi.us/wetlands/mcqiMap.html	Flooding, drought, extreme temperatures
MM	Great Lakes Water Safety Consortium	A nonprofit community of BEST practice, connecting and serving safety experts & water enthusiasts, educating the public on safer ways to enjoy the water, and encouraging leaders to take bold action to make their shoreline safer for residents and visitors.	https://www.greatlakeswatersafety.org/	Coastal Hazards - rip currents
NN	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.	https://www.fema.gov/floodplain-management/manage-risk/local	Inland and coastal flooding
OO	FEMA Flood Mitigation Assistance (FMA) Grant Program	FMA is a non-disaster, competitive grant program that provides funding to states, local communities, federally recognized tribes. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. <ul style="list-style-type: none"> ▪ \$800 million available in funding for FY22 ▪ Application Period: September 30, 2022, to January 27, 2023 ▪ Period of Performance: 3 Years ▪ Cost-share: 25% non-federal ▪ Severe Repetitive Loss (up to 100% federal) ▪ Repetitive Loss (up to 90% federal) ▪ Priorities are set each fiscal year 	https://www.fema.gov/grants/mitigation/floods	Inland and coastal flooding
PP	FEMA Building Resilient Infrastructure and Communities (BRIC) Grant Program	BRIC is a non-disaster grant program, which provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. Funding has doubled for BRIC to \$2.295 billion for FY21. <ul style="list-style-type: none"> ▪ Caps: Tribal set-aside: \$2 million; ▪ National Competition: \$2.133 billion ▪ Application Period: September 30, 2022 to January 27, 2023 ▪ Period of Performance: 3 year from start date on Recipient's federal award ▪ Cost-share: 25% non-federal ▪ Economically disadvantaged rural communities are eligible for 10% non-federal ▪ Priorities are set each fiscal year 	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities	All hazards
QQ	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.	https://www.fema.gov/grants/mitigation/hazard-mitigation	All hazards
RR	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.	www.michigan.gov/invasives/grants/misgp	Invasive Species
SS	Clean Boats, Clean Waters Program	Funding from the Michigan Department of Environment, Great Lakes, and Energy and the Great Lakes Restoration Initiative has enabled Clean Boats, Clean Waters to grow into a comprehensive aquatic invasive species boater outreach program. The program's mission is to prevent new aquatic invasive species introductions and limit their dispersal from water recreation activities through outreach and engagement. The program promotes understanding of boat cleaning practices and regulations through the distribution of educational materials, an online resource library, boat washing demonstrations, grants and partnerships.	www.canr.msu.edu/clean_boats_clean_waters/index	Invasive Species

TT	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.	https://www.michigan.gov/invasives/take-action	Invasive Species
UU	Michigan State University Extension	Resources available for: training elected and appointed officials, agriculture and food support programs, and natural resources protections.	https://www.canr.msu.edu/outreach/	Inland flooding, shoreline erosion; Invasive Species; Public Health Emergency
VV	MSU 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.	https://www.canr.msu.edu/michiganlakes/convention/	Inland flooding, shoreline erosion; Invasive Species
WW	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.	https://www.nrcs.usda.gov/	Drought; Extreme Temperatures; Invasive Species; Wildfire; Public Health Emergency
XX	The Leelanau Conservancy	Since 1988, the Conservancy has preserved over 16,000 acres and created 28 Natural Areas for public enjoyment with more than 28 miles of trails. They have also worked with over 190 landowners to protect family farms and cherished private lands with legal agreements called conservation easements. These agreements restrict development and protect the land's most important natural features. The Conservancy's priorities include: protecting natural lands and water quality; preserving family farms; and caring for the lands they have protected, such as monitoring for invasive species.	https://leelanauconservancy.org/	Flooding, Erosion, Invasive Species, Public Health Emergency
YY	Leelanau Conservation District	The District works closely with Federal, State and local agencies and organizations to promote the wise use of natural resources through information and technical assistance to the landowners and users of Leelanau County. Services include: • Natural Resource Site Visits • County Soil Erosion Permits, including Vegetation Removal Assurance Plan Application for Designated Critical Dune Areas • Forestry Assistance & Referrals • Plant, Insect & Disease Identification • Workshops & Demonstrations, Native Plant Sales	https://www.leelanaucd.org/	Flooding, shoreline erosion; Invasive Species; wildfire; drought
ZZ	Antrim Conservation District	ACD serves as the first stop for local citizens, farmers, landowners, conservation groups, and county government for their natural resource needs.	https://www.antrimcd.com/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
AAA	Benzie Conservation District	The District's purpose is to foster the best use of land for the present and future benefits of the community, based on the land's capabilities and landowners goals	https://www.benziecd.org/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
BBB	Charlevoix Conservation District	The Charlevoix Conservation District works to protect, promote and enhance natural resource conservation in Charlevoix County through partnerships, community outreach and providing landowner support.	https://www.charlevoixcounty.org/conservation-district/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
CCC	Grand Traverse Conservation District (GTCD)	The GTCD provides conservation, education, Boardman River Stewardship, agriculture, invasive species management, and volunteering support services.	https://natureiscalling.org/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
DDD	Manistee Conservation District	Our services assist Manistee County residents and landowners in the protection, enhancement and restoration of natural resources. We are passionate about helping our communities conserve their lands so our environment can be clean, healthy and robust for generations to come.	https://www.manisteedc2.org/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
EEE	Northwest Michigan Invasive Species Network (NMISN)	A Cooperative Invasive Species Management Area (CISMA) serving Benzie, Grand Traverse, Leelanau & Manistee counties to manage populations of invasive species that threaten northwest Michigan's high-quality natural areas through terrestrial invasive plant management and outreach.	https://www.habitatmatters.org/	Invasive Species

FFF	Charlevoix, Antrim, Kalkaska, Emmet Cooperative Invasive Species Management Area (CAKE - CISMA)	CAKE-CISMA was established in 2015 as a joint effort between local conservation districts and various non-profits. Their mission is to protect the natural resources, economy, and human health of Northern Lower Michigan through collaborative outreach and management of invasive species. They host educational events at schools, conduct invasive species treatment days with local non-profits, and treat high priority invasive species throughout the 4 county area. Most often they work with terrestrial invasive species, but occasionally work with aquatic invasive species as well. A particular funding source they are looking into is the NRCS' Environmental Quality Incentives Program (EQUIP) grant to fund workshops for landowners about Autumn Olive management options.	https://www.cakecisma.org/	Invasive Species
GGG	Tip of the Mitt Watershed Council	Dedicated to protecting lakes, streams, wetlands, and groundwater resources of Antrim, Charlevoix, Cheboygan and Emmet Counties through respected advocacy, innovative education, technically sound water quality monitoring, thorough research, and restoration actions.	https://www.watershedcouncil.org/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
HHH	Elk River Chain of Lakes - Watershed Plan Implementation Team	ERCOL-WPIT was formed in 2011 to implement activities pertaining to the Elk River Chain of Lakes in the Grand Traverse Bay Watershed Protection Plan. Organized by The Watershed Center and Tip of the Mitt Watershed Council, ERCOL-WPIT engages lake associations, local governments, area nonprofits, and interested citizens in collaborative efforts to protect and preserve water quality throughout the entire watershed.	https://gtbay.org/elk-river-chain-of-lakes-watershed-implementation-team/	Flooding, Coastal Hazards, Invasive Species, Public Health Emergency
III	The Watershed Center Grand Traverse Bay	Advocates for clean water in Grand Traverse Bay and acts to protect and preserve the bay's watershed. Pollution prevention and/ or restoration projects include establishing stormwater management and green infrastructure practices, installing riparian vegetation, naturalizing shorelines and streambanks, and restoring wetlands and hydrologic connectivity. Water quality monitoring projects are implemented in a variety of locations – often through volunteer collaboration – to identify threats, gauge restoration progress, and track changes in water quality over time.	https://gtbay.org	Flooding & Erosion, Coastal Hazards, Invasive Species, Public Health Emergency
JJJ	Conservation Resource Alliance (CRA)	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.	https://www.rivercare.org/	Flooding & Erosion; Invasive Species; Drought; Extreme Heat; Public Health Emergency
KKK	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.	https://great-lakes-stream-crossing-inventory-michigan.hub.arcgis.com/	Flooding & Erosion
LLL	Grand Traverse Regional Community Foundation	GTRCF supports a variety of community need areas, including youth, arts and culture, education, environment, and health and human services. We do this by promoting giving, engaging in collaborative leadership, supporting nonprofit organizations through meaningful grants and local students through scholarships, and building endowments that make a lasting impact for generations to come. Service area includes Antrim, Benzie, Grand Traverse, Kalkaska, and Leelanau Counties.	https://www.gtrcf.org/	Invasive Species, Flooding, Extreme Temperatures, Public Health Emergency
MMM	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.	https://www.groundworkcenter.org/food-farming/	Public Health Emergency
NNN	Michigan Public Service Commission's Low Income Winter Protection Plan	The state has adopted a Winter Protection Plan that protects seniors and low income families that receive services from MPSC-regulated natural gas and electric companies from having their electric or heat shut off during winter months.	https://www.michigan.gov/mpsc/consumer/get-help/utility-customers	Extreme Cold; Severe Winter Weather; Public Health Emergency

000	USDA Community Facilities Direct Loan & Grant Program	<p>The Direct Loan & Grant program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings. Funds can be used to purchase, construct, and / or improve essential community facilities, purchase equipment and pay related project expenses. Examples of essential community facilities include:</p> <p>Health care facilities such as hospitals, nursing homes or assisted living facilities Public facilities such as town halls, courthouses, airport hangars or street improvements Community support services such as community centers, fairgrounds or transitional housing Public safety services such as fire departments, police stations, prisons, police vehicles, fire trucks, public works vehicles or equipment Utility services such as telemedicine or distance learning equipment Local food systems such as community gardens, food pantries, community kitchens, food banks, food hubs or greenhouses</p>	https://www.rd.usda.gov/programs-services/community-facilities/community-facilities-direct-loan-grant-program	All hazards
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Monitoring and Evaluating the Plan

The GTB 2023 Natural Hazard Mitigation Plan is a living document that will provide guidance for reducing the impacts of natural hazards for future generations. To make sure this plan is accurate and current, it will be monitored, evaluated, and updated over its life.

The plan will be reviewed annually on the anniversary of plan adoption and after any major disaster or emergency declaration that applies to the GTB service area. Annual plan maintenance tasks, to be completed by the Natural Hazards Task Force, include the following:

- Determine if the hazard identification and assessments, tribal vulnerability summary, and mitigation strategies continue to be accurate, current and relevant.
- Document progress made on mitigation strategies, including a description of any successes and challenges.
- Monitor the progress of all hazard mitigation projects, including FEMA-funded projects in accordance with applicable grant management standards, including progress reports and regular financial reviews from the accounting department to be completed throughout the lifecycle of the project.
- Any significant revisions to the plan within the 5-year period will be forwarded as a plan addendum to the MSP EMHSD.

Natural Hazards Task Force members will coordinate with their respective departments in the above maintenance tasks. When a department or entity assigned responsibility for a mitigation action is not represented by a Task Force member, the Task Force will select a member to work with that department/entity. Each tribal department responsible for an action will provide updates in a timely manner to the Natural Hazards Task Force and will provide documentation of progress for incorporation into the plan.

Updating the Plan

The Stafford Act, as amended by the Disaster Mitigation Act of 2000, requires governmental entities to have a Natural Hazard Mitigation Plan be updated, adopted, and re-submitted for Federal Emergency Management Agency (FEMA) approval every five years.

Approximately 18 months prior to the plan's expiration date, the GTB Natural Hazards Task Force will convene to review the plan in compliance with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan as necessary to reflect changes in tribal or Federal laws and statutes. The Task Force will also determine if the GTB will need to seek grant funding to assist with the plan update.

Future plan updates will include determining changes in the Tribal service area (such as changes in development, an increase in exposure to hazards, an increase or decrease in the Tribe's capability to address hazards); addition and/or removal of mitigation actions and strategies; reviewing goals and objectives; and any change in federal or state

legislation. Upon completion of an updated draft plan and public review period, the GTB Tribal Council can review, approve and adopt the plan. The plan will then be sent to the State Hazard Mitigation Officer at the Michigan State Police for final review and approval in coordination with FEMA.

Continued Public Involvement

The GTB Natural Hazards Task Force is committed to keeping tribal members and stakeholders involved in the implementation and update of the Hazard Mitigation Plan. As described previously, the Tribal LPT is comprised of representatives from the GTB Tribe and Leelanau County. LPT and Tribal Council meetings are always posted and open to tribal members.

Public comment on plan revisions and updates will be solicited through public outreach efforts that may include open houses, public meetings, press releases, websites or displays at community events. Task Force and Tribal members may review the status of mitigation projects by evaluating implementation actions and processes, identifying those that have worked well, difficulties encountered, and making suggestions for revisions to the mitigation strategies as necessary.

Copies of the current Natural Hazard Mitigation Plans for both the GTB as well as Leelanau County will be available on the GTB website and/or regional planning agency (Networks Northwest) website. The Emergency Management Office will be responsible for keeping a record of public comments on the plan.

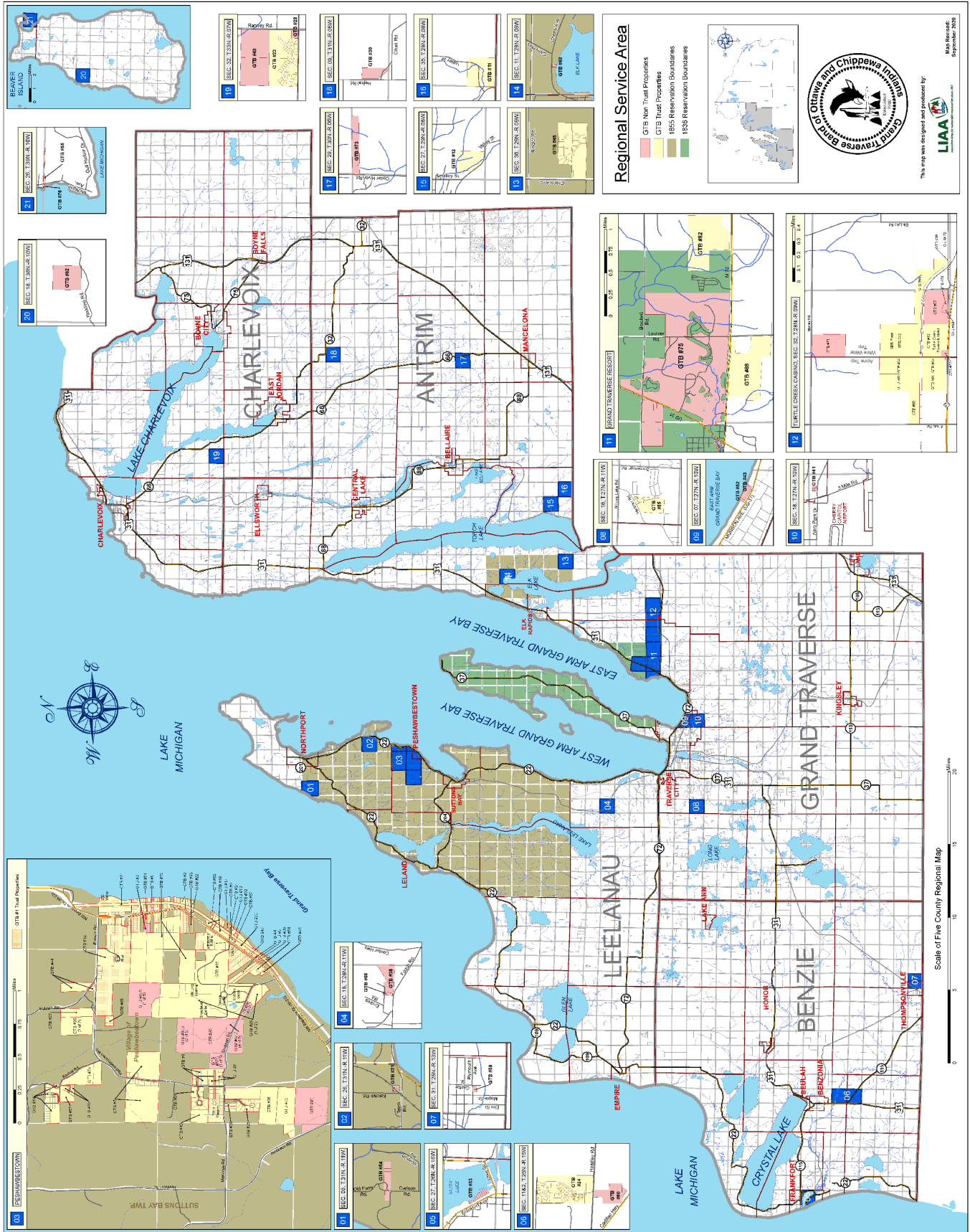
Plan Integration

Part of ensuring that the plan is current and useful to a community is integrating it into existing and future planning efforts. Once a year, the GTB Emergency Manager will gather information on all planning mechanisms expected to be updated in the next year. Then, the Tribal LPT will determine into which plans it makes sense to incorporate the mitigation plan's goals and actions. Key plans for integration include plans such as the 2012 Peshawbestown Master Plan and other tribal plans regarding natural resources management, housing, economic development, and transportation. Additionally, pertinent mitigation goals and objectives may be integrated into future updates of local planning documents, such as the Leelanau County Comprehensive Plan or the Suttons Bay Community Joint Master Plan.

The GTB will also continue to be a participant in future Natural Hazard Mitigation Plan updates for the counties within its service area: Antrim, Benzie, Charlevoix, Grand Traverse, Leelanau and Manistee. As such, counties will work with tribal representatives to maintain and update their information when it is warranted. Grand Traverse Band will continue to have an open seat on each County's LPT/LEPC.

APPENDIX A: MAPS

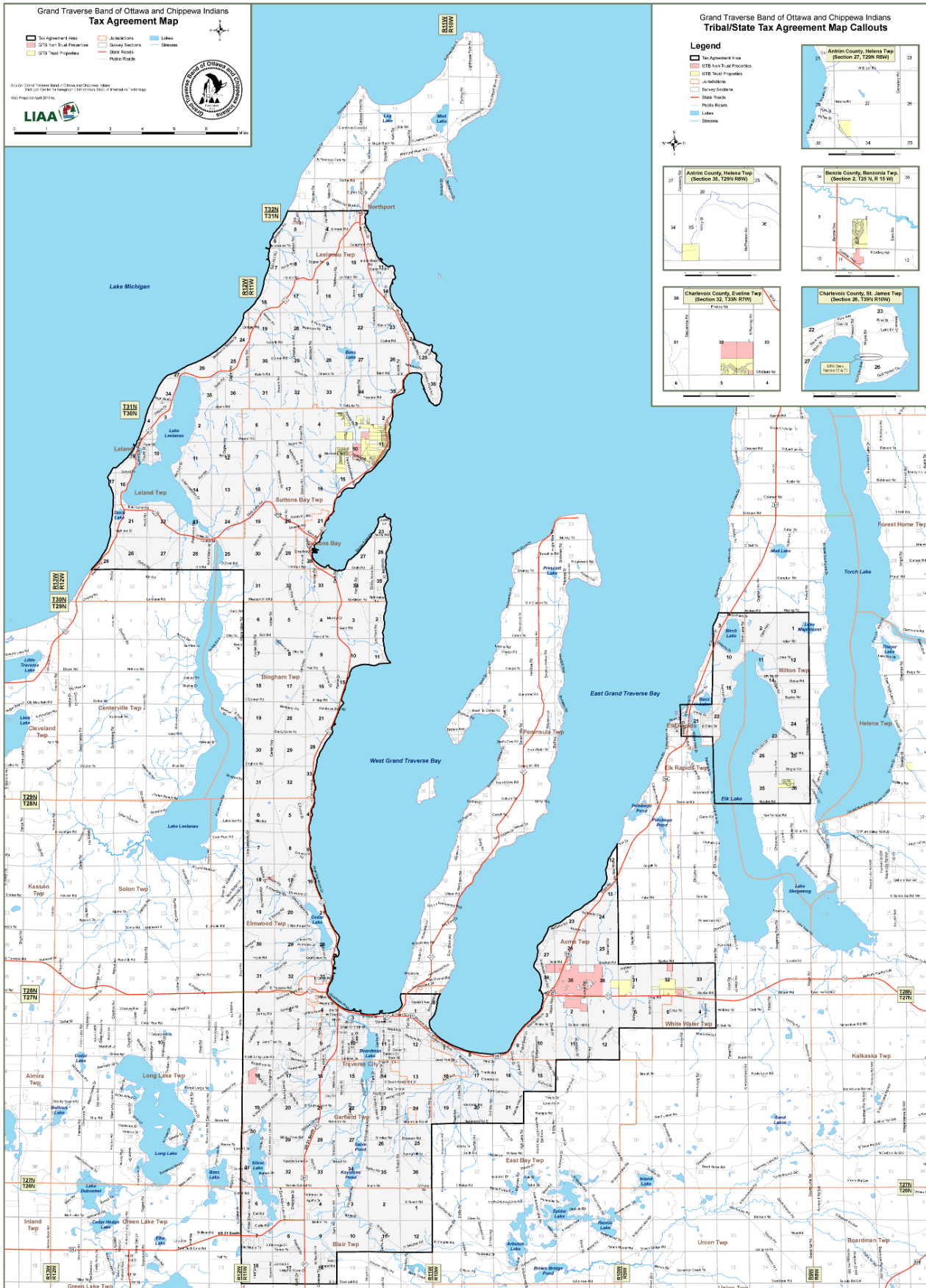
GTB Regional Service Area Map, Showing Trust and Non-Trust Properties



Peshawbestown Address Map

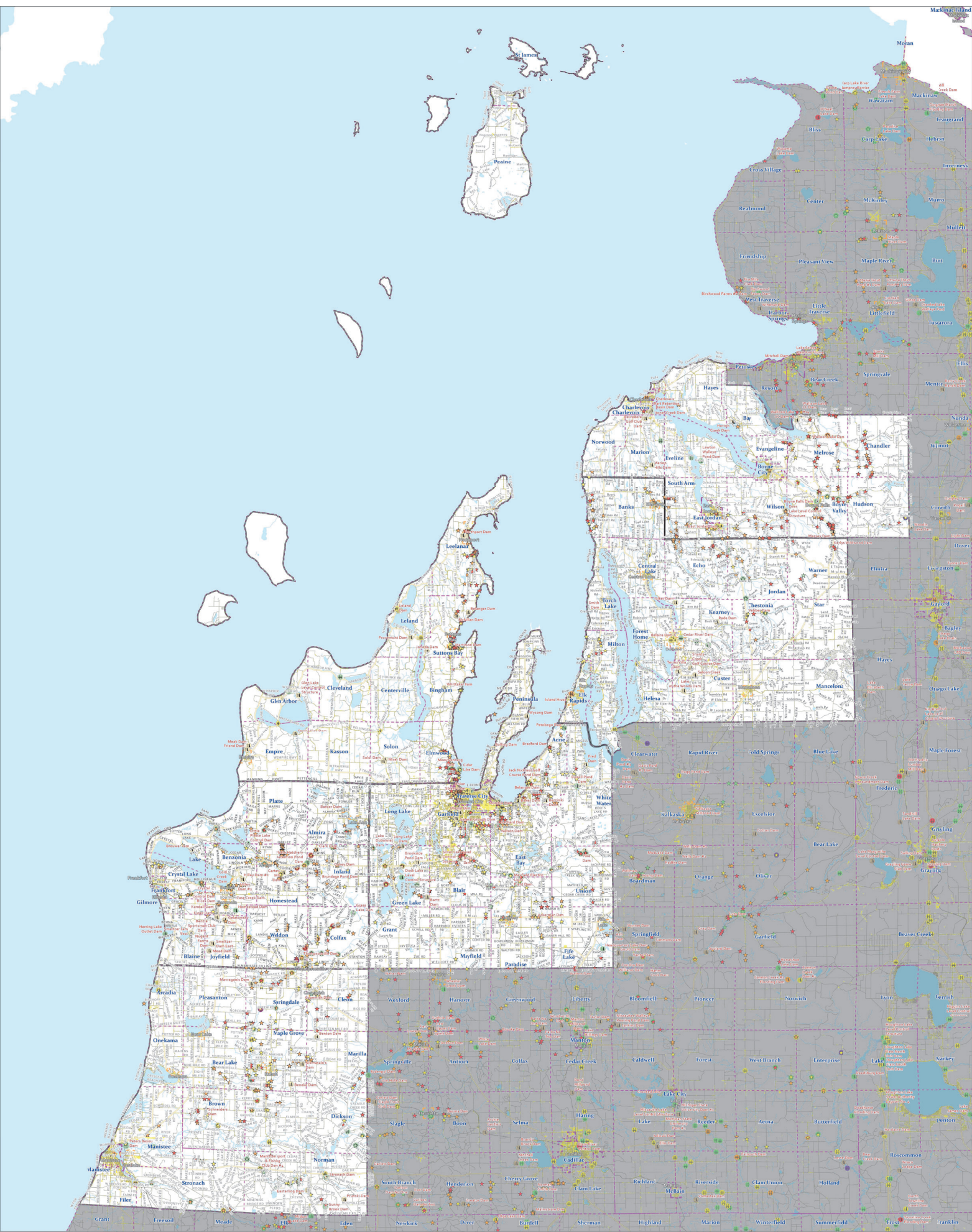


GTB Tax Agreement Map



The following Environmental Features maps were created by Networks Northwest for this plan. Due to the large file size, they can be viewed by clicking on these links:

- **GTB Environmental Features – Northern Service Area**
<https://drive.google.com/file/d/12MDjzRCDMNpl1ha1wh5jyyWTcSXKhDHZ/view?usp=sharing>
- **GTB Environmental Features – Central Service Area**
<https://drive.google.com/file/d/11WPTI-FdOucQ6iVeDzqcJAasnSieSSLH/view?usp=sharing>
- **GTB Environmental Features – Southern Service Area**
<https://drive.google.com/file/d/194M3Tz38alrLw3mJCqaDJIAoCGBkRZ4/view?usp=sharing>



**Grand Traverse Band
of Ottawa & Chippewa Indians
Infrastructure**

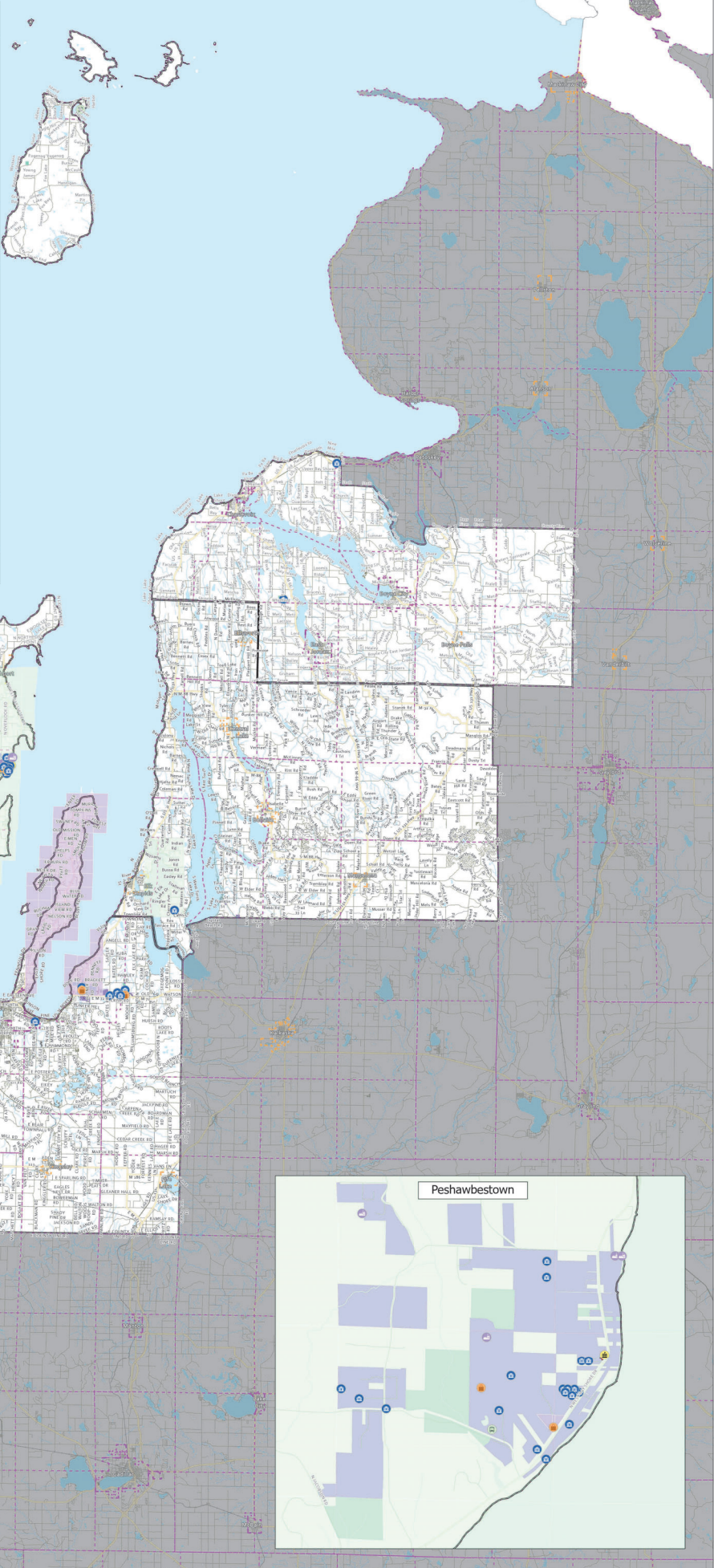
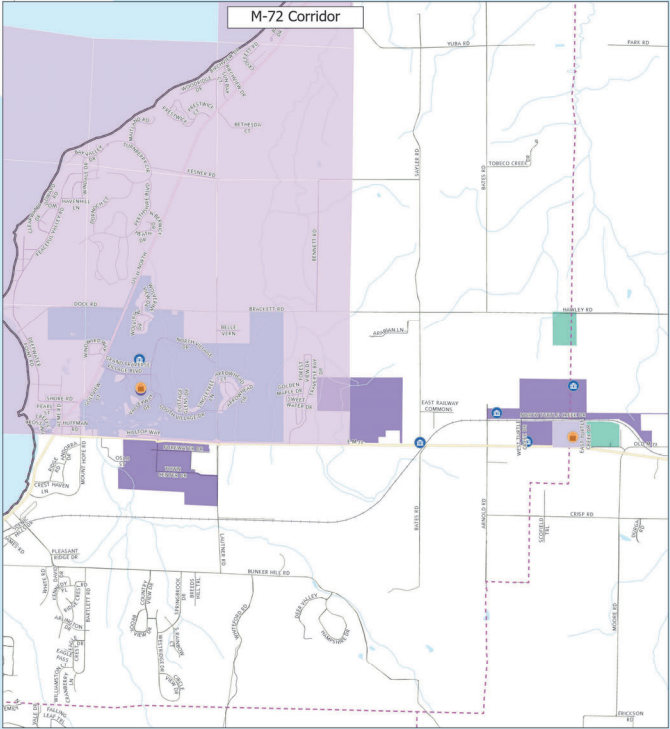
2023 Hazard Mitigation Plan

- Legend**
- Railroad
 - Highway
 - All Roads
 - River/Streams
 - Water Bodies
- Stream Crossings (CRA)**
- Severely
 - Major
 - Minor
 - Hydrotec
 - Unknown
- Bridge Condition**
- Rating
 - Good
 - Satisfactory
 - Fair
 - Poor
 - Serious
 - Critical
 - Closed
- MI Dam Inventory**
- Satisfactory
 - Fair
 - Poor
 - Unsatisfactory
 - Not Rated
- OTB Service Area**
- Non-Service Area
 - Villages
 - Cities
 - Township Boundaries

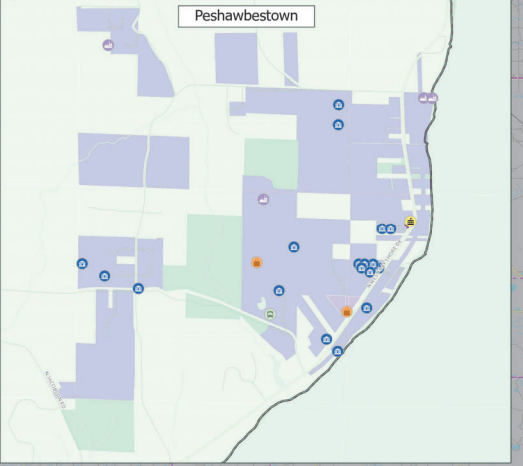


Grand Traverse Band of Ottawa and Chippewa Indians
Hazard Mitigation Planning Process
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, Esri, NOAA, USGS, Emergency Management & Natural Planning Team

M-72 Corridor



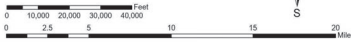
Peshawbestown



Grand Traverse Band of Ottawa & Chippewa Indians Critical Infrastructure Points

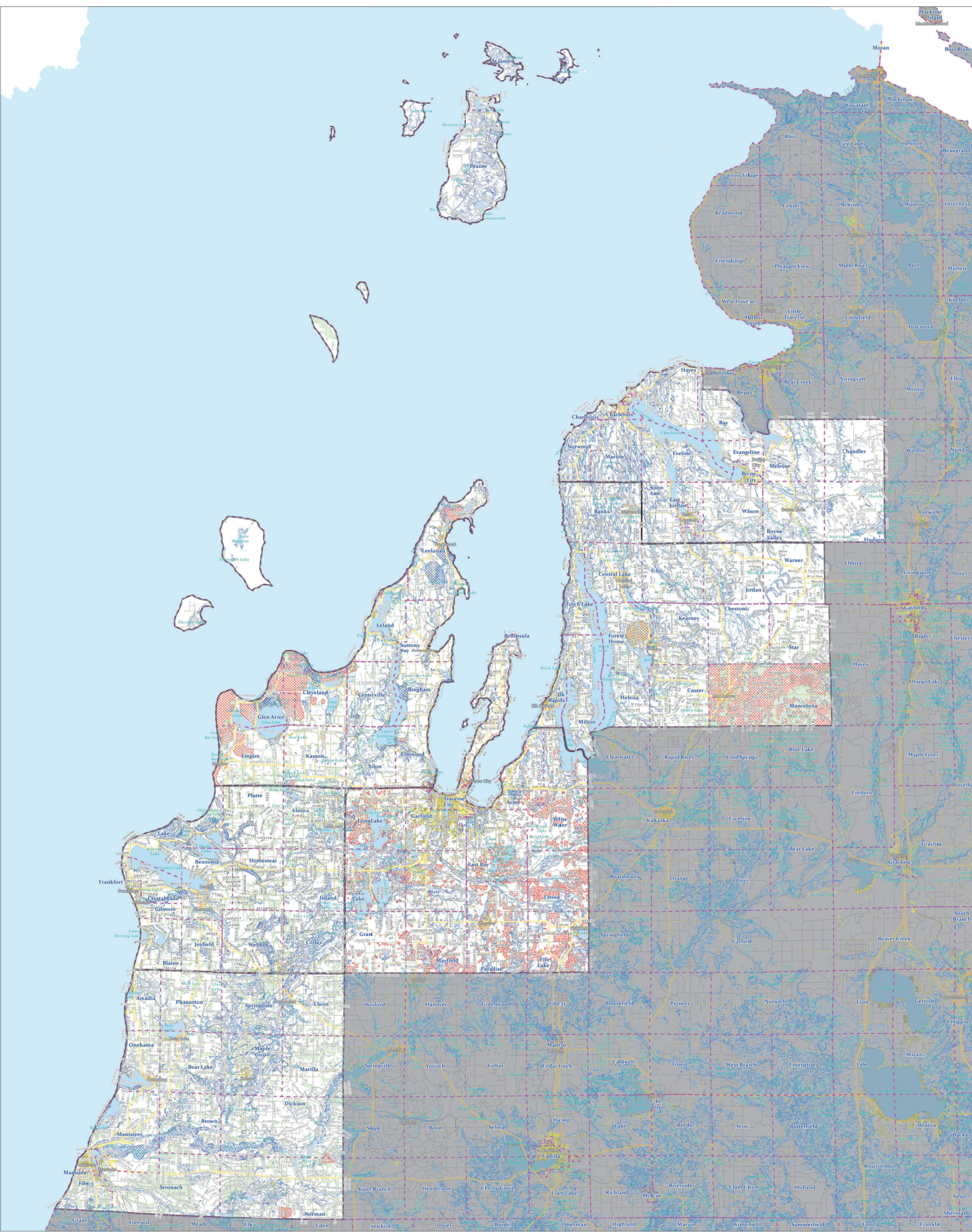
2023 Hazard Mitigation Plan

- Legend**
- Highways
 - All Roads
 - Railroad
 - Boundaries
 - Water Bodies
- Critical Infrastructure Points**
- | | | | |
|-----------------------|----------------|-----------------------|---------------------|
| Commercial | Healthcare | 1836ms | Villages |
| Communications | Industry | CTS Service Area | City |
| Emergency Services | School | Non-Service Area | Township Boundaries |
| Energy | Transportation | Tribal Parcels | |
| Government Facilities | | Non Trust | |
| | | Trust | |



Grand Traverse Band of Ottawa and Chippewa Indians
Hazard Mitigation Planning Process
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, Esri, NOAA, USGS, USGS, USGS,
Emergency Management & Natural Planning Team





**Grand Traverse Band
of Ottawa & Chippewa Indians
Hazard Areas**

2023 Hazard Mitigation Plan

Legend

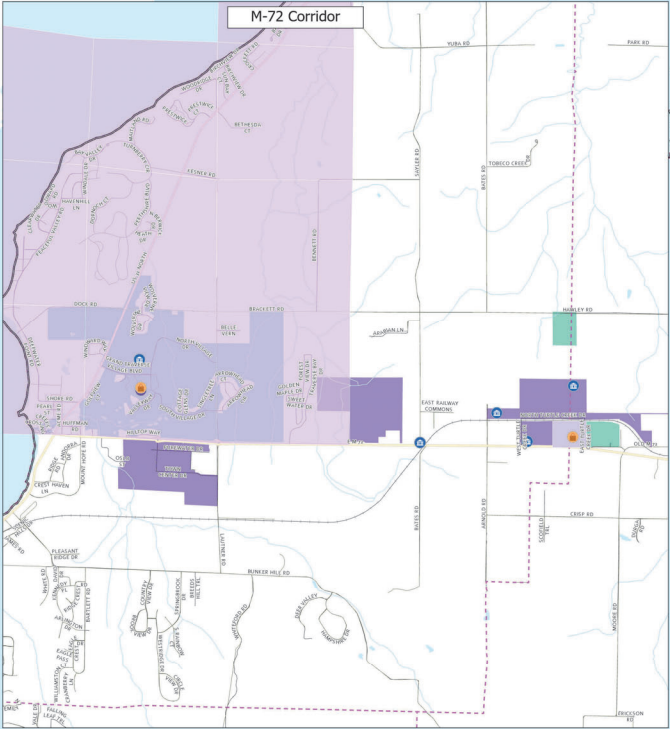
Highways	Rivers/Streams	Hazard Areas	Developed Land	GIB Service Area
All Roads	Water Bodies	Flood	High Medium & Low Intensity	Non Service Area
Railroad	Port 303 Wetlands	Fire		Cities
		Wind Tree Damage		Township Boundaries
		Road Washout		



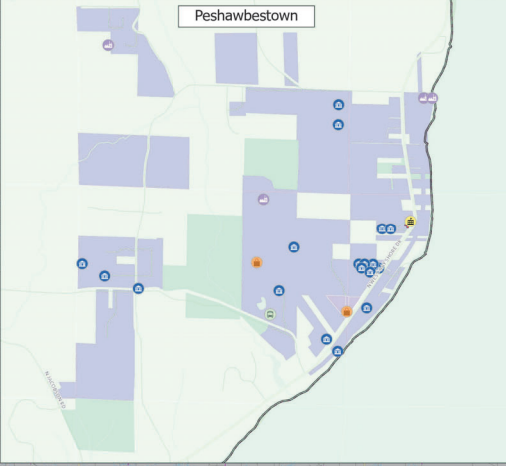
Grand Traverse Band of Ottawa and Chippewa Indians
Hazard Mitigation Planning Project
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, Esri, NOAA, USGS,
Emergency Management & Natural Priority Team



M-72 Corridor



Peshawbestown



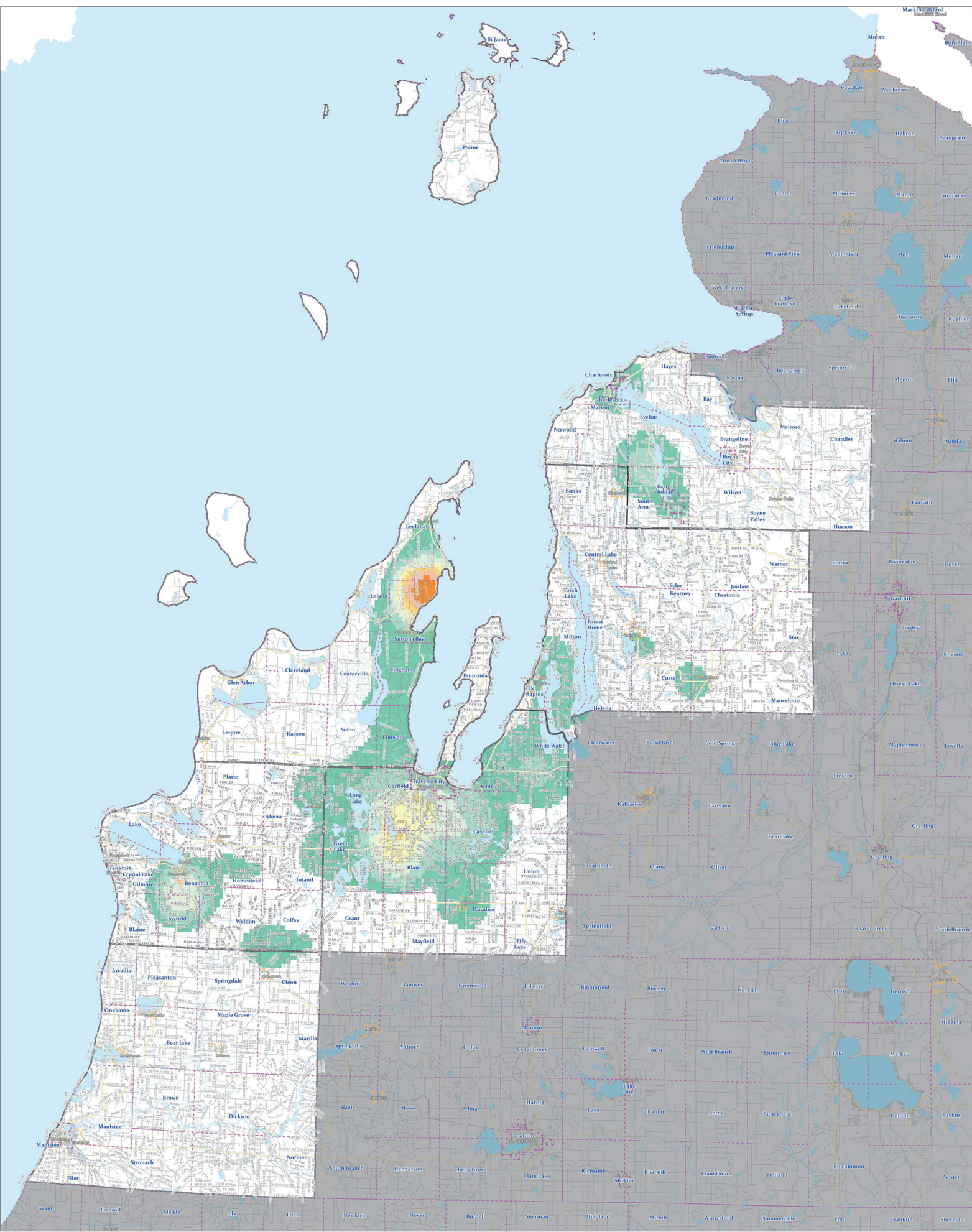
Grand Traverse Band of Ottawa & Chippewa Indians Hazard Areas & Critical Infrastructure Points 2023 Hazard Mitigation Plan

- Legend**
- | | | | | |
|---|---|---|---|--|
| <ul style="list-style-type: none"> Highways All Roads Railroad Rivers/Streams Water Bodies | <p>Critical Infrastructure Points</p> <p>Sector</p> <ul style="list-style-type: none"> Commercial Communications Emergency Services Energy Government Facilities | <p>Hazard Areas</p> <p>Type</p> <ul style="list-style-type: none"> Flood Shoreline Erosion Fire Wind Tree Damage Road Shutdown Tornado Path | <ul style="list-style-type: none"> 1836res 1855res OTB Service Area Non-Service Area Tribal Parcels Trust | <ul style="list-style-type: none"> Villages Cities County Boundaries Township Boundaries |
|---|---|---|---|--|



Grand Traverse Band of Ottawa and Chippewa Indians
Hazard Mitigation Planning Process
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, Esri, NOAA, USGS, 1955, Emergency Management & Natural Planning Team





Grand Traverse Band of Ottawa & Chippewa Indians Vulnerable Population

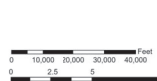
2023 Hazard Mitigation Plan

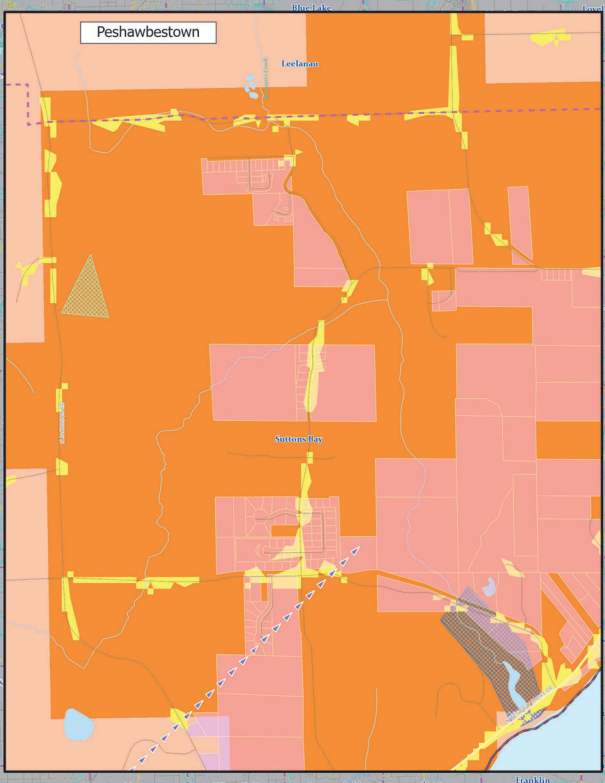
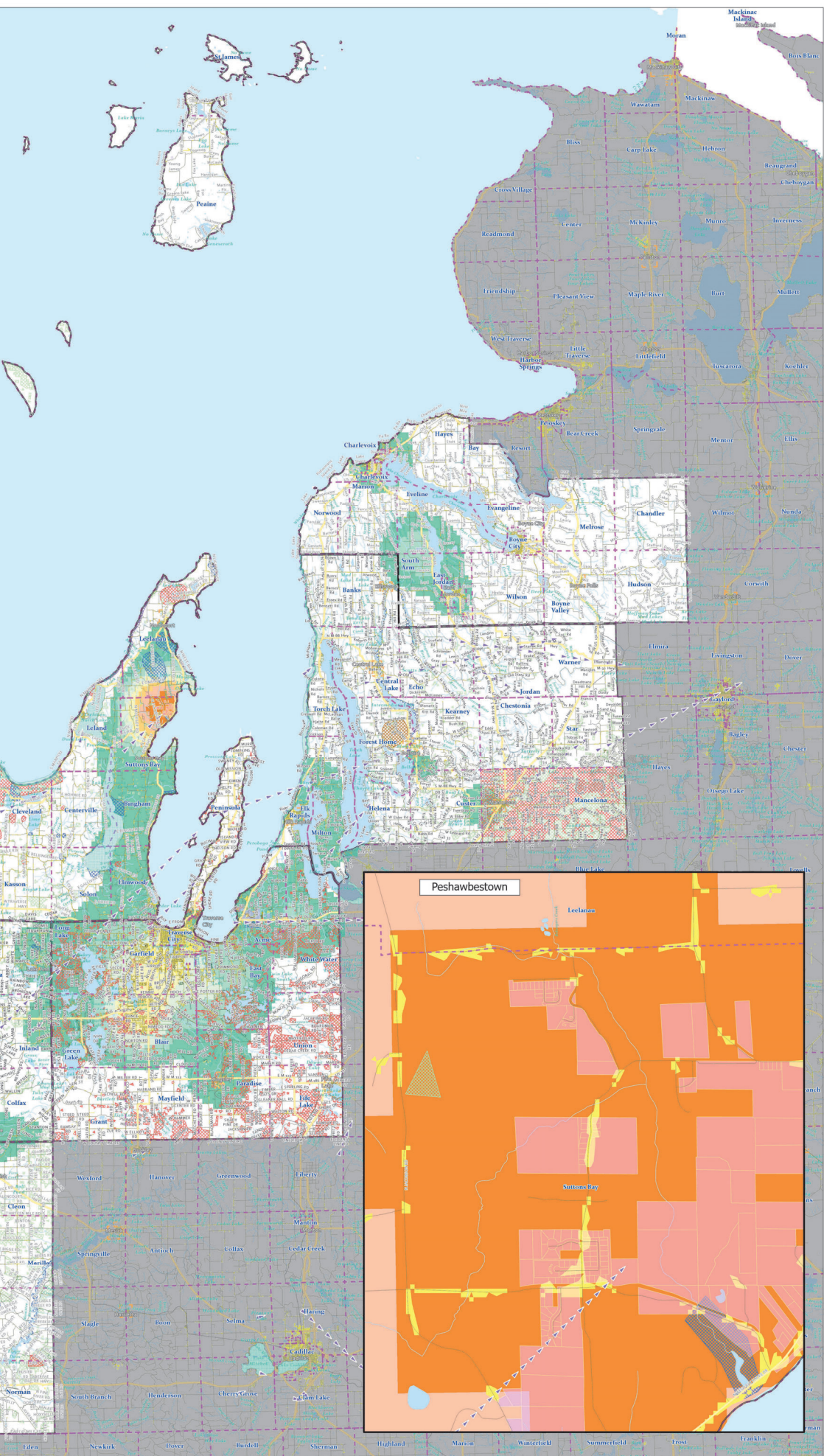
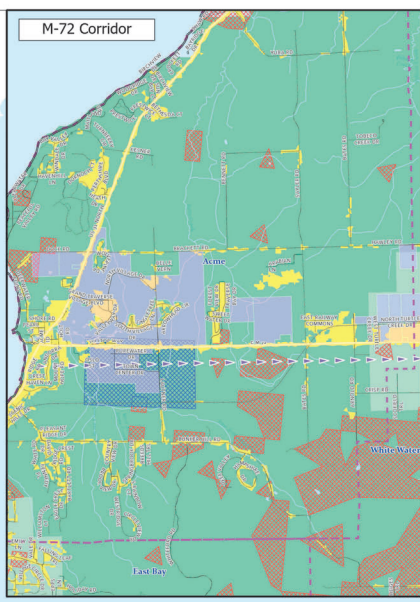
Legend

- Highways
- All Roads
- Railroad
- Water Bodies
- Rivers/Streams



- STB Service Area
- Township Boundaries
- Villages
- Cities
- Non-Service Area





**Grand Traverse Band
of Ottawa & Chippewa Indians
Hazard Areas & Vulnerable Population**
2023 Hazard Mitigation Plan

Legend

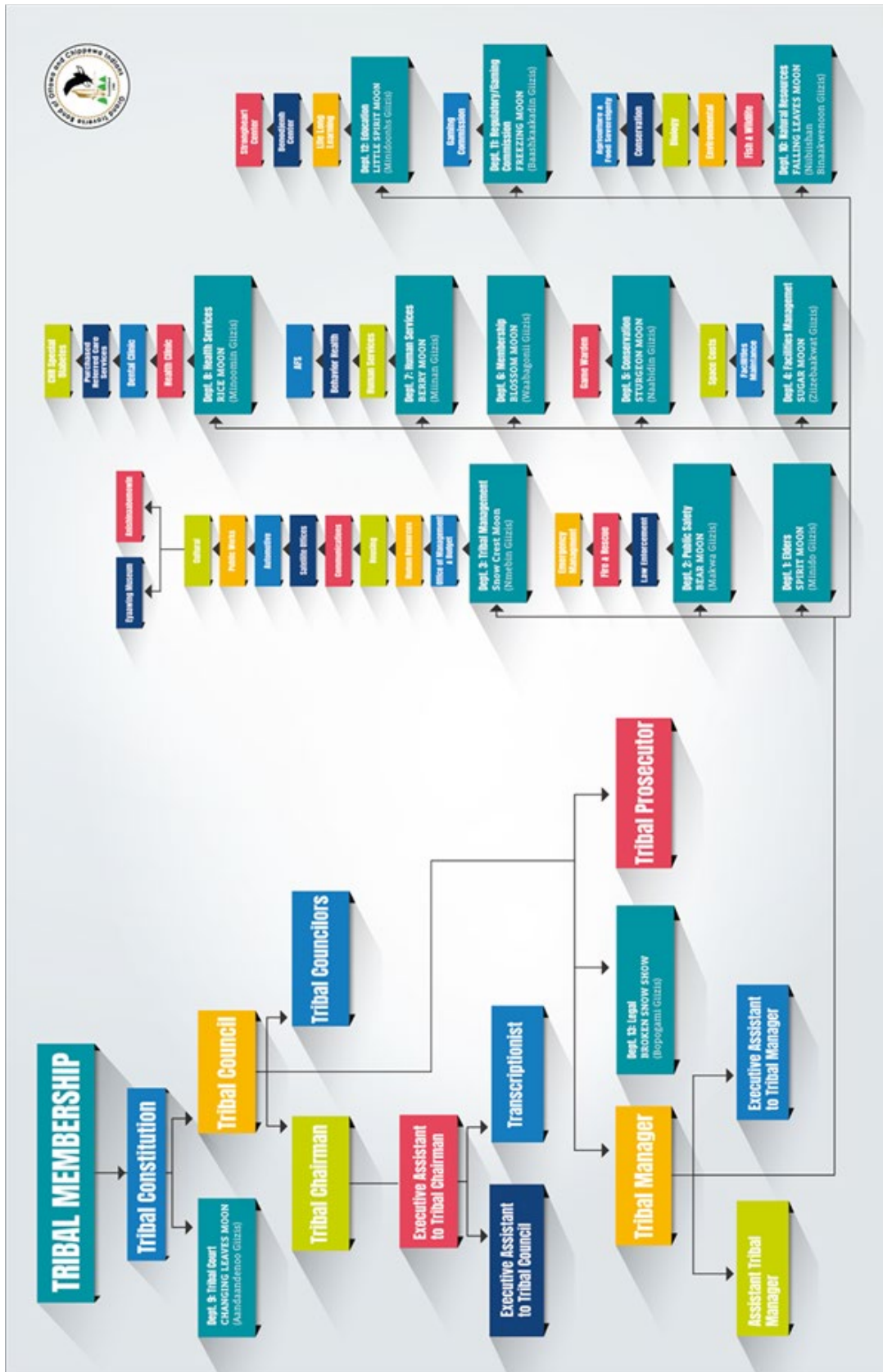
<ul style="list-style-type: none"> Highways All Roads Railroad Rivers/Streams Water Bodies Part 303 Wetlands 	<ul style="list-style-type: none"> Flood Shoreline Erosion Fire Wind Tree Damage Road Washout 	<ul style="list-style-type: none"> Tribal Member Address Density Less Dense More Dense 	<ul style="list-style-type: none"> High, Medium & Low Density 475 Service Area Non-Service Area Villages Cities Township Boundaries
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Scale: 0 10,000 20,000 30,000 40,000 Feet
0 2.5 5 10 15 20 Miles

North Arrow: N, S, E, W

Grand Traverse Band of Ottawa and Chippewa Indians
Hazard Mitigation Planning Process
Map produced by Networks Northwest Community Development 2023.
Map data sources: State of Michigan, Esri, NOAA, USGS, USGS, USGS,
Emergency Management & Natural Planning Team

APPENDIX B: TRIBAL GOVERNMENT ORGANIZATIONAL STRUCTURE



APPENDIX C: COMMUNITY SURVEY RESULTS

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

Q1 What is your role in the GTB community? (i.e, citizen, police officer, government employee, etc.)

Answered: 121 Skipped: 0

#	RESPONSES	DATE
1	Citizen & Government employee	1/14/2022 10:27 AM
2	Government Employee - Housing	11/17/2021 8:47 AM
3	on call receptionist	11/5/2021 9:39 AM
4	Citizen	10/28/2021 11:36 AM
5	Citizen	10/27/2021 7:39 PM
6	Government Employee	10/27/2021 4:21 PM
7	Na	10/26/2021 1:58 PM
8	Citizen	10/24/2021 4:59 PM
9	Citizen	10/23/2021 3:27 PM
10	Citizen	10/23/2021 1:04 PM
11	Citizen	10/23/2021 8:41 AM
12	Citizen	10/22/2021 8:48 PM
13	Tribal member	10/22/2021 7:00 PM
14	Citizen	10/22/2021 5:29 PM
15	Citizen an employee	10/22/2021 3:02 PM
16	Citizen.	10/22/2021 2:35 PM
17	Citizen	10/22/2021 2:24 PM
18	Judge	10/22/2021 2:17 PM
19	Citizen	10/22/2021 1:36 PM
20	Citizen	10/22/2021 1:36 PM
21	Citizen	10/22/2021 1:32 PM
22	Leelanau Sands Casino employee	10/22/2021 1:01 PM
23	Government employee	10/22/2021 12:44 PM
24	Government employee	10/22/2021 12:44 PM
25	Citizen	10/22/2021 12:35 PM
26	Citizen	10/22/2021 12:32 PM
27	Citizen	10/22/2021 12:30 PM
28	Employee	10/22/2021 12:29 PM
29	Citizen	10/22/2021 12:27 PM
30	Citizen	10/21/2021 6:57 PM
31	Citizen	10/21/2021 2:43 PM

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

32	government employee (natural resources)	10/21/2021 12:50 PM
33	Employee	10/21/2021 12:09 PM
34	Citizen	10/21/2021 11:26 AM
35	Tribal member	10/21/2021 9:00 AM
36	Tribal member	10/20/2021 6:02 PM
37	Citizen	10/20/2021 4:15 PM
38	Citizen	10/20/2021 11:58 AM
39	on call receptionist	10/20/2021 8:12 AM
40	Government employee	10/20/2021 7:40 AM
41	Citizen, part-time government employee, care giver to neighbor.	10/19/2021 3:58 PM
42	Citizen	10/19/2021 3:18 PM
43	Gaming employee	10/19/2021 11:57 AM
44	Government employee	10/19/2021 11:13 AM
45	Citizen, government employee	10/19/2021 10:12 AM
46	Government employee	10/19/2021 10:08 AM
47	government employee	10/19/2021 9:30 AM
48	Citizen and government employee	10/18/2021 8:44 PM
49	Tribal member	10/18/2021 6:45 PM
50	Citizen	10/18/2021 4:32 PM
51	Tribal citizen	10/18/2021 4:28 PM
52	Citizen	10/18/2021 4:27 PM
53	Community Member and Government Employee	10/18/2021 4:20 PM
54	citizen	10/18/2021 3:59 PM
55	Citizen	10/18/2021 2:55 PM
56	Citizen	10/18/2021 2:38 PM
57	Tribal elder	10/18/2021 2:34 PM
58	citizen	10/18/2021 2:17 PM
59	Citizen	10/18/2021 2:05 PM
60	GTB Agricultural Coordinator	10/18/2021 2:01 PM
61	Citizen	10/18/2021 1:53 PM
62	Citizen	10/18/2021 1:40 PM
63	Citizen	10/18/2021 1:31 PM
64	Member	10/18/2021 1:27 PM
65	Citizen	10/18/2021 1:21 PM
66	Citizen	10/18/2021 12:57 PM
67	citizen	10/18/2021 12:54 PM
68	Citizen	10/18/2021 12:53 PM
69	Citizen	10/18/2021 12:49 PM

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

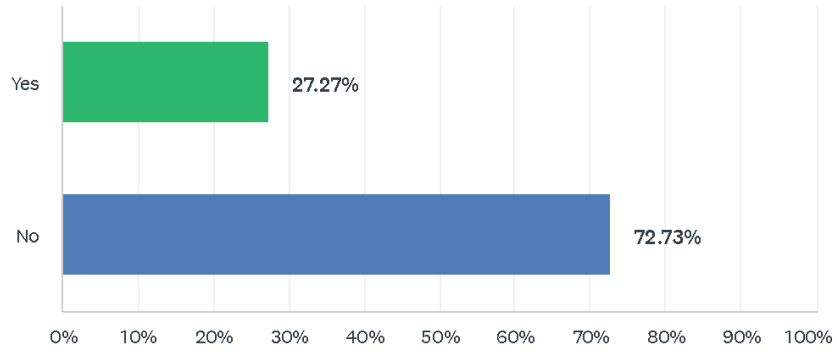
70	Citizen	10/18/2021 12:49 PM
71	Citizen	10/18/2021 12:48 PM
72	Tribal members	10/18/2021 12:47 PM
73	Citizen	10/18/2021 12:47 PM
74	Government Employee	10/18/2021 11:27 AM
75	Public Works Director	10/18/2021 11:03 AM
76	Employee	10/18/2021 10:52 AM
77	government employee	10/18/2021 10:45 AM
78	gov employee	10/18/2021 10:37 AM
79	Citizen and government employee	10/18/2021 10:16 AM
80	government employee	10/18/2021 10:05 AM
81	Tribal Member resident and government employee	10/18/2021 9:49 AM
82	government employee	10/18/2021 9:45 AM
83	citizen/government employee.	10/18/2021 9:35 AM
84	citizen	10/18/2021 9:28 AM
85	Government employee	10/18/2021 9:20 AM
86	citizen and executive employee	10/18/2021 9:18 AM
87	citizen, government employee	10/18/2021 9:16 AM
88	Government Employee	10/18/2021 9:16 AM
89	citizen and employee	10/18/2021 9:14 AM
90	Tribal Prosecutor	10/18/2021 9:12 AM
91	Government Employee	10/18/2021 9:11 AM
92	government employee	10/15/2021 2:46 PM
93	government employee	10/13/2021 10:33 AM
94	Government employee	10/12/2021 4:41 PM
95	Grand Traverse Band Economic Development Corporation	10/12/2021 3:06 PM
96	government employee	10/12/2021 10:21 AM
97	Government Employee	10/12/2021 10:21 AM
98	Lead Great Lakes Fisheries Biologist	10/12/2021 9:21 AM
99	citizen & government employee	10/12/2021 8:50 AM
100	I am a government employee.	10/12/2021 8:44 AM
101	Government employee	10/12/2021 8:19 AM
102	citizen	10/11/2021 5:01 PM
103	government employee	10/11/2021 4:10 PM
104	Government Employee	10/11/2021 3:52 PM
105	government employee	10/11/2021 3:47 PM
106	employee	10/11/2021 3:43 PM
107	government employee	10/11/2021 3:41 PM

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

108	government employee	10/11/2021 3:17 PM
109	Behavioral health counselor	10/11/2021 3:10 PM
110	Employee	10/8/2021 4:29 PM
111	Government employee, public safety	10/8/2021 2:31 PM
112	Teacher	10/8/2021 1:48 PM
113	employee, gtb member	10/8/2021 1:32 PM
114	government employee	10/8/2021 1:17 PM
115	Fire	10/6/2021 1:34 PM
116	Police Officer	10/6/2021 12:59 PM
117	police	10/6/2021 8:03 AM
118	Police	10/5/2021 6:22 PM
119	government employee	10/5/2021 4:11 PM
120	Housing Manager	10/5/2021 1:20 PM
121	Registered Nurse in the clinic	10/5/2021 11:18 AM

Q2 Are you familiar with the Tribe's Natural Hazard Mitigation Plan?

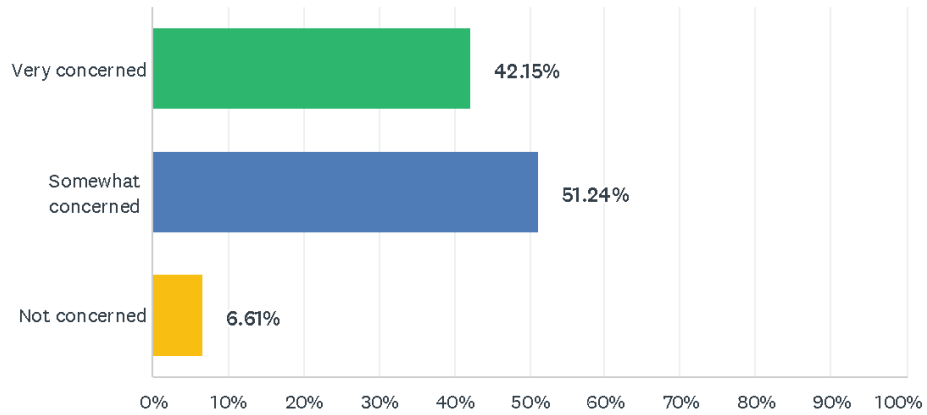
Answered: 121 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	27.27%	33
No	72.73%	88
TOTAL		121

Q3 How concerned are you about future natural hazard events impacting your community?

Answered: 121 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very concerned	42.15%	51
Somewhat concerned	51.24%	62
Not concerned	6.61%	8
TOTAL		121

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

Q4 What type of natural hazard events are likely to have the largest impact on your community (for example: fire, flood, drought, illness outbreak, etc.)?

Answered: 120 Skipped: 1

#	RESPONSES	DATE
1	Fire, tornado, illness outbreak	1/14/2022 10:27 AM
2	I don't know New to area.	11/17/2021 8:47 AM
3	n/a	11/5/2021 9:39 AM
4	Illness outbreak	10/28/2021 11:36 AM
5	Floods and fires. Along with illness as seen with the COVID pandemic	10/27/2021 7:39 PM
6	illness outbreak has proven to have a negative impact on our community	10/27/2021 4:21 PM
7	Fire illness	10/26/2021 1:58 PM
8	Outbreak, flooding.	10/24/2021 4:59 PM
9	Flood	10/23/2021 3:27 PM
10	Illness outbreak, indigenous life style	10/23/2021 1:04 PM
11	Illness outbreak	10/23/2021 8:41 AM
12	Flood	10/22/2021 8:48 PM
13	All the above	10/22/2021 7:00 PM
14	Illness outbreak, loss of jobs and people losing there homes	10/22/2021 5:29 PM
15	Power outage, drought	10/22/2021 3:02 PM
16	Illness outbreak.	10/22/2021 2:35 PM
17	Illness	10/22/2021 2:24 PM
18	All of those referenced in the question	10/22/2021 2:17 PM
19	Fire, illness, tornadoes, power outages	10/22/2021 1:36 PM
20	Outbreak	10/22/2021 1:36 PM
21	Illness outbreak	10/22/2021 1:32 PM
22	Covid Outbreak	10/22/2021 1:01 PM
23	Illness outbreak	10/22/2021 12:44 PM
24	Illness outbreak	10/22/2021 12:44 PM
25	Outbreak. Fire. Blizzard that takes election out for days	10/22/2021 12:35 PM
26	Illness	10/22/2021 12:32 PM
27	Bad water	10/22/2021 12:30 PM
28	Blizzard	10/22/2021 12:29 PM
29	Illness	10/22/2021 12:27 PM
30	Fire and Illness outbreak	10/21/2021 6:57 PM

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

31	Illness outbreak	10/21/2021 2:43 PM
32	heavy precipitation and severe storms such as: rain events with more than 1" per hour downfall, storm events that exceed the 100 year or 500 year floods, heavy snowfall/ice events that cut off power and make travel difficult or impossible. Similarly, we've also seen intense storm cells that produce straight line winds events (derecho) similar to damage from tornados. The current COVID pandemic/ and future illness outbreaks are an issue, including those that are the result of pest/pathogens like mosquito and tick born illnesses	10/21/2021 12:50 PM
33	Illness - Covid-19 impact on Community and Business Operations producing challenges in provision of services and economic challenges. Active Assailant Concerns -hyper local/national terrorism Behavioral Health Snow impacting infrastructure - heavy line damage/communications/energy availability	10/21/2021 12:09 PM
34	Outbreak	10/21/2021 11:26 AM
35	Drought, illness out break, lack of food lack of medical care	10/21/2021 9:00 AM
36	Drought and illness outbreak	10/20/2021 6:02 PM
37	Illness outbreak	10/20/2021 4:15 PM
38	Line 5 breaking and polluting lake michigan	10/20/2021 11:58 AM
39	Illness	10/20/2021 7:40 AM
40	illness outbreak	10/19/2021 3:58 PM
41	Illness outbreak	10/19/2021 3:18 PM
42	Power outages with storms, storm damages.	10/19/2021 11:57 AM
43	blizzard, illness	10/19/2021 11:13 AM
44	Fire, drought, wind and weather events	10/19/2021 10:12 AM
45	Wind, illness	10/19/2021 10:08 AM
46	illness outbreak	10/19/2021 9:30 AM
47	Outbreak, power outages related to weather	10/18/2021 8:44 PM
48	Illness outbreak	10/18/2021 6:45 PM
49	Illness outbreak, flooding, snowed in, power outage, no heat.	10/18/2021 4:32 PM
50	Blizzards and power outages	10/18/2021 4:28 PM
51	Heavy snow	10/18/2021 4:27 PM
52	Storms (winter or otherwise) knocking-out electricity to homes. Floods.	10/18/2021 4:20 PM
53	illness outbreak	10/18/2021 3:59 PM
54	Illness outbreak & natural weather disaster like a harsh winter with tons of snow fall	10/18/2021 2:55 PM
55	Illness outbreak	10/18/2021 2:38 PM
56	Our fresh water would be impacted by companies dumping hazardous Waste and materials in our Great Lakes. Breaks in the pipe lines in the water system and surrounding areas need to be stopped.	10/18/2021 2:34 PM
57	the loss of all possession from any disaster	10/18/2021 2:17 PM
58	Illness outbreak and loss of shelter	10/18/2021 2:05 PM
59	Flood	10/18/2021 2:01 PM
60	Illness, outbreak	10/18/2021 1:53 PM
61	Illness of all diffrent kinds having a outbreak of it.	10/18/2021 1:40 PM
62	Fire, flood, tornado	10/18/2021 1:31 PM

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

63	Fire	10/18/2021 1:27 PM
64	Fire, illness outbreak, animal attacks, and bitter cold	10/18/2021 1:21 PM
65	Illness outbreak	10/18/2021 12:57 PM
66	Flooding	10/18/2021 12:54 PM
67	Illness	10/18/2021 12:53 PM
68	Any, they can happen anywhere.	10/18/2021 12:49 PM
69	Illness	10/18/2021 12:49 PM
70	Illness outbreak, any natural disasters that may cause our members to become homeless and/or unable to food for their families	10/18/2021 12:48 PM
71	Fire	10/18/2021 12:47 PM
72	Loss of power.	10/18/2021 12:47 PM
73	COVID outbreak, flood	10/18/2021 11:27 AM
74	Flood, tornado, fire	10/18/2021 11:03 AM
75	Illness outbreak, Tornado-severe storm.	10/18/2021 10:52 AM
76	illness outbreak	10/18/2021 10:45 AM
77	drought, floods	10/18/2021 10:37 AM
78	Illness breakout, natural disaster-erosion, oil spills.	10/18/2021 10:16 AM
79	blizzard or severe cold	10/18/2021 10:05 AM
80	Drugs!	10/18/2021 9:49 AM
81	snow fall	10/18/2021 9:45 AM
82	I think the tribe is doing a great job an preparing us for whatever may come, I have faith in our tribe to help our people when its time.	10/18/2021 9:35 AM
83	Ice Storm and loss of electricity and closure of roads	10/18/2021 9:28 AM
84	illness outbreak	10/18/2021 9:20 AM
85	storms, illness outbreak	10/18/2021 9:18 AM
86	fire, illness outbreak,	10/18/2021 9:16 AM
87	Illness outbreak, rising water level over road near water, tree damage, power outage due to weather i.e. snow storms or thunderstorms	10/18/2021 9:16 AM
88	illness and snow events	10/18/2021 9:14 AM
89	Pandemic.	10/18/2021 9:12 AM
90	illness outbreak, fire, tomado, active shooter,	10/18/2021 9:11 AM
91	weather related impacts on roads and utilities such as wind damage and snow storms. outbreaks of communicable airborne disease	10/15/2021 2:46 PM
92	flood / severe weather / illness outbreak	10/13/2021 10:33 AM
93	climate change induced impacts, severe weather fluctuations causing flooding, drought, groundwater impacts, transportation infrastructure impacts, forestry impacts, illness outbreaks and a number of other social impacts related to disruptions in supply chains, resource availability and general disruption of economic stability.	10/12/2021 4:41 PM
94	Flood	10/12/2021 3:06 PM
95	drought	10/12/2021 10:21 AM
96	Illness	10/12/2021 10:21 AM

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97	* High water erosion problems. * Tree/Plant mortality due to invasive organisms (i.e. Oak wilt, Emerald ash borers, etc.) * Invasive species introduction (i.e. Asian/Invasive carp, Eurasian water milfoil, fragmites, etc.)	10/12/2021 9:21 AM
98	illness	10/12/2021 8:50 AM
99	Illness outbreak.	10/12/2021 8:44 AM
100	Illness outbreak, fire,	10/12/2021 8:19 AM
101	unknown	10/11/2021 5:01 PM
102	snow storm-blizzard	10/11/2021 4:10 PM
103	Fire, illness, food shortage	10/11/2021 3:52 PM
104	I think illness or winter storms	10/11/2021 3:47 PM
105	fire, illness outbreak	10/11/2021 3:43 PM
106	illness outbreak	10/11/2021 3:41 PM
107	in my area blown down trees, old bridges washing out	10/11/2021 3:17 PM
108	civil unrest	10/11/2021 3:10 PM
109	Either fire or flooding, possibly drought. I feel that the climate changes could pose threats of any kind	10/8/2021 4:29 PM
110	illness outbreak and power outages	10/8/2021 2:31 PM
111	Flood, tornado, pandemic	10/8/2021 1:48 PM
112	tomados	10/8/2021 1:32 PM
113	illness outbreak	10/8/2021 1:17 PM
114	severe weather, wildland fire	10/6/2021 1:34 PM
115	Illness	10/6/2021 12:59 PM
116	power outage due to sever weather.	10/6/2021 8:03 AM
117	Illness, flood, freeze	10/5/2021 6:22 PM
118	fire	10/5/2021 4:11 PM
119	Blizzard, illness	10/5/2021 1:20 PM
120	Freezing weather with a loss of electricity. Snow events that shut down roads. Oil spills destroying fresh water.	10/5/2021 11:18 AM

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Q5 Does your community have concerns about the condition of existing infrastructure (dams, bridges, utilities, etc.) being able to withstand a natural hazard event in the future? Please describe.

Answered: 118 Skipped: 3

#	RESPONSES	DATE
1	Unsure	1/14/2022 10:27 AM
2	unknown	11/17/2021 8:47 AM
3	n/a	11/5/2021 9:39 AM
4	Not aware of a shortfall	10/28/2021 11:36 AM
5	Yes, all of my neighbors and family are on the same page with trying to prevent any of our land from any sort of disaster. We recently rebuilt a dam in Walton Junction after seeking help from the DNR for years because of our pond drying up. It has since been saved by the beavers a family friend trapped and released into the pond.	10/27/2021 7:39 PM
6	The GTB Natural Hazard Mitigation Plan covers the risks as a result of a natural hazard event.	10/27/2021 4:21 PM
7	No	10/26/2021 1:58 PM
8	Yes, especially flooding of river and Lake Michigan inlets in our surrounding area.	10/24/2021 4:59 PM
9	The underground pipe system that drains water from homes and streets seems to get worse every year. I feel that the drainage system in place works well for small amounts of rain water but not with all this climate change rain.	10/23/2021 3:27 PM
10	Utilities	10/23/2021 1:04 PM
11	Utilities	10/23/2021 8:41 AM
12	Somewhat	10/22/2021 8:48 PM
13	All the above	10/22/2021 7:00 PM
14	Utilities like people loosing electricity, bridges need to be rebuilt. We need more hospitals because ours are all filling up	10/22/2021 5:29 PM
15	There should be a community building built out at the Antrim County that could be used as a storm shelter for that community.	10/22/2021 3:02 PM
16	Winter storms and being able to keep housing units warm without power and in extreme heats trying to keep them cool.	10/22/2021 2:35 PM
17	No	10/22/2021 2:24 PM
18	Not sure	10/22/2021 2:17 PM
19	We have dams, bridges , etc	10/22/2021 1:36 PM
20	I'm not sure	10/22/2021 1:36 PM
21	Not sure	10/22/2021 1:32 PM
22	Not sure	10/22/2021 1:01 PM
23	No nothing like that	10/22/2021 12:44 PM
24	Not sure	10/22/2021 12:44 PM
25	Electric going out during storms	10/22/2021 12:35 PM
26	Idk	10/22/2021 12:32 PM

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27	I don't know	10/22/2021 12:30 PM
28	No	10/22/2021 12:29 PM
29	Utilities	10/22/2021 12:27 PM
30	Trees on Roubal Rd with no shoulder on either side of lanes. There is no fire hydrant in the solar neighbor hood. Kitigan and Ninatigo Rd.	10/21/2021 6:57 PM
31	No at the moment	10/21/2021 2:43 PM
32	Yes, we've seen these issues already. In the summer of 2021, a section of Alden Highway at Finch Creek washed out completely because culverts at the creek failed during a severe thunderstorm. This occurred on a main road and prevented normal traffic flow as well as first responders. Undersized culverts and aging dams are risks to the community as are aging bridges or other municipal infrastructures.	10/21/2021 12:50 PM
33	Yes, Belanger (sp?) bridge - flooding potential, utility continuance during heavy ice and snow events/tornados	10/21/2021 12:09 PM
34	Yes bridge and natural disasters	10/21/2021 11:26 AM
35	I don't know. I would assume they have them in place.	10/21/2021 9:00 AM
36	N/A	10/20/2021 6:02 PM
37	Back up power generators would be nice for winter storms	10/20/2021 4:15 PM
38	Unknown	10/20/2021 11:58 AM
39	Whether is always different here.	10/20/2021 7:40 AM
40	From my perspective, the only large hazard I see is the dangers to our waters due to the greed of large corporations, and it is not a natural hazard event. We, as a people have been able to withstand "natural" hazard, it is the "unnatural" hazards which we will have to learn to withstand. Our natural resources is where our lives depend on, and they are being destroyed by "Big Business" greed.	10/19/2021 3:58 PM
41	No	10/19/2021 3:18 PM
42	No	10/19/2021 11:57 AM
43	not sure if the community has concerns, I do have a concern on the Belanger creek bridge.	10/19/2021 11:13 AM
44	Power lines in weather events have shut things down for up to a week a few times in the last decade or so with no power.	10/19/2021 10:12 AM
45	Communication can be taken out making it difficult to coordinate repairs	10/19/2021 10:08 AM
46	Utilities	10/18/2021 8:44 PM
47	N/A	10/18/2021 6:45 PM
48	???	10/18/2021 4:32 PM
49	Electrical outages	10/18/2021 4:28 PM
50	Yes, existing structures	10/18/2021 4:27 PM
51	Utility concerns are high amongst community members, especially during storms when our electricity frequently goes out. No electricity means no electricity to power the heaters that heat our homes. Wmter electrical outages are hard; especially for our Elders, who may have medical equipment at home and no way to power their medical devices when electricity goes out.	10/18/2021 4:20 PM
52	no	10/18/2021 3:59 PM
53	No	10/18/2021 2:55 PM
54	Tornadoes	10/18/2021 2:38 PM
55	Solar systems are a cleaner environment.	10/18/2021 2:34 PM

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56	yes extremely so, because for example the structure of our home is deminishing, foundation cracks , the quality was not great feom the beginning	10/18/2021 2:17 PM
57	Utilities	10/18/2021 2:05 PM
58	No roads tend to be cleared quickly of debris and power outages don't last long	10/18/2021 2:01 PM
59	Yes - dams and utilities	10/18/2021 1:53 PM
60	No	10/18/2021 1:40 PM
61	Yes	10/18/2021 1:31 PM
62	Bridges	10/18/2021 1:27 PM
63	Cold may impact due to LP gas tanks being empty or unaccessible	10/18/2021 1:21 PM
64	In Benzonia on the reservation here we live quite high so we're not worried about flooding maybe this may be storms in the winter	10/18/2021 12:57 PM
65	no	10/18/2021 12:54 PM
66	Charlevoix has a drawbridge that connects the cities North & South ends which requires constant maintenance.	10/18/2021 12:49 PM
67	No	10/18/2021 12:49 PM
68	Utilities and our administrative building within the GTB Government Community	10/18/2021 12:48 PM
69	Bridge	10/18/2021 12:47 PM
70	I don't know.	10/18/2021 12:47 PM
71	We are surrounded by water, so I would think this would definitely be a concern.	10/18/2021 11:27 AM
72	yes - there is always concern that there may me hazards that take out our utilities.	10/18/2021 11:03 AM
73	I have occasionally engaged in conversations with regards to old bridges, antiquated drainage systems and the need for above ground power to be moved underground to withstand winter weather.	10/18/2021 10:52 AM
74	no	10/18/2021 10:45 AM
75	not sure	10/18/2021 10:37 AM
76	erosion is a concern for community areas, fiberoptics is an issue for outer lying families. river bank stability.	10/18/2021 10:16 AM
77	utilities, particularly electricity	10/18/2021 10:05 AM
78	Old trees on Stallman Road hills that have potential to fall in the road on cars during inclement weather. Already occurred and will reoccur, but I believe this land may be private land.	10/18/2021 9:49 AM
79	no	10/18/2021 9:45 AM
80	I don't know that for sure.	10/18/2021 9:35 AM
81	Electricity is lost every winter due to weather; consequent loss of house water pipes due to freezing and bursting.	10/18/2021 9:28 AM
82	Not that I am aware of	10/18/2021 9:20 AM
83	yes, power.	10/18/2021 9:18 AM
84	not sure, maybe utilities because we are a rural community. bridges too because we have many waterways to cross.	10/18/2021 9:16 AM
85	Not sure	10/18/2021 9:16 AM
86	unknown	10/18/2021 9:14 AM
87	There are not a lot of natural disasters in our area. Occasionally heavy rain/snow storms may knock out power, but it is usually restored within a reasonable time.	10/18/2021 9:12 AM

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88	utilities	10/18/2021 9:11 AM
89	not sure	10/15/2021 2:46 PM
90	No	10/13/2021 10:33 AM
91	Yes. Many local dams and road stream crossings were designed and constructed decades ago and under hydrologic regimes that are now rapidly shifting towards more frequent and of higher intensity. Further, many stormwater and wastewater systems are also rapidly becoming outdated given these climate related hydrologic regime shifts. Much more funding needs to be directed towards assessment and re-design and construction of substandard infrastructure.	10/12/2021 4:41 PM
92	Not sure	10/12/2021 3:06 PM
93	yes	10/12/2021 10:21 AM
94	Not sure	10/12/2021 10:21 AM
95	I don't know. The only one that I am aware of locally would be Union Street Dam on the Boardman River in downtown Traverse City.	10/12/2021 9:21 AM
96	we lose power easy	10/12/2021 8:50 AM
97	Not that I am aware of.	10/12/2021 8:44 AM
98	utilities	10/12/2021 8:19 AM
99	Yes, utilities go out easily and it seems that our community is not priority in que of importance; also internet access is low	10/11/2021 5:01 PM
100	yes-all of the above	10/11/2021 4:10 PM
101	i would have to say all of the power outages due to tress on lines and such.	10/11/2021 3:52 PM
102	Not sure	10/11/2021 3:47 PM
103	no	10/11/2021 3:43 PM
104	no	10/11/2021 3:41 PM
105	yes, bridges washing out and high winds downing trees	10/11/2021 3:17 PM
106	I am uncertain	10/11/2021 3:10 PM
107	I am not sure what concerns the community has, as I have not spoken with very many members of the community. I think people are concerned about the roads in and out of the area should major damage occur to main roads	10/8/2021 4:29 PM
108	Power outage is a huge concern due to lack of generators in tribal facilities and overhead utility lines coming down during weather events. Loss of power for businesses, homes, critical healthcare services, etc.	10/8/2021 2:31 PM
109	Yes, poor water management/drainage. Unwilling to mitigate illness outbreak.	10/8/2021 1:48 PM
110	power going out	10/8/2021 1:32 PM
111	bridges	10/8/2021 1:17 PM
112	Power lines	10/6/2021 1:34 PM
113	None that I am aware of	10/6/2021 12:59 PM
114	yes we have seen power outages in our community and elders are unable to get out or have special needs.	10/6/2021 8:03 AM
115	Yes	10/5/2021 6:22 PM
116	possibly electrical outages	10/5/2021 4:11 PM
117	unknown	10/5/2021 1:20 PM
118	Yes, the aging oil pipeline going through the Straits of Mackinaw is vulnerable to many potential hazards, and would devastate the habitat, impacting tribal fishermen directly. Our tribe joins in with other tribes to voice our concerns.	10/5/2021 11:18 AM

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Q6 Does your community have concerns that a natural hazard event in the future would require investment in new and/or upgraded infrastructure and technology (renewable energy, improved stormwater management, internet/cellular, etc.)? Please describe.

Answered: 117 Skipped: 4

#	RESPONSES	DATE
1	internet/cellular there are a several areas within downtown Lake Leelanau that do not have cellular connection due to topography as well as along M204 and 22.	1/14/2022 10:27 AM
2	unknown	11/17/2021 8:47 AM
3	n/a	11/5/2021 9:39 AM
4	Internet	10/28/2021 11:36 AM
5	I believe so in a world that has become so reliable on technology.	10/27/2021 7:39 PM
6	We've already seen how the COVID-19 pandemic has affected our community and shown how we need upgraded infrastructure and technology, and the pandemic isn't over.	10/27/2021 4:21 PM
7	Internet	10/26/2021 1:58 PM
8	They are currently working on helping citizens get grants and access to funds to help with improvements.	10/24/2021 4:59 PM
9	Definitely would need new drainage network and roads would need to be replaced or repaired.	10/23/2021 3:27 PM
10	Internet/cellular,water managemnt,	10/23/2021 1:04 PM
11	Renewable energy	10/23/2021 8:41 AM
12	Yes	10/22/2021 8:48 PM
13	All the above	10/22/2021 7:00 PM
14	Improved storm water management and renewable energy we need more of to help save the earth from the damage we've done to it. Storm drains always flood and clog up during storms	10/22/2021 5:29 PM
15	Please start using fluoride in our water. Do your homework you're killing us slowly And making us dumb.I don't know who's getting a kickback but it's not good for us. If you can't swallow your toothpaste why are you swallowing the water that has fluoride.?	10/22/2021 3:02 PM
16	Renewable energy could help reduce the cost of the poor insulation/materials used for building the housing.	10/22/2021 2:35 PM
17	No	10/22/2021 2:24 PM
18	Not sure	10/22/2021 2:17 PM
19	In process of fixing bridges	10/22/2021 1:36 PM
20	Probably	10/22/2021 1:36 PM
21	Not sure	10/22/2021 1:32 PM
22	Not sure	10/22/2021 1:01 PM
23	Yes all of them	10/22/2021 12:44 PM
24	Probably	10/22/2021 12:44 PM
25	Yeah	10/22/2021 12:35 PM

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26	I would think, you fukn tard	10/22/2021 12:32 PM
27	I don't know	10/22/2021 12:30 PM
28	Not sure	10/22/2021 12:29 PM
29	Renewable energy	10/22/2021 12:27 PM
30	Street drains are clogged with leave.	10/21/2021 6:57 PM
31	I hope that they would upgrade	10/21/2021 2:43 PM
32	Yes. Roads and culverts may need to be repaired, as well as electrical grid and other power supplies after severe storms occur. Upgraded infrastructure or renewable energy supplies that offer backup power during grid failure are important to consider. We should shift stormwater management to be more forward focused on an increasing number severe storms such as 1000 year flood events in mind rather than 100 year events. We should do everything we can to INCREASE the number of functioning wetlands and focus on wetland and riparian restoration and connectivity to help absorb the effects of severe storms and reduce erosion, runoff and pollution.	10/21/2021 12:50 PM
33	Fiber replacement of above ground lines, Cell tower improvements	10/21/2021 12:09 PM
34	Unsure	10/21/2021 11:26 AM
35	I'm not sure where my community stands on this .	10/21/2021 9:00 AM
36	Renewable energy and internet/cellular	10/20/2021 6:02 PM
37	No	10/20/2021 4:15 PM
38	Na	10/20/2021 11:58 AM
39	Renewable energy.	10/20/2021 7:40 AM
40	As a community we have come to depend on technology and health wise the renewable energy and stormwater management are an important part of our comfort.	10/19/2021 3:58 PM
41	Maybe	10/19/2021 3:18 PM
42	Yes, the Tribe should explore developing renewable energy objectives into its long term strategy, especially as a back up in case of a natural disaster or something along those lines, installing elements into existing infrastructure, and should have the best in broadband available on the reservation land.	10/19/2021 11:57 AM
43	I am not sure what the community thinks, I do not have a concern. Leelanau county has plenty of money to fix things or upgrade infrastructure. 2nd richest county in Michigan.	10/19/2021 11:13 AM
44	Yes, newaygo county got larger power towers to run lines above the trees. Renewable energy in the form of solar, wind, or wave energy is not a bad idea. It's nice having dead zones with no cell service here, I would like that to continue or even get larger dead zones with no internet or cellular service, we don't need those services everywhere	10/19/2021 10:12 AM
45	Internet and cellular access is vital and impacted by power outages	10/18/2021 8:44 PM
46	N/A	10/18/2021 6:45 PM
47	Renewable energy	10/18/2021 4:32 PM
48	Should have generator's and renewable energy (solar, wind, geothermal) for each Tribal community in our service area.	10/18/2021 4:28 PM
49	Yes, all of the above	10/18/2021 4:27 PM
50	It would be a great benefit to the community to have all Rental and Elder housing connected to the natural gas lines with a back-up generator, in case of winter storm electrical outages. It would also be beneficial to GTB Citizens who don't rent from GTB, but who own their own homes - to have help in funding such generators for their homes to be connected to the natural gas lines. Funding solar energy would be beneficial, as well. Emergency radios would be helpful too.	10/18/2021 4:20 PM
51	no	10/18/2021 3:59 PM

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52	Yes, keeping technology available during storms.	10/18/2021 2:55 PM
53	Affordable	10/18/2021 2:38 PM
54	Invest in renewable energy.	10/18/2021 2:34 PM
55	yes, extremely so, all aspects need attention	10/18/2021 2:17 PM
56	Renewable energy and internet/cellular	10/18/2021 2:05 PM
57	Yes, relying on centralized fossil fuels is not sustainable and not a long term secure source	10/18/2021 2:01 PM
58	Renewable energy	10/18/2021 1:53 PM
59	Only lack of not helping our members	10/18/2021 1:40 PM
60	Yes, electricity	10/18/2021 1:31 PM
61	Renewable energy	10/18/2021 1:27 PM
62	Natural gas upgrade is readily available. A buried gas line (extension) into our neighborhood. Would make the homes and tribal community building safer during snow & temperature extremes. Planting trees to identify the curvature of the roads would keep vehicles clear of ditches and approaches during times of heavy, blowing snow.	10/18/2021 1:21 PM
63	No	10/18/2021 12:57 PM
64	no	10/18/2021 12:54 PM
65	Yes, if our bridge collapses or breaks it would be a huge inconvenience.	10/18/2021 12:49 PM
66	No	10/18/2021 12:49 PM
67	All listed	10/18/2021 12:48 PM
68	Technoolgy	10/18/2021 12:47 PM
69	I'm sure they do.	10/18/2021 12:47 PM
70	Possibly.	10/18/2021 11:27 AM
71	yes	10/18/2021 11:03 AM
72	I have occasionally engaged in conversations with regards to old bridges, antiquated drainage systems and the need for above ground power to be moved underground to withstand winter weather.	10/18/2021 10:52 AM
73	a need for more locally grown food due to issues with shipping across the country and pandemic shortages	10/18/2021 10:45 AM
74	yes	10/18/2021 10:37 AM
75	yes-under maintained structures need updating.	10/18/2021 10:16 AM
76	yes. sturdier electrical transmission; alternative energy; better internet and cellular coverage; roads	10/18/2021 10:05 AM
77	Internet and cellular capabilities for the community during natural hazard events need to be invested in. Current companies cannot withstand the natural hazards to keep the community informed as these events occur.	10/18/2021 9:49 AM
78	no	10/18/2021 9:45 AM
79	I don't know I have not heard anything on it.	10/18/2021 9:35 AM
80	last mile digital fiber to houses needs to be extended	10/18/2021 9:28 AM
81	Not sure	10/18/2021 9:20 AM
82	yes, IT, power generation.	10/18/2021 9:18 AM
83	not sure	10/18/2021 9:16 AM
84	I do think we need universal Internet since it is needed for everything and is not a luxury	10/18/2021 9:16 AM

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	anymore. I think we need to continue protecting our waters. And renewable energy is important as well.	
85	yes	10/18/2021 9:14 AM
86	Some concern, but nothing major.	10/18/2021 9:12 AM
87	yes, internet and electrical lines, water lines upgrade, sewer lines upgrade	10/18/2021 9:11 AM
88	unknown	10/15/2021 2:46 PM
89	Yes, internet service needs to be improved in Peshawbestown as well as other rural areas. Renewable energy / energy independence would benefit the tribe. Existing buildings are older and may not be the most energy efficient.	10/13/2021 10:33 AM
90	Yes. Communication systems continue to evolve but still tend to be outstripped by demand. Power distribution infrastructure remains vulnerable to severe weather events. The recent pandemic clearly demonstrated a much broader need for high speed internet networks in rural and non coastal areas locally and regionally.	10/12/2021 4:41 PM
91	Concerned with flooding or torrential rains that the sewer system might not be able to handle	10/12/2021 3:06 PM
92	yes	10/12/2021 10:21 AM
93	Not sure	10/12/2021 10:21 AM
94	Uncertain	10/12/2021 9:21 AM
95	we need homes for the homeless	10/12/2021 8:50 AM
96	Not that I am aware of.	10/12/2021 8:44 AM
97	renewable energy, internet/cellular	10/12/2021 8:19 AM
98	unknown	10/11/2021 5:01 PM
99	yes-all of the above	10/11/2021 4:10 PM
100	Natural gas would be a great asset.	10/11/2021 3:52 PM
101	Not sure	10/11/2021 3:47 PM
102	yes	10/11/2021 3:43 PM
103	yes, storm water management	10/11/2021 3:41 PM
104	if the trees blew down i would put in solar panels in my own area.	10/11/2021 3:17 PM
105	I am uncertain	10/11/2021 3:10 PM
106	Some community members have expressed concerns about the climate and how the weather is impacting things; it seems most people would want secure housing, medical facilities, temporary/emergency housing if needed, internet, electricity, etc., should there be some type of event.	10/8/2021 4:29 PM
107	Improved internet/cellular coverage and upgraded infrastructure and communication tower are critical needs to sustain power and services in rural location across GTB 6-county service areas.	10/8/2021 2:31 PM
108	Need to improve drainage and building restrictions to mitigate flooding.	10/8/2021 1:48 PM
109	internet, renewable energy	10/8/2021 1:32 PM
110	yes, not planned in budget or strategic plan to upgrade or rebuild the infrastructure/tech	10/8/2021 1:17 PM
111	renewable energy, internet/cellular, emergency radio communications	10/6/2021 1:34 PM
112	Always room for improvement	10/6/2021 12:59 PM
113	all the above.	10/6/2021 8:03 AM
114	We have no real back up	10/5/2021 6:22 PM
115	unsure	10/5/2021 4:11 PM

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116	unknown	10/5/2021 1:20 PM
117	During freezing weather the major concern would be loss of heat and electricity. Loss of life could result from lack of heat.	10/5/2021 11:18 AM

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Q7 Have there been any negative impacts on the public health and/or natural environment of your community that you attribute to climate change?

Answered: 118 Skipped: 3

#	RESPONSES	DATE
1	Unknown	1/14/2022 10:27 AM
2	Covid?	11/17/2021 8:47 AM
3	n/a	11/5/2021 9:39 AM
4	Don't know	10/28/2021 11:36 AM
5	Not that I have personally noticed or been informed about no.	10/27/2021 7:39 PM
6	Not that I'm aware of, although when we are getting smoke that has traveled from the California wildfires then I would think that this would have a negative impact on those suffering from asthma or other breathing/lung issues.	10/27/2021 4:21 PM
7	No	10/26/2021 1:58 PM
8	No	10/24/2021 4:59 PM
9	Yes, with more water sitting in roadways and yards due to poor drainage and excess of rain from the climate change, the mosquito population has boomed out of control which makes getting bit by one a high chance of catching dengai fever or malaria	10/23/2021 3:27 PM
10	None	10/23/2021 1:04 PM
11	Public health	10/23/2021 8:41 AM
12	Yes	10/22/2021 8:48 PM
13	N/A	10/22/2021 7:00 PM
14	Yes people getting sick and dying from contaminated water sources, air, people dieing from covid because we don't have enough hospitals or people who are in the medical field. People getting cancer more and more	10/22/2021 5:29 PM
15	Electric/heat cost	10/22/2021 3:02 PM
16	Benzie is in a big sandy/weed filled field so it gets really hot in the summer and cold in the winter months. A pond or body of water could help reduce the temperature for the reservation during the summer months. Helping reduce cost of bills as well as reducing our elders from overheating.	10/22/2021 2:35 PM
17	Yes	10/22/2021 2:24 PM
18	Yes	10/22/2021 2:17 PM
19	I don't know	10/22/2021 1:36 PM
20	Yes	10/22/2021 1:36 PM
21	Loss of shoreline	10/22/2021 1:32 PM
22	Water levels are decreasing	10/22/2021 1:01 PM
23	No	10/22/2021 12:44 PM
24	Unsure	10/22/2021 12:44 PM
25	No	10/22/2021 12:35 PM

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26	Idk	10/22/2021 12:32 PM
27	I wouldn't know.i think what they tell us is a lie.	10/22/2021 12:30 PM
28	No	10/22/2021 12:29 PM
29	Yes	10/22/2021 12:27 PM
30	Dying trees.	10/21/2021 6:57 PM
31	No	10/21/2021 2:43 PM
32	Yes. Species ranges are changing as a result of climate change (fewer cold weather dependent species, southern species moving north). The frequency of natural disturbance (wind, severe weather) is increasing, which adds stress to the local ecosystems. Summers are warmer which adds stress to human health (and other species). Indoor air conditioning is relatively rare here but is becoming more needed with hotter summers. Additionally, western wildfires [climate change] are negatively impacting air quality in the Great Lakes region.	10/21/2021 12:50 PM
33	Unknown = White fish are being bruised by Lake Trout per Tribal Fishing Community comments - Lake Trout are territorial - so something happened to place both species within close proximity to one another - could be water temperature related.	10/21/2021 12:09 PM
34	No	10/21/2021 11:26 AM
35	No	10/21/2021 9:00 AM
36	Drought and coronavirus pandemic issues	10/20/2021 6:02 PM
37	No	10/20/2021 4:15 PM
38	Colder winters	10/20/2021 11:58 AM
39	Always worried about this	10/20/2021 7:40 AM
40	Many worries about our health and environment is being caused by the denial of large corporations that they are endangering the natural resources, which in turn causes climate change.	10/19/2021 3:58 PM
41	No	10/19/2021 3:18 PM
42	Yes, I believe the fishing habitats, types of fish in Great lakes and amounts of fish have changed due to changes in the climate. The water clarity seems to change year after year and seems much clearer in lake MI. It seems warmer temperatures also are effecting the supplies of wild edible mushrooms and herbs as well.	10/19/2021 11:57 AM
43	The Rice beds are depleting. Not sure the cause, maybe climate change.	10/19/2021 11:13 AM
44	Not really climate change caused for sure, but invasive species coming in and destroying what was here thirty years ago has had an impact (emerald ash borer, zebra and quagga mussels, and probably dozens of others). Some say climate change is amplifying these species ability to alter our ecosystem, I tend to believe it.	10/19/2021 10:12 AM
45	No	10/19/2021 10:08 AM
46	Weather changes have impacted the environment and caused power outages and had negative consequences for agriculture.	10/18/2021 8:44 PM
47	Super hot i. Summer, causes AC to run non stop and hike of electric bills from companies	10/18/2021 6:45 PM
48	Not sure	10/18/2021 4:32 PM
49	Whitefish decline, trees dying from invasive insects	10/18/2021 4:28 PM
50	Erosion of lakeshore	10/18/2021 4:27 PM
51	Although we all should do our part in helping to reduce our carbon footprint on Mother Earth; climate change is a naturally occurring phenomenon and is going to happen with or without humans actions or interventions. Mother Earth has evolved through several Ice Ages. No - I don't feel there have been any negative impacts on public health and/or natural environments of our community that can be attributed to climate change. The only public health issues have	10/18/2021 4:20 PM

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been those 'created' by man and inflicted upon the Indigenous Peoples (smallpox) and today - nCovid-19 (lab-created), upon all.

52	no	10/18/2021 3:59 PM
53	Erosion is a very serious problem caused by rising water due to climate change	10/18/2021 2:55 PM
54	God is in control	10/18/2021 2:38 PM
55	The natural environment of our Fishing and hunting our negatively contributed by climate change because of the oil greed	10/18/2021 2:34 PM
56	yes, climate changes impacts our everything everyday it gets worse n worse	10/18/2021 2:17 PM
57	Yes	10/18/2021 2:05 PM
58	Yes, late heat causing loss of agricultural crop and disease issues. Lack of cold winters killing off pest insects in both agricultural and forestry species	10/18/2021 2:01 PM
59	Yes	10/18/2021 1:53 PM
60	Yes. Our tribe don't care about us!	10/18/2021 1:40 PM
61	No	10/18/2021 1:31 PM
62	No	10/18/2021 1:27 PM
63	Rising fuel costs, drought and bitter cold winters	10/18/2021 1:21 PM
64	No	10/18/2021 12:57 PM
65	no	10/18/2021 12:54 PM
66	Less snow equals less work for seasonal workers.	10/18/2021 12:49 PM
67	No	10/18/2021 12:49 PM
68	Not sure, but would like more information	10/18/2021 12:48 PM
69	No	10/18/2021 12:47 PM
70	Storms causing power outages.	10/18/2021 12:47 PM
71	Not that I am aware of.	10/18/2021 11:27 AM
72	yes	10/18/2021 11:03 AM
73	Not that I am aware of	10/18/2021 10:52 AM
74	growing seasons for local fruit	10/18/2021 10:45 AM
75	not sure	10/18/2021 10:37 AM
76	more invasive species with warmer climates.	10/18/2021 10:16 AM
77	yes, more shoreline erosion; extreme cold from polar vortexes; premature spring thaws that damage crops	10/18/2021 10:05 AM
78	Yes, with unpredictable weather due to climate change or global warming, there is a need for more funding in Human Services to help with higher utility bills and loss of food during a Vortex, thunder and lightening storms, blizzards, which cause outages with no way to recover the loss completely.	10/18/2021 9:49 AM
79	no	10/18/2021 9:45 AM
80	Ive seen a lot of used masks down by our eagle town an in the parking lots of some of our buildings.	10/18/2021 9:35 AM
81	yes;	10/18/2021 9:28 AM
82	No	10/18/2021 9:20 AM
83	yes, more intense and number (frequency) storms.	10/18/2021 9:18 AM
84	not sure	10/18/2021 9:16 AM

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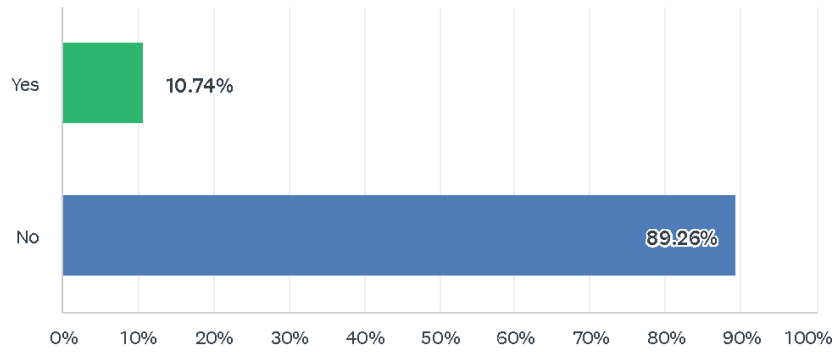
85	Not sure	10/18/2021 9:16 AM
86	unknown	10/18/2021 9:14 AM
87	Nothing that I could point to as being due to climate change, as it's difficult to show that as a causing factor.	10/18/2021 9:12 AM
88	yes, snow levels and water run offs	10/18/2021 9:11 AM
89	increased flooding and erosion	10/15/2021 2:46 PM
90	Yes, shoreline erosion and more precipitation have negatively impacted our region. Warmer temps are harming the ecosystem.	10/13/2021 10:33 AM
91	Yes. Previous responses describe many of these.	10/12/2021 4:41 PM
92	Warmer than usual winters	10/12/2021 3:06 PM
93	not sure	10/12/2021 10:21 AM
94	More drought and fire risk	10/12/2021 10:21 AM
95	Unknown...Although there has been a change to the fish and plankton communities in Lake Michigan (and the rest of the upper Great Lakes), it is primarily attributed to invasive species, but climate change could be a contributing factor.	10/12/2021 9:21 AM
96	all of those rich beach houses may fall in the water because people are melting the polar ice caps and oil drilling is draining in our soil and fresh water	10/12/2021 8:50 AM
97	I am uncertain.	10/12/2021 8:44 AM
98	no, I haven't seen anything	10/12/2021 8:19 AM
99	No	10/11/2021 5:01 PM
100	Yes	10/11/2021 4:10 PM
101	not yet	10/11/2021 3:52 PM
102	Coastal erosion from wave energy with higher water levels	10/11/2021 3:47 PM
103	no	10/11/2021 3:43 PM
104	yes	10/11/2021 3:41 PM
105	no not at this time.	10/11/2021 3:17 PM
106	Not that I can personally note.	10/11/2021 3:10 PM
107	Asthma and allergies are worse due to climate change and fires; some people may suffer from increased cardiovascular issues; there could be food and water borne illnesses (also, and briefly - COVID/SARS - originated in animals, mutated to humans (possibly related to deforestation - which is actually a huge issue; some scientists believe that different versions of SARS could present as deforestation continues or escalates)	10/8/2021 4:29 PM
108	Hotter and more volatile weather, reduced water in Great Lakes changes affecting environment and wildlife, insects, and pandemic impacts on humans.	10/8/2021 2:31 PM
109	Flooding events	10/8/2021 1:48 PM
110	no	10/8/2021 1:32 PM
111	floods, water change can't drink it at times	10/8/2021 1:17 PM
112	Unk	10/6/2021 1:34 PM
113	Not that I am aware of	10/6/2021 12:59 PM
114	not that i know of.	10/6/2021 8:03 AM
115	I don't know	10/5/2021 6:22 PM
116	not that I know of	10/5/2021 4:11 PM

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117	No	10/5/2021 1:20 PM
118	When we don't have an adequate freeze it affects our agriculture. All the perennial crops require a freeze. Also invasive species survive when we don't freeze, and kill off our woodlands.	10/5/2021 11:18 AM

Q8 Have you been involved in a natural hazard mitigation planning process before?

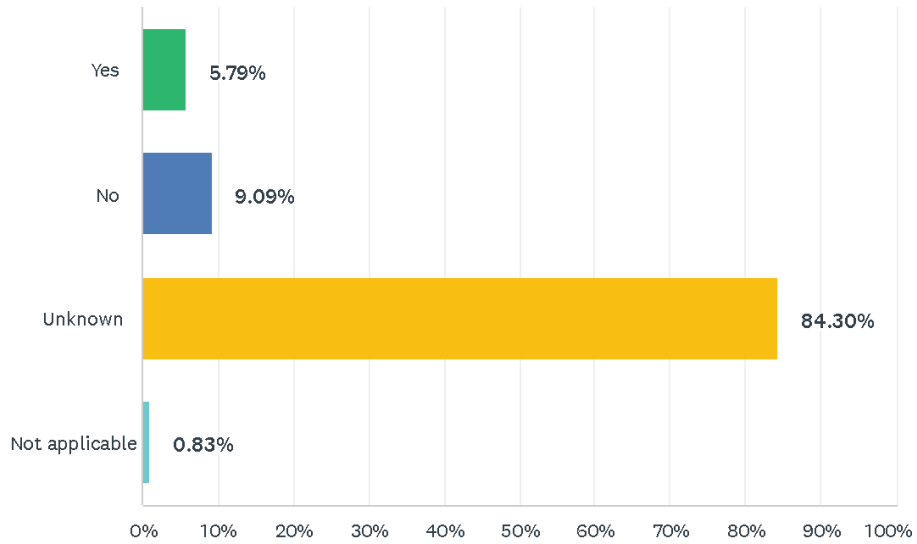
Answered: 121 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	10.74%	13
No	89.26%	108
TOTAL		121

Q9 Has your community requested assistance for mitigation projects in the past?

Answered: 121 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	5.79%	7
No	9.09%	11
Unknown	84.30%	102
Not applicable	0.83%	1
TOTAL		121

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

Q10 If so, was your request granted and what type of project did the request include?

Answered: 93 Skipped: 28

#	RESPONSES	DATE
1	unknown	11/17/2021 8:47 AM
2	n/a	11/5/2021 9:39 AM
3	Unknown	10/28/2021 11:36 AM
4	I told the pond story a few questions back and that to me would be the closest thing to a grant being denied. We have also asked for help with our road in the past due to freeze and thaw seasons.	10/27/2021 7:39 PM
5	We requested generators for main tribal governmental buildings through FEMA but weren't funded.	10/27/2021 4:21 PM
6	Na	10/26/2021 1:58 PM
7	There was no request.	10/24/2021 4:59 PM
8	Unsure as to if any request was made or granted	10/23/2021 3:27 PM
9	Water filtration	10/23/2021 1:04 PM
10	Unknown	10/23/2021 8:41 AM
11	Unknown	10/22/2021 8:48 PM
12	N/A	10/22/2021 7:00 PM
13	N/A	10/22/2021 5:29 PM
14	Not sure if it's applicable but requests were made to put a pool in Benzie county somewhere in the early 2000's to keep cool during the summer months, but it was ultimately denied.	10/22/2021 2:35 PM
15	N/a	10/22/2021 2:24 PM
16	Unk	10/22/2021 2:17 PM
17	I don't know	10/22/2021 1:36 PM
18	Unknown	10/22/2021 1:36 PM
19	Not applicable	10/22/2021 1:32 PM
20	Unknown to me	10/22/2021 12:44 PM
21	Not sure	10/22/2021 12:35 PM
22	Fuk if I know	10/22/2021 12:32 PM
23	Don't know	10/22/2021 12:30 PM
24	Not sure	10/22/2021 12:29 PM
25	N/a	10/22/2021 12:27 PM
26	Not sure	10/21/2021 2:43 PM
27	Yes - 2015 - Generators x 6	10/21/2021 12:09 PM
28	NA	10/21/2021 11:26 AM
29	N/A	10/21/2021 9:00 AM

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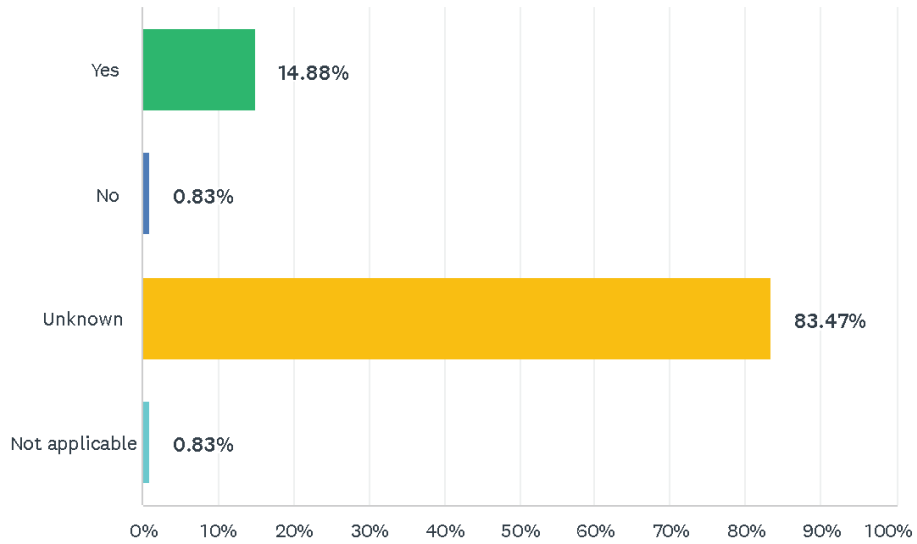
30	N/A	10/20/2021 6:02 PM
31	No	10/20/2021 4:15 PM
32	NA	10/20/2021 11:58 AM
33	NA	10/19/2021 3:58 PM
34	Unknown	10/19/2021 3:18 PM
35	n/a	10/19/2021 11:57 AM
36	not known, have not live here very long.	10/19/2021 11:13 AM
37	NA	10/19/2021 10:12 AM
38	Na	10/18/2021 6:45 PM
39	???	10/18/2021 4:32 PM
40	N/A	10/18/2021 4:28 PM
41	N/a	10/18/2021 4:27 PM
42	Unknown	10/18/2021 4:20 PM
43	?	10/18/2021 3:59 PM
44	Didn't make a request	10/18/2021 2:55 PM
45	None in our area that comes to my attention	10/18/2021 2:38 PM
46	???	10/18/2021 2:34 PM
47	i don't know	10/18/2021 2:17 PM
48	Unknown	10/18/2021 2:05 PM
49	No	10/18/2021 2:01 PM
50	Unknown	10/18/2021 1:53 PM
51	GTB leaves us out of everything so the members are clueless	10/18/2021 1:40 PM
52	N/a	10/18/2021 1:31 PM
53	NA	10/18/2021 1:21 PM
54	Unknown	10/18/2021 12:57 PM
55	n/a	10/18/2021 12:54 PM
56	N/A	10/18/2021 12:49 PM
57	No	10/18/2021 12:49 PM
58	N/A	10/18/2021 12:48 PM
59	Members loose there place 2 llive due 2 the weather n fire or other thing	10/18/2021 12:47 PM
60	.	10/18/2021 12:47 PM
61	I am unsure.	10/18/2021 11:27 AM
62	na	10/18/2021 11:03 AM
63	N/A	10/18/2021 10:52 AM
64	unknown	10/18/2021 10:45 AM
65	not known	10/18/2021 10:37 AM
66	NA	10/18/2021 10:16 AM
67	Don't recall but may include solar energy and gas or diesel generators	10/18/2021 10:05 AM

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68	n/a	10/18/2021 9:45 AM
69	na	10/18/2021 9:28 AM
70	unknown	10/18/2021 9:18 AM
71	Not sure	10/18/2021 9:16 AM
72	N/A	10/18/2021 9:14 AM
73	Unknown.	10/18/2021 9:12 AM
74	unknown	10/18/2021 9:11 AM
75	unknown	10/15/2021 2:46 PM
76	N/A	10/12/2021 10:21 AM
77	Unknown	10/12/2021 9:21 AM
78	people should at least recycle and compost maybe use solar panels for when we do lose electricity	10/12/2021 8:50 AM
79	NA	10/12/2021 8:44 AM
80	I didn't have any requests	10/12/2021 8:19 AM
81	NA	10/11/2021 5:01 PM
82	Unknown	10/11/2021 4:10 PM
83	I don't know	10/11/2021 3:52 PM
84	Not sure	10/11/2021 3:47 PM
85	n/a	10/11/2021 3:41 PM
86	N/A	10/11/2021 3:10 PM
87	Unknown	10/8/2021 4:29 PM
88	After numerous grant denials, awarded Covid funds through ICDBG for four generators for health dept, three tribal community centers and fire dept.	10/8/2021 2:31 PM
89	Generators	10/6/2021 1:34 PM
90	?	10/6/2021 8:03 AM
91	County assistance	10/5/2021 6:22 PM
92	unknown	10/5/2021 1:20 PM
93	I don't really know	10/5/2021 11:18 AM

Q11 Has your community considered mitigation strategies for potential or current hazards?

Answered: 121 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	14.88%	18
No	0.83%	1
Unknown	83.47%	101
Not applicable	0.83%	1
TOTAL		121

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

Q12 If so, please identify potential strategies you would like to explore in the near future.

Answered: 88 Skipped: 33

#	RESPONSES	DATE
1	unknown	11/17/2021 8:47 AM
2	n/a	11/5/2021 9:39 AM
3	I am not sure.	10/27/2021 7:39 PM
4	Periodic community surveys to keep the Plan updated as climate change results in a change in our environmental landscape.	10/27/2021 4:21 PM
5	Na	10/26/2021 1:58 PM
6	Unknown as to community plans at this time	10/24/2021 4:59 PM
7	How to rid the yards of excess stagnate water, clearing roadways of water. Less power outages	10/23/2021 3:27 PM
8	Water	10/23/2021 1:04 PM
9	More education	10/23/2021 8:41 AM
10	Unknown	10/22/2021 8:48 PM
11	N/A	10/22/2021 7:00 PM
12	N/A	10/22/2021 5:29 PM
13	Renewable energy would be great to implement in our outlying communities, not just in Leelanau county.	10/22/2021 2:35 PM
14	N/a	10/22/2021 2:24 PM
15	Unk	10/22/2021 2:17 PM
16	I don't know	10/22/2021 1:36 PM
17	Unknown	10/22/2021 1:36 PM
18	Building lasting infrastructure	10/22/2021 1:32 PM
19	Unknown	10/22/2021 12:44 PM
20	Emergency assistance needs to be lighter nobody likes asking for help when you have to fill out your whole autobiography	10/22/2021 12:35 PM
21	Idk	10/22/2021 12:32 PM
22	Idk	10/22/2021 12:30 PM
23	Na	10/22/2021 12:29 PM
24	N/a	10/22/2021 12:27 PM
25	Not sure	10/21/2021 2:43 PM
26	Improvement to communication systems EOC improvement with County Support - NIMS training Active Assailant Training, Emergency Plan Improvements and Future Live Exercises - Leelanau Sands Casino and Hotel, Government Campus - GTB Administration	10/21/2021 12:09 PM
27	NA	10/21/2021 11:26 AM
28	N/A	10/20/2021 6:02 PM
29	No	10/20/2021 4:15 PM

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30	NA	10/20/2021 11:58 AM
31	Planning for desalter that could happen.	10/20/2021 7:40 AM
32	Removal of all oil pipelines, Less plastic manufacturing, more environmental safeguards in place.	10/19/2021 3:58 PM
33	Unknown	10/19/2021 3:18 PM
34	n/a	10/19/2021 11:57 AM
35	unknown	10/19/2021 11:13 AM
36	NA	10/19/2021 10:12 AM
37	Na	10/18/2021 6:45 PM
38	???	10/18/2021 4:32 PM
39	Replanting Black Ash trees Try to eradicate emerald ash borer. Try to increase Whitefish population, and bring bee hives to the orchards...	10/18/2021 4:28 PM
40	Renewable energy	10/18/2021 4:27 PM
41	Flood mitigation strategies; finding alternative power - solar and/or wind; back-up generators for rentals, Elders and homeowner GTB Citizens. Emergency communication services if satellite/internet goes down. Expanding agricultural program to grow own food, in case of future food shortages.	10/18/2021 4:20 PM
42	?	10/18/2021 3:59 PM
43	Plans for future erosion along the great lakes	10/18/2021 2:55 PM
44	Involvement and communication skills	10/18/2021 2:38 PM
45	Not sure	10/18/2021 2:34 PM
46	we all need to know what the backup plan is for any circumstance	10/18/2021 2:17 PM
47	Programs on becoming a more self efficient community	10/18/2021 2:05 PM
48	No	10/18/2021 2:01 PM
49	Unknown	10/18/2021 1:53 PM
50	Does it matter. GtB council don't care what we think.	10/18/2021 1:40 PM
51	N/a	10/18/2021 1:31 PM
52	Buried natural gas line. Trees to identify the roads during deep blowing snow. Community building upgrades to ensure shelter during power or heating fuel outages	10/18/2021 1:21 PM
53	If there is a loss of phone service	10/18/2021 12:57 PM
54	n/a	10/18/2021 12:54 PM
55	N/A	10/18/2021 12:49 PM
56	Yes	10/18/2021 12:49 PM
57	N/A	10/18/2021 12:48 PM
58	No	10/18/2021 12:47 PM
59	.	10/18/2021 12:47 PM
60	Illness outbreaks.	10/18/2021 11:27 AM
61	na	10/18/2021 11:03 AM
62	N/A	10/18/2021 10:52 AM
63	not known	10/18/2021 10:37 AM

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64	NA	10/18/2021 10:16 AM
65	electricity generation and transmission; crop protection; sturdier roads	10/18/2021 10:05 AM
66	n/a	10/18/2021 9:45 AM
67	NA	10/18/2021 9:28 AM
68	unknown	10/18/2021 9:18 AM
69	not sure	10/18/2021 9:16 AM
70	Unknown.	10/18/2021 9:12 AM
71	active shooter, bomb threat, natural disasters	10/18/2021 9:11 AM
72	unknown	10/15/2021 2:46 PM
73	N/A	10/12/2021 10:21 AM
74	Unknown	10/12/2021 9:21 AM
75	NA	10/12/2021 8:44 AM
76	I don't know	10/12/2021 8:19 AM
77	NA	10/11/2021 5:01 PM
78	unknown	10/11/2021 4:10 PM
79	I don't know	10/11/2021 3:52 PM
80	Not sure	10/11/2021 3:47 PM
81	n/a	10/11/2021 3:41 PM
82	renewable energy at a price homeowners can afford	10/11/2021 3:17 PM
83	Unknown	10/11/2021 3:10 PM
84	Not sure but I would like to know more about all of it then offer potential strategies	10/8/2021 4:29 PM
85	Underground utility lines to reduce power outages, installation of generators for tribal businesses, preservation of public health and essential services. Increased solar energy to decrease climate change. Reduce blackout areas to increase communication tower coverage for essential services (police, fire, EMS, etc.)	10/8/2021 2:31 PM
86	maintaining and increase wetlands, streams, and drainage paths.	10/8/2021 1:48 PM
87	Power source back up, police manpower backup	10/5/2021 6:22 PM
88	Definitely we need to foster preparedness within the community. And within the incident responders we should be performing exercises which reflect any potential events/incidents.	10/5/2021 11:18 AM

Grand Traverse Band of Ottawa and Chippewa Indians Hazard Mitigation Community Survey

Q13 Is there any additional information you would like us to consider as we update the Tribe's Natural Hazard Mitigation Plan?

Answered: 99 Skipped: 22

#	RESPONSES	DATE
1	Yes, addressing county tornado notification system. Unless you were standing outside in Lake Leelanau it couldn't be heard on the west side of town. I haven't heard the notification in near Suttons Bay.	1/14/2022 10:27 AM
2	n/a	11/5/2021 9:39 AM
3	Specifically age related circumstances	10/28/2021 11:36 AM
4	I cannot think of anything no.	10/27/2021 7:39 PM
5	I would like to see a component for an assessment of falling trees that create hazards, both for public buildings and for private land owners.	10/27/2021 4:21 PM
6	No	10/26/2021 1:58 PM
7	I wud like to be more informed as to future plans concerning directives when looking at outbreak containment and resolution	10/24/2021 4:59 PM
8	Better ways to control the issue of power outages for residents and better drainage for homes from flooding	10/23/2021 3:27 PM
9	None	10/23/2021 1:04 PM
10	Not at this time	10/23/2021 8:41 AM
11	None	10/22/2021 8:48 PM
12	Not right now	10/22/2021 7:00 PM
13	Save our tribe and stand up for saving the environment before we keep losing people. Fix our roads and make it more affordable for native Americans struggling to keep a roof over there heads. Open more schools and jobs.	10/22/2021 5:29 PM
14	It would be wonderful if somebody could do A video explaining everything that people can access on our website.	10/22/2021 3:02 PM
15	Just to include our whole 6 county areas.	10/22/2021 2:35 PM
16	No	10/22/2021 2:24 PM
17	Not at this time	10/22/2021 2:17 PM
18	No	10/22/2021 1:36 PM
19	I'm sure we need some assistance but I am not on the reservation to know what we need.	10/22/2021 1:36 PM
20	Not now	10/22/2021 1:32 PM
21	Not knowledgeable on the Tribal needs	10/22/2021 1:01 PM
22	Not at this time	10/22/2021 12:44 PM
23	Not at this time	10/22/2021 12:44 PM
24	Making sure everyone gets the help they need	10/22/2021 12:35 PM
25	Do what you want	10/22/2021 12:32 PM
26	No	10/22/2021 12:30 PM
27	No	10/22/2021 12:29 PM

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28	No	10/22/2021 12:27 PM
29	Clean up strategy when a heavy snow storm displaces community.	10/21/2021 6:57 PM
30	Not at the moment	10/21/2021 2:43 PM
31	Impact Covid 19 has on services for the community and businesses and the inter-linked economic impact. Concerns about Economic stability of the area - losing employee base due to inability to provide competitive wages due to revenue loss and OSHA compliance with Vaccine/weekly testing mandate amid housing bubble - locals and other potential candidates from other states can not afford to work where they can no longer afford to live.	10/21/2021 12:09 PM
32	No	10/21/2021 11:26 AM
33	No just more information about it.	10/21/2021 9:00 AM
34	No	10/20/2021 6:02 PM
35	Nope	10/20/2021 4:15 PM
36	NA	10/20/2021 11:58 AM
37	Keep planning.	10/20/2021 7:40 AM
38	no	10/19/2021 3:58 PM
39	No	10/19/2021 3:18 PM
40	no	10/19/2021 11:57 AM
41	The Belanger creek bridge, if a crop dusting plane hit the water tower and flooded the creek, the bridge may washout.	10/19/2021 11:13 AM
42	No	10/19/2021 10:12 AM
43	No	10/18/2021 8:44 PM
44	Na	10/18/2021 6:45 PM
45	No	10/18/2021 4:32 PM
46	Make Housing communities in all 5 counties energy efficient. Also have generator's ready and available for power outages along with alternative energy like wind and solar...	10/18/2021 4:28 PM
47	Send to members	10/18/2021 4:27 PM
48	Incorporate Traditional Anishinaabek values when considering future endeavors and how the long-term impacts will affect Mother Earth. We, as Anishinaabek, truly are living in two worlds - as most have become accustomed to today's modern conveniences; however, we must strive to never forget our connection to Mother Earth and all life around us.	10/18/2021 4:20 PM
49	no	10/18/2021 3:59 PM
50	No	10/18/2021 2:55 PM
51	Jesus Loves Yuns and So Do We	10/18/2021 2:38 PM
52	No	10/18/2021 2:34 PM
53	let the people know the plan ans points of contact	10/18/2021 2:17 PM
54	Educating the public on agriculture and water filtration and irrigation and renewable energy sources to insure the growth of the community.	10/18/2021 2:05 PM
55	As we aim towards the long term goal of food sovereignty at GTB, a plan set aside resources and allocate funding to develop strong, sustainable and economically viable agricultural development is vital	10/18/2021 2:01 PM
56	No	10/18/2021 1:53 PM
57	Everything and getting a new council in.	10/18/2021 1:40 PM
58	No	10/18/2021 1:31 PM

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59	A community coordinator who could educate and help elderly community members of potential or imminent natural threats....in person. A place in the community building to gather during natural threats	10/18/2021 1:21 PM
60	No	10/18/2021 12:57 PM
61	no	10/18/2021 12:54 PM
62	Our climate environment is very important for everyone's future.	10/18/2021 12:49 PM
63	No	10/18/2021 12:49 PM
64	I think there should be a lot more info out there for members about this, I was unaware that there was a plan.	10/18/2021 12:48 PM
65	Y3s	10/18/2021 12:47 PM
66	Whole house generators.	10/18/2021 12:47 PM
67	Be transparent about any mitigation plans put in place so that the community is fully aware of them.	10/18/2021 11:27 AM
68	no	10/18/2021 11:03 AM
69	Not at this time	10/18/2021 10:52 AM
70	None at this time	10/18/2021 10:16 AM
71	no	10/18/2021 9:45 AM
72	farmer pesticide impact on water table	10/18/2021 9:28 AM
73	no	10/18/2021 9:18 AM
74	not sure	10/18/2021 9:16 AM
75	chains established to check on vulnerable people in the community	10/18/2021 9:14 AM
76	No.	10/18/2021 9:12 AM
77	water erosion from Lake Michigan on shoreline	10/18/2021 9:11 AM
78	n/A	10/15/2021 2:46 PM
79	no	10/12/2021 10:21 AM
80	Unsure	10/12/2021 10:21 AM
81	Not that I am aware of.	10/12/2021 9:21 AM
82	No.	10/12/2021 8:44 AM
83	NO	10/12/2021 8:19 AM
84	no	10/11/2021 5:01 PM
85	No	10/11/2021 4:10 PM
86	unknown	10/11/2021 3:52 PM
87	No	10/11/2021 3:47 PM
88	no	10/11/2021 3:41 PM
89	no	10/11/2021 3:17 PM
90	Common dissemination of the details submitted to members	10/11/2021 3:10 PM
91	We would want to identify any possible issues (obviously) ; are we working with FEMA? The community needs to be included with the issues, the plans, preventative measures, community involvement, etc. Escape routes would need to be planned; protecting the forests, protecting the water, having another source of water in the event of drought or contamination, educating the public on how they can help and why they should help, new structures should be as environmentally friendly as possible and use sustainable products and use as much natural	10/8/2021 4:29 PM

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power as possible (solar and wind, for example); reducing plastic use as much as possible; have a structure Tribal members can go to in the event of loss of power and extreme heat or cold, increase building code standards to include more naturally powered homes and structures, bridges should be built higher in the event of flooding.... those are some ideas

92	Include public health prevention strategies to save lives, increase ventilation/HVAC units in buildings, install redundancies and loop feeds to sustain new technology and underground utilities and generators for long-term sustainability.	10/8/2021 2:31 PM
93	Interesting and culturally relevant and attractive informative videos on the GTB website. create an interest in learning about the causes and prevention strategies that individuals can participate in.	10/8/2021 1:48 PM
94	A place to go if power goes out in the middle of the winter	10/8/2021 1:32 PM
95	clean up all the Tribal parks water line to make sure safe for tribal members with easy access	10/8/2021 1:17 PM
96	no	10/6/2021 8:03 AM
97	None	10/5/2021 6:22 PM
98	no	10/5/2021 4:11 PM
99	It is very important to gather the communities input. This will give them a voice, but also raise awareness in the importance of being prepared for adverse events. Also I think every employee (and possibly every interested community member) take the FEMA ICS classes.	10/5/2021 11:18 AM

APPENDIX D: CURRENT STATUS OF 2016 HAZARD MITIGATION PLAN STRATEGIES

The following table provides the feasible mitigation strategies that were identified in the GTB's 2016 Natural Hazard Mitigation Plan, along with the current status of any progress on these strategies and how they may have been incorporated into the 2023 plan. The lead department responsible for implementing the strategies was listed as the GTB Emergency Management Office.

2016 Priority Area and Mitigation Strategies	Cost Estimate	Timeframe	Priority Level	2023 Status/EM Comments	Related Strategies in the 2023 Plan and Priority Level
Priority Area 1: Extreme Winter Weather – heavy snow, extreme temperatures and concerns regarding power and agricultural loss. Snow Load Mitigation Strategies.					
a. Snow load design standards – develop planning grant for a study of snowfall patterns and occurrence of damage	\$10,000 - \$50,000	3 years from adoption of the plan	2	This strategy is no longer included as a feasible or necessary strategy in the 2023 plan. Snow load design standards follow that of the current State of MI Building code, enforced by county building departments.	Related strategies would be #35 and 36 in the new plan: “Educate developers and property owners about best building practices to mitigation impacts of natural hazards” and “As new buildings are built or buildings are modified, use new technology and/or natural techniques to create or increase structural stability” (Med)
b. Public education and awareness (Free NWS Weather Spotter classes are offered at the Emergency Operations Center)	\$2,000- \$10,000	1 year from adoption of the plan	1	NWS Weather alert messages are relayed to community members by the “Regroup” alert mass notification system	#1 (High), #1g (Medium)
c. Building code enforcement for new construction	\$50,000- \$100,000	5 years	3	County Building Departments currently enforce current building construction codes (issued by the State of MI) for GTB properties. GTB Natural Resources staff enforce the Tribal Soil Erosion and Stormwater Runoff Control ordinance.	#31, #32, #36 (Medium)
Priority Area 2: Severe Weather (High Winds and Tornadoes) – highlighting seasonal population influx and local festivals. High Winds and Tornado Mitigation Strategies					
a. Develop and implement mutual support and aid practices with surrounding communities	\$2,000- \$10,000	5 Years	2	Emergency Services Agencies have current Mutual Aid Agreements in place. Fire & EMS part of MI Mutual Aid Box Alarm System (MABAS)	Related strategy #13: “Continue interdepartmental cooperation and coordination of police, fire and rescue services to achieve service area coverage availability” (Medium)
b. Tree management by power companies on power line easements	\$10,000 - \$50,000	3 Years	3	Utility companies continue to perform emergency and preventative tree work	Continued in strategies #40 (High) and #42 (Medium)
c. Public education	\$2,000 - \$5,000	1 Year	1	Messaging via GTB social media and community outreach programs supported for Severe Weather Awareness Weeks	#1, 1a -1h, #2 (High to Low)
d. Suggest that events have an evacuation plan	\$2,000 - \$10,000	3 Years	4	GTB has a mass notification alert system (Regroup) to announce evacuation routes and receives emergency alerts through county 911, local, tribal, state Law Enforcement /Fire agencies. GTB issues Pre-Event Plans for large public events held on tribal lands.	#16 (Medium), #23 (High)
e. Building Code enforcement for new construction	\$10,000 - \$50,000	5 years	6	Same as #1c in this table.	#31, #32, #36 (Medium)

2016 Priority Area and Mitigation Strategies	Cost Estimate	Timeframe	Priority Level	2023 Status/EM Comments	Related Strategies in the 2023 Plan and Priority Level
Priority Area 3: Severe Heat					
a. Increased tree plantings around buildings to shade parking lots and along public rights-of-way.	\$10,000 - \$50,000	3 Years	1	<p>All new facilities are designed to include shade trees on south side of the building, including shade tree islands in parking lots. A zoning ordinance has been drafted but has not been approved by Tribal Council. The proposed zoning ordinance will be amended and submitted to Tribal Council for approval after the Peshawbestown Master Plan is completed in early 2024. All site plans include Low Impact Design.</p> <p>Tribal Council voted to retract the 2012 Peshawbestown Master Plan but are working on a new 2024 plan to include trees and shade areas.</p> <p>Natural Resource Department constructed some rain gardens and the like at the Tribal park next to Eyaawing Museum.</p>	<p>Although this particular strategy was not continued in the 2023 plan, it is represented on page 125 of the Peshawbestown Master Plan: "Because its sovereign status exempts the Tribe from state zoning and planning enabling legislation, the preparation of a site and building guidelines code should be considered to regulate development activity in the future. This action would ensure that as properties are developed that the same site amenities (lighting, parking, signage, landscaping, etc.) and architectural details would be followed. This will provide some uniformity and consistency when build-out occurs. It is suggested that separate guidelines be prepared for the business and entertainment district, residential neighborhoods, and the commercial district at Putnam and M-22. To encourage the use of sustainable design techniques the guidelines should include provisions for low impact stormwater design, dark-sky lighting, reduction of heat islands (parking lots), convenient transit stops, and non-motorized connections."</p>
b. Encouraging installation of green roofs, which provide shade and remove heat from the roof surface and surrounding air.	\$2,000 - \$10,000	1 Year	2	<p>A large portion of the roof on the GTB Turtle Creek Hotel consists of a green roof. Future green roofs will be considered based on construction costs.</p> <p>Construction on Herkner Rd. in Grand Traverse County is following the Enterprise Green Communities standards. This includes but is not limited to: Integrative Design, Sensitive Site Protection, Compact Development, Passive Solar Heating/Cooling, Environmental Remediation, Ecosystem Services/Landscape, Moving to Zero Energy, Ventilation, Dehumidification, and including a Resident Manual.</p>	<p>While these specific strategies were not incorporated into the 2023 plan, related strategies would be #34, #35 and #36 (Medium)</p>
c. Using cool roofing products that reflect sunlight and heat away from a building.		1 Year	3	<p>All new facilities with flat or low sloped roof are designed with membrane roofing systems with a white color to reflect heat gain from the sun.</p>	

2016 Priority Area and Mitigation Strategies	Cost Estimate	Timeframe	Priority Level	2023 Status/EM Comments	Related Strategies in the 2023 Plan and Priority Level
Priority Area 3, Continued: Severe Heat Mitigation Strategies					
d. Educate citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur.	\$2,000 - \$10,000	1 Year	4	GTB issues Regroup mass notification alerts on weather advisories from NOAA and NWS. Emergency preparedness awareness information is provided to the tribal community in the monthly GTB Newsletter. GTB opens community centers as needed for extreme heat or cold. Use of social media to notify/ educate community.	#1 (High), #1b (High), 1h (Low), #34, #35,
e. Organizing outreach to vulnerable populations, including establishing and promoting accessible heating or cooling centers in the community.	\$2,000 - \$10,000	1 Year	5	GTB installed 5 generators 2023 at Strong Heart Center, Benzie and Charlevoix Satellite Buildings, Medicine Lodge and Fire Station to support heating/cooling centers for community. Starting 2024 a generator will be installed at the Herkner Rd. development's Community Center. Use of social media to notify and educate community.	This strategy is continued as Strategy #26 in the 2023 plan (Medium)
f. Requiring minimum temperatures in housing/landlord codes.	\$10,000 - \$50,000	5 years	6	Current building on Herkner is following the Enterprise Green Communities standards. This includes but is not limited to: Integrative Design, Sensitive Site Protection, Compact Development, Passive Solar Heating/Cooling, Environmental Remediation, Ecosystem Services/Landscape, Moving to Zero Energy, Ventilation, Dehumidification, and including a Resident Manual.	This strategy was not continued in the 2023 plan due to lack of feasibility.
g. Encouraging utility companies to offer special arrangements for paying heating bills, if not already required by state law.	\$2,000 - \$10,000	3 years	7	The state has adopted a Winter Protection Plan that protects seniors and low income families that receive services from MPSC-regulated natural gas and electric companies from having their electric or heat shut off during winter months. Also, income-eligible GTB households can receive emergency heating assistance from the GTB Human Services Dept.	Related strategy #34 (Medium)
h. Creating a database to track those individuals at high risk of death, such as the elderly or homeless.	\$2,000 - \$10,000	3 Years	8	Elders Department, Goodwill, and Ending Homelessness Collation have tracking documentation of the Elderly and Homeless population.	Related strategy: #7 (High)

2016 Priority Area and Mitigation Strategies	Cost Estimate	Timeframe	Priority Level	2023 Status/EM Comments	Related Strategies in the 2023 Plan and Priority Level
Priority Area 4: Potential wildfire/urban interface Wildfire Mitigation Strategies					
a. Public education and awareness activities such as programs and brochures regarding fuel management, proper vegetation, fire breaks	\$2,000 - \$10,000	1 Year	1	Fire Wise awareness events have been held at the nearby Cedar Area Fire & Rescue Department (in Leelanau County). Townships, villages, GTB Tribe members are a regular part of County LEPC/LPT meetings.	#1f (Medium), #14 (Medium),
b. Continue enforcement of state fire codes regarding setback requirements	\$2,000 - \$10,000	1 Year	2	County Building Departments enforce setbacks in building permitting process. The GTB Fire and Rescue Department issues directives to individuals employed by the GTB, its enterprises, businesses and subsidiaries to act in compliance of the National Fire Protection Association Code (adopted by the GTB) for all GTB structures certified for occupancy.	#32 (Medium)
c. Public education utilizing the Michigan Department of Natural Resources flyers and FEMA information at parks and campgrounds	\$2,000 - \$10,000	1 Year	3	MDNR places public educational flyers in place at State Park area and campground	Related strategy #1c (High)
d. Assess fire suppression capabilities and make improvements	\$10,000 - \$50,000	3 Years	4	Tribal Fire Chief oversees routine assessments of staff, facilities, equipment.	This strategy has been continued as #3 (High)
e. Research the Department of Natural Resources' State Forest wildfire/urban interface rules or plan	\$10,000 - \$50,000	3 Years	5	Local DNR Fire Supervisor has active role in our monthly County Fire Chief's Association meetings	This strategy was not included in the 2023 plan due to the regular participation of MDNR Fire staff in local fire chief meetings; a related strategy would be #5 "Annually update the Tribe's basic Wildfire Operations Plan (coordinate with the MDNR)" (High).

Additional 2016 Mitigation Strategies and 2023 Status

Mitigation Strategies	2023 Status/EM Comments	Related Strategies in the 2023 Plan and Priority Level
Collaborate with governmental entities such as counties, townships and villages; organizations, businesses and the public.	<p>Ongoing. GTB staff from Public Safety are a regular part of County LEPC/LPT meetings.</p> <p>GTB Natural Resources Staff continue to:</p> <ul style="list-style-type: none"> • Develop and foster working relationships with Federal and State agencies to improve management efficiency, • Develop resource use agreements, and improve productive communication with other resource management agencies. • Conduct Public Outreach and Education (including Natural Resources Fair and Feast, Kids Free Fishing Days, fishery survey reports to membership, lake associations, and watershed committees) • Perform grant writing and administration for resource protection, restoration, and enhancement projects with particular emphasis on collaborative projects 	#1b, #2, #5, #6, #8-10, #11c, #13, #15, #24, #30, #32, #40, #43, #47, #51d
Develop a multi-hazard warning plan and strategies for festivals/events.	Completed. The GTB Tribe now offers the “Regroup” mass notification system for emergency or hazardous conditions.	#1 (High)
Incorporate the Plan’s hazard mitigation concepts, strategies and policies into existing elements of GTB Plans.	Ongoing. See subsection “Tribal Laws and Planning Mechanisms” of Section VII (Mitigation Strategies and Priorities) of the 2023 Plan.	#10 (High)

APPENDIX E: CONSIDERATION OF ALTERNATIVE STRATEGIES FOR 2023 PLAN

Hazard Mitigation Alternatives Considered for the GTB Tribe

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, 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. <i>(Advice to be provided in public outreach efforts).</i>
✓	Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas or event locations.

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

Hazard Mitigation Alternatives Considered for the GTB Tribe

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 the GTB Tribe

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 Urban Flooding	
✓	Stormwater management—Adequate design, installation, maintenance, and monitoring of municipal storm sewer systems. Ordinances or amendments to assist in stormwater management (e.g. forbidding illicit discharges). Planning for and regulating areas prone to flooding (acceptable uses and development restrictions through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, purchased or transferred development rights, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
	Homeowner's and rental insurance that includes coverage of damages and cleanup of sewer backflow impacts.
✓	Structural projects to channel water away from people and property (dikes, levees, floodwalls) or to increase drainage or absorption capacities (spillways, water detention and retention basins, relief drains, drain widening/dredging or rerouting, debris detention basins, logjam and debris removal, extra culverts, bridge modification, flood gates and pumps, wetlands protection and restoration).
✓	Higher engineering standards for drain and sewer capacity, or the expansion of infrastructure to higher capacity.
✓	Drainage easements (allowing the planned and regulated public use of privately owned land for temporary water retention and drainage).
✓	Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
✓	Farmland and open space preservation.
	Elevating mechanical and utility devices above expected flood levels.
	Flood warning systems and the monitoring of water levels with stream gauges and trained monitors.
✓	Increased coverage and use of NOAA Weather Radio.
	Anchoring of manufactured homes to a permanent foundation in flood areas, but preferably these structures would be readily movable if necessary or else permanently relocated outside of flood-prone areas and erosion areas.
✓	Control and securing of debris, yard items, or stored objects (including oil, gasoline, and propane tanks, and paint and chemical barrels) in floodplains that may be swept away, damaged, or pose a hazard when flooding occurs. <i>(Advice to be provided in public outreach efforts).</i>
✓	Back-up generators for pumping and lift stations in sanitary sewer systems, and other measures (alarms, meters, remote controls, switchgear upgrades) to ensure clear drainage infrastructure.
	Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
✓	Increasing the function and capacity of sewage lift stations and treatment plants (installation, expansion, and maintenance), including possible separation of combined storm/sanitary sewer systems, if appropriate.
✓	Wetlands protection regulations and policies.
	Use of check valves, sump pumps and backflow preventers in homes and buildings.
	Acceptable land use densities, coverage and planning for particular soil types and topography (decreasing amount of impermeable ground coverage in upland and drainage areas, zoning and open space requirements suited to the capacity of soils and drainage systems to absorb rainwater runoff, appropriate land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
✓	Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
✓	Protection (or restoration) of wetlands and natural water retention areas.
	Landslide mitigation ideas: Do not build houses, buildings, parks, or playgrounds close to steep slopes; install flexible pipe fittings to avoid gas and water line breakage.

Hazard Mitigation Alternatives Considered for the GTB Tribe

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 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 Considered for the GTB Tribe

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 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.
✓	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). (Advice to be provided in public outreach efforts).
	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 Considered for the GTB Tribe

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

Hazard Mitigation Opportunities for Public Health Emergencies	
✓	Maintaining proper levels of PPE for healthcare workers and first responders, with additional supplies for long-term care facilities.
✓	Immunization programs to vaccinate against communicable diseases.
✓	Improving ventilation techniques in areas, facilities, or vehicles that are prone to crowding or that may involve exposure to contagion or noxious atmospheres.
✓	Maintaining community water and sewer infrastructure at acceptable operating standards.
✓	Providing back-up generators for water and wastewater treatment facilities to maintain acceptable operating levels during power failures.
✓	Demolition and clearance of vacant condemned structures to help prevent vermin infestation.
✓	Adequate community clinics and school health services.
✓	Brownfield and urban blight clean-up activities.
✓	Proper location, installation, cleaning, monitoring, and maintenance of septic tanks.
✓	Separation of storm and sanitary sewer systems.
✓	Spraying programs to properly control mosquito populations.
✓	Updated Continuity of Operations (COOP) plans and alternative "work from home" schedules.

Hazard Mitigation Alternatives for Shoreline Flooding and Erosion	
✓	Floodplain/coastal zone management – planning acceptable uses for areas prone to flooding (comprehensive planning, zoning, open space requirements, subdivision regulations, land use and capital improvements planning).
✓	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.
✓	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 in the area (bank stabilization, planting of vegetation on slopes, creation of terraces on hillsides).
✓	Enforcement of basic building code requirements related to flood mitigation.
✓	Joining the National Flood Insurance Program.
	Obtaining private flood insurance.
	Participate in the Community Rating System (CRS) for NFIP.
✓	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, dike setbacks, flood gates and pumps, wetlands protection and restoration).

Hazard Mitigation Alternatives Considered for the GTB Tribe

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

	Elevating mechanical and utility devices above expected flood levels.
✓	Flood warning systems.
	Monitoring of water levels with stream gauges and trained monitors.
	Anchoring of manufactured homes to a permanent foundation in flood areas, but preferably these structures would be permanently relocated outside of flood-prone areas and erosion areas.
✓	Control and securing of debris, yard items, or stored objects in floodplains that may be swept away, damaged, or pose a hazard when flooding occurs. <i>(Advice to be provided in public outreach efforts).</i>
✓	Increased coverage and use of NOAA Weather Radio.
✓	Locating structures and infrastructure landward of the established setbacks.

APPENDIX F: LIST OF DAMS IN GTB TRIBAL SERVICE AREA

National Inventory of Dams Information for Antrim, Benzie, Charlevoix and Grand Traverse Counties

County	Antrim		
Dam Name	Bellaire Dam	Elk Rapids	Cedar River Dam
Owner Names	Antrim County Board of Public Works	Antrim County	Village of Bellaire
Primary Owner Type	Private	Local Government	Local Government
Purposes	Recreation	Hydroelectric	Recreation
River or Stream Name	Intermediate River	Elk Creek	Cedar River
State Regulated Dam	Yes	Yes	Yes
Federally Regulated Dam	No	Yes	No
Dam Types	Earth;Gravity	Gravity	Earth;Gravity
Year Completed	1906	1916	1890
Data Last Updated	4/7/2021	4/12/2023	4/7/2021
Last Inspection Date	11/2/2018	7/14/2022	6/28/2017
Inspection Frequency	3	3	3
Hazard Potential Classification	High	Low	High
Condition Assessment	Fair	Satisfactory	Satisfactory
Condition Assessment Date	11/2/2018	4/11/2023	6/28/2017
EAP Prepared	Yes	Not Required	Yes
EAP Last Revision Date		4/26/2021	1/27/1999
Operational Status		Normal Operations	

County	Benzie			
Dam Name	Homestead Dam	Crystal Lake Level Control Dam	Little Platte Lake Control Dam	Grass Lake Dam
Owner Names	MDNR Fisheries	Benzie County Road Commission	Benzie County	MDNR Wildlife
Primary Owner Type	State	Private	Private	State
Purposes	Recreation	Recreation;Other	Recreation;Other	Recreation
River or Stream Name	Betsie River	Crystal Lake Outlet	North Branch Platte River	Betsie River
State Regulated Dam	Yes	No	No	No
Federally Regulated Dam	No	No	No	No
Dam Types	Other	Gravity	Other	Gravity
Year Completed	1979	1977	1969	1951
Data Last Updated	4/7/2021	4/7/2021	4/7/2021	4/7/2021
Last Inspection Date	5/2/2016	9/21/2018	9/21/2018	10/28/2014
Inspection Frequency	4	5	5	5
Hazard Potential Classification	Significant	Low	Low	Low
Condition Assessment	Satisfactory	Satisfactory	Satisfactory	Satisfactory
Condition Assessment Date	5/2/2016	9/21/2018	9/21/2018	10/28/2014
EAP Prepared	Yes	Not Required	Not Required	Not Required
EAP Last Revision Date	7/26/2006			
Operational Status				

National Inventory of Dams Information for Antrim, Benzie, Charlevoix and Grand Traverse Counties

County	Charlevoix			
Dam Name	Boyne Falls Dam	East Jordan Dam	Walloon Lake Cc Dam #14	Boyne River
Owner Names	Village of Boyne Falls	East Jordan Plastics	Walloon Lake Country Club	Boyne USA Inc
Primary Owner Type	Local Government	Private	Private	Private
Purposes	Recreation	Recreation	Recreation;Irrigation	Hydroelectric;Recreation
River or Stream Name	Boyne River	Deer Creek	Tributary to Walloon Lake	Boyne River
State Regulated Dam	Yes	Yes	No	No
Federally Regulated Dam	No	No	No	Yes
Dam Types	Earth	Earth;Gravity	Earth	Earth
Year Completed		1900	1989	1904
Data Last Updated	4/7/2021	4/7/2021	4/7/2021	4/12/2023
Last Inspection Date	6/28/2017	6/1/2018	6/14/1990	9/9/2022
Inspection Frequency	4	4	4	3
Hazard Potential Classification	Significant	Significant	Significant	Low
Condition Assessment	Satisfactory	Fair	Not Rated	Poor
Condition Assessment Date	6/28/2017	6/1/2018		4/11/2023
EAP Prepared	Yes	Yes	Not Required	Yes
EAP Last Revision Date	2/2/2021	12/31/2006		1/3/2022
Operational Status				Under Remediation

National Inventory of Dams Information for Antrim, Benzie, Charlevoix and Grand Traverse Counties

County	Grand Traverse				
Dam Name	Sabin Dam	Union Street Dam	Petobego Dam	Bissell Pond Dam	Wysong Dam
Owner Names	Grand Traverse County	City of Traverse City	MDNR Wildlife	Angela Kirby	Peter Wysong
Primary Owner Type	Local Government	Local Government	State	Private	Private
Purposes	Recreation	Recreation	Recreation	Recreation	Recreation
River or Stream Name	Boardman River	Boardman River	Tobeco Creek	Williamsburg Creek	Tributary to Lake Michigan
State Regulated Dam	Yes	Yes	Yes	Yes	No
Federally Regulated Dam	No	No	No	No	No
Dam Types	Earth;Gravity	Earth;Gravity	Earth	Earth;Gravity	Earth
Year Completed	1906	1867	1951	1852	1989
Data Last Updated	4/7/2021	4/7/2021	4/7/2021	4/7/2021	4/7/2021
Last Inspection Date	8/20/2015	2/4/2021	9/17/2020	11/16/2018	1/27/1989
Inspection Frequency	3	3	5	4	4
Hazard Potential Classification	High	High	Low	Significant	Significant
Condition Assessment	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Not Rated
Condition Assessment Date	8/20/2015	2/4/2021	9/17/2020	11/16/2018	
EAP Prepared	Yes	Yes	Not Required	Yes	Not Required
EAP Last Revision Date	12/20/2012	12/18/2012		1/1/2019	
Operational Status					

County	Grand Traverse				
Dam Name	Mayfield Electric Light Plant Dam	General Growth Dam	Gerhard Dam	Headquarters Lake Dam	Lake Dubonnet Dam
Owner Names	Paradise Township	General Growth Partners, Inc	Philip and Donna Gerhard	MDNR Wildlife	MDNR Fisheries
Primary Owner Type	Local Government	Private	Private	State	State
Purposes	Recreation	Flood Risk Reduction	Recreation	Recreation	Recreation
River or Stream Name	Swainston Creek	Tributary to Kids Creek	Tributary to Mitchell Creek	Fife Lake Outlet	Platte River
State Regulated Dam	No	No	Yes	Yes	Yes
Federally Regulated Dam	No	No	No	No	No
Dam Types	Earth;Gravity	Earth	Earth	Earth;Gravity	Earth
Year Completed	1873	1990	1960	1955	1956
Data Last Updated	4/7/2021	4/7/2021	5/24/2021	4/7/2021	4/7/2021
Last Inspection Date	9/25/1990	8/29/1990	9/21/2019	9/17/2020	10/14/2015
Inspection Frequency	4	4	5	5	5
Hazard Potential Classification	Significant	Significant	Low	Low	Low
Condition Assessment	Not Rated	Not Rated	Satisfactory	Satisfactory	Satisfactory
Condition Assessment Date			9/21/2019	9/17/2020	10/14/2015
EAP Prepared	Not Required	Not Required	Not Required	Not Required	Not Required
EAP Last Revision Date					
Operational Status					

APPENDIX G: PARTICIPATION TABLE

GTB Tribe 2023 HM Plan Participation Table

Participant	Title	Completed Survey	HM Project Kick-off Meeting 7/1/2021 (in-person and via Zoom)	LPT 9/9/2021 (via Zoom)	LPT 10/21/2021 (via Zoom)	LPT 01/14/2022 (via Zoom)	LPT 03/11/2022 (via Zoom)	Public Input/LPT Meeting 4/14/22 on Hazard ID (joint in-person meeting with Leelanau County)	LPT Meeting 06/03/22 (via Zoom)	LPT Meeting 08/18/22 (via Zoom)	LPT Meeting 10/7/22 (via Zoom)	LPT Meeting 12/20/22 (via Zoom)	LPT Meeting 2/9/2023 (via Zoom)	GTB Tribal Council 5/3/2023 (in person)	LPT Meeting 9/28/2023 (via Zoom)
Grand Traverse Band Tribe		Various													
David Arroyo	Tribal Chairman													X	
Robert Kewaygoshkum	Tribal Vice Chair													X	
Ruth Dudley	Executive Assistant to Tribal Chairman													X	
Donna M. Swallows	Treasurer													X	
Theresa M. Marshall	Secretary													X	
Jane A. Rohl	Councilor													X	
Brian S. Napont	Councilor														
Tina A. Frankenberger	Councilor														
Michael Long	Associate Judge, Tribal Court													X	
Delores Wonegeshik	Elders Dept. Mgr.											X			
Jolanda Murphy	Public Safety Dept Manager/EM	X	X	X	X	X	X	X	X	X	X	X	X	X	X
David Crockett	Tribal Police Captain			X									X		X
Russ Cavanaugh	Law Enforcement - Tribal Police Sergeant						X		X	X	X	X	X		X
Suzanne McSawby	Law Enforcement Specialist		X	X	X				X	X	X	X	X		X
Garrett Fairchild	Fire Chief/GTB Fire	X	X	X	X	X	X			X	X	X	X		X
Becky Oien	Tribal Manager	X	X				X		X	X		X	X	X	X
Doris Winslow	Tribal Management Office			X						X		X			
George McClellan, II	IT Director			X											
Victoria Alfonseca	Communications Editor										X		X		
Nicki Basch	Housing Mgr/1st EM Deputy		X				X	X	X		X	X	X	X	X
Melissa Petoskey	Govt HR		X												
Jodi Lewis	Interim CFO/Compliance Mgr.				X	X									
Jason Verheek	GTB CFO, DA								X						
Joe Huhn	Public Works Coordinator		X			X	X	X	X	X	X	X	X		X
Rob Kalbfleisch	Land and Roads Mgr				X										
Christy Parker	Safety Specialist/ GTB Gaming Officer			X	X										
Lori Savaso	EDC Risk & Safety Director		X	X	X	X	X		X		X	X		X	
Deb Stojak	EDC Safety Officer												X		
Steve Feringa	EDC Architect			X	X						X			X	X
Carolyn Sonderegger	NRD Dept Mgr			X	X										
Jenna Scheub	Environmental Services Coordinator			X	X		X			X	X				
Courtney Hessel	NRD Environmental Services Coordinator						X	X	X	X	X	X	X	X	X
Scott Mitchell	NRD Environmental Response Specialist														X
Mari Raphael	GTB Health, RN								X			X			
Soumit Pendharkar	Health Administrator		X	X	X	X									
Shirley Alpers	Nurse, GTB Health								X						
Kathy Tahtinen	Department Manager, Human Services														X
Dawn Shenoskey	Education Dept. Mgr.											X	X		

GTB Tribe 2023 HM Plan Participation Table

Participant	Title	Completed Survey	HM Project Kick-off Meeting 7/1/2021 (in-person and via Zoom)	LPT 9/9/2021 (via Zoom)	LPT 10/21/2021 (via Zoom)	LPT 01/14/2022 (via Zoom)	LPT 03/11/2022 (via Zoom)	Public Input/LPT Meeting 4/14/22 on Hazard ID (joint in-person meeting with Leelanau County)	LPT Meeting 06/03/22 (via Zoom)	LPT Meeting 08/18/22 (via Zoom)	LPT Meeting 10/7/22 (via Zoom)	LPT Meeting 12/20/22 (via Zoom)	LPT Meeting 2/9/2023 (via Zoom)	GTB Tribal Council 5/3/2023 (in person)	LPT Meeting 9/28/2023 (via Zoom)
Benzie County Representative															
Rebecca Hubers	Emergency Management Coordinator		X						X		X	X			X
Leelanau County															
Matt Ansonge	911/Emergency Management Director	X	X	X	X		X	X		X	X		X		
Kelly LaCross	Emergency Management Deputy Director				X	X	X	X				X			
Trudy Galla	Planning & Community Development Director							X							
Andy Doornbos	Cedar Area Fire & Rescue, Fire Chief							X							
Joe Mosher	Centerville Township Planning Commissioner							X							
Jim Schwantes	Centerville Township Supervisor							X							
Dana Boomer	Kasson Township Clerk							X							
Dan Besson	Leland Township Fire Chief							X							
Clint Mitchell	Leland Township Planning Commissioner							X							
Lt. Jim Kiessel	Undersheriff							X							
Jim Calhoun	Leelanau County Board Member							X							
Brendan Mullane	Leelanau County Road Commission Managing Director							X							
Hugh Cook	Leelanau Township Fire Chief							X							
Jim Porter	Suttons Bay-Bingham Fire & Rescue, Fire Chief							X							
Mark Bowen	Suttons Bay-Bingham Fire & Rescue, Captain							X							
Amy Fairchild	Mobile Medical Rescue Operations Manager							X							
Bobbi Scott	Benzie-Leelanau County Health Dept. - Emergency Preparedness Coordinator							X							
Tpr. Jason Tropf	Michigan State Police							X							
Lt. Michael deCastro	MSP, Critical Incident Management System Trainer							X							
Nick Florip	Manager, Harbor Hill Fruit Farm, Leland Twp.							X							

APPENDIX H: MEETING AND PARTICIPATION DOCUMENTATION

Subject: Hazard Mitigation Kick Off Meeting Update



Murphy, Jolanda, A <IMCEAEX-_O=GTBINDIANS_OU=PROXY_CN=RECIPIENTS_CN=JOLANDA+2EMURPHY2@gtband.org>

29, 2021,

9:48 AM

to Crockett, David, Sonderegger, Carolan, DePetro, Eric, Fairchild, Garrett, Basch, Nicki, Kalbfleisch, Rob, Feringa, Steve, Anderson, Ron, Oien, Becky, Savaso, Lori, Arroyo, David, Wilson, Mark, Sullivan, James, Pendharkar, Soumit, Cahill, Sean, Petoskey, John, F, Dyal, Sammie, McClellan, George II, Huhn, Joe, Cook, Helen, Lewis, Jodi, Winslow, Doris, Cavanaugh, Russ, Parker, Christy, Fessell, Brett, Dudley, Ruth, Brooks, Amanda, Loucks, Christina

You are viewing an attached message.

Networks Northwest Mail can't verify the authenticity of attached messages.

Good Morning,

Networks Northwest will hold its first kick off event at Traverse City in-person or online to start the 5-year renewal of Natural Hazard Mitigation Plans (NHMP) for eight counties including GTB. Attached is the **Agenda** and **zoom link** in for the meeting.

2021 Hazard Mitigation Plan Update Kick Off Meeting - Thursday, July 1, 2021, 9:30 a.m.

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

GTB NHMP is attached to review GOALS and identify natural hazard areas prior to the meeting (erosion, floods, weather events, fires, snow, etc.) for updates in the six county service areas. Consider whether to start new GOALS and/or continue goals (page 49) due to pandemic impact affecting some of the mitigation strategies. Also, changes to Top Four Natural Hazards Priority Areas (page 55).

Benzie County hazards include:

- adding both upper and lower Herring Lakes to the flood prone area.
- Adding CSA and Ness Road to erosion areas (Lake Mi Shoreline)
- Add County Wide to the wildfire concern areas not specific to Almira.

- Add ice damming to the snow and ice concerns.

Other GTB tribal areas will be forwarded as soon as receive in the near future. A GTB Local Planning Team meeting will be scheduled in July to review GTB NHMP on updates.

Thank you

Jolanda Murphy, MPA

GTB Public Safety Dept. Manager

Office: (231) 534-7111

Cell: (231) 866-1165

Grand Traverse Band of Ottawa and Chippewa Indians - 2605 N. West Bay Shore Drive, Peshawbestown, MI 49682

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2 Attachments • Scanned by Gmail

Hazard Mitigation Plan Update Kick Off Meeting

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

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

I. In-person meeting location information

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

II. Remote meeting attendance

Community Planning is inviting you to a scheduled Zoom meeting.

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

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

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

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

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

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

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

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Thursday, September 9, 2021
Time: 3:00 P.M.
Location: Tribal Police Dept Conference Room – by Zoom

Call to Order

Approval of LPT Meeting Minutes Friday, August 30, 2019

Approval of Agenda

1. GTB Emergency Preparedness Updates

- a. Natural Hazard Mitigation Plan – Networks Northwest
 - review natural hazards and update

2. Region 7 Homeland Security Grant Updates

- Critical Infrastructure Review (CIKR) due December 17, 2021 to R7 Solution Area Planner
- Active Shooter Exercise with Leelanau County Sheriff Dept. (August)
- Wexford County Drone availability to counties

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. FY2022 BP3 New PHEP grant period
- b. Covid-19 After Action Report (AAR)
- c. NIMS Training Compliance Matrix
- d. MIHAN Verification User Update deadline 9/30/2021
- e. PPE Update – MDHHS
- f. Mass Notification System

4. Training and Exercise

- a. Emergency Operations for Tribal Governments course (L581) - September 27-30, 2021 at Little Traverse Bay Band of Odawa Indians, Odawa Casino Hotel, Petoskey, MI.
- b. 5th Annual North American Active Assailant Conference Oct. 13-15, 2021, Troy, MI.
- c. IAEM Conference in Grand Rapids, MI – October 2021.
- d. ICS-300 Training – Oct. 4-6, 2021, Gaylord University Center. Register MI-Train.
- e. VRC Training with Frank Post – Oct.16, 2021 at Gaylord University Center. Register MI-Train.
- f. MGT-433 Isolation & Quarantine for Rural Communities: A Whole Community Approach. Oct. 22 & 23, 2021 at Gaylord University Center. Register MI-Train.
- g. MGT-403 Access & Functional Needs Preparedness Planning for Rural Communities. Oct. 28, 2021 at Gaylord University Center. Register MI-Train.
- h. ICS-400 Training, Nov. 4-5, 2021 at Gaylord University Center. Register via MI-Train.

5. New Business

6. Open Discussion and Updates

7. Meeting Adjourned

Next meeting: 10:00 A.M. **Thursday, October 21, 2021** GTB Tribal Police Dept Conference Room – by Zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT) MINUTES

Date: Thursday, September 9, 2021
Time: 3:00 P.M.
Location: Tribal Police Dept Conference Room – by Zoom

Attendees:

Matt Ansoorge (Leelanau County EM/911 Director), Soumit Pendharkar (Health Administrator), Melissa Petoskey (Govt HR), Garrett Fairchild (Fire Chief/GTB Fire), Lori Savaso (EDC Risk Mgr.) Becky Oien (TMO), Joe Huhn (SBR Coordinator), Nicki Basch (Housing/EM 1st Deputy), Jolanda Murphy (PS Dept Mgr./EM), Suzanne McSawby (LE Specialist)

Meeting called to order: 3:04 p.m.

Approval of LPT Meeting Minutes - Friday, August 30, 2019 - No minute's avail.

Approval of Agenda:

MOTION by Matt Ansoorge, supported by Garrett Fairchild to approve agenda for September meeting as presented. ALL AYES MOTION CARRIES

GTB Emergency Preparedness Updates:

1. Natural Hazard Mitigation Plan.

- a. Networks Northwest to update natural hazard mitigation plans. Review plan and hazard handouts: impact of climate change, power outages and other hazards. GTB last plan updated 2016. Review NHMP pages 20-21, 35-37 and 39-55 for priority areas. We will look at focus areas but review whole plan. Networks Northwest will be meeting with counties and Tribes. Input important from everyone. See attachments from Networks Northwest. Review prior to next meeting.

2. Region 7 Homeland Security Grant Updates.

- a. GTB working on Critical Infrastructure Review (CIKR) due December 17, 2021.
- b. GTB Tribal Police and Fire Dept participated in annual Active Shooter Exercises with Leelanau County Sheriff Department, 8/4/2021 Leland School and 8/17/2021 Suttons Bay Public School.
- c. Wexford County Drone available to counties for emergency management events.

3. Public Health Emergency Preparedness (PHEP) Grant Updates.

- a. FY2022 BP3 New PHEP grant period started 10/1/2021.
- b. Covid-19 After Action Report (AAR) due 12/29/2021 and Soumit and Jolanda are working on report and objectives. Two staff attend Active Assailant Training at Troy, MI October 13-15, 2021.

- c. NIMS Training Compliance scheduled with GTB staff first quarter of FY2022. Compliance with PHEP grant and State of Michigan requirements for IS-100, 200, 700, 800 for specific roles.
- d. MIHAN Verification User Update deadline 9/30/2021.
- e. PPE Update –Soumit and Garrett ordered PPE through State of Michigan and received in September. This will be on our inventory.
- f. Mass Notification System - GTB Nixle contract ends in 2022. Regroup demo meeting held previously with Nicki and Jared with more option for alerts. Leelanau County uses RAVE, Grand Traverse and Benzie counties uses Code Red. State of Michigan uses Code Red. It may make sense for GTB to use Code Red. Another demo will be scheduled to revisit notification systems.

4. Training and Exercise

- a. Emergency Operations for Tribal Governments course (L581) - September 27-30, 2021 at Little Traverse Bay Band of Odawa Indians, Odawa Casino Hotel, Petoskey, MI.
- b. 5th Annual North American Active Assailant Conference Oct. 13-15, 2021, Troy, MI.
- c. IAEM Conference in Grand Rapids, MI – October 2021.
- d. ICS-300 Training – Oct. 4-6, 2021, Gaylord University Center. Register MI-Train. Available online.
- e. VRC Training with Frank Post – Oct.16, 2021 at Gaylord University Center. Register MI-Train.
- f. MGT-433 Isolation & Quarantine for Rural Communities: A Whole Community Approach. Oct. 22 & 23, 2021 at Gaylord University Center. Register MI-Train.
- g. MGT-403 Access & Functional Needs Preparedness Planning for Rural Communities. Oct. 28, 2021 at Gaylord University Center. Register MI-Train.
- h. ICS-400 Training, Nov. 4-5, 2021 at Gaylord University Center. Register via MI-Train, classroom format. Available online.

5. New Business

- a. Wastewater Covid-19 Testing completed by GTB SBR at Peshawbestown for 9 weeks. Test results indicated Covid-19 in wastewater. Joe Huhn provided weekly reports to evaluate the pandemic. We do not have funding for \$300 additional sampling.

6. Open Discussion and Updates

- a. GTB – Introduction of GTB Risk Manager, Lori Savaso.

7. Meeting Adjourned: 3:30pm

MOTION by Leelanau County EM Matt Ansorge, supported by Lori Savaso to adjourn 3:30 p.m. ALL AYES MOTION CARRIES

Next GTB LPT meeting: 10:00 a.m. Thursday, October 21, 2021 GTB Tribal Police Dept Conference Room by Zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Thursday, October 21, 2021
Time: 10:00 A.M.
Location: Tribal Police Dept Conference Room – by Zoom

Call to Order

Approval of LPT Meeting Minutes from

Friday 8/30/2019 Minutes approved 10/11/2019

Friday 10/11/2019 Minutes

Friday, 9/10/2021 Minutes

Approval of Agenda

1. GTB Emergency Preparedness Updates

- a. Natural Hazard Mitigation Plan – Networks Northwest
 - review natural hazards and update from Networks Northwest
 - NHP Community Survey

2. Region 7 Homeland Security Grant Updates

- a. Critical Infrastructure Review (CIKR) due December 17, 2021
- b. OWL Video Equipment

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. Covid-19 After Action Report (AAR)
- b. NIMS ICS Training
- c. Mass Notification System

4. Training and Exercise

- a. MGT-433 Isolation & Quarantine for Rural Communities: A Whole Community Approach. Oct. 22 & 23, 2021 at Gaylord University Center. Register MI-Train.
- b. MGT-403 Access & Functional Needs Preparedness Planning for Rural Communities. Oct. 28, 2021 at Gaylord University Center. Register MI-Train.
- c. ICS-400 Training, Nov. 4-5, 2021 at Gaylord University Center. Register via MI-Train.

5. New Business

6. Open Discussion and Updates

7. Meeting Adjourned

Next meeting: 10:00 A.M. **Wednesday, December 8, 2021** GTB Tribal Police Dept Conference Room by Zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Thursday, October 21, 2021
Time: 10:00 A.M.
Location: Tribal Police Dept Conference Room – by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Suzanne McSawby (LE Specialist-co-host)
David Crockett (Police Captain)	Christy Parker (GTB Gaming Safety Officer)
Soumit Pendharkar (GTB Health Administrator)	Stephanie Loria (Networks Northwest Coord.)
Garrett Fairchild (Fire Chief/GTB Fire)	Lori Savaso (EDC Risk Mgr.)
Matt Ansoorge (Leel. Co. EM/911 Director)	Doris Winslow (GTB TMO)
Kelly LaCross (Leel. Co. EM/911 Deputy Dir.)	Steve Feringa (GTB Project Mgr)
Jenna Scheub (NRD Environmental Coord.)	Carolan Sonderegger (NRD Dept Mgr)
Frank Post (Networks NW Coordinator)	George McClellan (GTB IT Director)
Robert Kalbfleisch, (Land and Roads Mgr.)	Stephanie Loria (Networks NW Coord.)
Jennifer Neal (Networks NW Community Planner)	

Meeting called to Order: 10:03am

Approval of LPT Meeting Minutes from Friday 8/30/2021

No MOTION needed. Minutes approved 10/11/2019.

Approval of LPT Meeting Minutes from Friday, 10/11/2019

MOTION by Police Captain Dave Crockett, supported by Fire Chief Garrett Fairchild to approve the minutes of October 11, 2019 as presented. ALL AYES MOTION CARRIES

Approval of LPT Meeting Minutes from Friday, 9/10/2021

MOTION by Police Captain Dave Crockett, supported by Risk Manager Lori Savaso to approve the minutes of September 10, 2021 as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Police Captain Dave Crockett, supported by 911 Director/EM Matt Ansoorge to approve the agenda for October meeting as presented. ALL AYES MOTION CARRIES

GTB Emergency Preparedness Updates:

1. Natural Hazard Mitigation Plan presentation by Networks Northwest for GTB to update hazard mitigation plan.
 - a. Networks Northwest (NNW) reviewed power point presentation on GTB survey results to date. Life of grant to 2023. Tribe responsible for in-kind match of \$11,000. Use normal hourly rate for each participated meeting. Submit signed In-kind form to J. Murphy for Frank Post, one form per meeting. GTB identify risk and strategies to minimize risks. Include cultural, agriculture, infrastructure and communication and natural resource data. Community survey extended through November. Jennifer will submit article for GTB Newsletter on hazard mitigation planning.

2. Region 7 Homeland Security Grant Updates.

- a. GTB working on Critical Infrastructure Review (CIKR) due December 17, 2021.
- b. OWL video equipment provided to GTB EOC from Region 7 Homeland Security Grant for EOC meetings with split screen and video/sound capability.
- c. Region 7 request projects for FEMA critical areas, cyber security, soft targets, EOC specific.

3. Public Health Emergency Preparedness (PHEP) Grant Updates.

- a. Soumit and Jolanda working on Covid-19 After Action Report (AAR). Due date pushed to 6/30/2022.
- b. NIMS Training started. Ends 12/31/2021 for IS-100, 200, 700, 800, ICS-300, 400.
- c. Mass Notification System email invites will be sent next quarter to review other systems with enhanced features such as ReGroup. GTB uses NIXLE system.

4. Training and Exercise

- a. Matt Ansorge and Kelly LaCross attended 5th Annual North American Active Assailant Conference Oct. 13-15, 2021, Troy, MI and it was an excellent training and recommend others attend when offered again.
- b. MGT-433 Isolation & Quarantine for Rural Communities: A Whole Community Approach. Oct. 22 & 23, 2021 at Gaylord University Center.
- c. MGT-403 Access & Functional Needs Preparedness Planning for Rural Communities. Oct. 28, 2021 at Gaylord University Center.
- d. ICS-400 Training, Nov. 4-5, 2021 at Gaylord University Center.

5. New Business

- a. Garrett Fairchild provided update on Grand Traverse Road Construction Project on Grandview, Parkway and Front Street will be closing down to one lane for entire tourism season. Traffic issues and reaching out as far as 2024 between M22 to M72 and Cherry Bend Roads. There will be approximately two years of traffic issues between GTB properties.

6. Open Discussion and Updates

- a. Garrett discussed medical responses to Whitewater Township, Acme and Turtle Creek Casino for ambulance response. Whitewater combining ambulances into one unit starting 12/1/2021. Garrett, Lori and Christy Parker are meeting next week to discuss emergency services response plans.
- b. New GTB Risk Manager Lori Savaso discussed letter for flood insurance studies timeframe for response. GTB does not have any sites and no huge exposure at this time from floods. Steve Feringa agreed.

7. Meeting Adjourned: 11:14 a.m. Motion: Dave Crockett / 2nd by Suzanne McSawby.

Next meeting: 10:00 A.M. Friday, January 14, 2022 by Zoom, GTB Tribal Police Dept.

- a. NIMS Training Matrix completed by GTB staff will be submitted to funding agency on health and emergency preparedness. Many thanks to staff for completing training. Request staff submit NIMS certificates for emergency management office file.

4. Training and Exercise

- a. Great Lakes Homeland Security Conference May 10-12, 2022. GTB staff attended conference. Receipts from conference due in July. Mari Raphael provided conference workshop updates with recommendations of useful trainings in public health, terrorism, first responders and cyber security.
- b. MEMA Conference is this fall in Bellaire. More information out soon.
- c. Sky One Weather Spotter training May 2, 2022 Suttons Bay Fire Department at 6:30 pm. Gaylord NOAA Weather notices available for pre-plan events.

5. New Business

- a. CDC Covid-19 wastewater testing project continued with data resource shared with health administrator's office, GTB wastewater program and emergency management office. CDC provides testing for several counties along with GTB.

6. Open Discussion and Updates

- a. Covid-19 vaccine weekly schedule every Wednesday and rotating clinics at satellite offices every three weeks and Charlevoix on demand. Call 231-534-7475 Covid-19 Hotline. Covid Vaccine for appointment. Daily Covid-19 testing outside 8am and 1pm, call to schedule appointment. Home tests, face masks and hand sanitizer and pulse oximeters are available by request. Call 231-534-7200 or call Clinic Nurse 231-534-7236. Still have positive cases in people who are vaccinated and unvaccinated. Vaccinated people are weathering virus with less severe symptoms and staying home and not going to the hospital. Monoclonal antibodies for people who test positive and are symptomatic and fall within guidelines to administer. Call clinic to talk with provider for treatment.
- b. Risk Management update from Lori Savaso. ITC and EPA inspecting C-Stores underground storage tanks with annual EPA inspectors on site in June to ensure safety of environment.
- c. Norton Mounds Native American burial grounds Grand River oil spill exercise meeting August 3, 2022 to review and tour the 55-acre Norton Mounds and discuss impacts with Tribes. The cultural department manager is familiar with the mounds and will participate in the exercise along with Federal and state agencies. Tabletop exercise scheduled for October 3, 2022 and exercise information will be shared with Tribal Managers Office, risk management and emergency preparedness staff.

7. Meeting Adjourned: 10:32 a.m.

MOTION by Suzanne McSawby, supported by Lori Savaso, to adjourn.

ALL AYES MOTION CARRIES

Next meeting: 2:00 P.M. Wednesday, August 10, 2022, location pending.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Friday, January 14, 2022
Time: 10:00 A.M.
Location: Tribal Police Dept Conference Room – by Zoom

Call to Order

Approval of LPT Meeting Minutes from
Thursday, 10/21/2021 Minutes

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Natural Hazard Mitigation Plan – Networks Northwest survey and data updates
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
 - a. ICS update
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M. **Friday, March 11, 2022** GTB Tribal Police Dept Conference Room
by Zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Friday, January 14, 2022
Time: 10:03 A.M.
Location: Tribal Police Dept – by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Suzanne McSawby (LE Specialist-co-host)
Soumit Pendharkar (GTB Health Administrator)	Garrett Fairchild (Fire Chief/GTB Fire)
Kelly LaCross (Leel. Co. EM/911 Deputy Dir.)	Steve Feringa (GTB Project Mgr.)
Jenna Scheub (NRD Environmental Svs. Coord.)	Carolan Sonderegger (NRD Dept Mgr.)
Christy Parker (Safety Specialist, EDC)	Joe Huhn (Public Works)
Jodi Lewis (Interim CFO/Compliance Mgr.)	Stephanie Loria (Networks NW Coord.)
Jennifer Neal (Networks NW Community Planner)	Lori Savaso (Risk Manager)

Meeting called to Order: 10:03am

Approval of LPT Meeting Minutes from Thursday 10/21/2021

MOTION by Garrett Fairchild, supported by Kelly LaCross to approve the minutes of October 21, 2021 as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by 911 Deputy/EM, Kelly LaCross, supported by Garrett Fairchild to approve the agenda for January meeting as presented. ALL AYES MOTION CARRIES

GTB Emergency Preparedness Updates:

1. Natural Hazard Mitigation Plan presentation by Networks Northwest Jennifer Neal and Stephanie Loria, Community Planners.
 - a. Networks Northwest (NNW) power point presentation to assist GTB on the Hazard Mitigation Plan to update plan every 5 years per FEMA requirement to be eligible for pre-hazard mitigation funding before a hazard event occurs. Today's presentation on community profile survey, hazard identification and historic weather events and initial mapping. Overview of GTB community profile with 120 survey responses received. Include in plan expansion of housing units in mapping area. GTB posted four county surveys on GTB website. Data reflects more education on what is hazard mitigation with 40% concerned about hazards. Illness outbreak mentioned the most times followed by wildland fire and drought. Other concerns on power outages, bridges and utilities. Interest in renewable energy, climate change negative impacts and addressing water issues, fish, warming, public health and invasive species. Community requested mitigation assistance with generators. More education to inform community on what hazard mitigation can do and more funding sources for additional assistance. A newsletter was sent out to educate community and more information can be provided. Include in plan cleanup strategy, snowstorms, assessing impact of Covid-19, internal strategies and importance of addressing pandemics in

this plan. Discussion on downed trees and tree clearing, six county area geographic scope of plan, and what to include of major threats and impact in service area. Include information on Belanger creek area and potential washout, incorporate traditional Anishinabek values, food sovereignty and sustainable agriculture practices, lakeshore erosion, community shelter space and public planning for potential or natural hazard. More transparency and communication to community on hazards.

Additional information will be added in plan on straight line windstorms, a more common natural hazard. Survey question #4 on hazard identification was the most impact with illness outbreak over 32%, fire 16%, flooding 13%, storms 10% and snow 6.7%. Other potential hazards in community was power outage December 16-19, 2021 affecting tribal government and gaming businesses. The power outage brought this higher in priority for sustainable power, generators and interoperability. Trees falling on power lines is a county-wide event. Communication with utility companies in Peshawbestown is good but there were deficiencies with the power outage to be addressed due to vulnerable population and operations for a government. The gaming side lost 40 trees at Grand Traverse Resort from straight line winds. GTB Facilities Maintenance, GTB Fire and Consumers have tree maintenance programs. Consumers was working on tree trimming around power lines on M22 right before windstorm. GTB has a forest timber management plan to remove hazardous trees and will add this plan to report. Networks Northwest will start ranking strategies at next meeting on potential hazards and how to mitigate them.

Will also add property damage, climate change and invasive species (Emerald Ash Borer and Beech bark disease) impacts, resulting in dead standing trees in area. A lot of these events are tied together as they kill off trees resulting in wildfire risks. All of these will be mentioned in plan with definitions and describe how frequently they occur on impact historically. This will be part of overall ranking and assessment of plan to support priorities and goals. In addition, Dam failure concerns with Boardman and shoreline erosion. Peshawbestown concern as it is a coastal community and susceptible to flooding. Historical weather data for 2020 was 22 weather events in the past six years range from blizzard to ice storm, high winds, and power outages. Impacts result in property damage, crop damage, flooding, excessive heat with increase in medical assistance and wildfires.

GTB has largest population in Leelanau and Grand Traverse with Herkner expansion of 36 units in Grand Traverse County adding community center, residential homes and elder complex. Plan will look at emergency services, healthcare, fire, police, spread across six counties.

GTB had Community Health Representative (CHR's) stationed at outlying locations pre-pandemic but now have expanded health services and types of testing in more accessible format. Plan will look at pandemic impact on staffing and what changes

were made to provide services due to staff were quarantined limiting coverage to other locations. Pandemic increased CHR's skillset for testing. Health Dept purchased vans with unique features for Covid transport. Health purchased mobile medical trailer for vaccination clinics and stationed CHR's at established sites. Health currently have drive-thru sheds for Covid testing and vaccinations which are helpful, but this could be better as sheds not a perfect solution. An example is look at high volume type of clinic, the sheds did not seem to work as well with Covid patients to provide vaccinations, treatments and other services outside main clinic. The plan will look at protection of staff. Health staff doing best they can but there are limitations.

A mapping exercise will be done next time with Belanger dam and residential areas. n Peshawbestown and Leelanau County has a large population and businesses, but plan will include six county service areas. Other counties are updating their plans in Antrim, Benzie, Grand Traverse and Leelanau. Networks Northwest will work on other hazards and strategies in entire tribal service areas with goal to have a project ready to access project funds through FEMA to address mitigate hazards in community. Networks will do more in-depth hazard analysis, looking at vulnerable infrastructure, risk assessment mapping. A draft plan will be ready for next meeting, preferably in person for mapping exercise. Community survey remains open through January 2022. In-kind forms due for every meeting submitted to Networks Northwest for grant match from LPT members.

2. Region 7 Homeland Security Grant Updates.

- a. Great Lakes Homeland Security Conference May 10-12, 2022 at Grand Rapids and registration on MSP website.
- b. Interoperability Conference March 1-4, 2022 at Great Wolf Lodge in Traverse City.
- c. Critical Infrastructure Key Resources (CIKR) due December 17, 2021.
- d. Region 7 Homeland Security Grant working on EOC improvement projects.
- e. In-person meetings required for Region 7 meetings starting in January 2022 for voting purposes.

3. Public Health Emergency Preparedness (PHEP) Grant Updates.

- a. MDHHS has KN95 masks to distribute on weekly basis to local health departments and Tribes until supplies run out. We continue to provide Covid response.

4. Training and Exercise

- a. ICS-300 and ICS-400 training held in December 2021 and about fifteen employees completed training. Remaining staff unable to complete training due to Covid response. Working to identify additional funding for remaining staff to complete training next quarter.

5. New Business

- a. GTB had wind event December 16-19, 2021 resulting in power outage for government and gaming businesses shutting down services until restored.
- b. Jodi has FEMA cloth masks stored in purchasing when Covid started over a year ago and storage capacity limited to store masks. Healthcare will retain N95 masks. KN95 and cloth masks can be distributed to general public.

6. Open Discussion and Updates

- a. Kelly LaCross – Completed CIKR and submitted yesterday. Working on hazard mitigation next month and organizing exercises with a tabletop in the spring and full exercise in August at a school or at Leelanau County Government Center.
- b. Garrett Fairchild - March Pediatric Disaster Response Preparedness class in Gaylord and open for anyone to attend at no expense and registration on MITRAIN.
- c. Steve Feringa – comment on FEMA coastal zoning maps for flooding and Peshawbestown. There is a blanket coverage map due to being along shoreline. The only flooding of concern would be flash flood on local creeks such as Belanger. There is not a threat of flooding in Peshawbestown based on topography and elevation on most of the properties along shoreline. When we do the maps, we should localize the areas of consideration to make sure they are more accurate. GTB will have to update maps as brought up several times before with FEMA to change maps. GTB will supplement those maps so first responders have accurate information, possibly next year as FEMA recently updated maps two years ago.
- d. Jenna Scheub looking at brownfields. She will follow up with Tom Callison on the Forest Management Plan.
- e. Jolanda Murphy working on after-action plan for December 2021 power outage for Government. Lori working on insurance aspect of outage. The outage affected interoperability of communications and residential impact. GTB look at redundancy plans as generators went down at government and Leelanau Sands Casino. Recommend underground utilities and tree trimming to reduce impact. Steve mentioned when he works on new project, they try to get everything underground on utilities and add generators to new buildings for emergency power.
- f. Joe Huhn and his staff discussed with Tribal Manager communication failure from power outage. Requested on-scene group when incidents occur for communication awareness. Cell phone text was only communication working during power outage and need more redundancy.
- g. Other counties working on Hazard Mitigation planning. Participants welcome to participate in meetings with Antrim, Benzie, Grand Traverse and Leelanau counties. Participation goes toward that counties grant match. Leelanau County LPT meeting is 2/10/2022 at 12 pm.

7. Meeting Adjourned: 11:29 a.m. Motion: Garrett Fairchild / 2nd by Kelly LaCross.

Next meeting: 10:00 A.M. Friday, March 11, 2022 by Zoom, GTB Tribal Police Dept.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Friday, March 11, 2022
Time: 10:00 A.M.
Location: Tribal Police Dept Conference Room – by Zoom

Call to Order

Approval of LPT Meeting Minutes from
Thursday, 1/14/2022 Minutes

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
 - a. Great Lakes Homeland Security Conference, May 10-12, 2022
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 2:00 P.M. Tuesday, **May 17, 2022** GTB Tribal Police Dept Conference Room.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Friday, March 11, 2022
Time: 11:03 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Russ Cavanaugh (GTB Law Enforcement)
Becky Oien (GTB TMO)	Nicki Basch (Housing Mgr./1 st EM Deputy)
Kelly LaCross (Leel. Co. EM/911 Deputy Dir.)	Matt Ansorge (Leel. Co. EM/911 Director)
Courtney Hessel (NRD Environmental Spec.)	Jenna Scheub (NRD Services Coordinator)
Joe Huhn (Public Works)	Garrett Fairchild (GTB Fire Chief)
Soumit Pendharkar (GTB Health Administrator)	Jodi Lewis, (GTB, Interim CFO)
Stephanie Loria (Networks NW Coord.)	Lori Savaso, GTB Risk Manager)
Jennifer Neal (Networks NW Community Planner)	

Meeting called to Order: 11:03am

Approval of LPT Meeting Minutes from Friday, January 14, 2022

MOTION by Kelly LaCross, supported by Russ Cavanaugh, to approve the minutes of January 14, 2022 as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Lori Savaso, supported by Kelly LaCross, to approve the agenda for March 11, 2022 as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. Natural Hazard Mitigation Plan – Networks Northwest, Jennifer Neal and Stephanie Loria provided power point presentation of part 2 of hazard mitigation of historic weather events and hazard identification. FEMA offers planning and project grants for hazard mitigation, resilient building code implementation, drainage improvements and storm shelters. FEMA grant applications will be out in October-November and due in January. Today's power point presentation on tribal maps of tribal counties except Manistee, which will be added later. Currently looking at coastal areas and historic hazard analysis. Recap of community survey responses of high concern was illness outbreak, fire, flooding, power outages due to weather events, blizzards and snow storms. Federal Declarations of 2020 were issued and GTB submitted Emergency Declaration for pandemic. Three flooding incidents in 1986, 2008, 2013 for entire six county service area followed by frost freeze events, thunderstorms, one tornado in 1956, snow storm/blizzard 1978 and other NOAA weather historic events. Highest weather events were recorded in Grand Traverse and Benzie counties. Winter weather highest event followed by high winds and thunder storms. Extreme heat events in 2018 and 2021 impacting vulnerable population with health conditions. Drought moderate for GTB and there is high risk for wild fire risks, especially

Manistee with a lot of pine trees. Wetlands areas overview historically will accommodate flooding and moisture. Four dams listed on national inventory in Leelanau County and 12 dams listed in Grand Traverse county and two of those dams have been removed, Boardman Dam and Sabin Dam. National Dam inventory lists high flooding potential, one in Manistee, two of the three dams in Antrim and two of the ten in Grand Traverse and two of the four in Leelanau are high hazard. Unfamiliar with Northport dam near North Street, Park Drive and Warren Street. Networks Northwest will include on maps.

Networks Northwest looking at road and stream crossings with resources from River Restoration project from Grand Traverse county. Jennifer obtaining information from Road Commissions on improvements made coinciding with culverts and bridges for potential of flooding on site conditions. Jennifer will send data for Leelanau County road/stream crossing to Lori Savaso. The previous road/stream crossing project data focused on eastern side of Leelanau County previously which included Peshawbestown. DNR data dashboard will be added for this data set. Grand Traverse and Leelanau County watershed data will be reviewed and considered for flooding hazards. GTB is currently not part of National Flood Insurance Program but reviews annually with FEMA due to no significant flood concerns on tribal lands. Coastal flooding and recession is cyclical with 2020 maximum water levels. Manistee high water flooding and maps cover Leelanau County with most attention on Manistee. Three flooding phase areas on map by color, lucky (green), expected (yellow) and perfect storm (red) flooding with red color impacts for Peshawbestown and Manistee regions. Other piece is coastal recession and erosion, losing one foot of coast line a year for Great Lakes based on wave action hitting coast and sand and soil going into the water, we are losing one foot of coastline every year. Great Lakes slowly getting shallower impacting habitats and development. This may be a concern of coastal erosion for GTB due to potential developments, wetlands and marina. Natural Resource Department (NRD) will have to determine impact due to spawning grounds and fish populations.

Next LPT meeting will discuss hazards and prioritization of data. Invasive species cause economic and environmental harm along coastline with milder climate. Avian influenza concerns and Networks Northwest will consider this part of disease outbreaks in other states with monitoring by departments in plan. Avian influenza water fowl carriers moving North now for backyard and commercial flocks with low human impact currently. Jennifer will consider adding livestock and invasive species in natural hazard plan. Networks working with Conservation districts on invasive plants and species lists most common to our region. Include aquatic species, fish, and aggressive nature of Lake Trout against White fish. Important to note fish hatcheries and lake fish cohabitating concerns. Follow up with NRD Manager Carolan Sonderegger on fish concerns and scheduling meeting with Jennifer and Stephanie on economic impact, flooding and forestry and value of resources to show importance

for GTB. Next steps are hazard mapping and compiling information into maps and potential field trip.

2. Region 7 Homeland Security Grant Updates

- a. EOC improvement projects laptops and keyboards arrived for county/tribal EOC's.
- b. Trainings - ICS/Interface training at Antrim July 18, 2022. Great Lakes Homeland Security Conference at Grand Rapids, MI May 10-12, 2022. Grand Traverse County exercise August 10, 2022 at TC Airport in the morning and local school and family reunification center exercise in the afternoon.
- c. American Red Cross has Q-Code for smoke alarms and provided First Responder Direct Disaster contact numbers.
- d. Grand Traverse County submitted First Net proposal project to purchase portable unit for our region to support WIFI and cells within 5-mile radius, a small-scale cell tower on first responder network. This will operate for six hours without much supervision for unit, cost \$70,000 with \$4,000 annual data plan with satellite service. Region 7 cannot pick up recurring annual data plan cost, but Grand Traverse County has agreed to take on this cost if purchased. This project is moved to Region 7 Technical Committee for research and consideration of proposal this summer. The good part is this equipment is local. The satellite data plan is 40 gigs with AT&T service, a third-tier redundancy for providing service. If supplementing area with spotty reception of first net, this would be perfect for this and not have to tap into any datapoints. Matt Ansonge will send information on First Net to LPT.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. PHEP funding received for new grant period starts July 1, 2022.
- b. PHEP grant funding one person to attend Great Lakes Homeland Security Conference.

4. Training and Exercise

- a. Great Lakes Homeland Security Conference May 10-12, 2022.

5. New Business

- a. No new business.

6. Open Discussion and Updates

- a. Pipeline Training held in Traverse City March 10, 2022 with GTB staff attending from NRD Jenna Scheub, Courtney Hessel, and J. Murphy, S. McSawby. This training recommended for general staff and first responders.
- b. Lori Savaso - emergency management group reviewing new mass notification systems to replace NIXLE. Next meeting mid-March with Alert Media. Reviewing at least three systems and completed review of Regroup. IT Manager George McClellan reviewed platforms.

c. Kelly LaCross – Leelanau County scheduled Sky One Weather Spotter training May 2, 2022 at Suttons Bay Fire Department at 6:30 pm.

7. Meeting Adjourned: 12:17 p.m.

MOTION by Kelly LaCross, supported by Lori Savaso, to adjourn.

ALL AYES

MOTION CARRIES

Next meeting: 10:00 A.M. Friday, May 17, 2022, location pending.



**LEELANAU COUNTY
OFFICE OF EMERGENCY MANAGEMENT/9-1-1**

8525 E. Government Center Drive Suttons Bay, MI 49682 Phone (231) 256-8775 Fax (231) 256-8701

**Leelanau County LEPC/LPT Meeting
Thursday, April 14, 2022
SIGN-IN SHEET**

	Name (Please Print)	Agency
1	MATT ANSERGE	EM / 911
2	Amy Boomer	CEDAR
3	Garrett Fairchild	GTB
4	HUGH COOK	LTFD
5	Jim Carroon	LERC
6	James Kiessel	LCSD
7	Pana Boomer	Masson Township / Cedar Fire
8	Amy Fairchild	mmr
9	Sam Schwartz	CENTRILLERTWP
10	ODan Besson	Leland Twp Fire
11	Bobbi Scott	BLDHD
12	Jolanda MURPHY	
13	Dr. Jason Tropea	MSP
14	Bryan Mullane	LERC
15	Lori SAVASO	GTB Risk mgmt -
16	Joe Mosher Mosher	Centerville Twp.
17	MICHAEL de Castro	MSP EM/SP
18	Clint Mitchell	Leland Township
19	Nick Florip	Harbor Hill Fruit Farm
20	Nicki Basch	GTB
21	Courtney Hessell	GTB
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**LEELANAU COUNTY
OFFICE OF EMERGENCY MANAGEMENT/9-1-1**

8525 E. Government Center Drive Suttons Bay, MI 49682 Phone (231) 256-8775 Fax (231) 256-8701

**Leelanau County LEPC/LPT Meeting
Thursday, April 14, 2022
SIGN-IN SHEET**

	Name (Please Print)	Agency
1	KELLY LACROSS	EM / 911
2	Jim Porter	SDBFD
3	Tony Gulla	Co. Planning
4	Brian Mulha	LCRC
5	Mark Bowen	SBBFD
6	Joe Mulha	GTB PPW
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Leelanau County/Grand Traverse Band Tribe

Hazard Mitigation – 4.14.22 Public Input Meeting Notes

- Matt Ansorge (Leelanau County EM/911 Director/Chair)
- Kelly LaCross (Leelanau County EM/911 Deputy Director)
- Undersheriff Jim Kiessel (Leelanau County Sheriff's Office)
- Tpr. Jason Tropf (Michigan State Police)
- Lt. Michael de Castro (MSP EMHSD)
- Brendan Mullane (Leelanau County Road Commission)
- Jim Calhoun (Leelanau County Road Commission)
- Trudy Galla (Leelanau County Planning Department)
- Bobbi Scott (Benzie-Leelanau Dist. Health Dept.)
- Joe Huhn (Grand Traverse Band DPW)
- Jolanda Murphy (GTB Public Safety)
- Chief Garrett Fairchild (GTB Fire & Rescue)
- Nicki Basch (GTB Housing Manager)
- Lori Savaso (GTB Risk Mgmt)
- Courtney Hessel (GTB Marina & Environmental Response Specialist)
- Chief Andy Doornbos (Cedar Area Fire & Rescue)
- Jim Schwantes (Centerville Twp.)
- Joe Mosher (Centerville Twp.)
- Amy Fairchild (Mobile Medical Response EMS)
- Chief Hugh Cook (Leelanau Twp. Emergency Services)
- Dana Boomer (Kasson Twp./Cedar Fire)
- Chief Dan Besson (Leland Twp Fire)
- Clint Mitchell (Leland Twp.)
- Chief Jim Porter (Suttons Bay-Bingham Fire & Rescue)
- Capt Mark Bowen (Suttons Bay-Bingham Fire & Rescue)
- Nick Florip (Harbor Hill Fruit Farm – Leelanau Peninsula)

Presenters from Networks Northwest:

Jennifer Neal, AICP – Community Planner; Zach Vega, AICP – Community Planner; Stephanie Loria – Community Planner

Sticky Note Exercise – Top 3 Hazards of Concern

Natural Hazard Event or Impact	# of Times Indicated
High Winds	10
Heavy Snow/Snowstorm	8
Electrical Grid Failure	6
Wildfire	5
Thunderstorm/Severe Storm/Tornado	4
Flood	3
Dam Failure	2
Communications Failure	2
Road Closures	2
Agriculture Loss	1
Invasive Species	1
Loss of Community Facilities	1
Shoreline Erosion	1
Sewer Failure	1
Extreme Cold	1

Group Discussions – Impacts on People, Economy, Natural Environment and Built Environment

Thunderstorms

- Power outages, trees down, wires down
 - Gas stations are closed; impacts commerce. Gas is needed to fuel generators!
 - Road closures due to downed trees, etc. prohibits EMS timely response to incidents; people can be stuck in their homes/neighborhoods. Also impacts local commerce if the roads are not able to be used to transport goods and services.
 - People living on oxygen or who have a low food supply or primarily perishable food supply are directly impacted
 - Glen Arbor, Peshawbestown and other areas of the County in 2015 – 5-day stretch without power after a thunderstorm. GTB had downed lines (they have a lot of overhead lines). Their sewer stations had pump failures at the main lift and had to supply generators to power them. Many negative impacts to commerce and transportation. Debris management is a cost to the county and to contract out at the State level.
 - Only have 1 power company in the County, which limits their ability to respond quickly to all outages in a wide-spread event.
 - Power outages are costly to emergency services and residents.
- Can result in big floods
- Lightning strikes can cause fires, impacting homes, woodlands

- Money and time spent on the extreme demand placed on local responders – pay overtime for increased manpower
- Leelanau County receives 1-2 events per year that meet the criteria of a severe thunderstorm, windstorm, hail, lightning, tornado... Given our seasonal influx of tourists and the high potential for these storms at the same time of the year this could have devastating impacts to the economy, infrastructure and environment.

Winter Storms

- Ice dams along rivers/lakes can damage adjoining properties
- Food pantry can lose their supplies if the power is out.
- Agricultural products (vineyards, cropland) can be impacted if there is a late spring heavy frost, ice or hail storm. This can negatively impact the local agriculture economy and people's personal property.
- People who aren't aware of storm damage to their seasonal homes and return in the spring/summer to find and report damaged property (perhaps they had a roof leak or water lines that froze)
- More vulnerable residents whose homes are not well insulated could have more problems with roof damage and frozen pipes.
- 2012 storms left businesses, government and roads closed for 5 days
- Have a lack of community shelters
- Winds and ice can pull electrical lines down
- Increased potential for car accidents
- Gas stations down if they don't have back up power
- Cell towers down causes challenges with communications
- Many people rely on wood/propane fuel to heat their homes and often live in rural areas that are difficult to access in an emergency to provide their fuel source if needed.
- Population stranded on rural properties; can't be accessed by emergency vehicles with heavy/drifted snow or ice.
- Erratic winter weather patterns recently – less consistent.
- Extra burden and cost placed on the Road Commission and emergency services.
- 1977 Blizzard MSP/Corp of Engineers – road closures
- GTB Tribe added generators since the 2012 winter storms

Extreme Heat/Drought

- Brine on roads for dust control
- Electric grid is burdened by draw from lots of AC unit use
- Wildfire risk increases
- Crop and agricultural loss – orchards, vineyards, dairy and beef cattle
- Dehydration and heat stroke, especially in elderly and tourist populations
- Reduction in lake levels
- Concerns for fisheries, agriculture and livestock
- Extreme heat a concern for people who work outside.
- Need cooling shelters, welfare checks for vulnerable populations

- Increased demands on emergency services
- Possibly fewer tourists if it's too hot, or an increase in tourism creating a lack of resources for year-round citizens.
- Brine roads to keep dust down but is expensive and doesn't last long
- Excessive water usage; GTB has 3 wells at TCC; 2 at GTR; 2 wells on farms and 3 in Peshawbestown.

Invasive Species – Group Discussion

- Crowding out forests – Woolly adelgid; pests and diseases that affect ash, beech, maple trees
- Aquatic invasives damaging the Great Lakes ecosystem/local fishing.
- Considering what trees from southern latitudes to plant up here because they are adapted to our current climate. ½ the plant species that were here 30 years ago are gone due to climate change.
- Fisheries – invasive mussels; algal bloom on lake bottom causes fish not being able to spawn.

Pandemic – Group Discussion

- **Shortcomings/ Problems**
 - Located so far “up north” that they didn't have the resources and equipment needed to service large populations of sick people
 - Exposed reliability on Munson Healthcare hospitals – limited capacity of beds
 - They typically do not stockpile resources because they do not have the funds to do so.
 - Munson – mental stress on workers, constantly changing COVID protocols.
 - Effects of isolation, work stress...increased behavioral health problems in the community. There is a lack of mental health resources to support everyone.
 - This was a long process and taxed EM/Healthcare workers with protocol changes; difficult to inform people of what recommendations and rules were as they changed frequently.
 - The economic impact from reduced services/shutdown on businesses, housing, and EMS/healthcare. Need to plan for sustainability in these areas in a future scenario.
 - Still dealing with supply chain issues – vehicles and equipment down in EMS/Fire/Road Commission fleet because can't get repair parts.
- **What Worked Well**
 - Benzie-Leelanau Health Dept. testing and vaccination clinics – set up and service delivery – positive feedback
 - GTB – Health Dept. – positive feedback on vaccination and testing clinics and case monitoring. Collaboration with local, state, and federal partners.
 - Specific fire/EMS teams were dispatched to handle emergencies that were COVID-related. Had ambulances set up to only handle COVID patients.
 - They had never gone through this public health scenario before but they got what they needed.

- Had agreements and good coordination with other EMS departments for staffing – could share staff if one dept. was short staffed. Also coordinated with use and sharing of COVID-specific ambulances.
- Municipalities managed to the election process with health protocols
- Zoom meetings improved communication processes and will continue to be used in combination with in-person meetings

MAPPING EXERCISE – LEELANAU COUNTY

Flooding Risk/Issue Areas

- Empire Twp. – A seiche occurred on Glen Lake in August 2015. High winds from the west pushed the lake water from the west end to the east end. The west end of the lake was temporarily emptied, causing localized flooding along properties surrounding the south/southeast part of the lake.
- Glen Arbor Twp. – land on the north side of Glen Arbor Lake
- Cleveland Twp. – area located east of S. Bohemian Road (CR 669) between Lake Michigan Road and M-22; area located west of Bohemian Road between W. Harbor Highway and Lake MI Road; Traverse Lake Road near intersection with West Harbor Hwy. (M-22); E. Narlock Road, east of Maple City Road
- Leland Twp. – Downtown Leland; Leland Dam has improvements with 24/7 monitoring; flooding potential at the intersection of Duck Lake Road over the Lake Leelanau channel
- Leelanau Twp. – Northport Dam area and wetlands located east of Mill St., north of 7th street, south of E. Woolsey Lake Rd. and adjoining the coast of West Grand Traverse Bay; water/wetland areas in the area between Lighthouse Point Rd. and Forest Beach Shore Dr.; Gills Pier Road, south of Onomonee Rd.
- Suttons Bay Twp. – Belanger Creek overflow impacts M-22; Belanger Dam; CR 633 between E. Richter Road/S. Pineview Road and Eckerle Rd.
- Solon Twp. – Wet areas in the community of Cedar, near the intersection of E. Bellenger Rd., Railroad and Nelson Roads, Kasson St., S. Good Harbor Trail and S. Schomberg Rd.; East Traverse Road between Cedar Valley Road and Cedar Run Road.
- Centerville Township – Gatzke Road on east and west sides of intersection with Good Harbor Trail
- Centerville and Solon Townships – Cedar River area along Lake Leelanau.
- Elmwood and Solon Townships – S. side of Lake Leelanau in the Fouch Rd. area.
- Bingham Township – Adjoining the east coast of Lake Leelanau between Melissa Drive/East Sierra Drive and CR 641; S. Lee Point Road/ E. Hendryx Road area with West Grand Traverse Bay adjoining to the south
- Elmwood Township – Meeuwenberg Dam and Cedar Lake Dam; excessive rainfall runoff from roads in the SE part of the township; Center Highway near the intersection with Cherry Bend Road
- Kasson Township – Southwest corner of the township

MAPPING EXERCISE – LEELANAU COUNTY (cont'd)

Fire Hazard/Risk Areas

- Most of the Sleeping Bear Dunes (NPS) property in Glen Arbor, Empire, Cleveland Twps. and parts of Centerville Twp.
- Empire Twp. – NPS land surrounded by Welch Rd (CR 616), S. Leelanau Hwy (M-22), S. Dune Hwy (CR109) and Frederickson Rd.; Plowman Rd located south of W. MacFarlane Rd.
- Glen Arbor Twp – NPS land surrounded by Day Forest Rd., S. Glen Lake Rd., W. Harbor Hwy (M-109), S. Forest Haven Rd., and Stocking Rd.
- Glen Arbor/Cleveland Twps – land located north of Trumbull Rd., south of W. Harbor Hwy, and between Wheeler Rd, CR 675 and M-22
- Leelanau Twp – area surrounded by the following roads: Sugar Bush, Kehl, Snyder, Ottis, Howell, Woolsey Lake and Kitcherman.
- Elmwood Twp. - Bugai Rd. and Hoxie Rd.; Birch Point Rd.
- Solon Twp - S. Solon Road, located south of Rudolph Rd.; Where Darga Rd. from Kasson Twp. intersects the Twp. line.
- Centerville Twp. – Bodus Rd. between Schomberg and Good Harbor Trail.
- Leland Twp. - High Bluffs Drive area
- Kasson Twp. – Maple City Rd between Valley Rd and S. Olivia Drive; Baatz Rd at the intersection of Gilbert Rd.; Pettengill Rd. near the SW corner of the Township.
- Cleveland Twp – S. Hlavka Hills Drive; between Bohemian Rd. and Hlavka Rd; and area east of Bohemian Rd., between W. Harbor Hwy (M-22) and Lake Michigan Rd.

Lake Michigan Coastal Hazard Areas

- Empire Twp. and parts of Glen Arbor Twp. coastlines
- Empire Twp. – most of the coast from N. Bar Lake to Empire Bluffs area; Village of Empire where inland lake is closest to the coast of Lake MI.
- Glen Arbor Twp – Intersection with Harbor Highway and S. Ray St.
- Leland Twp. - coastline from Leland Dam up to Cathead Point; Leland Dam
- Elmwood and Bingham Townships - roadwork along parts of West Bay Shore Drive (M-22)
- Elmwood Twp - Intx. Cherry Bend Road and East Carter Road; M-22 and Sinclair Rd.
- Bingham Twp – West Bay Shore Dr (M-22) between Bingham Rd and Valley Hills Dr.
- Suttons Bay - roadwork along S. Shore Drive
- Leelanau Twp - roadwork along: M-22, southwest of Omena; W. Bay Shore Dr. (M-22) between Freeland and Tatch Rd; CR 640 on the northeast side of Northport Bay; Northport Point Rd. and Circle Drive; on the east side of the peninsula, along N. Forest Beach Shores Drive.
- S. Manitou Island – SE coast along Burdick Road and coastal area

MAPPING EXERCISE – PESHAWBESTOWN

Flooding Risk/Issue Areas

- The Belanger Creek Dam (at the end of Belanger Creek at the intx. with M-22)
- Belanger Creek, located southeast of Stallman Road to the outlet in the Bay – potential for overflow
- Stallman Road near the intersection with Belanger Creek, located SW of Strongheart Way.

Lake Michigan Coastal Hazard Areas

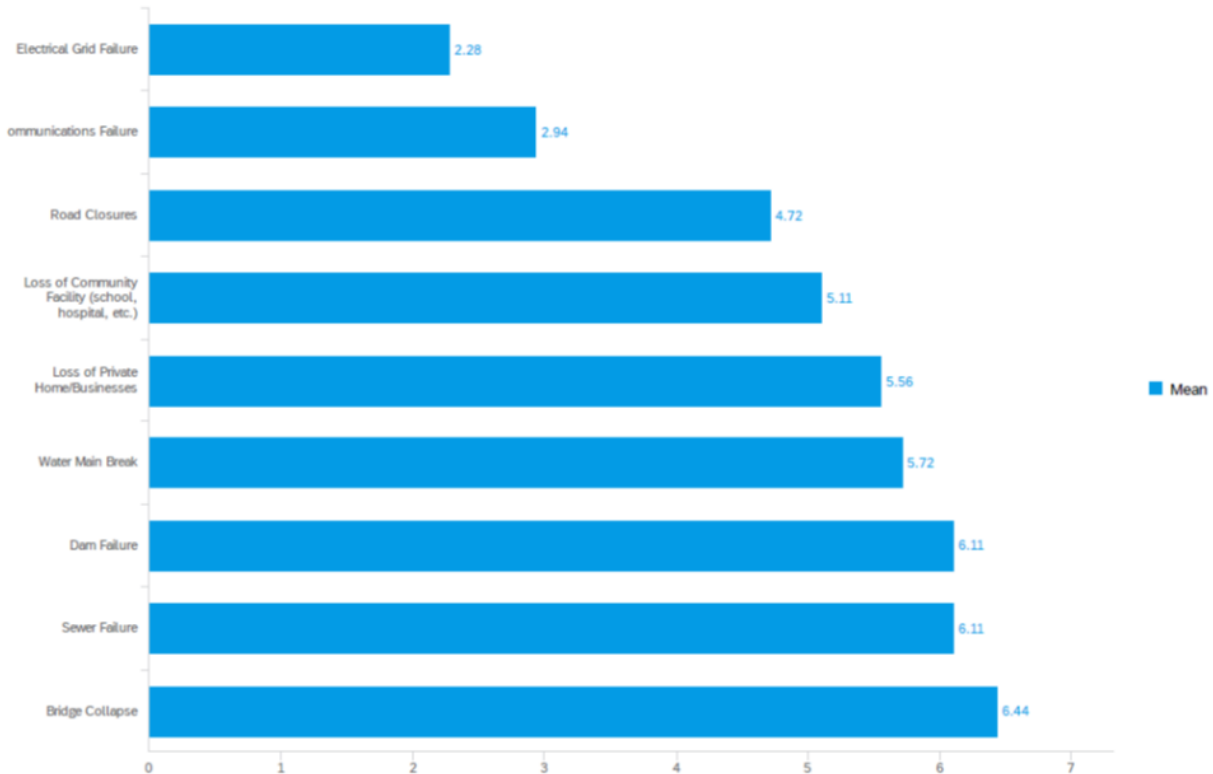
- 3 areas of concern along the shoreline; one is near a gas station – possible contamination source if impacted by rising lake levels

Fire Hazard/Risk Areas

- Putnam Road, east of Peshawbestown Rd., where the Natural Resources building, Fire Station and residences are located.

Ranking Question (18 people responded)

Please rank the infrastructure failures that would most concern you, with 1 being the most concerning and 9 being the least concerning. (Responses are listed from most concerning to least concerning in descending order).



LOCAL PLANNING TEAM (LPT) MEETING MINUTES

Date: Thursday, April 14, 2022, at 10:30 am
Location: Leelanau County Government Center – Lower-Level Meeting Room
8525 E. Government Center Dr.
Suttons Bay, MI 49682

Membership and Others Present:

Matt Ansoerge EM/911 Director/Chair	Tpr. Jason Tropf (MSP)
Kelly LaCross (EM/911 Deputy Director)	Amy Fairchild (MMR)
Undersheriff Jim Kiessel (LCSO)	Brendan Mullane (LCRC)
Chief Garrett Fairchild (GTBF&R)	Chief Hugh Cook (LTES)
Chief Andy Doornbos (CAF&R)	Dana Boomer (Kasson Twp.)
Jim Calhoun (LCRC)	Chief Dan Besson (Leland Twp Fire)
Jim Schwantes (Centerville Twp.)	Jolanda Murphy (GTB Public Safety)
Bobbi Scott (B-L Dist. Health Dept.)	Joe Mosher (Centerville Twp.)
Lori Savaso (GTB Risk Mgmt)	Clint Mitchell (Leland Twp.)
Lt. Michael de Castro (MSP EMHSD)	Nicki Basch (GTB)
Nick Florip (Harbor Hills Fruit Farm)	Chief Jim Porter (SB-BF&R)
Courtney Hessell (GTB)	Capt Mark Bowen (SB-BF&R)
Trudy Galla (Planning Department)	Joe Huhn (GTB DPW)

Membership / Others Absent:

Ranger Andy Blake (NPS)	William Bunek (B.o.C.)
Barb MacGregor (Heartland Hospice)	Ruth Blick (Salvation Army)
Parker Ameel (MAEAP)	Gary Frederickson (Agriculture)
Amber Weber (Building Safety)	Meghan Powers (Red Cross)
Laurie Spencer (Equalization)	Ron Plamondon (LCIT)
Brian Flickinger (EGLE)	

Meeting called to order at 10:30 am.

Approval of the LEPC Meeting Minutes of Thursday, February 10, 2022:

MOTION by Undersheriff Jim Kiessel, supported by Chief Hugh Cook to approve the minutes of the February meeting as presented. ALL AYES MOTION CARRIES

Approval of today's agenda:

MOTION by Chief Garrett Fairchild, supported by Undersheriff Jim Kiessel to approve the agenda for the April meeting as presented. ALL AYES MOTION CARRIES

Reports from Other Departments/Committees:

Hazard Mitigation Grant:

- Networks Northwest provided an update/exercise with the group on progress they have made toward the completion of the Hazard Mitigation Plan.
- Attendees from multiple agencies, jurisdictions, and businesses participated in the update briefing/development of the plan.
- Attendees broke into groups and conducted area hazard identification on maps in regards to flooding, wildfires, shoreline erosion, natural hazards, etc. and discussed potential hazards across the County.

Emergency Management/9-1-1 - Mr. Ansoerge reported the following:

- a. The contract is almost complete for the new Government Center Tower.
- b. Motorola is still researching options for the rapid notification updates for fire and rescue.

GTB Public Safety – Jolanda Murphy reported the following:

- a. GTBF&R is down one employee.
- b. GTB LE is down two employees
- c. Conducting COVID testing and providing booster shots to those eligible on a daily basis.
- d. GTB will be conducting tornado siren testing this week.

Leelanau County Sheriff's Office – Undersheriff Kiessel reported the following:

- a. Thanked personnel for their assistance with the bomb threat in Leland Harbor.
- b. Discussed the Constitutional Crusaders visit to the Leelanau County Government Center.
- c. LCSO is currently fully staffed.

Leelanau County Road Commission – Mr. Mullane reported the following:

- a. LCRC has moved to its summertime schedule.
- b. Inquired about road closure notifications and if Active911 can map closures. Active911 is unable to map road closures.

Michigan State Police – Tpr. Tropf reported he attended a HAZMAT conference down state and received lots of good information.

MMR – Ms. Fairchild reported the following:

- a. MMR is fully staffed.
- b. MMR ECHO unit is in the process of getting radios installed.

Leelanau Township Emergency Services – Chief Cook reported the following:

- a. Building construction is in the final stages.
- b. Fully staffed

Leland Twp. Fire & Rescue – Chief Besson reported they have an advertisement out for two employees.

Cedar Area Fire & Rescue - NSTR

Benzie/Leelanau District Health Department: Ms. Scott reported the following:

- a. COVID numbers are down.
- b. Increased interest in 2nd booster. Appointments are maxed out.
- c. Hanu continues with COVID testing in Leelanau and Benzie.
- d. Paul Oliver Hospital has walk-in vaccination clinics available.
- e. Highly Pathogenic Avian Influenza (HPAI) is increasing. There have been two cases identified in MI.

Correspondence Review:

Homeland Security Grant Updates: NSTR

Upcoming Training and Exercise information:

- a. May 2, 2022 @ 18:30 – NWS Weather Spotter Training – Suttons Bay/Bingham Fire and Rescue.
- b. May 24, 2022 @ 0900 – Leelanau Fruit HAZMAT TTX.

New Business: None

Open Discussion: None

Adjournment: meeting adjourned at 12:30pm

MOTION by Undersheriff Jim Kiessel, supported by Chief Dan Besson to adjourn at 12:30pm
ALL AYES MOTION CARRIES

The next combined LEPC/LPT meeting is scheduled for **Thursday, June 9, 2022**, in the EOC at 12:30.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Friday, June 3, 2022
Time: 10:00 A.M.
Location: Tribal Police Dept – by Zoom

Call to Order

**Approval of LPT Meeting Minutes from
Friday, 3/11/2022 Minutes**

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
 - a. Great Lakes Homeland Security Conference, May 10-12, 2022
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 2:00 P.M. Wednesday, August 10, 2022 GTB Tribal Police Dept Conference Room.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Friday, June 3, 2022
Time: 10:00 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Jason Verheek (GTB CFO, DA)
Becky Oien (GTB TMO)	Nicki Basch (Housing Mgr./1 st EM Deputy)
Courtney Hessel (NRD Environmental Spec.)	Joe Huhn (Public Works)
Mari Raphael, RN (GTB Health)	Shirley Alpers, Nurse (GTB Health)
Lori Savaso, (GTB Risk Manager)	Rebecca Hubers, (Benzie EM Coordinator)
Russ Cavanaugh, (GTB LE)	

Meeting called to Order: 10:00am

Approval of LPT Meeting Minutes from Friday, March 11, 2022

MOTION by Lori Savaso, supported by Russ Cavanaugh, to approve the minutes of March 11, 2022 as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Lori Savaso, supported by Rebecca Oien, to approve the agenda for June 3, 2022 as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. Natural Hazard Mitigation Plan – Networks Northwest, Jennifer Neal and Stephanie are consolidating data for next meeting. Attached is 3/11/2022 HMP power point for review for those who missed March meeting. Jennifer will contact Housing Manager on Herkner properties and wind events. Request return of In-kind forms.
- b. Lock-down procedures and videos for Government employees will be sent to Tribal Managers Office and Human Resources for Government employees' awareness.
- c. Leelanau County Sheriff Office active assailant training in August 2022. Tribal Police and Fire Departments will participate. A good opportunity for LPT members to observe or play to understand process. More information will be shared in August.

2. Region 7 Homeland Security Grant Updates

- a. Updates on Gaylord tornado and response assessment and first responder's response and recovery. Benzie EM Coordinator discussed debris management plan at LEPC meeting. Gaylord debris pile was two stories high and two football fields long and wide. Debris locations need to be identified ahead of time. Benzie working on a debris plan as well as GTB. Impacts of tornado and winds felt in Presque county, causing millions in Gaylord and surrounding communities.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. NIMS Training Matrix completed by GTB staff will be submitted to funding agency on health and emergency preparedness. Many thanks to staff for completing training. Request staff submit NIMS certificates for emergency management office file.

4. Training and Exercise

- a. Great Lakes Homeland Security Conference May 10-12, 2022. GTB staff attended conference. Receipts from conference due in July. Mari Raphael provided conference workshop updates with recommendations of useful trainings in public health, terrorism, first responders and cyber security.
- b. MEMA Conference is this fall in Bellaire. More information out soon.
- c. Sky One Weather Spotter training May 2, 2022 Suttons Bay Fire Department at 6:30 pm. Gaylord NOAA Weather notices available for pre-plan events.

5. New Business

- a. CDC Covid-19 wastewater testing project continued with data resource shared with health administrator's office, GTB wastewater program and emergency management office. CDC provides testing for several counties along with GTB.

6. Open Discussion and Updates

- a. Covid-19 vaccine weekly schedule every Wednesday and rotating clinics at satellite offices every three weeks and Charlevoix on demand. Call 231-534-7475 Covid-19 Hotline. Covid Vaccine for appointment. Daily Covid-19 testing outside 8am and 1pm, call to schedule appointment. Home tests, face masks and hand sanitizer and pulse oximeters are available by request. Call 231-534-7200 or call Clinic Nurse 231-534-7236. Still have positive cases in people who are vaccinated and unvaccinated. Vaccinated people are weathering virus with less severe symptoms and staying home and not going to the hospital. Monoclonal antibodies for people who test positive and are symptomatic and fall within guidelines to administer. Call clinic to talk with provider for treatment.
- b. Risk Management update from Lori Savaso. ITC and EPA inspecting C-Stores underground storage tanks with annual EPA inspectors on site in June to ensure safety of environment.
- c. Norton Mounds Native American burial grounds Grand River oil spill exercise meeting August 3, 2022 to review and tour the 55-acre Norton Mounds and discuss impacts with Tribes. The cultural department manager is familiar with the mounds and will participate in the exercise along with Federal and state agencies. Tabletop exercise scheduled for October 3, 2022 and exercise information will be shared with Tribal Managers Office, risk management and emergency preparedness staff.

7. Meeting Adjourned: 10:32 a.m.

MOTION by Suzanne McSawby, supported by Lori Savaso, to adjourn.

ALL AYES MOTION CARRIES

Next meeting: 2:00 P.M. Wednesday, August 10, 2022, location pending.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Thursday, August 18, 2022
Time: 11:00 A.M.
Location: Tribal Police Dept – by Zoom

Call to Order

**Approval of LPT Meeting Minutes from
Friday, 6/3/2022 Minutes**

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
 - a. MEMA Conference, Oct. 8-10, 2022, Shanty Creek
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M., **Friday, October 7, 2022** GTB Tribal Police Dept Conference Room, zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Thursday, August 18, 2022
Time: 11:00 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Doris Winslow (GTB TMO Ex. Asst.)
Becky Oien (GTB TMO)	Nicki Basch (Housing Mgr./1 st EM Deputy)
Courtney Hessel (NRD Environmental Spec.)	Joe Huhn (Public Works)
Jenna Scheub (NRD Svs. Coordinator)	Russ Cavanaugh, (GTB LE)
Garrett Fairchild (GTB Fire)	Suzanne McSawby (GTB LE Specialist)
Kelly LaCross (Leelanau County EM Deputy)	Jennifer Neal (Networks Northwest)
Stephanie Loria (Networks Northwest)	

Meeting called to Order: 11:03am

Approval of LPT Meeting Minutes from Friday, June 3, 2022

MOTION by Jenna Scheub, supported by Russ Cavanaugh, to approve the minutes of June 3, 2022 as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Russ Cavanaugh, supported by Kelly LaCross, to approve the agenda for August 18, 2022 as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. Natural Hazard Mitigation Plan – Networks Northwest, Jennifer Neal and Stephanie Loria are consolidating data for next meeting. Jennifer and Stephanie provided power point overview of GTB Natural Hazard Mitigation Plan (NHMP) DRAFT. Reminder to submit in-kind forms for match requirement and sign in your name in CHAT on zoom meeting. The difference between 2016 NHMP and this draft is more data on weather and prioritization from hazards to flooding, wild fire, drought. FEMA requests addressing strategies to mitigate hazards. There is information missing but will be filled in as this is a DRAFT. Anticipate adoption of NHMP 2023. Submit edits to Jennifer Neal and Stephanie Loria. NHMP identifies federal regulations for adopting plan along with required in-kind match, number of meetings, who participated. Educational pieces will be important to add to plan. FEMA wants to see a wide range of strategies. Additions of cultural preservation and values to address tribal needs and getting help they need and community displacement.

Plan has community profile on GTB history and working on maps. Focus on Leelanau and natural resources. Contact Jennifer or Stephanie to include additional information in this area. Membership of GTB is highest in GT County and 2nd highest is Leelanau County. Discussion of vulnerable population, youth and elders with

highest vulnerable impact to elders. Benzie has the highest percentage of elders on Table 3. US Census unreliable currently and not readily available yet. Networks has housing information from GIS data and percentage of units by county data. Include other economic engines and culture important to be included in plan.

Historical weather events with hurricane Katrina of 2005 evacuees coming to Michigan. Limited wildland fire information except for DNR. Most frequent storm events are extreme winter weather. Tornado in Antrim. Think about vulnerability, homes, mobile homes, who is impacted. Economic impact analysis. Climate change and impacts for invasive species and aquatics. Extreme weather on elder and families. Housing without air conditioning, power outages, health impacts, fires, elderly deaths from heat. Chronic breathing issues, grass fires. Invasive species changes aquatic food web, soil impacts, most harmful to climate, water temp and habitat threatened, fish spawning impacts, dry and warm springs, agriculture, food sovereignty and reliance on ground water for growing food. Ask if GTB is reliant on food resources. Community gardens in Antrim, Charlevoix and Peshawbestown for food resources and growing crops for community distribution. Is GTB growing own food to be self-reliant, which some communities are going in this direction. What is some climate change that could impact the Tribe in the future? Questions on climate change: How has the climate change impacted the Tribe? How will climate change impact the Tribe? What is or should the Tribe be doing to prepare for climate change?

Look at questions on PowerPoint draft on renewable energy. Discuss with other departments building impacts and fill in. See the strategies in blue menu bar: Priority and Action Strategies/Responsible Parties/Timeframe/Priority. Geothermal and solar energy, power grid outage impacts. Mitigation strategies and priorities slide. NRD is looking at grants on renewable energy spectrum. NRD has a Climate Preparedness Plan and this may be one of the strategies. Food sovereignty fall under goal 4. Looking at having one strategy for each natural hazard. Add in natural resource impacts and list each strategy and types of strategies. Networks would like everyone to review 2016 Tribal Mitigation Strategies. Example is snow loads on flat or low-pitched roofs increase damage or tree pruning strategies around low hanging power lines to reduce power outages and protect home owners' homes from falling trees. Every tribal department review 2016 tribal mitigation strategies to determine priority level or delete if not a priority. Submit strategies to Jennifer Neal. They need one strategy for each hazard type. Some hazards may not of had a strategy such as lightning or rip current. If have ideas for new strategies, send those as well.

Strategies fall into 4 categories: planning, regulation, structure and infrastructure and natural systems protection. Example is building a natural or native habitat or soft shoreline that is a natural systems protection to help rebuild shoreline. Educational programs on rip currents, even though small significance, but it may cause death so include on a brochure for swimming areas. All ideas are welcome. Some strategies

may fall into different categories of educational awareness and natural resource protection or storm water project. Everyone reviews 2016 NHMP strategies again to add or change and submit to Jennifer Neal who will compile list and go over in next meeting. Look at vulnerabilities and impacts they had and change 2016 goals and objectives. Change 2016 goals and objectives and change wording in Goal 3. Keep Goal 1 and 2. Climate Adaptation Plan importance and effect on building, farming, environment, population, healthcare. Combine Goal 3 & 4 or reword. Goal 3 reword to: *Utilize available resources to apply for future natural hazard mitigation grants or partnerships.* Align plan and projects with other departments. Work plans covered in Goal 2. Keep Goal 5 & 6. The attachments will be sent out with tribal mitigation strategies and FEMA webinar information on suggested strategies.

2. Region 7 Homeland Security Grant Updates

- a. Mobile EOC cabinet delivered in August to GTB purchased by Region 7 Homeland Security Planning Board from emergency preparedness grant.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. New Tribal Health Administrator scheduled to start 8/15/2022.

4. Training and Exercise

- a. MEMA Conference Oct. 10-12, 2022 at Shanty Creek, MI.
- b. Weapons of Mass Destruction Training Sep. 28-29, 2022, Leelanau County.

5. New Business

- a. Courtney Hessell meeting with EPA representative Jennifer Manville on oil spill plans and may set up tabletop exercise. GTB Fire Chief send existing spill plans for gas stations and marina to Courtney and Jenna.

6. Open Discussion and Updates

- a. Fire Chief Fairchild completed professional emergency management designation involving 17 classes and certified as Professional Emergency Manager.
- b. Jenna Scheub and Courtney Hessell discussed environmental training. Courtney completed phase 1 environmental certification review.
- c. Fire Dept working with Natural Resources department on mutual aid response with natural resource department hazard mitigation trailer at Leland fish town, Suttons Bay marina, Leland river on hazardous materials responses and mitigation of waterways. GTB proud to assist local communities with stopping fuel leaks and human wastes from sewer leaks.

7. Meeting Adjourned: 12:53 p.m.

MOTION by Suzanne McSawby, supported by Garrett Fairchild, to adjourn.

ALL AYES MOTION CARRIES

Next meeting: 10:00 A.M. Friday, October 7, 2022, zoom/location pending.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Friday, October 7, 2022
Time: 10:00 A.M.
Location: Tribal Police Dept – by Zoom

Call to Order

**Approval of LPT Meeting Minutes from
Friday, 8/18/2022 Minutes**

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M., Friday, December 2, 2022 GTB Tribal Police Dept Conference Room, zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Friday, October 7, 2022
Time: 10:00 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Dee Wonegeshik (GTB Elders Dept Mgr.)
Becky Oien (GTB TMO)	Nicki Basch (Housing Mgr./1 st EM Deputy)
Courtney Hessel (NRD Environmental Spec.)	Joe Huhn (Public Works)
Russ Cavanaugh, (GTB LE)	Garrett Fairchild (GTB Fire)
Suzanne McSawby (GTB LE Specialist)	Kelly LaCross (Leelanau County EM Deputy)
Lori Savaso (EDC Risk & Safety Director)	Mari Raphael (GTB Health RN)
Dawn Shenoskey (Education D. Mgr.)	Rebecca Hubers (Benzie County Emg. Mgr.)
Doris Winslow (GTB Ex. Asst.)	Jennifer Neal (Networks Northwest)
Stephanie Marchbanks (Networks Northwest)	

Meeting called to Order: 10:03am

Approval of LPT Meeting Minutes from Friday, October 7, 2022

MOTION by Garrett Fairchild, supported by Russ Cavanaugh, to approve the minutes of October 7, 2022, as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Lori Savaso, supported by Rebecca Oien, to approve the agenda for October 7, 2022, as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. Natural Hazard Mitigation Plan – Networks Northwest community planner Jennifer Neal and Stephanie Marchbanks reviewed 2016 mitigation strategies with comments made at previous meeting. Past plan focused on major hazards: thunderstorms, wind, etc. This new plan will focus on coastal hazards, wildfire, other inland funding, drought, extreme temperatures, covering wider range of areas which means strategies will cover wider range. New plan combined all winter events (blizzard, ice, winter storm, etc.) on excel spreadsheet bottom tabs. Italic words on spreadsheet are new strategies to consider. The Goals listed on spreadsheet are overarching ideas of strategies to apply in goals.

Strategy type will fall into one of the four categories such as developing ordinances or plan and what were doing internally. Building infrastructure (new build or retro build), natural system environment (wildfire, buffer zone around structures), education/awareness and strategies to inform people, notification systems. Strategies can be what you're doing but may do better. (i.e.: generator needs maintenance or need a new generator).

Assign tasks on who would be implementing strategy such as planning and building department (i.e., building infrastructure for specific areas, natural gas vs diesel generators). Develop partnerships if don't have a department to implement strategy. If strategy is to have emergency generators, then identify generators for specific areas. If include generators across government then include on-going maintenance of generators. Recommendation to hook up generators to natural gas for continual supply of fuel. Suggestion to add for future generators to use natural gas, especially for outlying areas, reducing fuel trucks for outlying areas to refill is an issue.

FEMA requirement to add climate change to plan and how you handle climate change. Consider alternative power sources to add to generators. Look at renewable energy sources and planning for future to power buildings independently without support from power grid.

Vulnerable populations and elder community and people living in remote areas. Are there on-going efforts for call tree to reach people during winter events? Contact Elder Department Manager and Health Department Community Health Representatives (CHR's) and elder coordinators to call people. Add this to strategies spreadsheet to continue efforts.

Debris removal and power outages. Are there groups to provide tree clearing. GTB Fire Department and maintenance assisted with clearing trees from roadways or near tribal lands during wind events. Unsure how housing handles tree clearing on housing properties. Safety issue to handle traffic while tree clearing or debris removal. May have to contract for tree removal and debris removal. Law enforcement not allowed to remove power lines from trees due to liability. Develop tree removal strategy or gaps in system. Fill in gaps or vulnerability, such as working with utility companies. Installing roadway technology to prevent snow buildup is cost prohibitive so this could be changed or deleted or add to ordinances on how to reduce ice buildup. Capture ideas into policy and plans to address. Add comments in asterisk column on strategy spreadsheet. Networks Northwest will add additional columns and identify people to work on strategies. Highlighted areas on spreadsheet were for purpose of discussion at LPT meeting. Italicized strategies are new and recommendations. If some of the strategies have been completed, then take off plan. Follow up with NRD on status of alternative power source of solar panels. NRD receives credit for solar panels but currently they are inactive and do not power anything as a piece is missing and maintenance is working on this. The solar panels generate energy and GTB receives credit on bill for NRD budgets.

GTB and EDC use Regroup mass notification system for general and emergency notices sent to public, including use of social media, FB, newsletter. EDC will utilize for emergency communications within organization at casino and resort via phones,

desktop computers. Weather radios mentioned in previous plan replaced with Regroup mass notification system.

Emergency shelters identify locations and GTB coordinates with local counties based on specific events. Shelters require generator support and GTB is very close to implementation of generators this year. Wireless service is available. Previous snowline useful for those without cell phones, internet service and usage of this will be determined by Tribal Manager. Provide alternative ways to inform community for those without cell phones as alternative methods. Social media and face book useful for groups. GTB has more than one method to get across communications for emergencies and general activities. GTB uses communications department to share messages or information to the public.

Thunderstorm section discussed adoption of international building code. This strategy was completed, so remove from strategy. This section was technical so summarize building code information instead of separate strategies. Request Steve Feringa review building code section and summarize, same with Nicki Basch review housing section. Bring in LLC Ken Ockert for input on strategies in plan. Add one strategy to address all these to make it easier to address. Continue LIHEAP weatherization program instead of individual strategies on weatherization. Remove traffic light strategy as not applicable for GTB to complete.

Clarify, reword, or delete loop feeds language or be more specific. This may be for Consumers Energy, so reword sentence to working with utility companies.

Technology and protection of information systems. Add IT Department regarding technology information and protection. Include recommendations on facilities and redundancy for disaster recovery. Include redundancy in plan as a strategy. Remote work was implemented during Covid-19 pandemic and authentications for utilization. Survey was completed on remote work and zoom meetings. Need broadband for remote areas and list as priority. There is a broadband project underway now for broadband. Telehealth implemented during pandemic and remains an option for patient encounters due to distance within six counties.

Tornado shelters and implementation in housing areas for natural hazards. Determine what these are and how well their working with Nicki Basch for future development and continuation of this strategy. GTB has six tornado shelters purchased by FEMA grant and how these are working. Herkner does not have a tornado shelter currently but could be added as a future project near community center.

GTB pre-plans are developed for over 50-person event capacity and shared with local agencies first responders. Alternate areas are included in pre-event plans for

inclement weather. Follow up with Tribal Manager to create reserve fund for pre-plan events if disaster occurs after hours. Determine nearby alternative shelter locations.

Inform people and youth on what to do through education and awareness. Review education strategies, change or delete activity. Consider how to do outreach and teach school children. Develop safety and lightning brochure, public safety announcements and add information to website. If strategies are done, cross off list and create new strategies.

Inland flooding and coastal hazards for flooding and erosion. Know where flood areas are and identify flood areas. Change or delete recommendations. Courtney Hessell will locate more information for the highlighted area strategy #5 on spreadsheet. Check on Soil Control Sedimentation Ordinance. NRD Biologist handles soil erosion permits for new construction and Courtney will follow up on review of soil permit. Be more specific on construction building codes. Highlight successes and development projects. For strategy #3, if implementing green strategies, then show in plan and show it's a priority for future projects. Check with Green Committee and NRD on input and have them review strategies. Include tree planting strategy for NRD. Such as rain gardens or planting trees. If already doing this, then point out in plan.

Strategy #7 NFIP flood insurance plan is expanding per FEMA, 500-year flood is now 100-year flood. Flooding is #1 hazard in Michigan and most costly. Contact Tribal Manager on NFIP implementation and if does not work, then cross off list. Establish green infrastructure system that connects and expands and manages flood waters. If have culverts, bridges, and road crossings, include site specific locations in plan with strategies.

Strategy #15 and #18 deals with septic systems. Check on septic ordinance or inspection. There is an impact on ground water if not inspected. Identify flood prone areas due to basement flooding potential. FEMA provides to GTB annual maps of flood prone areas. Post and share information. Two potential flood areas are TCC creek near 3 mile in Traverse City and near museum in Peshawbestown along bay. Educate awareness of flood prone areas and have students at schools plan small rain gardens. Small signs have big impact for butterfly gardens and native planting areas.

Coastal and natural shorelines implementation and softening shoreline. Create native environment to help with community resiliency after storm. Be more specific on code enforcement or not building on 25 feet of shoreline, etc. Follow up with NRD, Land and Roads Office and Parks Dept.

Next step is to identify specific departments to address implementation projects and potential mitigation. NRD review invasive species section and comment on strategies

as most of these NRD may already be doing. Drought and extreme temperatures and having water sources available. Consider anyone growing crops or farming and if priority to grow food, preparing for potential water cycles and decrease of water levels and have plan in place to continue growing food. Well water is an issue and minor drought cause decrease access to water and have plans in place to address.

Review wildfires and available hydrants. Look at water tank locations or critical infrastructure locations and available water source. Peshawbestown has hydrants throughout community. Benzie and Charlevoix have stored water tank facilities. Hydrants have potable water and storage facilities are not potable. Peshawbestown, Turtle Creek and Grand Traverse Resort hydrants are potable. Benzie and Charlevoix have water tanks but probably is not drinkable water. Fire departments have hydrant phone app dispatched to phones on location of hydrants and water sources.

Next steps are to vet out strategies with departments if still relevant. Once Networks has complete strategy table, they can put together final draft plan. The last part is implementation so this will be added to plan. Add in who will be responsible for these strategies. Mitigation strategy spreadsheet will be resent to staff to review seven (7) goals to address strategies. Networks will fill out plan when they receive strategies from staff. Plan for community workshop mid-December or January to review whole plan and maps. Need feedback. Submit in-kind match form (for non-federal staff) as Tribe has in-kind grant match. Community workshop will help with participation input and feedback for grant and contribute to match. Count your match time today of 2 hours and can also count match time when working on the spreadsheet. Staff review strategies, goals and add comments or new strategies on strategy spreadsheet and return to Dept 2 Manager J. Murphy.

2. Region 7 Homeland Security Grant Updates

- a. No updates.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. GTB Clinic providing flu shots at Medicine Lodge drive-thru shelters on Tuesdays 2-4pm and every scheduled doctor appointment and nurse walk-ins Monday through Friday 9-11am or 1-4pm. Covid vaccines provided on Wednesday at Med Lodge and rotate to satellite offices Tuesdays, call 534-7475 for appointment. Tuesday walk-in clinics do not need appointment, just show up. New formulation bivalent booster vaccine available for 12 years and up eligible and must be 2 months out from last Covid vaccine for bivalent booster. Covid testing continues at outside drive-thru shelter 8am and 1pm everyday and encourage appointments for patients and eligible clients. Home test kits available, call clinic 231-534-7200 for test kits. Biologics available for positive patients, antiviral and pre-exposure prophylactic and monoclonal antibodies.
- b. MEMA Conference October 10-12, 2022, at Shanty Creek.

4. Training and Exercise

- a. Louisiana State University provided homeland security approved Run, Hide, fight training and reinforce NCBRT Active Assailant exercise held week of October 23-28, 2022, for GTB Government and EDC employees.
- b. ICS Training available at University Center in October, register through MITRAIN.
- c. Courtney Hessell planning tabletop gas station oil spill exercise in January-February 2023 with Jenny Manville of EPA.
- d. Norton Mounds oil spill exercise held October 5, 2022, on cultural remains found during oil spill. Discussion of federal, state, and tribal agency contacts. GTB staff from NRD Courtney, Fire Dept Chief Fairchild and Public Safety J. Murphy participated in virtual exercise. The exercise scenario involved found artifacts during oil spill and how to return remains to Tribes. Exercise information will be shared with cultural department and Tribal Manager to add to GTB policy and procedures. Risk and Safety Director Lori Savaso will follow up with underwriters on how to address cultural remains for GTB.

5. New Business

- a. No updates.

6. Open Discussion and Updates

- a. No updates.

7. Meeting Adjourned: 12:12 p.m.

MOTION by Russ Cavanaugh, supported by Suzanne McSawby, to adjourn. ALL AYES
MOTION CARRIES

Next meeting: 10:00 A.M. Friday, December 2, 2022, zoom/location pending.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Tuesday, December 20, 2022
Time: 10:00 A.M.
Location: Tribal Police Dept – by Zoom

Call to Order

Approval of LPT Meeting Minutes from - Friday, 10/7/2022 Minutes

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M., **Thursday, February 9, 2022** GTB Tribal Police Dept Conference Room, zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Friday, December 20, 2022
Time: 10:00 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Nicki Basch (Housing Mgr./1 st EM Deputy)
Courtney Hessell (NRD Environmental Spec.)	Joe Huhn (Public Works)
Russ Cavanaugh, (GTB LE)	Garrett Fairchild (GTB Fire)
Suzanne McSawby (GTB LE Specialist)	Joe Huhn (Public Works)
Lori Savaso (EDC Risk & Safety Director)	Rebecca Hubers (Benzie County Emg. Mgr.)
Matt Ansoerge (Leelanau 911 Director/EM)	Jennifer Neal (Networks Northwest)
Stephanie Marchbanks (Networks Northwest)	Victoria Alfonseca (Communications Editor)
Jenna Scheub (Environmental Svs. Coordinator)	Steve Feringa (EDC Architect)

Meeting called to Order: 10:00am

Approval of LPT Meeting Minutes from Tuesday, December 20, 2022

MOTION by Lori Savaso, supported by Garrett Fairchild, to approve the minutes of December 20, 2022, as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Steve Feringa, supported by Russ Cavanaugh, to approve the agenda for December 20, 2022, as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. Natural Hazard Mitigation Plan – Networks Northwest community planner Jennifer Neal and Stephanie Marchbanks reviewed mitigation strategies. Discussion of Herkner Property and shelter status, to be add shelters to mitigation strategy. Shelters accommodate 32 individuals. Networks Northwest recommends drive-through at Herkner property. Currently four buildings, 4-plex apartments. None with basements but have crawl space areas. Townhomes have lower-level walkout basement. GTB has six tornado shelters prefabricated from 2008 holding 32 people. Herkner plans to have 178 units with future homeowners. Smaller cottages, elders' units on slabs and other units on crawl spaces and future homeowners and depends on which home they built. Tornado shelters close in October and open in April. Challenge is with elderly people due to steep staircase/ladder. Shelters have not been utilized to date. Benzie shelter located next to satellite office. Tornado shelter locations will be shared with local emergency managers, so they know locations. Networks will update strategy with color columns and change wording. GTB has generators in Benzie and Charlevoix pending final inspection.

Add a new strategy to plan at Herkner to include tornado shelters. Herkner has plans for a community center with basement which can be used as a shelter. The center will be located close to elder housing, made for easier access for elders. Recommend adding new strategy of planting trees to reduce wind impact at Herkner. Jenna located soil erosion permit and will send information to add as mitigation strategy. The current mitigation strategies are ideas only and can add or delete strategies as we move through this process. Add more information for invasive species and funding amounts into narrative for impact and economically impacting Tribe. Look at any projects in last 5 years and include partnering agencies.

Identify culturally significant species in natural hazard mitigation plan impacted by climate change. List habitat loss, depopulation of species and program impacts. Jenna will check if GTB has native plant medicine list, like other Tribes to include in plan as a culturally significant. Networks would like more information. Goal is to add culturally significant species in natural hazard mitigation plan impacted by climate change. GTB is involved in some form of re-introduction efforts for fisheries and Jenna will follow up with natural resource department and biologists.

GTB involved in re-introduction efforts for fisheries and Jenna will seek input from biologists to include in strategies. Benzie emergency manager requests clarification of extreme temperature tab on mitigation strategies, reword to include other counties including Leelanau County. Generators for Medicine Lodge and Strongheart Center final inspection scheduled for January 10-11, 2023, and Benzie and Charlevoix later.

Networks Northwest requests assignment of responsible parties to J. Murphy on mitigation strategies spreadsheet. Fill out table last task. Jennifer will send a revised draft plan with highlighted areas to comment on and review. The last step of implementation of plan is to have planning projects added. Steve Feringa is planning to update GTB Master Plan to include six county service areas with specific site plans and will bring to February LPT meeting. The Master Plan will include housing, tribal government, EDC and include stakeholders from LPT to review. Jennifer stated FEMA wants to see integrated plans, green infrastructure to carry over into Master Plan is recommended. Jennifer and Stephanie will have final draft hazard mitigation plan as Networks Northwest grant ends December 2023. The plan requires submission to Michigan State Police and FEMA for approval. There will be questions for J. Murphy on final draft. The plan will be open for public review and recommendations. Jennifer Neal requests mitigation strategies be submitted to her by January 12, 2023. Networks will be looking for specific projects to add to plan to include in strategies.

2. Region 7 Homeland Security Grant Updates

- a. Region 7 working on submission of Critical infrastructure plans for the state, due February 2023. Region 7 goal is to submit CIKR by 12/16/2022.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. J. Murphy working on submission of quarterly Activity Reports to the state. Working on critical structure plan for homeland security, due in December as a region but due in Feb 2023. Working on quarterly reports and Covid-19 Action After Report (AAR) re: COVID.

4. Training and Exercise

- a. Courtney Hessell planning EPA-GTB Spill exercises April 20-21, 2023, for both gas stations and Arthur Duhamel Marina with EPA. Courtney has a planning meeting with EPA January 6, 2023.
- b. Ice Rescue exercise at Grand Traverse County with game wardens and Leelanau February 21 ICS training and February 22 full-scale exercise on Boardman Lake.
- c. No Spills Conference February 15-17, 2023, in Traverse City. After Action Report discussion from last years spill exercise scheduled on the agenda.

5. New Business

- a. GTB sponsoring with Mira for Snowmobile race 250 at Acme, January 28-29, 2023. Tickets \$15 for weekend. No Beer Tent but there will be Food Trucks. Using GTB/SBR Fire Hydrant to build ice track.

6. Open Discussion and Updates

- a. No updates.

7. Meeting Adjourned: 10:52 a.m.

MOTION by Russ Cavanaugh, supported by Matt Ansorge, to adjourn. ALL AYES
MOTION CARRIES

Next meeting: 10:00 A.M. Thursday, February 9, 2023, zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Thursday, February 9, 2023
Time: 10:00 A.M.
Location: Tribal Police Dept – by Zoom

Call to Order

Approval of LPT Meeting Minutes from - Friday, 12/20/2022 Minutes

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan Update
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M., Thursday, April 13, 2023, GTB Tribal Police Dept Conference Room, zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Thursday, February 9, 2023
Time: 10:00 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Becky Oien (GTB TMO)
Nicki Basch (Housing Mgr./1 st EM Deputy)	Garrett Fairchild (GTB Fire)
Courtney Hessel (NRD Environmental Spec.)	Joe Huhn (Public Works)
Dave Crockett, (GTB LE)	Matt Ansorge (Leelanau Co. EM)
Rebecca Hubers (Benzie County Emg. Mgr.)	Deb Stojak (EDC Safety Officer)
Jennifer Neal (Networks Northwest)	Stephanie Marchbanks (Networks Northwest)
Victoria Alfonseca (GTB Communications)	

Meeting called to Order: 10:05am

Approval of LPT Meeting Minutes from Friday, December 20, 2022

MOTION by David Crockett, supported by Matt Ansorge, to approve the minutes of December 20, 2022, as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by David Crockett, supported by Rebecca Oien, to approve the agenda for December 20, 2022, as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. Natural Hazard Mitigation Plan – Networks Northwest community planner Jennifer Neal and Stephanie Marchbanks reviewed updated mitigation strategies with table description and consolidated strategies by Hazard Types. Discussion of FEMA Pre-Disaster Infrastructure Grants eligibility requirements to be eligible to receive assistance. Submit changes in two weeks to Jennifer Neal. Early spring public outreach. Add natural spring flooding. Currently no solution. Evaluate locations where natural spring flooding occurs such as drainage problem, funnel away but not remove it. Recheck latitude and longitude of critical infrastructure maps to determine how to display data. Considering when to conduct public meeting, possibly in May 2023. A tribal council work session with Dept Manager will be held prior to public viewing in April with 30-day posting to accept comments. Everything due mid-March to Jennifer Neal. Approve plan to FEMA May 2023 Tribal Council Special Session with LPT members present with Networks Northwest.

2. Region 7 Homeland Security Grant Updates

- a. No updates.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. PHEP Joint Partners Meeting May 8, 2023, prior to Great Lakes Homeland Security Conference. Tribal partners present information to share with local health departments on healthcare system.
- b. Great Lakes Homeland Security Conference May 9-11, 2023, Grand Rapids.

4. Training and Exercise

- a. Paradigm Pipeline Safety Training, March 9, 2023, Traverse City.
- b. Center for Domestic Preparedness 8th Annual Tribal Nations Training March 11-18, 2023, Anniston, AL.

5. New Business

- a. No updates.

6. Open Discussion and Updates

- a. GTB Oil Spill EPA training April 20-21, 2023, at LSC Showroom with exercise.
- b. Discussion of emergency shelter and warming shelter procedures.

7. Meeting Adjourned: 11:05 a.m.

MOTION by Russ Cavanaugh, supported by Suzanne McSawby, to adjourn. ALL AYES
MOTION CARRIES

Next meeting: 10:00 A.M. Friday, Thursday, April 13, 2023, zoom/location pending.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Thursday, April 13, 2023 (Rescheduled to Tuesday, 4/18/2023)
Time: 10:00 A.M.
Location: Tribal Police Dept – by Zoom

Call to Order

Approval of LPT Meeting Minutes from - Thursday, 2/9/2023 Minutes

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Networks Northwest Update – Hazard Mitigation Plan Update
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M., Thursday, June 8, 2023, GTB Tribal Police Dept Conference Room, zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Tuesday, April 18, 2023
Time: 10:00 A.M.
Location: Tribal Police Department by Zoom

Attendance:

Jolanda Murphy (GTB EM)	Becky Oien (GTB TMO)
Garrett Fairchild (GTB Fire)	Joe Huhn (Public Works)
Dave Crockett, (GTB LE)	Matt Ansorge (Leelanau Co. EM)
Deb Stojak (EDC Safety Officer)	Lori Savaso (EDC Risk Manager)

Meeting called to Order: 10:00am

Approval of LPT Meeting Minutes from Thursday, 2/9/2023

MOTION by Garrett Fairchild, supported by Lori Savaso, to approve the minutes of February 9, 2023, as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by Garrett Fairchild, supported by Lori Savaso, to approve the agenda for April 18, 2023, as presented. ALL AYES MOTION CARRIES

1. GTB Emergency Preparedness Updates:

- a. GTB Natural Hazard Mitigation plan will be reviewed with Tribal Council next month. Everyone submits in-kind forms anytime you work on natural hazard plan as these hours can be counted.

2. Region 7 Homeland Security Grant Updates

- a. Strategos Training August 13-19, 2023, at Pellston.
- b. Cybersecurity Training at Tree Tops, Gaylord April 10-11, 2023. Judy Stott, GTB Health Department, IT Dept tech and J. Murphy of Public Safety attended training.
- c. Lori providing April 28th training on cybersecurity at Turtle Creek Casino and invites were sent out.

3. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. NOAA Meteorologist meeting with Pat Bak was held April 7, 2023, held with Becky, Garrett, Russ, JoJo and Ron at Tribal PD. Overview of weather, impacts and spotter trainings.
- b. After Hours Drill with State of Michigan to contact tribal health staff after hours held April 13th.
- c. Tornado Shelters open for season and tornado siren in the process of being fixed, waiting on battery charger. Siren is tested monthly, and issue found.

4. Training and Exercise

- a. Cybersecurity Training at Tree Tops, Gaylord April 10-11, 2023.
- b. Oil Spill Training/Exercise held at Leelanau Sands Casino April 20-21, 2023, facilitated by Courtney Hessel of Natural Resource Department.
- c. Great Lakes Homeland Security Conference May 9-11, 2023.
- d. 6th North American Active Assailant Training Conference June 7-9, 2023, at Troy, MI.
- e. Lori Savaso is holding April 28th Cybersecurity Incident Response Plan training and will bring NCBRT AAT training back in the fall or winter of 2023.
- f. Active Assailant Training drills will start the first week of May 2023 for the government, facilitated by Garrett, Lori, JoJo, and officers, who received training previously. Oil Spill Response Plan meeting will be held with Lori from insurance company and Lori will follow up with Garrett.
- g. Lori and Deb of EDC are holding Aerial Lift Training and Serv Safe Training the first week of June 2023.
- h. Fire Dept. can provide CPR, First Aid, Stop the Bleed, Narcan and Epi-Pen training. Contact Garrett Fairchild.

5. New Business

- a. Natural Hazard Plan additions to plan. Add water runoff into Leelanau County and GTB Natural Hazard Plans after discussion with Matt Ansorge and Garrett Fairchild regarding M22 and Hill Top south, creek on M22 close to shoreline. Becky spoke with DJ Shook and the Road Commission will fix water runoff issue Thursday, 4/20/2023 off Rainbow End Road. Becky had discussion with Deb Allen, Leelanau County Clerk Administrator, who is aware of this issue too and failure of stream bed or culvert.

6. Open Discussion and Updates

- a. Lori had discussions with Steve Feringa and Rob Kalbfleisch on EDC parking lot gutter issue to be fixed. Steve Feringa and Rob Kalbfleisch addressing on the south side land and gutter issue of EDC, water in basement and creation of diversion from M22 roadways. M22 dips on highway creating run off and Museum drainage issues.

7. Meeting Adjourned: 10:26 a.m.

MOTION by Garrett Fairchild, supported by Lori Savaso, to adjourn. ALL AYES
MOTION CARRIES

Next meeting: 10:00 A.M. Thursday, June 8, 2023, GTB Tribal Police Department Conference Room, zoom.



GRAND TRAVERSE BAND

OF

OTTAWA AND CHIPPEWA INDIANS

Requested Meeting to Review GTB Natural Hazard Mitigation Plan Maps and GTB Mitigation Strategies of NHMP

Wednesday, May 3, 2023; 2:30 p.m-4:00 p.m.

Tribal Administration Building

Peshawbestown, Michigan

PLEASE PRINT NAME CLEARLY

- | | |
|--------------------------|--------------------------------------|
| 1. _____ | 21. <u>Donny Swallow^S</u> |
| 2. <u>Nicki Basch</u> | 22. _____ |
| 3. <u>Jelanda Murphy</u> | 23. _____ |
| 4. <u>Steve Feringa</u> | 24. _____ |
| 5. <u>Michael Long</u> | 25. _____ |
| 6. <u>[Signature]</u> | 26. _____ |
| 7. <u>Curtis Hassell</u> | 27. _____ |
| 8. <u>[Signature]</u> | 28. _____ |
| 9. _____ | 29. _____ |
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| 17. _____ | 37. _____ |
| 18. _____ | 38. _____ |
| 19. _____ | 39. _____ |
| 20. _____ | 40. <u>Jane A Fohl</u> |

5/3/2023 GTB Hazard Mitigation Planning Meeting

Tribal Council Chambers, Administration Building, Peshawbestown, MI

Council Members in attendance: Chairman Arroyo, Treasurer Swallows, Councilor Rohl, Secretary Marshall

Start # 2:40 p.m.-Jolanda Murphy introducing Stephanie Marchbanks

Stephanie- the current job plan is on the networks northwest website, as well as several litigation strategies. The purpose of the plan is, this is submitted to FEMA, and once FEMA approves it, it makes your tribe eligible to apply for pre-disaster hazard mitigation grant funding. That's the incentive to doing this, aside from it just being good planning practice.

The plan itself goes through- we had a community survey that we did online, some the results for that survey drove some of the priorities of the plan as to what you want to focus on. We do have a bit of community profile history, information we were able to obtain about your population, housing units, member age, that sort of thing. We also look at historical analyses of severe weather events. We primarily looked at Leelanau County, though, for where that event occurred. It seems to be the most common is extreme winter weather; followed by thunderstorm, wind, and severe wind; followed by hail. Wildfire is #3 with 60 wildfires on DNR lands. That is very similar to what we are doing with the other counties as far as looking at history of severe weather events.

The bulk of the plan goes into a lot of the history and evaluating the probability of a future event of that type, and the vulnerability assessment for that event. We do also talk about the public health emergency. This is not something that was discussed in a previous hazard mitigation plan done for Leelanau County. It's something new this year. We got some good input on what worked well, and what didn't work so well with how your tribe handles the public health event. We also talk about specific invasive species of concern and how that might affect your natural resources, along with a summary of impacts of climate change.

We were asking people to rank the level of concern with certain hazards, and to comment on "can you elaborate on that more". We've been working with Jolanda and her emergency planning committee throughout this whole process- it's been about 2 years, to get their input as well.

The strategies table- this is essentially a to-do list. It is not "you have to do this", it's a wish list or best practices list on how we're going to address certain natural hazards. It's broken down by category. The first page, you see "awareness and preparation" column. That's the theme for those particular strategies. Each row is a strategy. It can apply to one or more hazard types. We list who the responsible party is for implementing it. The "how" column, resources and partnerships, we have a list of resources, such as grant funding or other departmental resources you could rely on for implementing that-we'll fill that in. We have a key for that with a letter so you can reference later.

The time frame-the priority type- high, medium, or low priority. And then the 4 columns were just different types of strategies they're looking for. #1, if it's a local planning and building/regulations type of strategy; #2, if it's a building and infrastructure project; #3, natural systems protection; and #4, education and (inaudible) efforts. So there is a lot in the awareness and preparation category. A lot of

them are just 'continue what you're doing', they're not necessarily new things. We also have a section on shelter.

Councilor Rohl- I saw that, and it made me think- how they have those concrete bathrooms at most parks, we don't have that for the powwow grounds. We don't have a safe facility in case of if there's a tornado during the powwow.

Steve Feringa(I think this is who's speaking) Medicine Lodge would be the closest.

Becky Oien- we're getting some soon, hopefully

Councilor Rohl- we don't know what they're being constructed of- that's something to consider. And then it said something about 'vulnerable population'- the not-vulnerable people aren't going to get in there

Stephanie- so when we talk about 'vulnerable population,' it essentially means- folks that are lower income, folks that are out at campgrounds and outdoors- that are more exposed to hazardous weather events. And folks that live in mobile homes. That's one of the things we've marked on the maps that I'll go over with you in a minute. We could also consider all of the area in which your tribal members live as a vulnerable population. We're currently working on the plan for LTBB as well.

Page 3, #33- that strategy is evaluating the feasibility of constructing additional community storm shelters. Your suggestion for having a tornado shelter type structure at powwow grounds would fit into that.

Chairman Arroyo- would you have a funding source available for that?

Treasurer Swallows- it's a medium priority

Stephanie- (re: funding source) I will find one. The resources list goes through- local programs and orgs, but there are some grant programs. We could look into a couple of FEMA hazard mitigation grants for shelters, and also for generators. The remaining categories- we have strategies for shelters, we have strategies in building and development realm; that would be something like, you could replace a culvert in an area that floods frequently.

Councilor Rohl- this allows for additional funding?

Stephanie- possibly. There's something called a BRIC grant through FEMA, I think it stands for Building Resilient Infrastructure and Communities. They do fund infrastructure projects, but it has to be related to some sort of other type of environmental improvement/greater scope. Then there's utilities and technology. The big thing is making sure the powerlines are clear of vegetation. So working with the road commission and utility companies.

Chairman Arroyo- is it the responsibility of the homeowners if it's on someone's property, or the utility companies?

Stephanie- If it's in the right of way then I think it's utility company. We also work with utility companies to identify new, renewable sources of power. If you wanted to expand on your solar, that might be something to look into, particularly if you can document you have power outages that occur in a certain

area. Expanding availability of high-speed internet is also one of the things. Has really helped dealing with the pandemic.

Councilor Rohl- so this is all FEMA funding?

Stephanie- no; some of these strategies might be eligible for FEMA funding, and some not. I have a list that's got a code to it of the different resources. I'll put those in the column for each strategy. But it's really up to you to investigate those.

Becky- this list will help us get that funding-

Stephanie- I'll have links to a website with each one

Treasurer Swallows- how was the priority column determined?

Stephanie- Jolanda could you speak to how you prioritized the strategies?

It's just based on- if it's something we could do within the confines of time, money, and availability and access to resources. We can change the priority levels if we need to, if Council sees something different

Treasurer Swallows- the timeline- if it says 'ongoing' it means we're already doing it?

Stephanie- correct. Some of these things are just 'keep doing what you're doing'.

Stephanie- These plans are good for 5 years. After 5 years, you have to submit a new plan to FEMA. ... so, our current one is expired. It was approved in July 2016. Expired in 2021. Many of the other counties in Michigan plans have expired also. This will need to come to Tribal Council for approval.

....

Stephanie- we also have environment and natural resources themed strategies. A lot of them are focused on invasive species reduction. Your NRD staff is working on a lot of that. And also working with your other partners for land management outside the tribe.

At this time, maps are presented. Stephanie- these are so detailed because we included all the counties where you have land. This is an environmental features map. It shows wetlands that are regulated, jurisdictional boundaries, steep slopes greater than 30% are highlighted. We also included the reservation boundaries. Green=1855; pink=1836. Anything in green is a pine forest area. We highlight that because those are the most flammable tree types.

Stephanie- this one is just a basic infrastructure map. We pull the data from whatever data we can get online. Stream crossing inventory; green= restored road stream crossing, yellow=minor repairs needed; anything in orange or red is moderate to severe. Lot of orange and red in Ptown area. We also included dams and their condition. Green=satisfactory, etc. and then we have bridges. We used MDOT data. Then we have just your critical infrastructure points. We have symbols for commercial (essentially means the casinos), etc., it's a large map and a lot of the symbols overlap.

Further discussion of the maps ongoing. Stephanie- this is our hazard areas map. The areas that we can map geographically for hazard areas; blue for flooding, shoreline erosion is in purple, primarily along the

west coast; fire areas- in some counties this corresponds to pine forest areas. When working on Benzie county's plan, they specifically said Mancelona township was their primary fire area concern. This next map shows the hazard areas with critical infrastructure points added. You can see where your infrastructure is overlaid with the hazard areas.

This map shows where your population density is. It shows where the concentrations of your tribal members are without giving away private address info.

Treasurer Swallows- how did we incorporate all the Herkner property data that is going to increase population? Herkner will have 98 units; elsewhere, 89 units plus homeowners

Stephanie- when you update the plan, you'll have to provide updated address data. You could also do a plan addendum. ... we'll make sure we put some anticipated numbers in for member population increase. That's really all I have. If you want to come up and look at the maps, feel free to, they're also available online. Is there anything else you would want to see on a map?

Chairman Arroyo- it doesn't really have much to do with the strategies, but we've had several collaboration projects where we helped with a culvert or bridge; that detail may be helpful to have on there. I don't know if that's needed, but something to think about.

?- we could include it- do you have a map product of where those projects are?

?- my department has something like that.

Stephanie- depends on how much time it would take. We're at the end of this process, kind of wrapping things up. That's all I have unless there are any other questions?

Treasurer Swallows- re: invasive species, does that include plants also?

Stephanie- it does include terrestrial and aquatic.

Councilor Rohl- I looked up the FEMA website- they received \$45 billion in ARPA funds. What were those funds used for?

Stephanie- I don't know what that's about in relation to this

?- in terms of grant applications, if there are updates based on population shift, does that improve or increase the grants we will be able to apply for?

Stephanie- once this is done, it should be good for 5 years. Unless you have a major change you want to make to the plan. When FEMA is looking at funding hazard mitigation grants, they look at your plan and say, where in the plan do they mention this problem? So, it has to be discussed. That is also why we have so many strategies. Trying to be as broad as possible. If a new issue comes up, you'd need to do an addendum. Once the final draft is all put together, you'll have a public comment period. Usually about a month or so. Any comment comes back to me. You, at a tribal council meeting, hold the public hearing on the plan and then you vote to- whether or not you want to submit it to Michigan State Police. So it's the homeland security division MSP that gets it first. And then once they- they have a checklist and if you meet all the criteria, they send it to FEMA. The state sends it to FEMA. That process can take at least 3 months. We need to have this finished by December 31. Once FEMA sends the approval letter back, you officially adopt it. Sent to FEMA hopefully by July- August at the latest.

Treasurer Swallows- So December 31 is FEMA's-

Stephanie- Networks Northwest applied for a grant to help communities write their plans. Our grant timeframe ends on December 31. I don't see it going any longer than that, I think it will be a pretty straight forward process. So, once FEMA reviews it, hopefully they say 'great, approved' and then we bring it back to Council for adoption. .. FEMA's requirements for the plan updates are getting more stringent. They are requesting more info. There is a grant match for this. It should be \$11,000 that the tribe has committed in-kind. I didn't bring in-kind forms with me today; if you could all fill one out and send it back to JoJo, for your time today, that counts towards the in-kind match.

Councilor Rohl- so does it deal with disasters out in the water?

JoJo- it's to address mitigation- if we see that, we could put it in there to say 'ok we want to address a shoreline erosion issue' or something, that would be a mitigation strategy, and then we put it in our plan so we can start looking for some funding for that. But you're saying if something happened today?

Councilor Rohl- I was thinking more like...a storm on the water- we have fishers out there all the time. How are we protecting them?

?- that would come down to a warning system on your phone

JoJo- so it would be looking at how can we address that. A shoreline siren or something- if the waves are high, don't go out. Warn the fishers ahead of time that this is not a good day to be out on the water.

DS- you work with other counties also on developing their plans- have you seen anything that they may have included that we've missed?

Stephanie- a lot of your strategies are copied from theirs, so there's a lot of similarities. Because you share lake Michigan shoreline, Benzie County and Manistee, anything that has to do with environment or natural resources, you probably have the same strategies. There is a lot of overlap. I don't think there's anything missing. So, it would be an awareness and preparation type of strategy for making sure fishermen... we could add something in here

Chairman Arroyo- would be good to include it

Councilor Rohl- we had waterspouts last year

Stephanie- waterspouts would be a coastal or shoreline hazard. Right now, we've just got it covering erosion, shoreline flooding, dangerous currents; I could also talk about waterspouts.

Treasurer Swallows- so does this mainly just cover climate type storms?

Stephanie- weather related, primarily. Exceptions are the pandemic preparation. That's a public health emergency type situation. And then invasive species. Dam failure is discussed- that's a technological hazard. You have dams throughout the counties but you don't have any on tribal property, I don't think.

Treasurer Swallows- I was thinking of oil spills, and what that does, and how far it may travel. If anything ever happened to line 5, with the right weather that could travel very quickly to our area.

Stephanie- that wasn't part of our scope of work. That's more of a technological hazard.

Treasurer Swallows- so if it's not in there, and if that happens, FEMA doesn't get involved?

Lori Savaso- they still would. If something like that happened.

Treasurer Swallows- but it wouldn't be involved with the tribe then, it would be involved with the state?

Stephanie- I think the way I understand it is, the Chairman would declare a national disaster within the tribe. And then that would open up FEMA. If we declare national emergency, then we can get Federal funding, even if the state hasn't declared it. The tribe can declare their own state of emergency. Little River band suggested looking into developing a program where they have a mobile generator or two that they could bring out to certain people that would need to rely on electricity for powering medical devices.

Stephanie- strategy #52 is 'continue to maintain effective communications practices with utility companies re: power restoration after storms.

Discussion of large storm in ~2012 that knocked out power to peninsula for over a week.

As of 2013, federally recognized tribal governments have the option to request a presidential emergency major disaster declaration independent of the state.

Meeting ended at 3:42 p.m.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

AGENDA

Date: Thursday, September 28, 2023 (Rescheduled from Thursday, June 8, 2023)
Time: 11:00 A.M.
Location: Tribal Police Dept Conference Room and Zoom.

Call to Order

Approval of LPT Meeting Minutes from - Tuesday, 4/18/2023 Minutes

Approval of Agenda

- 1. GTB Emergency Preparedness Updates**
 - a. Hazard Mitigation Plan Update
- 2. Region 7 Homeland Security Grant Updates**
- 3. Public Health Emergency Preparedness (PHEP) Grant Updates**
- 4. Training and Exercise**
- 5. New Business**
- 6. Open Discussion and Updates**
- 7. Meeting Adjourned**

Next meeting: 10:00 A.M., Thursday, November 9, 2023, GTB Tribal Police Dept Conference Room and Zoom.

Grand Traverse Band LOCAL PLANNING TEAM (LPT)

MINUTES

Date: Thursday, September 28, 2023
Time: 11:00 A.M.
Location: Tribal Police Department Conference Room and Zoom

Attendance:

Jolanda Murphy (GTB EM)	Becky Oien (GTB TMO)
Garrett Fairchild (GTB Fire)	Joe Huhn (Public Works)
Dave Crockett, (GTB LE)	Scott Mitchell (Env'l Response Specialist)
Nicki Basch (GTB EMC-1 / Housing)	Courtney Hessel (Env. Svs. Coord.)
Russ Cavanaugh (GTB LE)	Suzanne McSawby (GTB LES)
Kathy Tahtinen, (GTB Human Svs.)	Steve Feringa (GTB Architect)
Rebecca Hubers (Benzie EM)	

Meeting called to Order: 11:05am

Approval of LPT Meeting Minutes from Thursday, 2/9/2023

MOTION by David Crockett, supported by Garrett Fairchild, to approve the minutes of February 9, 2023, as presented. ALL AYES MOTION CARRIES

Approval of Today's Agenda

MOTION by _____, supported by _____, to approve the agenda for September 28, 2023, as presented. ALL AYES MOTION CARRIES

- 1. Introductions** added to Agenda due to new employees. The new Natural Resource staff is Scott Mitchell, Environmental Response Specialist.
- 2. GTB Emergency Preparedness Updates:**
 - a. GTB Natural Hazard Mitigation Plan (NHMP) 2023 Final Draft received from Networks Northwest for review and comments. The NHMP Draft will be submitted to Tribal Council next month to post for public comment. Request review and provide answers to some of the blank areas in the plan and to eight questions specific to housing, elders, animal, and invasive species. GTB Master Plan will be updated by GTEC and Tribal Council unadopted previous plan. Steve will provide an answer to address Master Plan question. Courtney reviewing mitigation strategies #35, 36, human services review #34 on weatherization of homes. Housing new builds at Herkner has green policies to follow and these should fall under #34, 35 and 36 and Nicki will submit information to Stephanie. Herkner housing adding safe areas in the basement with generator support for heat and cooling. Total of 88 units at Herkner, best available refuge area (BARA). The BARA is not specific to tornado shelter so able to add BARA to address strategies 34, 35, 36 and 26 organizing and informing people of community center facility. Good Will may have database on elderly death statistics. Housing utilizes signage, red (need assistance) and green (okay) window signs to notify law enforcement if they need help or not during power outages, etc.

The NHMP will be sent to Agricultural and Cultural Dept to address animal, plant and cultural strategy questions. Request clarification with Networks Northwest on number of housing units' question if it is specific to Housing units or all tribal member homes in six county service areas on GTB lands. A question was asked on adoption of other county hazard mitigation plans. GTB has adopted other counties in the past and we will do the same again due to tribal lands in the six counties.

3. Region 7 Homeland Security Grant Updates

- a. Michigan Emergency Management Association (MEMA) Conference October 9-11, 2023, at Shanty Creek.
- b. American Red Cross moved to new location in Traverse City.
- c. Natural Hazard Mitigation Plan proceeding with other counties n Region 7.

4. Public Health Emergency Preparedness (PHEP) Grant Updates

- a. PHEP Grant transferred to GTB Health Department and Health Administrator.
- b. PHEP Grant funds a portion of Regroup mass notification system and assists with public/tribal health vaccine clinics and training and exercises.

5. Training and Exercise

- a. MICIMS Basic and Refresher Training October 23, 2023, at Benzie. Email Rebecca Hubers, Benzie EM to sign up.
- b. FEMA FCC nationwide test around 2:00 PM scheduled on October 4, 2023. This notification was sent out on Regroup.
- c. NCRBT Active Assailant Run, Hide, Fight training scheduled for Government employees December 7-8, 2023, at Leelanau Sands Casino.
- d. Evacuation Order error on regroup sent out last week to department managers on fire alarm at LSC and was mistakenly sent to everyone. Lori Savaso will address and fix. Another message was sent out that everything was all clear. GTB will address different types of alerts on Regroup, specific to emergency situations and generic messages.
- e. North American Active Assailant Conference, June 5-7, 2024, in Troy, Michigan and 3,000 participants allowed. Save the Date. Registration will open soon. Excellent conference to attend.
- f. NCBRT Active Assailant Joint Training with Grand Traverse County and GTB law enforcement, fire, and EMS March 11-13, 2024, in Traverse City.
- g. FEMA CDP Tribal Nations Emergency Preparedness Training March 10-16, 2024, Anniston, Alabama.
- h. Enbridge Tabletop Exercise October 17-18, 2023, in person and virtual in Watersmeet Line 5 Oil Spill training.
- i. Natural Resources is considering holding GTB practical training on deploying booms with EPA in spring 2024.

6. New Business

- a. None.

7. Open Discussion and Updates

- a. Fire Department updating GTB Emergency Guide which has different emergencies listed for CPR, flooding, bomb threats, etc. The guides will be updated and printed for employees. Added Stop the Bleed and Active Assailant information.
- b. Smoke alarms expiring next year and the Fire Dept working with State to replenish smoke and carbon monoxide alarms.
- c. Fire Dept getting with State on M22 flooding issue.
- d. Human Services has Narcan available and Narcan boxes were installed in tribal buildings. Rite-Aid has Narcan availability advertised. Scott Scholten, Kathy Tahtinen, and GTB Fire staff are trained to teach Narcan with power point.
- e. Fire extinguishers training added to CPR and first aid training.
- f. The Fire Dept is working on emergency coordination, so everyone is covered if a fire department is on a large fire scene. EMS license renewed for another year.
- g. Fire Dept working on full-scale exercise next year due to training program requirement. If you have ideas for exercise, send information to the Fire Chief.

8. Meeting Adjourned: 12:07 PM

MOTION by Suzanne McSawby, supported by David Crockett, to adjourn.

ALL AYES

MOTION CARRIES

Next meeting: 10:00 A.M. Thursday, November 9, 2023, GTB Tribal Police Department Conference Room and Zoom.

Winslow, Doris <Doris.Winslow@gtb-nsn.gov>
to Murphy, Jolanda, A

You are viewing an attached message. Networks Northwest Mail can't verify the authenticity of attached messages.

It is perfect and works well!!

Doris Winslow

Work 231-534-7965 / Cell 231-866-1108 / Fax 231-534-7112

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From: gtbindians@regroupcloud.com <gtbindians@regroupcloud.com>
Sent: Thursday, October 19, 2023 12:28 PM
To: Winslow, Doris <Doris.Winslow@gtb-nsn.gov>
Subject: [GTB Message] Grand Traverse Band of Ottawa and Chippewa Indians (GTB) Natural Hazard Mitigation Plan 2023

Grand Traverse Band of Ottawa and Chippewa Indians (GTB) Natural Hazard Mitigation Plan 2023

The Grand Traverse Band of Ottawa and Chippewa Indians and Networks Northwest is updating the Natural Hazard Mitigation Plan, which must be updated every 5 years for communities to apply for pre-disaster, hazard mitigation grant funds from FEMA. The plan is in accordance with the Disaster Mitigation Act of 2000.

Hazards such as climate change, wildfires, severe weather, floods, invasive species, drought, and public health emergencies can have significant impacts on families and in the community. The natural hazard mitigation plan is to identify hazards and reduce long-term risks to people and property through mitigation strategies and build sustainability and resiliency in communities.

Public comments and questions regarding the plan are requested in person at the GTB Membership Meeting at the Grand Traverse Resort or by mail through Saturday, 10/28/2023 at Grand Traverse Band of Ottawa and Chippewa Indians, 2605 N. West Bay Shore Drive, Peshawbestown, MI 49682 or by email to Jolanda.Murphy@gtb-nsn.gov

GTB Natural Hazard Mitigation Plan 2023 - Northwest Networks Here: https://bit.ly/GTBHM_NN

Grand Traverse Band of Ottawa and Chippewa Indians

Public Comments Welcome for the
GTB Natural Hazard Mitigation Plan 2023

The Grand Traverse Band of Ottawa and Chippewa Indians and Networks Northwest is updating the Natural Hazard Mitigation Plan, which must be updated every 5 years for communities to apply for pre-disaster, hazard mitigation grant funds from FEMA. The plan is in accordance with the Disaster Mitigation Act of 2000.

Hazards such as climate change, wildfires, severe weather, floods, invasive species, drought, and public health emergencies can have significant impacts on families and in the community. The natural hazard mitigation plan is to identify hazards and reduce long-term risks to people and property through mitigation strategies and build sustainability and resiliency in communities.

Public comments and questions regarding the plan are requested in person at the GTB Membership Meeting at the Grand Traverse Resort or by mail through Saturday, 10/28/2023 at Grand Traverse Band of Ottawa and Chippewa Indians, 2605 N. West Bay Shore Drive, Peshawbestown, MI 49682 or by email to Jolanda.Murphy@gtb-nsn.gov. To view [GTB Natural Hazard Mitigation Plan 2023](#) [GTB Natural Hazard Mitigation Plan 2023 - Draft](#) For more information, go to [Networks Northwest: https://bit.ly/GTBHM_NN](https://bit.ly/GTBHM_NN)

Hazard and Protection Activities are used courtesy of FEMA and are available at <https://www.fema.gov/prepare/prepare-for-disasters> or have reached out to EMM@regroupcloud.com with questions.

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NFIP Data Request

Sink, James <james.sink@fema.dhs.gov>
To: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>
Cc: "Radics, Minh-Huy (EGLE)" <RadicsM@michigan.gov>, "Killen, Brian" <brian.killen@fema.dhs.gov>, FEMA-R5-NFIP-DataRequest <fema-r5-nfip-datarequest@fema.dhs.gov>

Thu, Feb 22, 2024 at 2:51 PM

Ok! I will work on pulling the aggregate information and get it to you by tomorrow morning!

From: Stephanie Marchbanks <stephanie.marchbanks@networksnorthwest.org>
Sent: Thursday, February 22, 2024 1:48 PM
To: Sink, James <james.sink@fema.dhs.gov>
Cc: Radics, Minh-Huy (EGLE) <RadicsM@michigan.gov>; Killen, Brian <brian.killen@fema.dhs.gov>; FEMA-R5-NFIP-DataRequest <fema-r5-nfip-datarequest@fema.dhs.gov>
Subject: Re: NFIP Data Request

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Hi James,

I am only looking for aggregate data that would not include names and specific property addresses that would provide this information:

- Estimated numbers and types (residential, commercial, institution, etc.) and County; Community Name/City; Community Number; Mitigated? (y/n); and NFIP Insured? (y/n).

I am also copying Susan Conradson, Floodplain Engineer with MI EGLE for the northern counties in the lower Michigan peninsula, on this email; I emailed her earlier this week requesting the same information for other counties in the NW Lower Peninsula within her region of work, and she is out of the office until next week.

So, in sum, I am looking for information on NFIP Repetitive Loss Properties for all NFIP-participating jurisdictions within these counties:

Antrim
Benzie
Charlevoix
Emmet
Grand Traverse
Kent
Lake
Leelanau
Manistee
Mason
Muskegon
Newaygo
Oceana
Ottawa
Wexford

Do you need me to provide you with a list of each NFIP-participating community within these counties, or can you search for the information I requested based on county name?

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

Desk: 231.439.5247

Mobile: 231.590.0930

stephanie.marchbanks@networksnorthwest.org

2240 Mitchell Park Dr., Suite B

Petoskey MI 49770

On Thu, Feb 22, 2024 at 12:18 PM Sink, James <james.sink@fema.dhs.gov> wrote:

Good afternoon, Stephanie. Your request for NFIP data (repetitive loss properties) was forwarded to me. I am able to provide aggregate data without an Information Sharing and Access Agreement (ISAA); however, information that can be tied to a specific person or property is restricted by the Privacy Act of 1974 (as amended).

If you require only aggregate data, please let me know the communities for which you are seeking information. If you require more detailed information, please complete the attached template letter, sign it, and send it to fema-r5-nfip-datarequest@fema.dhs.gov. From there, the request will be routed to FEMA headquarters for further action.

Please be aware that if you are a contractor supporting the hazard mitigation planning process, contract information will be required to complete the ISAA. There is a space in the template letter to provide the required information.

Should you have questions or need any assistance, please let me know.

James G. Sink

Regional Flood Insurance Liaison | Mitigation Division | FEMA Region 5

(C) 202-285-8519

james.sink@fema.dhs.gov

Federal Emergency Management Agency

[fema.gov](https://www.fema.gov)



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