KEWEENAW BAY INDIAN
COMMUNITY
2020-2025

Hazard Mitigation Plan

Keweenaw Bay
Indian Community

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SECTION 1: Acknowledgements

The Keweenaw Bay Indian Community Hazard Mitigation Plan (KBIC-HMP) is the culmination of the interdisciplinary and interagency planning effort that required the assistance and expertise of numerous agencies, organizations, and individuals. Without the technical assistance and contributions of time and ideas of these agencies, organizations, and individuals, the KBIC-HMP could not have been completed.

Each entity within Keweenaw Bay Indian Community (KBIC) reservation and on lands owned by the KBIC is a continuing participant in the update of the KBIC-HMP. The following is a list of key contributors who are instrumental in the development of the KBIC-HMP:

- KBIC Tribal Council
- KBIC Local Planning Team
    - (Office of Planning & Development, Tribal Police, Natural Resources Department, KBIC Fire & Emergency Management, CEO's Office and the Baraga County Road Commission)
- The KBIC tribal community that provided input and comments
- KBIC Government departments that provided valuable feedback and comments
- Western U.P. Planning & Development Region (WUPPDR)

SECTION 2: Resolutions of Adoption and Final FEMA Letter of Transmittal

KEWEENAW BAY INDIAN COMMUNITY

Keweenaw Bay Tribal Center
16429 Beartown Road
Baraga, Michigan 49908
Phone (906) 353-6623
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2020 TRIBAL COUNCIL

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GARY F. LOONSFOOT, JR., Vice President
KIM KLOPSTEIN, Secretary
TONI J. MINTON, Assistant Secretary
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DON MESSER

RESOLUTION
KB-007-2021
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KEWEENAW BAY INDIAN COMMUNITY 2020 HAZARD MITIGATION PLAN ADOPTION

WHEREAS: the Keweenaw Bay Indian Community is a federally recognized Indian Tribe exercising inherent sovereign authority over its members and its territories, and the Keweenaw Bay Indian Community has a reservation created pursuant to the 1854 Treaty with the Chippewa, 10 Stat. 1109; and

WHEREAS: the Keweenaw Bay Indian Community is organized pursuant to the provisions of the Indian Reorganization Act of 1934, (48 Stat. 984, 25 U.S.C. §5123) with a Constitution and Bylaws duly approved by the Secretary of the United States Department of the Interior on December 17, 1936; and

WHEREAS: Article VI, Section 1 (a) of the Constitution imposes a duty on the Tribal Council to protect the health, security and general welfare of the Keweenaw Bay Indian Community; and

WHEREAS: the Keweenaw Bay Indian Community has prepared a Hazard Mitigation Plan that outlines options to reduce overall damage and impact from natural hazards; and

WHEREAS: the Keweenaw Bay Indian Community has reviewed and updated the Hazard Mitigation Plan on the five-year cycle as required; and

WHEREAS: the Keweenaw Bay Indian Community has reviewed and updated the Hazard Mitigation Plan on the five-year cycle as required; and

WHEREAS: the Keweenaw Bay Indian Community has provided opportunities to review and comment on Hazard Mitigation Plan have been provided to the public, and local, state and federal agencies;

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NOW THEREFORE BE IT RESOLVED: the Keweenaw Bay Indian Community Tribal Council formally adopt the updated Keweenaw Bay Indian Community Hazard Mitigation Plan dated January 20, 2021, as an official plan of the Keweenaw Bay Indian Community. The Natural Resources Department shall submit a written report to Tribal Council when updates, revisions, or other actions are recommended or required, at a minimum once every five years.

RESOLUTION
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CERTIFICATION

We, Warren C. Swartz, Jr., President and Kim Klopstein, Secretary of the Keweenaw Bay Indian Community, do hereby certify that this Resolution No. KB-007-2021 to be a true and exact copy as approved by the Tribal Council of the Keweenaw Bay Indian Community at a duly called meeting held on January 20, 2020 there being a quorum present, by a vote of: 9 In Favor, 1 Opposed, and 0 Abstentions, as follows:

Vice President, Gary F. Loonsfoot, Jr.:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Secretary, Kim Klopstein:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Assistant Secretary, Toni J. Minton:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Treasurer, Doreen G. Blaker:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Councilperson, Robert R.D. Curtis, Jr.:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Councilperson, Eddy Edwards:	AYE	(NAY)	ABSTAIN	NOT PRESENT
Councilperson, Dale F. Goodreau:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Councilperson, Randall R. Haataja:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Councilperson, Susan J. LaFernier:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Councilperson, Rodney Loonsfoot:	(AYE)	NAY	ABSTAIN	NOT PRESENT
Councilperson, Don Messer:	AYE	NAY	ABSTAIN	(NOT PRESENT)
President, Warren C. Swartz, Jr.:	AYE (If Required)	NAY	ABSTAIN	NOT PRESENT

Warren C. Swartz, Jr., President

Kim Klopstein, Secretary

SECTION 3: Preface

Local governments and tribal governments have a responsibility to protect the health, safety and welfare of their citizens. Planning and implementing hazard mitigation are effective ways for local governments to reduce the risk of injury, loss of life, and property damage in their community. When properly implemented, hazard mitigation is an investment in public health, infrastructure and the economy of a community.

Hazard mitigation is any action taken before, during, and after a disaster to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards. This procedure is an essential element of emergency management, along with preparedness, response, and recovery. Emergency management includes four phases: (1) a community prepares for a disaster; (2) responds when it occurs; and then there is a transition into the recovery process, during which mitigation measures are (3) evaluated and (4) adopted.

The mission of the KBIC-HMP is to: permanently eliminate or reduce long-term risks to people and property from natural hazards so that the Community can be sustained and strengthened. This can be accomplished through collaborative efforts/activities amongst agencies within the Keweenaw Bay Indian Community.

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. This process is needed to ensure 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.

Recognizing the importance of reducing community vulnerability to natural hazards, KBIC seeks to actively address the issues through the development and implementations of this plan. The many benefits to be realized from this effort are:

Community Benefits of a Natural Hazard Mitigation Plan
Protection of the public health and safety
Preservation and Growth of essential services
Prevention of property and critical infrastructure damage
Preservation of the local economic and cultural assets

This process will help ensure that the reservation and owned lands of the KBIC remain vibrant, sustainable, safe, enjoyable places in which to live, raise families, continue to conduct business, and maintain habitats for hunting, fishing, and gathering.

SECTION 4: Executive Summary

In 2000, the Disaster Mitigation Act shifted the Federal Emergency Management Agency's (FEMA) scope of work to promoting and supporting prevention, or what is called hazard mitigation planning. FEMA now requires government entities to have hazard mitigation plans in place and updated on a 5-year cycle as conditions for receiving grant money, such as hazard mitigation grant program funds, in the future.

To meet this requirement, the Michigan State Police provided funding and guidance to encourage regional cooperation in the development of individual county Hazards Mitigation Plans. The Western Upper Peninsula Hazard Mitigation Planning Project update was coordinated by the Western U.P. Planning and Development Region (WUPPDR). The updates included Baraga, Gogebic, Houghton, Iron, Keweenaw, and Ontonagon counties and was expanded to include the KBIC-HMP.

WUPPDR works with local planning teams to update the county plans for these counties as well as the KBIC Tribal Government for the KBIC-HMP, which includes a general community profile, a comprehensive inventory of existing hazards, risk assessment, goals and objectives, and feasible mitigation strategies to address the prioritized hazards.

The KBIC-HMP focuses on natural hazards such as drought, wildfires, flooding, shoreline erosion, thunderstorms and high winds, tornadoes, and extreme winter weather, and was created to protect the health, safety, and economic interests of the residents and businesses by reducing the impacts of natural hazards through planning, awareness, and implementation. Through the KBIC-HMP, a broad perspective was taken in examining multiple natural hazards mitigation activities and opportunities in KBIC Tribal areas. Each natural hazard was analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigation action.

The KBIC-HMP serves as the foundation for natural hazard mitigation activities and actions within the KBIC Tribal 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:

The 2020 HMP presents documentation of the planning process and how hazard mitigation resources have been organized (Section 5), characterization of natural hazards and a risk assessment (Sections 9 and 10), provides an overview of the community (Section 6) and its mitigation capabilities (Section 11), presents the community's goals for hazard mitigation including a comprehensive set of strategies to reduce vulnerability (Section 12), and includes a maintenance plan for the HMP (Sections 11 and 12). Appendices provide reference sources and supporting documentation. The mitigation planning process encourages coordination among tribal authorities and other governmental agencies, tribal members, residents, businesses, academia, and nonprofit groups and promotes their participation in the plan development and implementation process. This broad-based approach enables the development of mitigation actions that are supported by tribal members and other stakeholders and that reflect the needs of the Tribal government.

SECTION 5: Plan Authority and Purpose of the KBIC-HMP

In recognition of tribal sovereignty and the government-to-government relationship that FEMA has with Tribal governments, FEMA amended 44 CFR Part 201 at 72 Fed. Reg. 61720, on October 31, 2007, and again at 74 Fed. Reg. 47471, on September 16, 2009, to consolidate and clarify the requirements for Tribal governments, establish Tribal Mitigation Plans separately from State and Local Mitigation Plans, and finalize the Mitigation Planning rule. Tribal governments with an approved Tribal Mitigation Plan in accordance with 44 CFR 201.7 may apply for assistance from FEMA as a grantee. A grantee is an entity such as a State, territory, or Tribal government to which a grant is awarded and that is accountable for the funds provided. Tribal government 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 its plan whenever necessary to reflect changes in tribal or Federal laws and statutes, [44 CFR § 201.7(c)(6)].

The purpose of the KBIC-HMP is to find solutions to existing problems, anticipate future problems, prevent wasteful public and private expenditures, protect people and their properties, and allocate land resources. The implementation of the KBIC-HMP is intended to prevent injury, loss of life, property damage, breakdown in vital services like transportation and infrastructure, economic slumps, diminished tourist activity, liability issues, and damage to the community's treaty protected resources. For KBIC Tribal lands in the Upper Peninsula of Michigan, the planning process utilized the following steps in the development of the KBIC-HMP. Emphasis was placed on natural hazards that have had significant impact on the community in the past.

Steps in the Planning Process
Identification of natural hazards and risk
Preparation of draft plan
Identification of natural hazards mitigation goals and objectives for emergency management programs
Selection of evaluation criteria
Selection of mitigation strategies using locally chosen criteria
Public Comment
Completion of the final plan

What is a Hazard?

A hazard is an event or physical condition that has potential to cause fatalities, injuries, property damage, infrastructure damage, and agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. The KBIC-HMP focuses on principle natural hazards that affect KBIC Tribal lands. The KBIC-HMP is intended to be a resource for building

coordination and cooperation within a community for local control of future mitigation and community preparedness.

Principal Natural Hazards for Keweenaw Bay Indian Community
Severe Storms (Thunderstorms, Winter storms)
Severe Winds
Dam Failure
Extreme Temperatures
Flooding
Wildfires and Structural Fires
Drought
Subsidence (Ground Collapse)

What is Mitigation?

Mitigation is the sustained action taken to lessen the impact from natural hazards and to work to reduce the long-term risk to human life and property, and their effects. This long-term planning distinguishes mitigation from actions geared primarily to emergency preparedness and short-term recovery. Mitigation distinguishes itself by dedicating itself to breaking cycles of damage and reconstruction. The KBIC-HMP can be used as a tool to identify and profile hazards, to lessen the impact, to support and be compatible with community goals, to lay out considerations in choosing, executing, and evaluating methods, and to look at the feasibility of mitigation strategies – especially as it pertains to types of FEMA and other agencies' mitigation project funding and non-emergency disaster assistance.

SECTION 6: Community Profile

This section will provide detailed information on the history, geography, climate, population, economy, cultural resources, emergency services, and critical facilities of the Keweenaw Bay Indian Community (KBIC), L'Anse Reservation, and Off-Reservation Trust Land. KBIC is a Lake Superior tribal community that have an active subsistence and ceremonial life with rights to these activities being secured by the Treaty of 1842.

History

The Keweenaw Bay Indian Community Lake Superior Band of Chippewa Indians are part of a larger Native American nation known as the Anishinaabe. They are one of the largest groups in North America with nearly 150 different bands living in present-date United States and Canada[1]. The Anishinaabe are currently known by many different names: the Chippewa, Ojibway, Ojibwe, or Ojibwa, as well as the Ottawa or Odawa and Potawatomi. All these names refer to the larger group that originated from the Great Salt Water (Atlantic Ocean) on the eastern shores of North America.

Families share social ties through a tribal-wide network of totemic clans. Traditionally, the Ojibwe Odoodemiwag (Clan System) was created to provide leadership and structure to care for these needs. There were seven original clans given duties to provide the structure needed to care for the people. The seven original clans have expanded into over twenty different clans according to region. The duties and responsibilities of the different clans within the system of government remain and the Clan System continues to build on equal justice, voice, law and order and reinforcement of teachings and principles of a sacred way of life.[2]

Many of the Anishinaabe group names can be sourced from the Anishinaabe Migration that took place many generations ago. The migration is believed to have begun at around 900 A.D. and continue for approximately 500 years. It included seven major stopping points along the south shores of the St. Lawrence River, and proceeded among all the Great Lakes. The final stop for KBIC was Lake Superior's Keweenaw Bay.

As the successor of the L'Anse and Ontonagon Bands of Lake Superior Chippewa Indians, KBIC is the signatory to two peace treaties made with the United States, an inherent recognition of their status as sovereign nation[3]. In the 1842 *Treaty with the Chippewa*, KBIC reserved their existing rights to hunt, fish, gather, and worship within the ceded territory for their people in perpetuity. The 1854 Treaty with the Chippewa addresses these rights and established the L'Anse Indian Reservation. Reservations lands contain about 59,000 acres and are primarily

[1] Gagnon, Valoree. (2016). Ojibwe Gichigami ("Ojibwa's Great Sea"): an intersecting history of treaty rights, tribal fish harvesting, and toxic risk in Keweenaw Bay, United States. *Water History*. 8. 10.1007/s12685-016-0185-7.
[2] Natural Resources Department (2014) KBIC Wildlife Stewardship Plan, page 7
[3] Keweenaw Bay Indian Community (KBIC) (2013) Keweenaw Bay Indian Community application for programmatic approval under section 303 of the clean water act

located in Baraga County with smaller land tracts in Ontonagon and Marquette Counties. All Reservation land sits within 70 miles of the southern Lake Superior shoreline.

In December 1936, KBIC achieved federal recognition upon adoption of their Constitution and By-laws, making them the oldest and largest federally recognized Indian Tribe in the State of Michigan. This marks the beginning of KBIC as the legal and political entity it is today.

Government

The KBIC constitution and by-laws were approved on December 17, 1936 and a corporate charter was ratified on July 17, 1937, pursuant to the 1934 Indian Reorganization Act. The legislative body consists of a 12-member Tribal Council with six elected representatives from two voting districts. Elections are held in December annually for three-year terms, where one-third of the Council is up for re-election annually.

There are approximately 1,100 enrolled Tribal members, some residing within the L'Anse Reservation boundaries, or in Baraga County. Approximately 36% of land holdings are owned by KBIC, with the remaining 64% owned by individual Tribal and non-Tribal members, local governments, or area businesses.

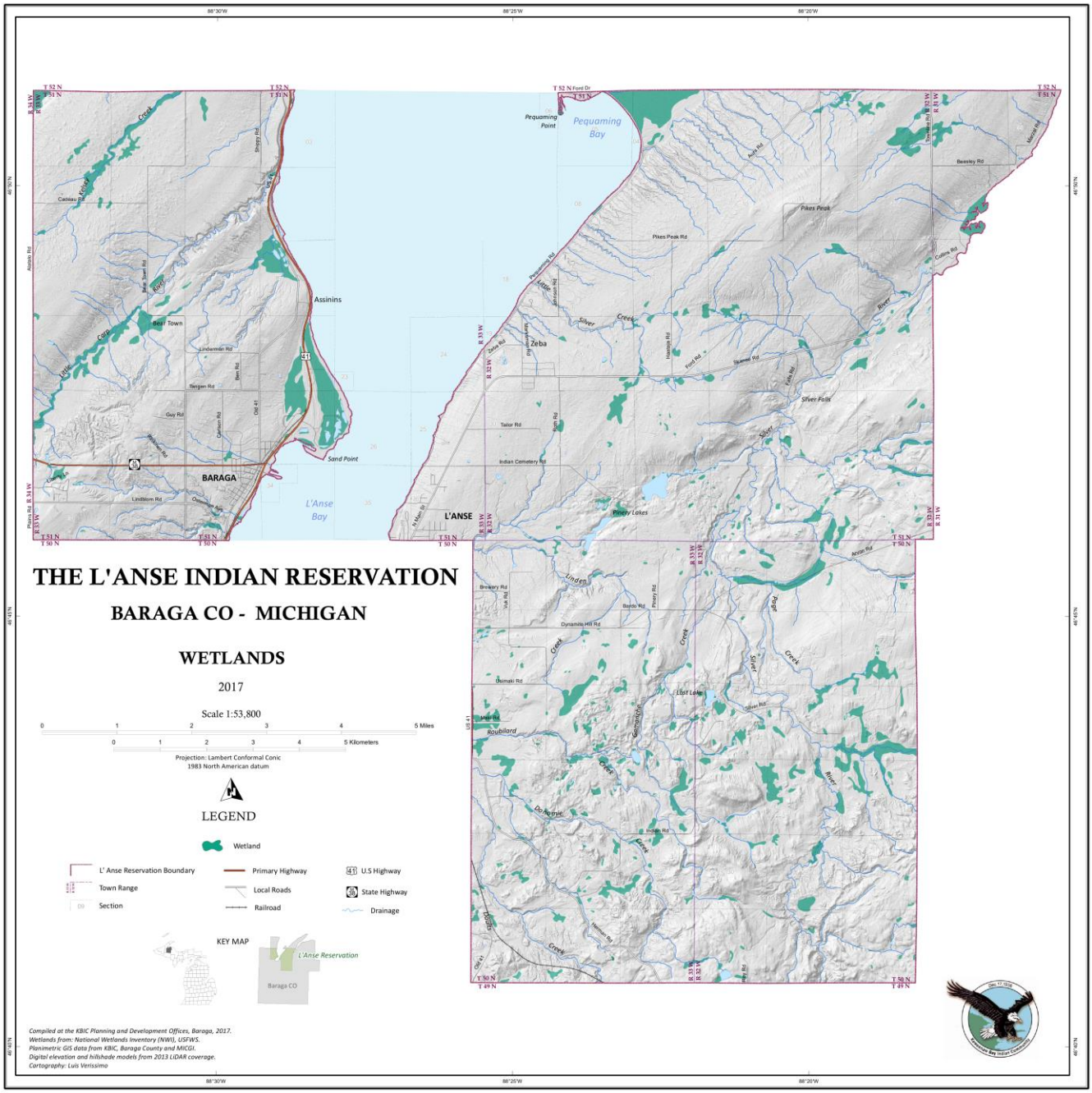
Geography and Climate

The L'Anse Indian Reservation covers portions of T50N R32W, T50N R33W, T51N R31W, T51N R32W, and T51N R33W. The original Reservation area established by the Treaty of 1854 was 54,664 acres and was allotted to individual Tribal members. The total KBIC land ownership is now 18,811 acres and is divided into three general ownership types: 6,516 acres of Tribal Trust lands; 7,789 of Allotted lands, and 4,506 acres of Tribal-owned, Restricted Fee lands.

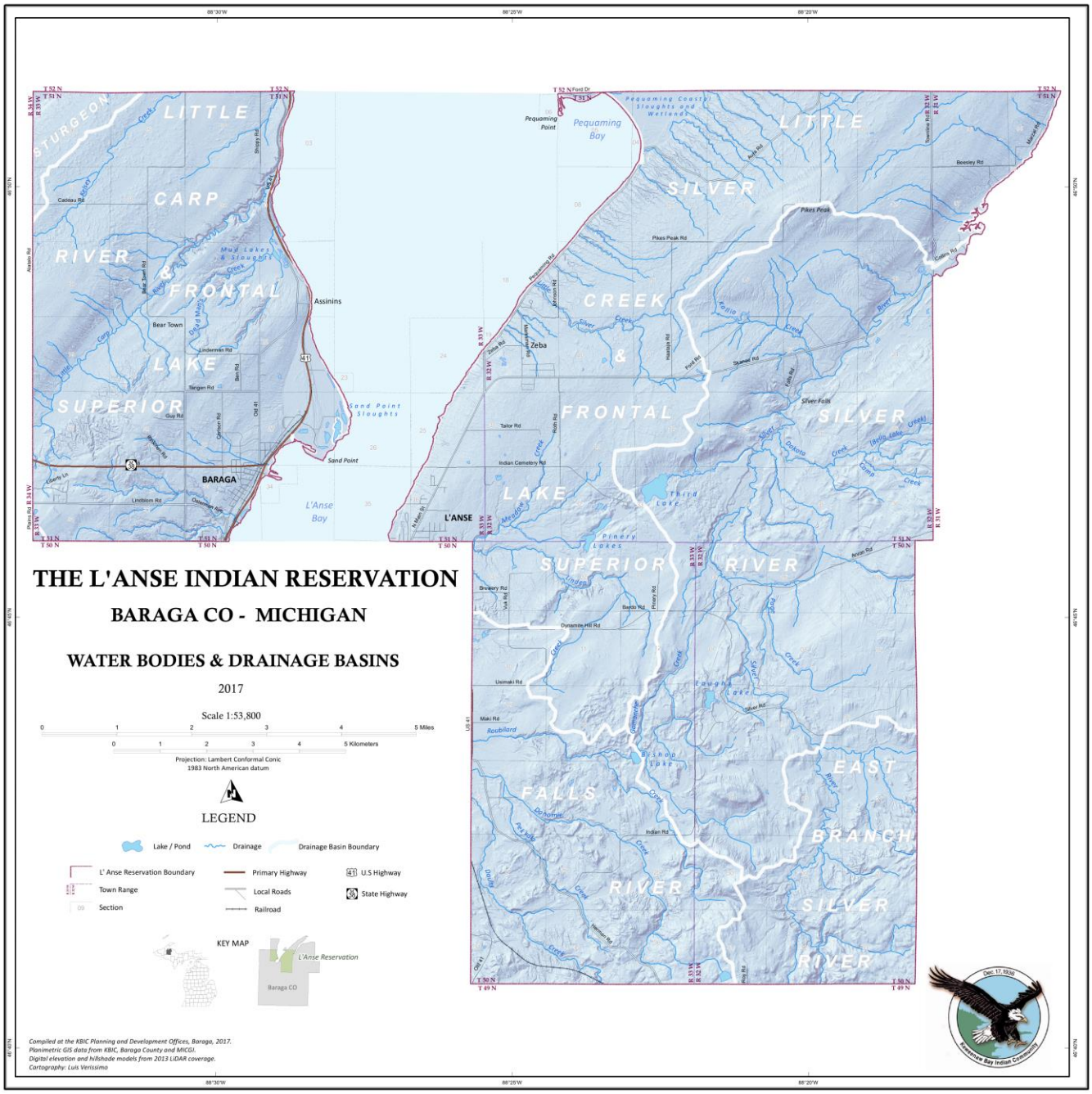
There are approximately 19 miles of Lake Superior shoreline, 3,000 acres of wetlands (**Map 6.1**), and 80 miles of rivers within five watersheds that are either wholly or partially within the L'Anse Reservation boundaries. The Village of Baraga and community of Zeba both lie entirely within the Reservation boundaries, while the Village of L'Anse lies partially within the Reservation. The Ontonagon Indian Reservation is in Ontonagon County along the Lake Superior shoreline. It is approximately 3,000 acres in size, has about 2 miles of Lake Superior shoreline, and includes three watersheds partially within Reservation boundaries. KBIC also administers approximately 200 acres of land holdings and housing in Marquette County.

The Lake Superior region in which KBIC resides is home to an interconnected network of rivers, streams, lakes, and wetlands, most of which eventually flow into the Great Lake (**Map 6.2**). Water plays an integral role in the lives of the Community. The people of KBIC have a long and deep place-based cultural connection with the water, wetlands, forests and all beings within it. KBIC embraces the responsibilities given to them in the first Treaty with Creation to be good stewards of the Land and all beings within it. They recognize that they are nurturing, protecting, maintaining, and healing the natural environment not only for the current community, but for their children down through the future seven generations.

Map 6.1: Wetlands in KBIC, Baraga County



Map 6.2: Watersheds and Water Bodies in KBIC, Baraga County



Geology

The surface features of the Upper Peninsula (U.P.) of Michigan are the results of the underlying Archean and Precambrian bedrock features and unconsolidated glacial deposits overlying the bedrock (**Map 6.3**). Landforms including glacially derived sediments, outwash plains, moraines, and till plains created by Pleistocene glacial advances and retreat, which occurred as recently as 9,900 years ago, are the predominant features. As the glacial lobes in Keweenaw Bay melted, a series of ponded-meltwater lakes and wetlands formed, including the area now known as the Baraga Plains. Topography of the area is rugged and the altitude ranges from about 600 feet at the lake level to about 1,979 feet at Mt. Arvon in the eastern part of the county, which is the highest point in Michigan (**Map 6.4**). Upper Precambrian rocks primarily composed of Jacobsville Sandstone are found near the shore of Huron and Keweenaw Bays, with interbedded siltstones and shales. Outcrops are visible in many places on or near the shore of Lake Superior.

The soils vary widely in texture, natural drainage, slope, and other characteristics, with about 20% being poorly drained mineral soils and very poorly drained organic soils (**Map 6.5**). The area has over 100 different kinds of soil and because of steep slopes, stoniness, and rockiness, many soils are best suited to woodlands. A few small areas of beach deposits are along Keweenaw and Huron Bays. The largest areas of lake plain sediments consist of stratified sand and clay and extensive deposits of stratified alluvium are in the valley of the Sturgeon River. Most of the riverbeds are rocky and bouldered and waterfalls are common. Most large public water supplies are obtained from Lake Superior, but some smaller supplies are obtained from wells and springs[4].

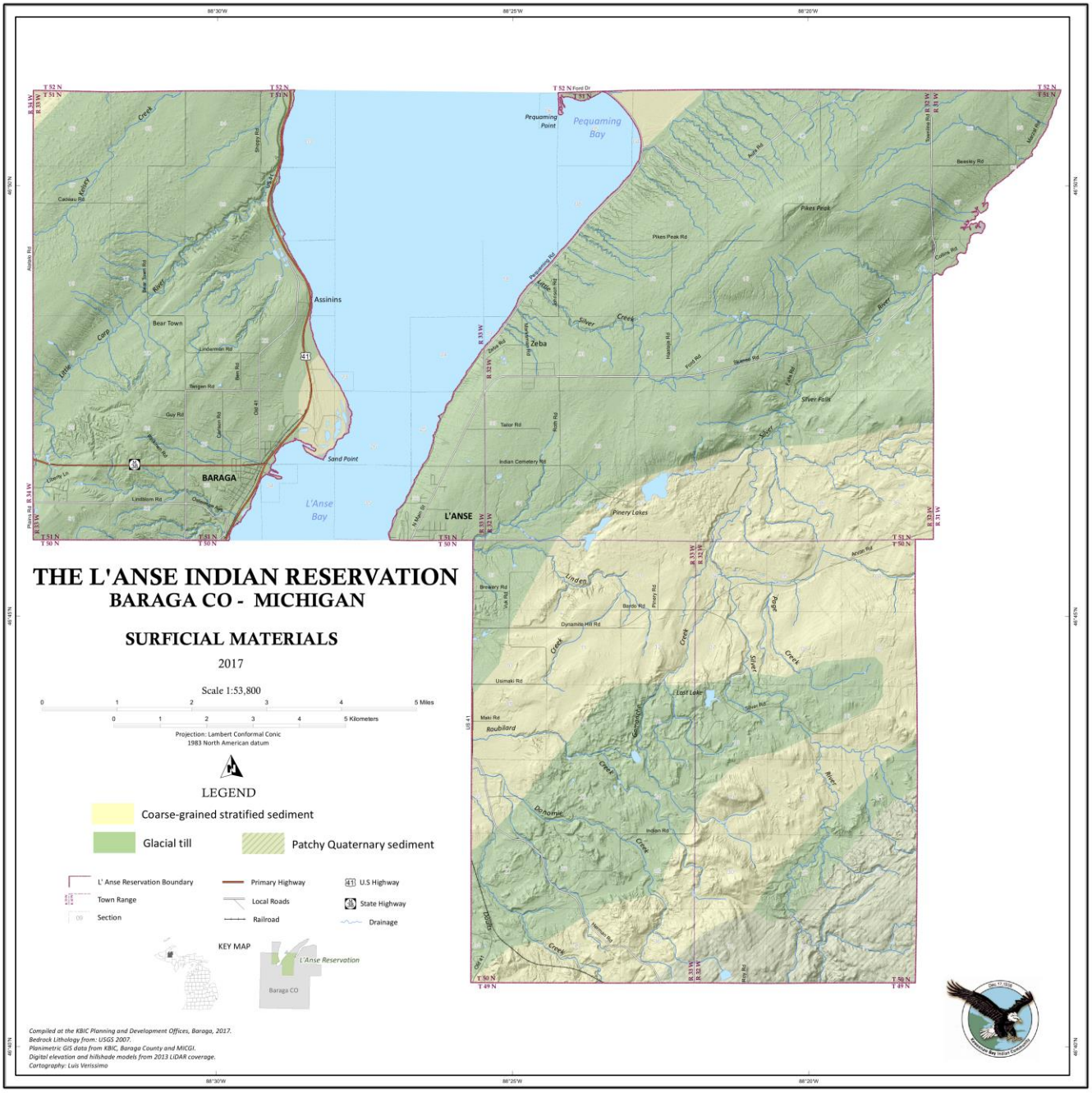
Climate

The U.P. has a humid continental climate typified by large seasonal temperature differences, with warm to hot (and often humid) summers and cold (sometimes severely cold) winters. The Great Lakes have a large effect on most of the peninsula. Winters tend to be long, cold, and snowy for most of the peninsula, and because of its northern latitude, the daylight hours are short—around eight hours between sunrise and sunset in the winter. Lake Superior has the greatest effect on the area, especially the northern and western parts. Lake-effect snow causes many areas to get in excess of 100–250 inches (250–640 cm) of snow per year—especially in the Keweenaw Peninsula and Gogebic County, and to a lesser extent Baraga, Marquette, and Alger counties, making the Western U.P. a prominent part of the midwestern snow belt.

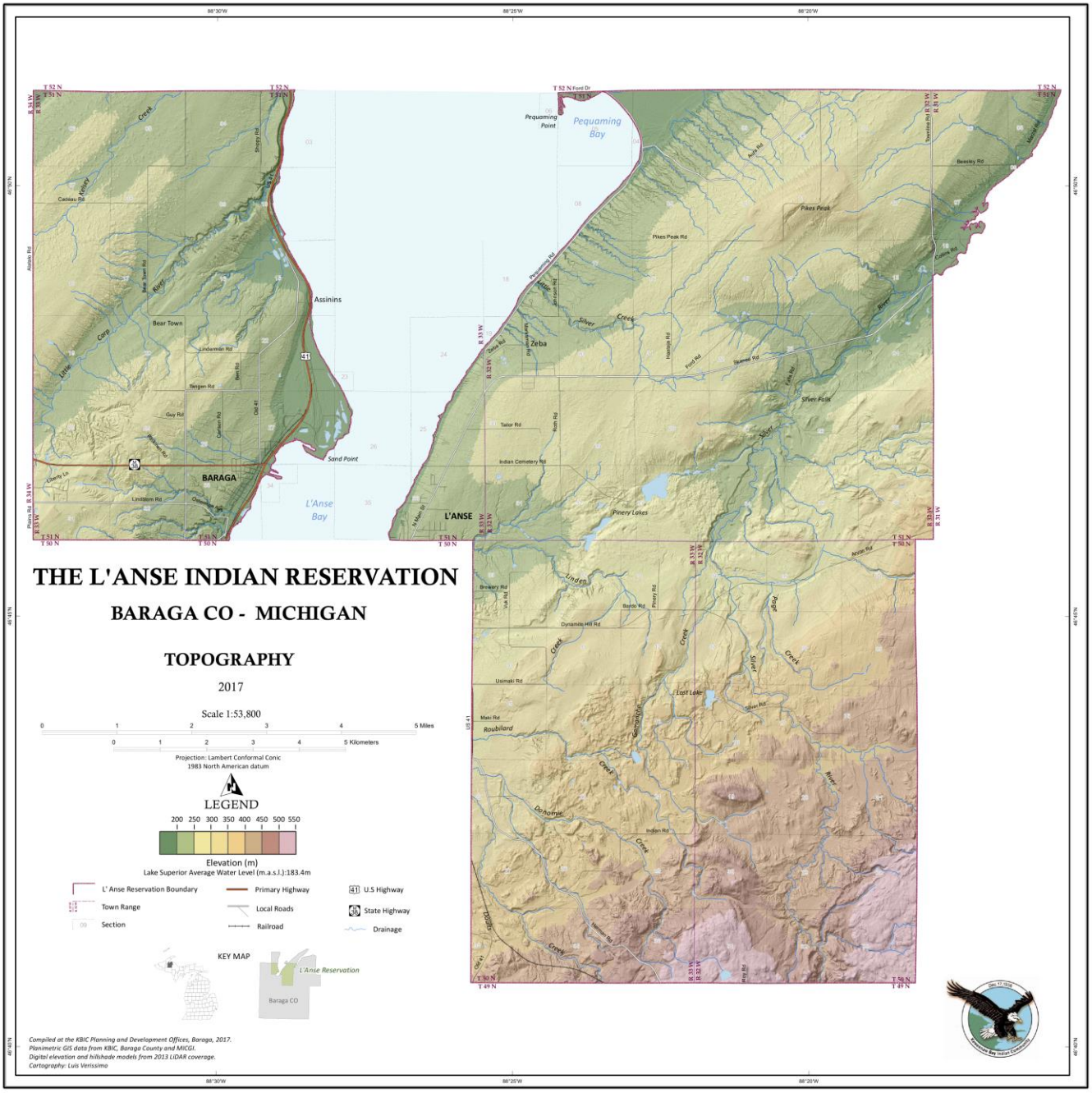
Seasonal variability of precipitation in the watershed is considerable, most falling from May through November and less water-equivalent precipitation from December through April. Baraga County, Michigan, gets an average of 36 inches of rain per year. Snowfall average is 185 inches. The number of days with any measurable precipitation is 161. On average, there are 187 sunny days per year in Baraga County, Michigan. The July high is around 78 degrees Fahrenheit while the January low is 3 degrees. The comfort index, which is based on humidity during the hot months, is a 48 out of 100, where higher is more comfortable.

[4] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture.

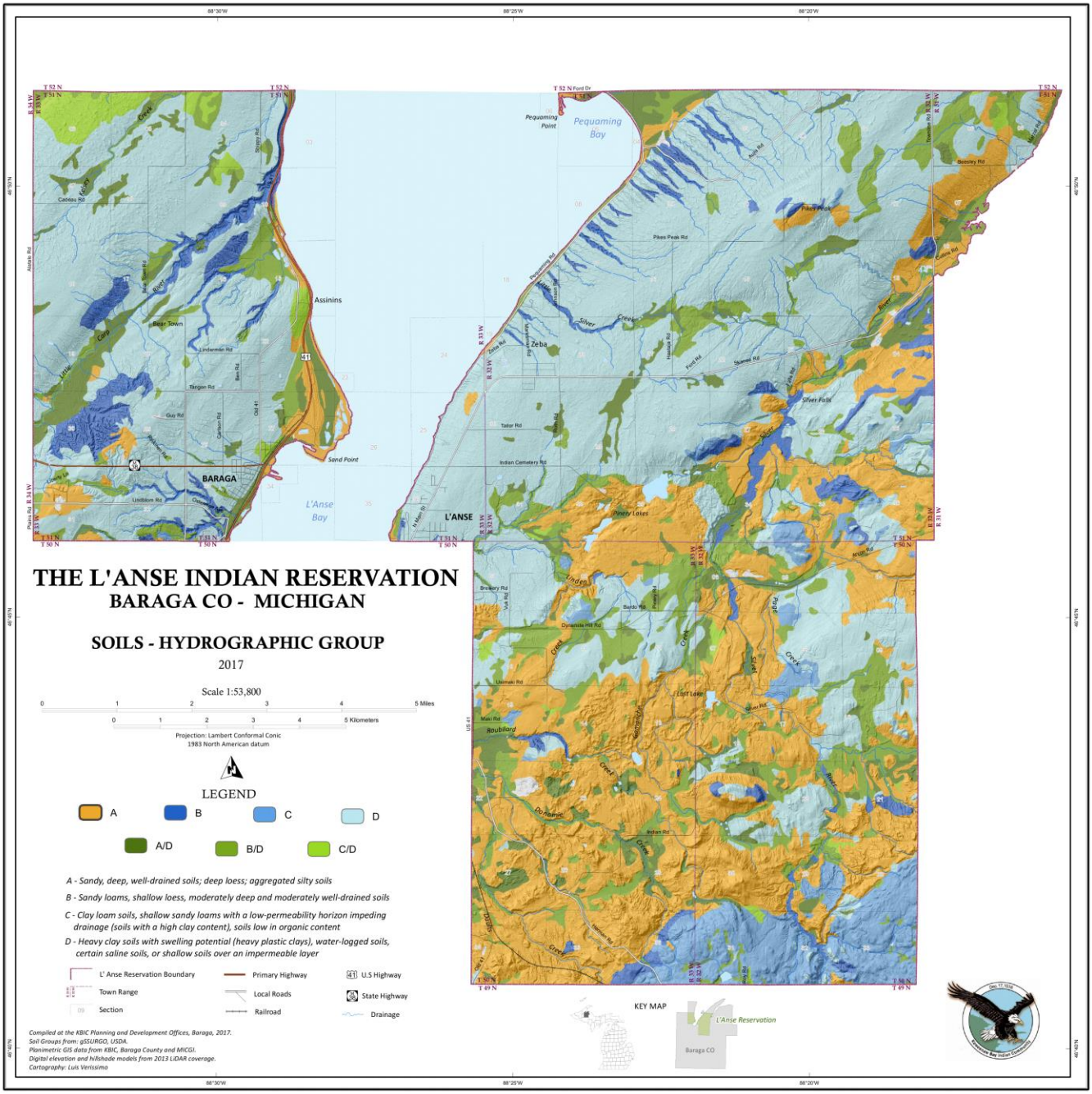
Map 6.3: Geology in KBIC, Baraga County



Map 6.4: Topography of KBIC, Baraga County



Map 6.5: Soil Types in KBIC, Baraga County



Climate is defined as the long-term weather patterns over a period of at least 30 years. Climate is measured in several of ways, including average temperatures, humidity, atmospheric pressure, wind, and precipitation. In addition to changing the global climate, human-caused climate change impacts regional climates and weather events. In northern Michigan and the Lake Superior basin, climate change impacts include far more frequent and intense storm events which could increase coastal damage and flooding, overload stormwater systems, and increase agricultural runoff affecting water quality for all species who depend upon it. In the Great Lakes area, climate change also influences freshwater systems by warming water temperatures, reducing ice cover, altering streamflow, and increasing storm events, which in turn affects both native and non-native species. With all these changes, landscape infrastructure needs such as roads, streams, crossing, bridges, and trails are also changing along with effects to KBIC Treaty Resources and relationships.

Population and Demographics

This section discusses the population characteristics of the KBIC, especially in terms of vulnerable populations. Focus will be on the KBIC Tribal members living on and off the Reservation. Many of the non-Tribal members on the Reservation are middle or upper-class, and often their primary homes are elsewhere. In contrast, Tribal members are below the national averages for education and income and generally are more vulnerable after a disaster event. The demographic information for the KBIC is based on the 2013-2017 American Community Survey, United States Census data and from information supplied by Tribe. The 2020 Census is currently under development and thus much of the data is older than preferred.

Why Consider Demographics in Hazard Mitigation Plans?

Research has shown that people living near or below the poverty line, the elderly, the disabled, women, children, ethnic minorities, and renters have all been shown to experience more severe effects from disasters than the general population. Vulnerable populations may vary from the general population in how they perceive risk perception, how they access information about a hazard event, and their access to resources for post-disaster recovery. While this plan covers the entire Community and everyone living on the Reservation, including nontribal members, Tribal members have typically relied more on the support and resources of the Tribe. Typically, non-tribal members living on the Reservation have sought support and assistance outside from Baraga County during previous disaster events. Therefore, more emphasis is intentionally focused on aiding vulnerable Tribal members, even though the entire population is considered in the planning process. Additionally, KBIC has strong relationships with the natural environment and all beings within it to sustain themselves.

Population

According to the American Community Survey (ACS) 5-Year Estimates for 2013-2017, the total population on the L'Anse Reservation and Off-Reservation Trust Land is 3,062. There are approximately 1,100 enrolled Tribal members, some residing within the L'Anse Reservation

boundaries, or in Baraga County. The median age is 47 years. Nearly 22.6% of the population is comprised of persons that are 65 years old and over. Poverty rates are estimated at 17.2%.

Age Distribution

The vulnerability of elderly populations can vary significantly based on health, age, and economic security. However, as a group, the elderly most often lacks the physical and economic resources necessary for response and are more likely to suffer health-related consequences that make recovery slower.

According to the 2014-2018 ACS, 21.6% or 770 of the population on L'Anse Reservation and Off-Reservation Trust Land is 65 or older. This is more than the state average of 15.9% and the Baraga County average of 19.9%. Of this, 294, or 38.2% of elderly persons, have disabilities of some kind. Children under 18 (24.9%) can also be more vulnerable during a disaster, as they often require assistant during and after an event. If roads are inaccessible during school or working hours, families can be separated, and sheltering-in-place may be ignored in favor of reuniting with children. If an adult in a home is injured or otherwise disabled, children in that home may not know how to get help. **Figure 6.1** shows the distribution of age on the L'Anse Reservation and Off-Reservation Trust Land.

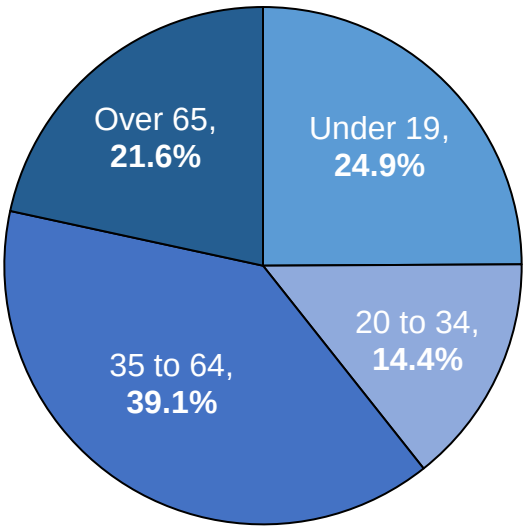


Figure 6.1: Age Groups of L'Anse Reservation and Off-Reservation Trust Lands, 2014-2018

Employment and Industry

Income

In the United States, to some extent individual households are expected to use personal resources to prepare for, respond to, and recover from disasters. Impoverished people are therefore more adversely impacted from disasters than the general population. Additionally, the poor typically

occupy inadequately maintained housing of any given community, which are more likely to be damaged or destroyed during a hazard event.

The median household income on the L'Anse Reservation and Off-Reservation Trust was $44,656. About 17.2% of the population live below the poverty level, compared to 14.4% in Baraga County and 15.6% for the State of Michigan.

Employment

The 2013-2017 ACS reported that the 46.2% of the L'Anse Reservation and Off-Reservation Trust Land over the age of 16 were employed, less than the state average of 56.7%. The unemployment rate from 2013-2017 was about 7.9%.

Of the employed population over the age of 16, roughly 75.2% work in private industry, while 18.8% work for the government. The KBIC is employed in a diverse field of occupations. For the residents of the L'Anse Reservation and Off-Reservation Trust Land, the top three occupations are educational services and healthcare and social assistant; manufacturing; and retail trade. **Table 6.1** shows percentages for occupations of all residents on the reservation.

Table 6.1: Employment by Sector in L'Anse Reservation and Off-Reservation Trust Land, 2013-2017.

Employment Sector	Percentage
Educational services, health care, and social assistance	22.5
Manufacturing	17.2
Retail trade	11.8
Arts, entertainment, recreation, accommodation, and food services	11.3
Public administration	11.1
Other services, except public administration	5.9
Construction	5.8
Finance, insurance, real estate, rental, and leasing	3.8
Professional, scientific, management, administrative, and waste management services	2.9
Transportation, warehousing, and utilities	2.6
Agriculture, forestry, fishing, hunting, and mining	2.2
Wholesale trade	1.5
Information	1.4

Percentage indicates those 16 years and over who are employed; Source: ACS

Shopping and entertainment options on and off Reservation include the Ojibwa Casinos, which draw visitors from around the region, and the downtown shopping area in L'Anse. Some high-end specialty stores, and other retail shops are located less than 40 miles away in neighboring counties, Houghton and Marquette.

KBIC is a fishing community that all families are connected to. Commercial fishing is an important industry for supplemental income and food for sustenance. The natural environment is integral for the continued subsistence harvesting of fish, wildlife, and plant species.

Housing, Infrastructure and Land Use

Housing

In 2017, there were 1,791 total housing units in KBIC. Of these 1,275 were inhabited, 951 were owner occupied (74.6%) and 324 were renter occupied (25.4%). The average household size for the community is 2.3 persons. Median home values in 2017 were $95,400 for owner-occupied units.

Schools and Daycares

KBIC operates the Keweenaw Bay Ojibwa Community College (KBOCC) with locations in Baraga, L'Anse, and Pelkie. The College was developed upon the principle that American Indian students deserve an educational system that is responsive to their needs and concerns. Its basic purpose is to provide an educational program in which students experience success and enhance their self-image, dignity, and independence while preparing for their chosen career paths. KBOCC offers higher education including certificate programs and 2-year associates degrees.

KBIC manages the Pre-Primary Education Program in Baraga. KBOCC manages Migiziinsag (Little Eagles) Preschool Program and the Ojibwa Child Care in L'Anse.

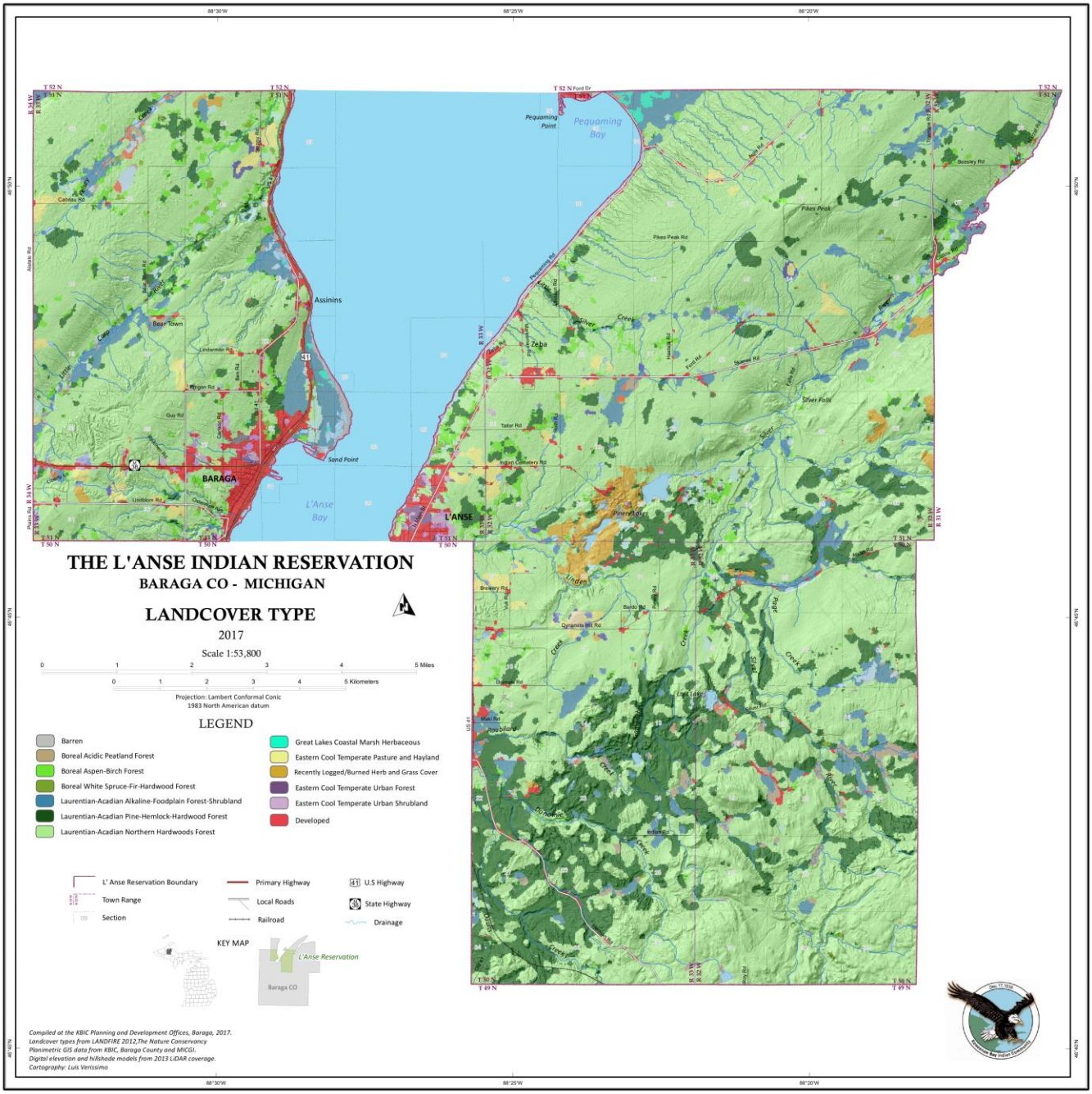
Land Use and Resources Management

Land use or types on L'Anse Reservation Lands is influenced largely by extensive forests throughout the region (**Map 6.6**). Outside of these areas, developed "urban" land use is focused within the Villages of Baraga and L'Anse. Outlying residential are found along numerous lakes, Lake Superior, and in scattered townsites throughout the area. Most Reservation Lands are classified as northern hardwood forests. Sugar maple, yellow birch, and hemlock, amongst other hardwood species, are the dominate trees found in this kind of forest.

KBIC has an established Natural Resources Department (NRD) which includes fisheries, wildlife, environmental programs and natural resources. The department is comprised of twenty-two, and their missions to be responsible for assisting KBIC with protecting, preserving, enhancing, and mitigation of the environment and natural resources.

An Integrated Resource Management Plan (IRMP) was adopted and approved in 2003 by the Tribal Council and Bureau of Indian Affairs. This plan includes management of biological control chemicals, air quality, hazardous waste, storage tanks and solid waste. The IRMP goals and objectives also incorporate: Cultural resource management, fisheries resource management, wild rice and native plants management, wildlife management, wetlands management, forestry and fire management, enforcement management, recreation management, economic development management, soils management, water quality, roads/transportation management, land acquisition and use, and GIS, and partnerships and education. The IRMP has also assisted in the development of specific management and stewardship plans, ordinances, and other documents.

Map 6.6: Land Cover Types in KBIC, Baraga County



Roads, Public Works, and Community Resources

KBIC in Baraga County is crossed by four major highways, numerous county roads, and many miles of two track roads. U.S. 41 enters on the eastern edge of the County and travels north to and through the Villages of L'Anse and Baraga into Houghton County. Highway M-28 takes a westerly route from U.S. 41 towards southern Houghton County, and U.S. 141 branches off M-28 in the center of the county, traveling south into Iron County. M-38 leaves the Village of Baraga land heads westerly towards Houghton and Ontonagon Counties. These main highways are all heavily traveled transportation routes. U.S. 41 to M-28 is also a primary route for Canadian traffic through the Upper Peninsula. The remainder of KBIC is accessed via numerous county and forest roads. The area also contains many miles of seasonal roads with a number in southern Baraga County being built and maintained by the U.S. Forest Service. Each incorporated community owns and maintains the local street networks within its limits. Highways in KBIC are maintained by the Michigan Department of Transportation.

Rail

Canadian National (formerly Wisconsin Central) is the only line still providing destination rail service to KBIC in Baraga County. The railroad enters on the east from Marquette County, and the tracks end at the Village of Baraga. The far southwest corner of the County is crossed by the Lake Superior line on its way to industrial areas of Ontonagon County.

Ports

KBIC is directly connected to Lake Superior via Keweenaw Bay. Historically in the village of L'Anse, the Ford lumber mill brought in lake carriers for product transport; they can accommodate larger ships. However, this is not a registered port. Baraga County also hosts private and recreational marinas and docks for small boats and watercraft.

Airports

No commercial airports are located within the boundaries of KBIC. Prickett-Grooms Field Airport (6Y9) is located west of the community in Sidnaw. The airport has a turf runway, offers no services, and is closed during the winter months. It is used for general aviation, commercial flights without scheduled passenger service, and air taxi service.

Houghton County Memorial Airport (CMX), the closest with scheduled passenger service, offers two daily flights to and from Chicago on United Airlines via SkyWest Airlines. This airport is in Hancock about 40 miles north of KBIC. The airport also offers parking; hangars; fuel, airframe, and power service; and flight instruction. Sawyer International Airport, in Marquette County, offers service to Detroit on Delta Airlines and service to Chicago via American Airlines (Envoy). This airport is located approximately 80 miles driving distance southeast of Baraga and L'Anse.

Transit

B&B Wheelchair Transport offers non-emergency transportation to medical appointments for individuals in wheelchairs. All B&B vehicles are equipped with wheelchair ramps and/or lifts and can also accommodate individuals who cannot sit upright.

Baragaland Senior Citizens Center provides demand response pickups, long-distance flexible route transportation, and non-emergency medical appointment transport for senior citizens and persons with disabilities in Baraga County. Demand-response pickups are provided within Baraga, L'Anse, Aura, Covington and Skanee 8-10 times/month.

Indian Trails Inc. is a charter bus company that partners with Greyhound Bus to service KBIC and Baraga County. Indian Trails offers daily trips with transfers in Escanaba to a regional network of destinations that connect to Amtrak or Greyhound.

North Star Taxi is a 24/7 taxi service based in Baraga and L'Anse, with regular rides to Houghton County Airport, KI Sawyer Airport in Marquette, and any requested destination.

The KBIC Medical Clinic offers transport to tribal members during clinic operating hours and service within 200 miles roundtrip. Medical transport for the clinic must be arranged in advance.

Emergency Services, Law Enforcement, and Medical Facilities

Emergency Services and Law Enforcement

Emergency services in the Keweenaw Bay Indian Community includes tribal law enforcement, KBIC Fire and Emergency Management Department (KBIC FEMD) and emergency response teams. There are established predetermined sites for emergency management, coordination, and distribution of community resources during a hazard event. KBIC FEMD responds to local natural disasters, and wildland fires both locally and throughout the United States. The KBIC Tribal Police service facilitates and promotes community policing by enforcing Tribal and Federal laws within the boundaries of all reservation sites in Baraga, Marquette, and Ontonagon Counties.

In the event of an emergency, multiple locations can serve as an emergency operation center (EOC) and/or gathering centers for KBIC members and descendants including the Big Buck Bingo Hall, and the Niiwin Akeaa Community Center. The Center is located within KBOCC and is equipped with showers, kitchen facilities, and space to distribute medicine.

The Keweenaw Bay Indian Community Tribal Conservation Officer enforces the KBIC Tribal Code for Title 10, and the Natural Resources Department (KBIC NRD) assists the Tribal Police in the collection of data, focusing on reserved hunting, fishing, trapping, and gathering rights protected under the Treaty of 1842. KBIC's Forestry Department enhances and sustains forest resource while balancing the many uses and values of KBIC forests. This includes improving forest health, wildlife habitat and diversity, incorporating cultural knowledge, needs, and education into stewardship, and protecting culturally sensitive areas on the L'Anse Reservation.

The Forestry Department also provides Free Use Permits to KBIC members who wish to harvest firewood, sap, and/or other forest resources. Forestry can issue a violation for unauthorized trespassing or harvesting of trees.

KBIC NRD developed an Integrated Resource Management Plan (IRMP) for KBIC that was adopted in 2003. Part of this plan is fire and forestry management. The KBIC Fire and Emergency Management Department trains, prepares, and coordinates emergency response and recovery efforts on the reservation.

Medical Facilities and Community Assistance Programs

Established in 1971, the KBIC's main health facility is the Donald A. LaPointe Health and Education Center which provides comprehensive health care services to over 2,500 tribal members and descendants who live in Baraga, Houghton, and Ontonagon Counties. The center is staffed by 39 employees, including 7 nurses, 3 medical doctors, and a dental health team of 4. Services at the clinic include dental, behavioral, pharmacy, diabetes care, maternal and childcare, as well as transportation services within 200 miles roundtrip. Medical transport is offered only during clinic operating hours and must be scheduled ahead of time.

The KBIC Health System also hosts a traditional medicine clinic. In addition to this main medical facility, the KBIC has community substance abuse programs[5] offering inpatient treatment at the Oshki Gijigad (New Day) residential facility and an outpatient addiction treatment center. KBIC also has a halfway house for community members in need of longer-term stays. The Niimigimiwang Transitional Home Program offers services to victims and survivors of violence – domestic, dating, sexual assault and stalking. They also provide services to community members that have been affected collaterally.

The KBIC Community Assistance Program provides multiple financial and social service programs through the Bureau of Indian Affairs. This includes Emergency Assistance for situations when home or personal possessions are destroyed or damaged through forces beyond the home or property owner's control. It also includes General Assistance for basic essential needs and Burial Assistance. Assistance Programs that may be closely linked to natural hazards include a Community Service Block Grant program and multiple Heating and Energy Assistance Programs available to KBIC members and descendants. Tribal Social Services is critical for maintaining continuity of living and safety for foster children and the health and safety of at-risk adults receiving adult prevention services.

Cultural Resources

Rooted in Anishinaabe traditions for nearly a millennium, the community's culture originates from the people's relationship with the environment and all its resources, all things living and non-living, all things physical and spiritual, all things mutually respected and dignified[6].

[5]Keweenaw Bay Indian Community Substance Abuse Programs. https://www.kbicsap.com/
[6] Vecsey, C. 1983. Traditional Ojibwe Religion and Its Historical Changes. American Philosophical Society. 233 pp.

The external cultural resources for KBIC are the burial grounds at Sand Point and traditional and modern cemeteries at Assinins and Indian Cemetery Road. Annual Pow Wow activities, teachings, and Harvest Feast are also demonstrations of culture. However, the cultural sites exist at various other locations both on and off the reservation. These cultural sites may take many different forms such as gathering areas, fishing and hunting camps, wild rice beds, maple sugar bushes, cooking and living areas, etc. KBIC utilized various cultural resources management techniques such as establishment of a Culture Committee to inventory, monitor and handle situations which may harm or impact cultural resources[7].

Throughout this document we use the term "beings" to describe organisms, creatures, and/or spirits and imply an equal importance to all. Beings include those which are both animate (such as fish) and inanimate from the western perspective (such as rocks).

There are over 384 plant species recognized as being of great importance to the Anishinaabe[8]. Relationships between those of the plant nation are complex and interwoven and a more protective stewardship is needed to have careful consideration of decisions that may be beneficial to some but not others. Thus, the overall guidance was given to protect biodiversity and keep expanses of pristine land available for all to enjoy. Wetlands are also referred to as "medicine cabinets" for the rich, diverse number of species found within them. Thus, wetland protection is a high priority in the region[9].

Some relationships with species are more widely known and a few of them have had specific care taken to preserve, protect, and restore them. Many of these are related to seasonal activities and traditions in the community. Migration of Ojibwa to the area is tied to prophecies that they should move west until they found the "food that grows on the water," wild rice, and there are historical accounts of wild rice and restoration in this area. The KBIC identifies this as a species of cultural significance and having it in harvestable amounts is paramount to preserving community culture.

The KBIC Culture Committee meets to plan powwows, sponsor events, and keep culture alive in the Keweenaw Bay. The Culture Committee is one of many tribal committees dedicated to the growth and development of the community.

In 2005 the Tribal Council created the Tribal Historic Preservation Office, which preserves and protects all aspects of Ojibwa culture – from cultural sites, artifacts, intellectual property rights for specific language and art. The restricted archives host interviews, books, ethnographic materials and documents that are private for their protection.

[7] KBIC Integrated Resource Management Plan 2002-2012 (2012), 13pp.
[8] Meeker, J. E. (1993). Plants used by the Great Lakes Ojibwa. Odanah, WI: Great Lakes Indian Fish and Wildlife Commission.
[9] KBIC Integrated Resource Management Plan Draft (2016-2025).

Critical Facilities and Cultural Assets

Critical facilities fulfill essential public safety, emergency response, and disaster recovery functions in a community. For a critical facility to function, building systems and equipment must remain operational. Furthermore, it must be supplied with essential utilities because the loss of municipal utilities (typically power, water, waste disposal, and communications, and occasionally natural gas or steam) can prevent some critical facilities from functioning during and immediately after a major hazard event.

In addition to critical facilities, this section includes critical cultural assets of importance to the KBIC. **Cultural assets** are broadly defined as any component of a community's culture that contributes to the vitality, strength and quality of life of community members. Understanding and inventorying important cultural assets of the KBIC provides a more thorough understanding of assets to the community that go beyond basic infrastructure, although many critical facilities may also be considered cultural assets.

Examples of critical facilities and cultural assets requiring special consideration include:

- Police stations, fire stations, critical vehicle and equipment storage facilities, and emergency operations centers needed for response activities before, during, and after an incident
- Medical facilities, including hospitals, long term care facilities, blood banks, and health care facilities (including those storing vital medical records) likely to have occupants who may not be sufficiently mobile to avoid injury or death during an incident
- Schools and day care centers, especially if designated as shelters or evacuation centers
- Power generating stations and other public and private utility facilities vital to maintaining or restoring normal services to impacted areas before, during, and after an incident
- Drinking water and wastewater treatment plants
- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials

Appendix C summarizes critical facilities and cultural assets in the KBIC.

Other Cultural Assets

Keweenaw Bay Tribal Fish Hatchery

The KBIC hatchery facility consists of two groundwater-fed, half acre rearing ponds. The hatchery is used to rear lake trout, brook trout, and walleye, three species of significant importance to KBIC culture and fisheries. The hatchery facility includes monitoring systems, an alarm system, oxygen injection equipment, and a water distribution system that is sourced by a well pumped from a Pequaming-area aquifer.

Sand Point

Sand Point is a culturally important site for the KBIC that includes a marina, wild rice beds, and

the Ojibwa Campground and Maawanji-inding (Pow Wow) grounds. Tribal events (e.g., Pow Wows and traditional healing clinics) take place in this area, and Sand Point is also the site of a Brownfield remediation and habitat restoration project that protects and restores coastal wetlands.[10] Noteworthy components of the greater Sand Point area include:

Historic Sand Point Lighthouse – The Sand Point Lighthouse is located at the Ojibwa Campground and Recreation Area and is owned by the KBIC, and visitors can tour the grounds. The lighthouse keeper dwelling has been restored to its original design, and the structure is listed on the National Register of Historic Places.

Sand Point Lighthouse[11]

Ojibwa Recreation Area – The Ojibwa Recreation Area includes a marina, wooded campground, and Maawanji-inding (Pow Wow) grounds.

Grand Entry of the 41st Annual KBIC Pow Wow in 2019 (Source: L'Anse Sentinel[12]*)*

[10] http://nrd.kbic-nsn.gov/sand-point
[11] http://www.exploringthenorth.com/baraga/sandpoint.html
[12] Besonen, N. (2019 August 2). "Crowd comes out for Pow Wow." L'Anse Sentinel. https://lansesentinel.net/crowd-comes-out-for-pow-wow/

Sand Point Brownfield Remediation and Habitat Restoration Site –Sand Point contains an over 33-acre brownfield restoration project site. Sand Point is a historically important site for native people, but the area now hosts many tonnages of industrial copper mining sands or "stamp sands" that are the byproduct of an industrial copper mining and stamp mill operation. Restoration activities include installation of a 33.6-acre cap that was planted with short grasses and legumes, installation of seed plots, mound plots, a two-acre garden, and trails.

Sand Point Brownfield Remediation and Restoration Site[13]

[13]KBIC NRD. Sand Point. http://nrd.kbic-nsn.gov/sand-point

SECTION 7: Planning Process

The requirements for the documentation of the planning process, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 REQUIREMENTS: PLANNING PROCESS

Documentation of the Planning Process
Requirement §201.7(c)(1): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

(i) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(ii) As appropriate, an opportunity for neighboring communities, Tribal and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(iii) Review and incorporation, if appropriate, of existing or ongoing planning efforts, studies, reports, and technical information.

Requirement §201.7(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Element

- Does the new or updated plan provide a narrative description of the process followed to prepare the plan?
- Does the new or updated plan indicate who was involved in the current planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan indicate that an opportunity was given for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?

Source: FEMA, 2008

The Local Planning Team (LPT) is a committee appointed by the Natural Resources Department, which included representation from response agencies, elected officials, the Baraga County Road

Commission, and community groups. The LPT for the Keweenaw Bay Indian Community (KBIC) serves as the oversight committee for the development of the Tribal Hazard Mitigation Plan. Representatives from KBIC also participated in the Baraga County LPT meetings where tribal land makes up 30% of the regional planning area. Other general forms of LPT participation included phone conversations and email communications.

The first local planning team meeting was held on May 8, 2019 with a defined goal of working through the hazard analysis worksheet including event probability and occurrences, as well as, approving the public engagement surveys. Those who participated in the LPT meetings are listed in **Table 7.1**.

Table 7.1: Keweenaw Bay Indian Community Local Planning Team

Name	Agency/Jurisdiction
Luis Verissimo	Office of Planning & Development
Dale Dakota	Tribal Police
Duane Misegan	Tribal Police
Evelyn Ravindran	Natural Resources Department
Doug Mills	Baraga County Road Commissioner
Thomas Chosa	Fire & Emergency Management
Dione Price	Natural Resources Department
Serene Gauthier	Natural Resources Department
Sarah Smith	CEO

For the second meeting, held on November 1, 2019, the LPT reviewed the hazard analysis portion of the plan, assisted in calculations relating to the risk assessment matrix and finalized the rating of those identified risks. They also reviewed community vulnerabilities, capacity, and mitigation strategies.

The Tribal Hazard Mitigation Plan draft was presented and discussed at several local meetings, advertised for public comment, and presented to the Tribal Council. As the planning process continued to evolve, individual communities and representatives were sought after for participation and information on matters that directly impacted them. LPT meeting invitations were widely distributed, and as always, these meetings are open to the public, with input from the public welcome. When these meetings were not convenient for those parties whose information was vital to the plan update, individual meetings or discussions were held to gather this information. Other groups or committees that have offered input throughout the planning process including filling out surveys and/or discussing the risk assessment matrix are the Health Department, Tribal Housing, and individual community members. Funding for implementing mitigation strategies will likely derive from local sources, the Bureau of Indian Affairs (BIA) and FEMA.

Throughout the planning process, several references were made during various discussions about the informal networks that exist among individuals, families and communities. When disaster strikes, jurisdictional boundaries begin to fade, and people pull together to respond with

resilience. While the tribe does not have all the tools necessary for any job, they rely on and coordinate with neighboring counties. A diagramed Tribal Government Organizational Structure can be seen in Appendix B: KBIC Governance Structure.

The KBIC-HMP draft, questions, public surveys, and the county-wide Hazard Mitigation Plans (Baraga, Gogebic, Houghton, Iron, Keweenaw, and Ontonagon) were posted on the Western U.P. Planning & Development Region website, www.wuppdr.org and shared through regional news outlets. Survey results and other public participation information is included in Appendix F.

Incorporating other planning documentation

The following plan documents were utilized to access pertinent information and data:

- KBIC Integrated Resources Management Plan, 2002-2012
- Great Lakes Restoration Summary Report, 2011
- Baraga County Hazard Mitigation Plan, 2012
- KBIC Wildlife Stewardship Plan, 2014
- KBIC Aquatic Invasive Species Adaptive Management Plan, 2015
- KBIC Department of Health and Human Services Strategic Plan, 2015
- Marquette County Hazard Mitigation Plan, 2015
- KBIC Terrestrial Invasive Species Management Plan, 2018
- Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu, 2019
- State of Michigan Hazard Mitigation Plan, 2019

Review and Approval

KBIC and FEMA have reviewed the KBIC HMP. Following final approval from FEMA (Appendix H), this HMP has been formally adopted by KBIC (Appendix I).

Implementation

The Local Planning Team (LPT) and Tribal government is responsible for initiating and implementing this HMP. Communicating need, procuring funding, scheduling mitigation projects, collaborating with surrounding municipalities, and executing mitigation actions are necessary tasks for the LPT to be successful.

Monitoring Evaluating and Updating

The LPT will be responsible for monitoring the programs and projects that are implemented by HMP. Information about the progress and completion of mitigation actions needs to be documented and evaluated. Monitoring and evaluating the mitigation efforts provide the necessary content for regular, periodic updates of the HMP.

SECTION 8: Climate Change Considerations in Keweenaw Bay Indian Community

"*Climate change has impacted and will continue to impact indigenous peoples, their lifeways and culture, and the natural world upon which they rely, in unpredictable and potentially devastating ways*."[14]

Climate Change and the Great Lakes

Global climate change is the overall warming of the planet due to increases in atmospheric greenhouse gas concentrations.[15] In the Great Lakes region, climate change influences local and regional weather by increasing the occurrence of extreme temperatures and intense precipitation events, causing declines in snowpack and lake ice cover, and disrupting the timing of natural ecological events such as the last spring frost and first fall frost.[16] Understanding climate change impacts in the Great Lakes region requires first acknowledging the interconnections between the five Great Lakes and the region's daily weather and long-term climate conditions. Due to their size, the Great Lakes influence the region's daily weather conditions and climate variability by moderating high and low temperatures and changing seasonal cloud cover and precipitation patterns near the lakes.

The lakes are also directly impacted by climate change. Observable climate change impacts on the waters of the Great Lakes include warming lake surface temperatures, declining ice cover, increasing summer evaporation rates, and earlier occurrence of seasonal temperature stratification, or "turnover" in lake waters.[17] The earlier turnover of lake waters is an important seasonal event (akin to growing seasons on land) that corresponds with the movement of oxygen and nutrients between the lake bottom and throughout the water column. If lake turnover occurs earlier or not at all, it can lead to reduced oxygen levels in deeper lake waters and decreased nutrient concentrations in surface waters. Additionally, the timing of lake turnover can also affect the beginning of the aquatic growing season; earlier lake turnover triggers an earlier growing season. This has direct impacts on aquatic species such as phytoplankton (algae), and zooplankton (microscopic animals) that rely on specific nutrients and form the basis of aquatic food webs that fish, birds and other beings rely on.

Additionally, climate change is expected to impact fish and other aquatic species in the Great Lakes and inland waters by changing critically important water temperatures that organisms require at different stages of life, influencing fish growth rates, and increasing the success of some invasive species. Pollution, nutrient and sediments from agricultural activities, habitat loss

[14] Tribal Adaptation Menu Team. 2019. Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin. 54 p.
[15] USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.
[16] Ibid.
[17] Ibid.

and degradation, fisheries management practices, and invasive species all interact with climate change impacts in the Great Lakes region. For example, increased water temperatures combined with agricultural run-off containing nutrients contribute to harmful algal blooms.

Climate Change and Natural Hazards

Over the last several decades, natural disasters throughout the region have become more numerous and costly. Climate change threatens to further exacerbate this trend by increasing both the severity and duration of many natural hazards, ultimately leading to even greater costs to life and to the land.

Climate change increases the risk of hazardous events such as extreme temperatures, ice storms, and other intense precipitation events.[18] For example, although lake-effect snowfall in the Great Lakes region has increased since the early 1900s, climate scientists expect regional warming to reduce lake ice and warm winters to the extent that snowfall events will shift to rain events. Hazardous weather events can disrupt both human systems and infrastructure and other living systems such as forest health and the timing of natural events non-human species rely on.

Based on the recently published Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu, strategies for addressing climate change impacts through hazard mitigation include:

- Supporting community engagement in the environment through educational opportunities.
- Prioritizing threatened resources "*to ensure that traditional crafts, medicines, and relationships can continue in a changing environment.*"
- Sustain fundamental ecological and cultural functions.
- Reduce the impact of biological and anthropogenic stressors.
- Reduce the risk and long-term impacts of disturbances and when there are major disturbances – support a new ecosystem balance.
- Maintain and enhance community, structural, and genetic diversity.
- Design and modify infrastructure and access to match future conditions and community needs.

Climate change considerations for each unique hazard described in this Hazard Mitigation Plan are included in the Hazard Analysis section that follows.

[18] Tribal Adaptation Menu Team. 2019. Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin. 31 p.

SECTION 9: Hazard Analysis

This section of the plan identifies and analyzes the natural and human-caused events that pose a threat to the people, non-living and living beings[19], and cultural sites and resources located within the Keweenaw Bay Indian Community (KBIC) and its land holdings. Each hazard is profiled to determine its past impact(s) on the community and potential future risks to the KBIC's L'Anse Indian Reservation in Baraga County as well as KBIC land holdings in Ontonagon and Marquette Counties. Hazard risk assessment considers hazard descriptions and historical occurrences[20] including extent and location, climate change considerations (when applicable), and the probability of future occurrences for each hazard. Information has also been included on vulnerable areas, facilities, ecosystems, and populations where the hazard vulnerability may have a greater impact. This hazard identification and analysis process was informed by credible sources including the State of Michigan Hazard Analysis, Fourth National Climate Assessment, KBIC Natural Resources Department, and NOAA National Centers for Environmental Information. The risk assessment that follows the hazard identification and analysis includes the extent of each hazard as it pertains to KBIC and the priority risk index which assigns a risk level to each hazard in the three counties where the KBIC has land holdings (Baraga, Marquette, and Ontonagon).

Study Area

To a large extent, historical records are used to identify the level of risk within the planning area – with the methodological assumption that the data sources cited are reliable and accurate. This section also provides a series of maps that illustrate the location and spatial extent for those hazards within KBIC land that have a recognizable geographic boundary (i.e., hazards that are known to occur in certain areas of KBIC, such as the 100-year and 500-year floodplains, shoreline erosion areas, etc.). For those hazards not confined to a specific geographic area, such as thunderstorms and tornadoes, general information on the applicable intensity of these events across the entire planning area is provided.

The HMP focuses on both lands owned and held in trust by the KBIC, and on behalf of members of the indigenous community. However, because KBIC members do not solely reside on trust lands, historic hazard data from the counties of Baraga, Ontonagon, and Marquette have been taken into consideration.

[19] "Being" refers to organisms, creatures, and/or spirits, including those which are both animate (such as fish) and inanimate from the western perspective (such as rocks). The term implies an equal importance to all.
[20] Historical occurrences for hazards were sourced from NOAA's Storm Events Database, unless indicated otherwise.

Natural Hazards: Weather Hazards

The following significant weather hazards are covered in this section:

1. Extreme Temperatures
2. Fog
3. Hail
4. Ice and Sleet Storms
5. Lightning
6. Severe Winds
7. Snowstorms and Blizzards
8. Tornadoes

Weather-related hazards are the primary natural hazards in most areas, and the increased occurrence of hazardous weather events due to climate change makes weather hazards a growing concern. Climate change increases the variability of weather conditions and weather hazard events and increases the frequency and severity of extreme weather events.[21] Within the KBIC reservation lands, weather hazards vary greatly by season and from year to year. Generally, a distinction can be made between the "winter weather risk season" and the "non-winter weather risk season." The region experiences heavy and frequent snowfalls throughout Baraga, Marquette, and Ontonagon counties, and the winter weather risk season is defined in terms of historically documented events involving extreme cold and significant snowstorms.

Transportation during and after winter storms is hazardous and is discouraged during severe weather events through school closings and, less commonly, road closings. Collapsing roofs are another of the primary winter hazards and are dependent on the age of buildings and building codes. The non-winter weather risk season includes thunderstorms, hail, high winds, and extreme temperatures. Weather hazards are variable and location dependent. Thus, due to the variably and inability to control these types of storm events, response plans are the best mitigation.

Extreme Temperatures

Hazard Description

Extreme temperatures are broken down into two categories: extreme heat or extreme cold. In both instances there are extended periods of either abnormally low or high temperatures worsened by conditions such as high humidity with lack of rain or heavy snowfalls with high winds. Extreme temperatures can occur in the middle of a seemingly normal weather pattern (without advanced warning) and last for weeks. Extreme heat and extreme cold can cause loss of life to vulnerable populations (e.g., elderly, young children, impoverished individuals, and those in poor health), damage to infrastructure, and disruptions to schools and businesses. Extreme

[21] USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

heat and cold temperatures also pose a threat to ecological systems, including plant and animal species.

Extreme heat or a "heat wave" occurs mainly during late May to early September in the Upper Peninsula and is marked by temperatures above 90°F. Individuals working outdoors, the elderly, and children need to be accounted for during oppressively hot conditions. Extreme hot temperatures also put a strain on the energy demands for an area, as air conditioning becomes a necessity for vulnerable populations. The National Weather Service devised the Heat Index as a mechanism to better inform the public of heat dangers, The Heat Index Chart, shown in **Figure 9.1**, uses air temperature and humidity to determine the heat index or apparent temperature. The major threats of extreme heat are heat exhaustion and heatstroke (a major medical emergency). **Table 9.1** shows the dangers associated with different heat index temperatures.

Figure 9.1: NOAA's National Weather Service Heat Index Chart

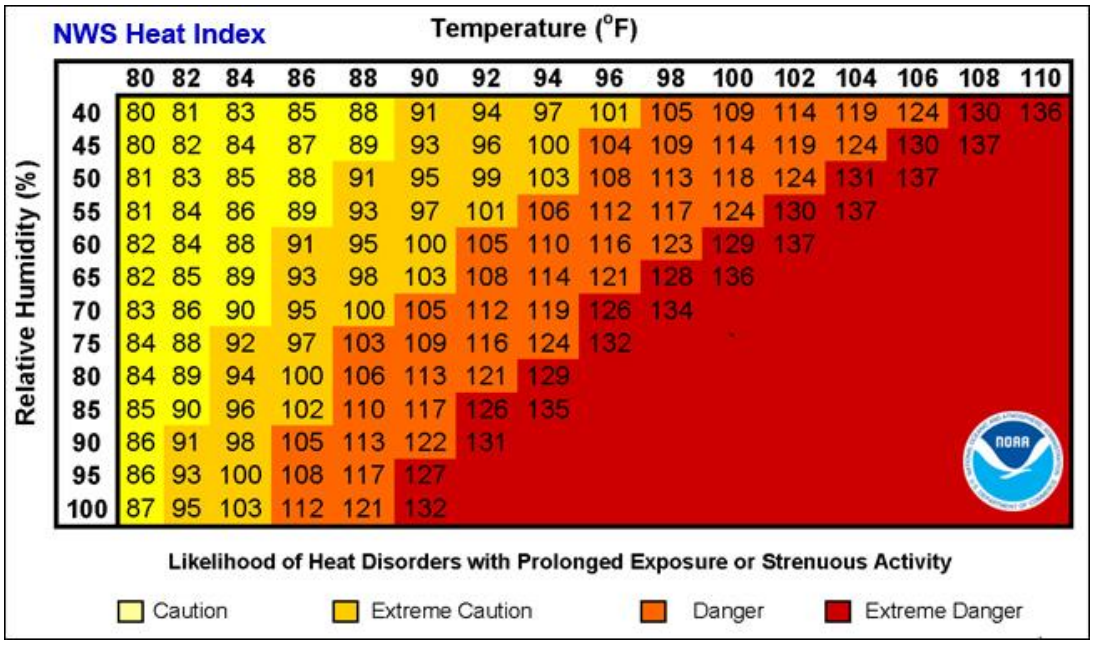


Table 9.1: Heat Index and Related Heat Disorders

Heat Index (°F)	Possible Heat Disorders
80°F - 90°F	Possible fatigue with prolonged exposure and/or physical activity
90°F - 105°F	Heat exhaustion, heat cramps, and heat stroke possible with prolonged exposure and/or physical activity
105°F -130°F	Heat exhaustion and heat cramps likely; heat stroke possible with prolonged exposure and/or physical activity.
130°F or higher	Heat stroke exceedingly likely with continued exposure

Source: NOAA – National Weather Service

Extreme cold is categorized as temperatures plunging near or below 0°F. In the Upper Peninsula, extreme cold is associated with the wintery months and occurs between late September and May. An extreme cold event to the NWS can refer to a single day of extreme or record-breaking day of sub-zero temperatures. A single day or extended period of extreme cold temperatures can be hazardous to people in both urban and rural areas and cause problems with buildings and transportation. Culturally important beings can also be impacted by extreme temperatures. **Table 9.2** lists and defines several threats associated with extreme cold that are particularly concerning for individuals living in inadequately heated apartments or rooms. These cold hazards can lead to a medical emergency, such as hypothermia, and loss of life can occur in these situations. Damage to buildings and pipelines can also occur in extreme cold conditions, resulting in expensive repairs, school shutdowns, loss of potential business, and subsequent risk to individuals' sources of income.

Table 9.2: Cold Disorders Associated with Extreme Cold Temperatures

Cold Hazard	Definition
Wind Chill	Temperature based upon how wind and cold feel on exposed skin. As wind increases, it draws heat from the body, which drives down skin temperature and internal body temperature. Animals are also affected by wind chill.
Frostbite	Damage to body tissue when exposed to cold temperatures for a long period of time. A wind chill of -20°F will cause frostbite in 30 minutes. Frostbite is most susceptible to fingers, toes, ear lobes, and the tip of the nose. Signs of frostbite include loss of feeling and a white or pale appearance.
Hypothermia	A condition that occurs when body temperature falls below 95°F and, if not properly treated, can result in death. Warning signs include uncontrollable shivering, memory loss, disorientation, slurred speech, drowsiness, and exhaustion. Most commonly occurs in very cold temperatures, but it can also occur at cool temperatures (above 40°F) if an individual is not properly clothed.

Climate Change Considerations

The Great Lakes region has already seen notable changes resulting from the impacts of climate change on lake conditions and related weather patterns. Climate change has increased Great Lakes surface water temperatures, caused declines in lake ice cover, increased summer water evaporation rates, and caused the seasonal stratification of temperatures in the lakes to occur earlier in the year. These changes at the lake-level are important because the Great Lakes influence local and regional weather events and patterns.[22]

Most climate projection scenarios predict that, in general, the risk of death from extremely cold temperatures will decrease in the future in the Midwest. The region's winter season has also been

[22] Gla & Peltier. 2011. Report for the Ontario Ministry of Environment. Dynamical Downscaling over the Great Lakes Basin of North America using the WRF Regional Climate Model. https://files.ontario.ca/moe_mapping/downloads/4Other/CC/PDF/2009-10_UT_Report.pdf

shortening in length, and historical data show that the Great Lakes region has experienced colder temperatures in the past. As a result, residents in this region are largely adapted to coping with severe cold. However, less predictable weather patterns resulting from climate change will decrease the amount of time people have to acclimate to cold weather. For instance, increasingly mild Fall weather from October to early December will suddenly give way to bitter cold, winds, ice, and snow, with the shorter winter season providing less time for people to adjust to frigid, cold weather. Furthermore, instances of persistently cold temperatures, ice storms, freezing rain, and heavy snowstorms are becoming more common across the region.

Extreme heat problems due to climate change are expected to increase in the future. New heat records outnumbered new cold records by 3 to 1 during the 1990s and 6 to 1 in the 2000s. Increased temperatures at nighttime and during the day are associated with heat-related disease and impacts the health, safety, and productivity of workers, especially individuals who work outside or in indoor environments that lack air conditioning or proper ventilation.

Historical Occurrences

Extreme temperatures typically cover a large area and cannot be confined to any geographic or political boundaries. All areas of Michigan are subject to extreme temperatures. Monetary damages are generally minimal, though schools are often closed during these events.

Over 20 cold/wind chill events were reported in Baraga, Marquette, and Ontonagon Counties from 1996-2019 (**Table 9.3**). Typical cold/wind chill events are caused by Arctic airmasses bringing extreme cold to the Upper Peninsula. During these events subzero temperatures reached as low at -40 to -45 degrees Fahrenheit, and sometimes impacted daily life (e.g., school start time delays and closures). Extreme cold events in the past have led to school closures in Baraga County (including schools attended by KBIC members). Extreme cold also puts water infrastructure (e.g., water transport and delivery systems) at risk when low temperatures freeze water and cause pipes to rupture. This cuts off water delivery systems and causes household damage. When they occur in tandem with ice storms, extreme cold events can also be dangerous if there is a risk of power loss due to ice damage on power lines.

Table 9.3: Extreme cold events in Baraga, Marquette, and Ontonagon Counties, 1996-2019

Event Date(s)	Description
1/31/1996	An Arctic airmass brought extreme cold to parts of Upper Michigan. Low temperatures reached -41 at Amasa, -40 at Iron River, -38 at Champion, -37 at Stephenson, -36 at Kenton and -33 at Iron Mountain and Ironwood.
2/1/1996-2/4/1996	Arctic air became entrenched over Upper Michigan during the first four days of February. Low temperatures on the 1st reached -41 in Iron, -33 in Champion, and -27 in Alberta.
2/17/2006	A blast of arctic air behind the departing low brought another round of briefly heavy lake effect snow and near-blizzard to blizzard conditions to the western

	U.P. Wind chill values across the west and central Upper Peninsula commonly fell into the -25 to -35.
3/6/2007	Fresh snow cover under clear skies and calm wind allowed temperatures to plummet to -20 or colder over various interior locations of Upper Michigan on the morning of the 6th.
1/19/2008-1/20-2008	The passage of an Arctic cold front on the 18th ushered in very cold air and bitter cold wind chill temperatures. Wind chill temperatures plummeted into the -20 to -40 range across much of the west and central interior of the U.P.
1/30/2008	Low temperatures and winds gusting over 35 mph caused wind chill readings to plummet to -30 on the 30th. Schools were closed throughout the county due to the bitter cold, including Northern Michigan University. (Marquette County only)
12/15/2008	Wind chill values plunged into the 25 to 35 below zero range. Ewen-Trout Creek Schools closed on the 16th due to the bitter cold. (Ontonagon County only)
12/16/2008	Wind chill values hovered around 25 below zero on the morning of the 16th.
1/14/2009	Wind chill readings dipped to 25 to 30 below zero on the mornings of January 15th and 16th. Schools were closed throughout much of Baraga County on the 15th due to the cold weather.
1/26/2009	Bitter cold wind chills of -20 to -30 occurred throughout much of the period.
1/19/2012	Wind chill values lowered between -20 and -30.
1/21/2013	Wind chill values were estimated between -25 and -35 on both mornings of the 21st and 22nd. Area schools were closed on the 22nd due to the extreme cold. (Baraga & Marquette Counties only)
12/11/2013	Wind chill readings between -25 and -30 on the 11th forced the closure of Ontonagon and Ewen-Trout Creek Schools. (Ontonagon County only)
12/29/2013	Wind chills fell into the -25 to -35 range throughout much of the period for locations well away from Lake Superior. (Ontonagon County only)
1/1/2014	Arctic air spreading into the area along with wind around 10 mph at times caused wind chill readings in the -25 to -30 range over portions of west and central Upper Peninsula for the early morning of the 1st. The K.I. Sawyer Airport recorded wind chills between -25 and -30 for the early morning of the 1st. (Marquette County only)
2/27/2014	Wind chill readings throughout the period ranged from -25 to -35. Area schools were closed on the 27th and 28th due to the bitter cold wind chills. (Baraga County only)
12/31/2014	Southwest winds 10 to 20 mph combined with temperatures in the single digits below zero to produce wind chill values -25 to -30.
2/14/2015	Wind chill values dropped between -25 and -30 during the period. (Baraga County only)

2/18/2015	Gusty north winds and sub-zero temperatures forced wind chill values into the -25 and -35 through much of the period. Area schools were closed on the 19th due to the bitter cold wind chills.
2/20/2015	A very cold Arctic air mass surged into Upper Michigan in the wake of a series of Alberta clipper systems moving through the area. Bitter cold wind chills occurring from the 18th into the 20th closed schools across much of Upper Michigan. (Marquette County only)
2/22/2015	Sub-zero temperatures combined with gusty northwest winds drove wind chills down into the -25 to -35 range throughout much of the period. The dangerously cold wind chills closed area schools on the 23rd.
2/26/2015	Sub-zero temperatures combined with north winds to drive wind chills down into the -25 to -35 range throughout much of the period. The dangerously cold wind chills closed area schools on the 26th.
1/4/2017	The passage of a strong cold front and the advection of very cold Arctic air across Lake Superior resulted in a prolonged lake effect snow and bitter cold wind chill event from the 3rd into the 7th. Lowest wind chills during the period were between -25 and -35. (Ontonagon County only)
1/07/2017	The passage of a strong cold front and the advection of very cold Arctic air across Lake Superior resulted in a prolonged lake effect snow and bitter cold wind chill event from the 3rd into the 7th. Lowest wind chills at Sawyer International Airport during the period were between -20 and -25. (Marquette County only)
1/26/2019	Minimum wind chill values dipped into the -25 to -30 during the period. Schools were closed most days between the 28th and the 31st due to the bitter cold.
2/1/2019	Wind chills ranged from -30 to -35 on the morning of the 1st. L'Anse Schools were delayed at the start of classes two hours on the morning of the 1st due to the bitter cold.

Note: Events were recorded in all three counties unless noted

There are very few recorded incidences of excessive heat/heat events in Baraga, Marquette, and Ontonagon Counties in the NOAA Storm Events Database between 1996-2019[23]. A heat event occurred on July 31, 2006 where temperatures reached well into the 90s, with heat indices in the 100 to 105-degree Fahrenheit range. This event affected Baraga, Marquette, and Ontonagon Counties in addition to other parts of the central and Western Upper Peninsula. Extreme heat is a less common historical occurrence in this area, which means KBIC members are less adapted to this hazard – the absence of central air conditioning in most homes in the Upper Peninsula is one example of this.

[23] Any excessive heat events that may have occurred between 1950-1995 are not included in this database.

Occurrence Probability and Vulnerability

The probability of an extreme temperature event is moderate as it can occur anytime during the year. The frequency of occurrence for extreme cold events is between one and two events per year. For extreme heat, however, the probability of future occurrence is very low. There was only one extreme heat event in the past 10 years. While there is a likelihood that these events will occur any given time during the year, severity is low regionwide as resident behaviors are effective in limiting damage to life and property.

All KBIC community members are vulnerable to extreme heat and cold events. Vulnerability to extreme heat primarily impacts the elderly, small children, low-income populations, outdoor workers, and persons with pre-existing or chronic health problems.[24] It also primarily impacts individuals who live in housing with inadequate ventilation or cooling systems. Extreme heat events can trigger physiological conditions related to heat stress. Heat stroke is a type of heat stress where the body can no longer self-regulate its temperature. Without emergency treatment, heat stroke can cause permanent disability or even death. Extreme heat also increases demand on electric utilities and may cause power outages to critical facilities. Critical facilities vulnerable to the extreme cold include drinking water services, such as the L'Anse and Baraga Wastewater Treatment Facilities and water distribution systems. If water mains were to break, these facilities would be unable to provide water to residents.

Fog

Hazard Description

Fog forms near the ground when water vapor condenses into tiny liquid droplets that remain suspended in the air. This reduces horizontal visibility, or the visual range, to less than 1,000 meters.[25] Many different processes can lead to the formation of fog, but the main factor is saturated air. Two ways that air can become saturated are by cooling it to its dew point temperature or by evaporating moisture into it to increase its water vapor content. Fog itself is not a hazard because it does not actually apply destructive forces, but the interaction between humans and fog can be a dangerous situation, sometimes resulting in disastrous consequences. However, *freezing fog* (NWS does issue special statements for this hazard) can cause direct harm by causing slickness on roadways and thus leading to serious transportation accidents.

Fog can be very dangerous because it reduces visibility. Although some forms of transport can penetrate fog using radar, road vehicles must travel slowly and use more lights. Localized fog is especially dangerous because it catches drivers by surprise which can lead to multi-vehicle accidents on roadways covered by fog.

[24] American Public Health Association. 2020. Fact Sheet: Extreme Heat Can Impact Our Health in Many Ways. https://www.apha.org/publications-and-periodicals/fact-sheets
[25] Klemm, O., & Lin, N. (2016). What causes observed fog trends: air quality or climate change. *Aerosol and Air Quality Research*, 16(5), 1131-1142.

Historical Occurrences

From 2006-2019, multiple dense fog events were recorded in Baraga, Marquette, and Ontonagon Counties during this period (**Table 9.4**) While no property damages or injuries were reported as a result from these events, the low visibility was attributed to longer commute times in the area. There were no reported incidences of freezing fog in these three counties.

Table 9.4: Reported Dense Fog events in Baraga, Marquette, and Ontonagon Counties, 2006-2019

Event Date(s)	Description
6/7/2006	Widespread dense fog developed over Gogebic, Ontonagon, Keweenaw, Houghton and Baraga counties in the early morning hours of the 7th, slowing the morning commute to work. (Baraga and Ontonagon Counties only)
4/3/2007	Dense fog formed in Marquette and Baraga counties on the morning of the 3rd and then continued into the afternoon hours before dissipating. Widespread dense fog reduced visibility to one-quarter mile or less. (Marquette and Baraga Counties only)
1/6/2008	Warm, moist air moving over melting snowpack produced widespread dense fog across much of Upper Michigan from the 6th continuing into the 8th.Widespread fog was reported through much of this period. (Marquette and Baraga Counties only)
1/7/2008	Warm, moist air moving over melting snowpack produced widespread dense fog across much of Upper Michigan from the 6th continuing into the 8th. Widespread dense fog was reported through much of this period. (Ontonagon County only)
11/2/2008	Abundant low-level moisture trapped under drier air aloft resulted in periods of widespread dense fog across portions of Upper Michigan from the evening of the 2nd through the morning of the 4th. Dense fog reported throughout much of the period at the Sawyer International Airport AWOS. (Marquette and Ontonagon Counties only)
11/3/2008	Abundant low-level moisture trapped under drier air aloft resulted in periods of widespread dense fog across portions of Upper Michigan from the evening of the 2nd through the morning of the 4th. Widespread dense fog reported throughout the county. (Baraga County only)
2/17/2011	A warm moist southerly flow of air ahead of an approaching cold front and across an existing snowpack resulted in dense fog over portions of central and eastern Upper Michigan on the 17th and the early morning of the 18th. Dense fog reduced visibility to one-quarter mile or less over portions of Marquette County.
4/29/2014	Relatively warm moist air moving over a recent wet snowfall generated widespread dense fog over much of west and north central Upper Michigan from late on the 29th into the morning of the 30th. Widespread dense fog to one-quarter mile or less visibility was reported by many area spotters and confirmed by area webcams. (Marquette and Ontonagon Counties only)

Note: Events were recorded in all three counties unless noted

Occurrence Probability and Vulnerability

Fog is a common occurrence in the Upper Peninsula. Although fog instances are not well-tracked or documented, fog is often associated with the Great Lakes coastlines. Areas near shorelines typically experience more fog events during spring and early summer when the Great Lakes are cold. Warm, moist air is rapidly cooled as it moves across the lakes which leads to moisture condensation in the form of fog. Fog events will continue to occur in the future and are not preventable. Only when fog and humans interact on transportation corridors, facilities and people become vulnerable to fog.

KBIC members and area residents are generally used to coping with fog conditions when it arises. Residents in this area can follow safety precautions such as using running lights and headlights when driving in fog conditions, driving slower, and avoiding boating and/or driving during periods of thick fog that makes it dangerous to operate motorized vehicles.

Hail

Hazard Description

Hail is produced during thunderstorms when strong updrafts among the clouds carry water droplets above the freezing level, causing the formation of ice pellets around some nucleus, such as a water crystal or a speck of dust. Additional water droplets gradually accumulate and freeze around the ice crystals until they become heavy enough to fall as hailstones. Hailstones typically take the form of a ball or irregularly shaped ice mass greater than 0.75 inches in diameter. Hail is typically accompanied by heavy rains. Falling hailstones can damage crops and built structures (especially roofs), dent vehicles, and injure wildlife, livestock, pets, and people. Estimates of hail-related damages across the United States range from $10 to $20 billion annually.[26] In Michigan, there is usually at least one intense hailstorm per year that causes significant damages. Unfortunately, the total property damages for many hailstorms goes unreported.

As a product of thunderstorms, the size of hail is usually proportional to the intensity of the storm cell that generates it. As a thunderstorm passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, strong winds occurring at high altitudes in the thunderstorm can blow hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Instances of hail can also be very localized – to an area as small as a few city blocks.

Hail reported in Michigan range in size from a pea (¼" diameter) to a golf ball (1 ¾" diameter), but hailstones larger than baseball (2 ¾" – 3" diameter) have occurred with the most severe thunderstorms. **Table 9.5** provides official classifications of hail magnitude as often used in weather reporting and event records.

[26] Loomis, I. (2018), Hail causes the most storm damage costs across North America, Eos, 99, https://doi.org/10.1029/2018EO104487. Published on 16 August 2018.

Climate Change Considerations

Climate change increases the occurrence of the more extreme and severe thunderstorms that often accompany hailstorms.[27] This means that, although North America may experience fewer rainstorms overall, the storms that do occur are those that are more likely to come with larger hailstones that can be dangerous and damaging to plants, animals, crops, and property.[28]

Table 9.5: Hail Size Reference

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

Historical Occurrences

A hail event may occur anywhere throughout the county and is not confined to any geographic boundaries. Often accompanying thunderstorms, these events are typically widespread. **Table 9.6** provides an overview of hail events in Baraga, Marquette, and Ontonagon Counties from 1955-2019. In Baraga County, 46 hail events occurred between 1955 and 2019 with the earliest event recorded in 1961. The most significant hailstorm event in Baraga County occurred on August 2, 1982 where severe thunderstorms produced damaging winds and hailstones up to 2.5 inches in diameter. A total of 168 hail events were reported throughout Marquette county from 1955-2019 with 13 of these events occurring on May 14, 2007 and 18 of these events occurring on June 20, 2007. Marquette County saw two separate instances of hailstones up to 3 inches in diameter that damaged vehicles including shattering car windows or totaling vehicles. Reported estimates of property damages due to hail events in June 2007 alone exceeded $64 million during this period. In Ontonagon County, 49 hail events were reported from 1955-2018 and no property damages were recorded related to these storms.

[27] Brimelow, J. C., Burrows, W. R., & Hanesiak, J. M. (2017). The changing hail threat over North America in response to anthropogenic climate change. *Nature Climate Change*, 7(7), 516-522.
[28] Botzen, W. J. W., Bouwer, L. M., & Van den Bergh, J. C. J. M. (2010). Climate change and hailstorm damage: Empirical evidence and implications for agriculture and insurance. *Resource and Energy Economics*, 32(3), 341-362.

Table 9.6: Reported Hailstorm Events by Size in Baraga, Marquette, and Ontonagon Counties, 1955-2019

Hail Size Reported	Number of Events		
	Baraga	Marquette	Ontonagon
0.5”	0	1	0
0.75”	20	47	26
0.88”	7	28	5
1”	11	49	12
1 ¼”	1	12	1
1 ½”	2	11	2
1 ¾”	3	14	3
2”	1	2	0
2 ½”	1	1	0
2 ¾”	0	1	0
3”	0	2	0
TOTAL	46	168	49

Occurrence Probability and Vulnerability

The annual frequency of a hail event occurring in Baraga County since 2010 is approximately one event per year. In Marquette County, at least two hail events per year has been recorded since 2010, while Ontonagon County has seen an average of approximately one hail event per year during the same period. Thus, the probability of a hail event occurring in KBIC lands every year is highly likely.

There are no known areas in the Reservation that have a higher risk from hail, but some areas may have structures that are more vulnerable to hail damage than others. Damage to vehicles, homes, and buildings, such as broken windows, dented roofs, and damaged siding, is frequently reported. Wild rice beds, the community garden, walleye ponds, and beehives are also particularly vulnerable to hail. Critical KBIC facilities are vulnerable to receive similar damage from hail, but hail should not negatively impact the services a facility provides.

Ice and Sleet Storms

Hazard Description

Ice storms and sleet are two distinct and severe winter weather phenomena. Ice storms, often called “freezing rains”, are the result of cold rain that freezes on contact with a surface. Ice storms coat the surfaces of roads, trees, power lines, buildings, and other exposed objects with a thick and heavy layer of ice, sometimes causing extensive damage. Massive traffic accidents and power outages from downed tree limbs and utility lines are common when an ice storm occurs. When electric lines are downed due to an ice storm/freezing rain event, power may be out for several days. Ice storms are often accompanied by snowfall that covers and camouflages the ice, creating treacherous transportation conditions.

Ice storms are sometimes incorrectly referred to as sleet storms, but these are different phenomena. Sleet is small frozen raindrops or ice pellets that bounce when hitting the ground or other objects. Because sleet does not stick to trees and wires, sleet storms are less dangerous than ice storms. However, sleet can cause hazardous driving conditions depending on the severity of a sleet event and how much sleet covers roadways and/or impacts visibility. Both ice storms and sleet occur when the temperature is close to 32°F but are far more severe when the temperature is between 20 to 30°F.

Climate Change Considerations

Climate change will likely cause an increase in the number of ice and sleet storm events. This is because average temperatures in and around the winter months will be closer to the freezing point and therefore at the temperature at which ice and sleet events typically occur. Although winter has shortened in duration somewhat over time, winters in the Great Lakes region remain hazardous because precipitation more often takes the form of major snow events. These snowstorms produce moisture that melts during thawing periods and refreezes when temperature drop below freezing again. This cycle of snow and ice storms with many thawing and refreezing events during winter causes treacherous ice cover on frozen surfaces, weighs down cables and tree branches, and can cause infrastructure failures.

Historical Occurrence

Ice storms usually have a regional effect instead of effecting just one isolated area when they occur. The NOAA Storm Events Database began collecting ice and sleet storm data in 1996. Across Baraga, Marquette, and Ontonagon Counties, a total of two ice storms and one sleet storm were recorded from 2002-2019. They are listed in **Table 9.7**: Reported Ice and Sleet Storms in Baraga, Marquette, and Ontonagon Counties, 1996-201, including estimated property damages.

Large tree limb collapsed in front of NWS Marquette office due to weight of ice, February 4, 2019 (Source: NWS Marquette)

Table 9.7: Reported Ice and Sleet Storms in Baraga, Marquette, and Ontonagon Counties, 1996-2019

Date	Type of Storm	Description and Location	Property Damages
3/9/2002	Ice Storm	Freezing rain coated Negaunee, Marquette and Harvey with 1/4 to 1/2 inch of ice. High winds of 50 to 60 mph knocked down trees and power lines and caused blizzard conditions. Numerous minor traffic accidents were reported, including one 5 car pile-up. Some roads were closed when	No reported damages

		snowplow crews could not keep up with falling and blowing snow. (Marquette County only)	
12/18/2002	Ice Storm	Ice accumulations around a quarter to half inch thick on road surfaces as well as cars and trees. Many schools were closed, and minor traffic accidents were reported due to slick roads. (Marquette County only)	No reported damages
12/30/2004	Ice Storm	Quarter inch or more of ice on roadways with numerous minor accidents reported by law enforcement officials. (Marquette County only)	No reported damages
01/01/2005 to 01/02/2005	Ice & Sleet Storm	Significant ice accumulation reported overnight of a quarter inch or more; Sleet accumulation of a half inch to an inch created hazardous travel on area roadways with few minor accidents reported by law enforcement.	No reported damages
04/26/2017	Ice Storm	Higher elevations of Porcupine Mountains State Park received over an inch of ice accumulation from freezing rain which was then covered by 2-4 inches of wet snow. This combination of the ice and snow toppled thousands of large trees, causing extensive damage to 35-50 miles of hiking trails within the park. Light to moderate accumulations of ice and snow were reported at lower elevations which led to minor tree damage and slippery conditions on area roads and sidewalks. (Ontonagon County only)	$100,000
2/4/2019	Ice Storm	A strong winter storm dropped ¼ to ¾ inches of ice accumulation across Marquette County on the morning of the 4th. The storm caused tree damage and power outages across the county, and schools throughout the county were closed due to slippery conditions. (Marquette County only)	$30,000

Note: Events were recorded in all three counties unless noted

Occurrence Probability and Vulnerability

Ice and sleet storms are infrequent and the probability of an event occurring is low. Storm severity is variable, but generally low to moderate. However, according to the LPT, KBIC's vulnerability to ice and sleet storms is high, as very little can be done to lessen the impacts of an ice and sleet storm. These impacts primarily involve infrastructure damages, delayed public safety responses, and critical facility failures. The entire planning area for Keweenaw Bay Indian Community is equally at risk to ice and sleet storms. Transportation and electric infrastructure are vulnerable to ice storm, causing icy roadways or potential for power and communication outages. Icy weather conditions can slow emergency response travel time when responding to automobile accidents and other incidents related to ice storms and/or sleet storms. Ice storms can

also lead to school cancellations, impacting the students and families of the community. Heavy volumes of traffic in and out of a facility may contribute to transportation accidents on area roadways.

Ice storms usually causes damage to trees, as the weight of accumulated ice brings down limbs and branches, sometimes even entire trees. If the soil is not already frozen, ice loads can cause root damage, furthering damage to trees. Trees that have suffered damage due to ice may dry and become more prone to fire. Widespread ice damage to forested lands can disrupt some species' habitats, composition, and species diversity. Additionally, wildlife and ecosystems are inadvertently impacted from transportation accidents or infrastructure failures due to ice storms, which may result in local contamination of land, air, and water if hazardous materials are released due to an accident or failure.

Lightning

Hazard Description

Lightning is the discharge of electricity from a thunderstorm. It is a random and unpredictable product of energy from a thunderstorm. Lightning strikes when the electric potential (the difference between its positive and negative charges) of a thunderstorm becomes great enough to overcome the resistance of the surrounding air. A single thunderstorm can produce hundreds or even thousands of lightning strikes. In the US, approximately 100,000 thunderstorms occur each year and each of those storms generates lightning.[29] It is not uncommon for a single thunderstorm to produced hundreds or even thousands of lightning strikes.

Lightning can ignite forest fires, damage private property, and impact electrical infrastructure such as power lines and electrical grid systems. Many persons in the public perceive lightning as a minor hazard even though lightning damages many structures and even causes more deaths per year, on average, than tornadoes or hurricanes. From 2006 through 2018, 396 people were struck and killed by lightning in the United States.[30] Those who suffer fatal injuries due to a lightning strike are typically engaged in outdoor recreation with fishing, boating, and beach activities topping the list. Given the close ties of KBIC members to water-based recreation and both subsistence and commercial fishing, it is important to mitigate any potential risk to KBIC residents due to hazardous lightning events.

Lightning deaths, injuries, and property damage can be reduced by increasing public education, situational awareness, and proper planning supplemented by forecasting and proper building safety provisions.[31] However, it is virtually impossible to completely protect individuals and

[29] The National Severe Storms Laboratory. National Oceanic and Atmospheric Administration. Severe Weather 101. https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/
[30] Jensenius, Jr. 2019. A Detailed Analysis of Lightning Deaths in the United States from 2006 through 2018. National Lightning Safety Council Report. https://www.weather.gov/media/safety/Analysis06-18.pdf
[31] National Oceanic and Atmospheric Administration. Lighting Safety Brochure. https://www.cdc.gov/features/lightning-safety/index.html

structures from lightning, which means this hazard will continue to be a problem for Michigan's residents and communities.

Climate Change Considerations

Lightning and climate change are closely interconnected. As a product of intense storms, lightning is an indicator of climate change as the occurrence of more extreme weather events increases due to climate change. Additionally, lightning strikes produce nitrogen oxides which are a greenhouse gas. This means that lightning is both a symptom and a cause of climate change.[32]

Historical Occurrence

There have been multiple recorded lightning events in Marquette County in recent years (**Table 9.8**) and no recorded lightning events in KBIC lands or in Baraga and Ontonagon Counties. While lightning events have likely occurred in other areas, these events usually do not have any damage reported.

Table 9.8: Reported lightning events in Marquette County, 2008-2019.

Date	Description and Location	Property Damages
7/17/2008	Lightning struck a power pole outside a residence in Negaunee. The lightning bolt traveled into the residence igniting a fire.	No reported damages
7/14/2010	Lightning from thunderstorms moving through the area caused a house fire in Chocolay Township.	$15,000
5/20/2012	Lightning and high wind from thunderstorms caused more than 200 customers to lose power in Ishpeming.	$2,000
8/26/2013	A lightning strike damaged electronics equipment in a neighborhood northeast of Negaunee.	$4,000
9/6/2015	A fallen tree caused damage to a boat, a pickup truck and a camper awning in Van Riper State Park after it was struck by lightning. No injuries were reported.	$15,000
7/18/2017	A spotter four miles north of Negaunee reported that lightning struck a maple tree eight feet from his residence.	$500
6/30/2018	A cold front moving through a very moist and unstable air mass produced severe thunderstorms over portions of west and central Upper Michigan during the afternoon and evening of the 30th. Smoke was reported at the U.P. Health System in Marquette due to a lightning strike.	$2,000

[32] EOS. 2018. Lightning: A New Essential Climate Variable. https://eos.org/science-updates/lightning-a-new-essential-climate-variable

7/12/2018	The Marquette Fire Department determined that a lightning strike from a thunderstorm caused the fire and destroyed a shed in the city of Marquette. The structure was a total loss. The electrical supply for an adjacent home was damaged by the radiant heat from the fire. Marquette Police blocked off Lincoln Street between Ridge and Jefferson streets during containment of the fire.	$20,000

Occurrence Probability and Vulnerability

The likelihood of the lightning event causing damage to human life or property is negligible. However, when a damaging event does occur its severity is extreme at the discharge site. Trees can be blown apart if struck by lightning or have branches and bark broken off that can scar and kill them. Lightning can also cause large wildfires that can be devastating to an area's short-term ecological condition and long-term subsistence.

There is really no way to pinpoint exactly where, when, and to what extent lightning will cause damage. The entire planning area for Keweenaw Bay Indian Community is equally at risk to a lightening event. Critical facility in the region should be protected by lightning strikes through grounding and other protective measures. A more specialized study will need to be completed to determine what facilities in the area are at higher risk and might need greater protection.

Severe Winds

Hazard Description

Severe winds, or "straight-line" winds, are winds that exceed 50-60 miles per hour. These fast-moving winds are associated with severe thunderstorms and other weather systems. Severe winds can be so damaging to a community that they are often confused with a tornado occurrence. Parts of the Great Lakes and associated shorelines may also see hurricane-velocity gusts that exceed 74 miles per hour. In addition to severe winds, high winds of lower magnitude occur regularly along the Great Lakes shoreline. Somewhat weaker wind events termed high winds and thunderstorm winds can cause similar damage as severe winds.

Severe winds can cause damage to homes and businesses, power lines, trees, and agricultural crops. Additionally, power outages resulting from severe winds can result in a need to shelter persons left without power for extended times. Although severe events are typically less life-threatening and damaging than tornadoes, property damage from straight line winds can be more widespread than tornadoes and often affect multiple counties at a time. These wind events also have the potential to cause loss of life from breaking and falling trees and flying debris.

Climate Change Considerations

Increased intensity and frequency of extreme weather events is one of the most visible consequences of climate change. Because climate change increases the occurrence of the severe thunderstorms and/or blizzards that extreme winds are typically associated with, hazardous wind events will continue to occur in the future and potentially increase in severity and frequency.[33]

Historical Occurrence

Severe windstorms are rarely a singular event; they usually accompany other severe weather events like thunderstorms and occasional blizzards. Details of all windstorms are listed in **Table 9.9**, including a list of costly wind events. Of the 71 severe wind events reported in Baraga County, 41 resulted in an estimated $490,500 in property damage. The largest wind gust recorded in Baraga County was 70 knots or 80.5 miles per hour on July 28, 2006 near Covington. Large tree limbs fell, and trees were uprooted along a 20-mile damage path. Downed trees and power lines were reported throughout the region as well as other property damage totaling an estimated $50,000.

Of the 81 severe wind events reported in Ontonagon County, 32 resulted in total of $195,000 in property damages and a total of $1,060,000 in crop damage. The crop damage is attributed to two severe wind events: on November 11, 1998 severe wind destroyed $1 million worth of timber in and outside of the Ottawa National Forest and on July 30, 1999 severe wind damaged or destroyed many medium to large sized apple trees.

Marquette County had the highest number of severe wind events with a total of 213 events reported. Of these, 107 had reported property damage totaling over $3.5 million. In addition to property damages, three reported deaths were caused by severe wind events. The most recent of these fatalities occurred on October 9, 2007 when severe winds and waves capsized a fishing boat on Lake Independence; two elderly men drowned.

Table 9.9: Reported Severe Wind Events in Baraga, Marquette, and Ontonagon Counties, 1950-2019

County	Total Number of Events	Number of Events Causing Property Damage	Total Property Damage	Total Crop Damage	Injuries	Deaths
Baraga	69	41	$490,500	0	0	0
Marquette	213	107	$3,529,750	0	0	3
Ontonagon	81	32	$195,000	$1,060,000	0	0

[33] Cheng, C. S., Lopes, E., Fu, C., & Huang, Z. (2014). Possible impacts of climate change on wind gusts under downscaled future climate conditions: Updated for Canada. *Journal of Climate*, 27(3), 1255-1270.

Specific severe wind events that caused significant property damage in the past 10 years include:

- July 18, 2013: A cold front moving slowly across the region caused severe thunderstorms to focus over Baraga County. The storms were accompanied by sporadic straight-line winds that caused property damage across a 1-1.5-mile-wide path. Winds (estimated at 65 mph) uprooted trees and broke off large limbs. A tree fell on a mobile home when the owner was nearby and caused a fire to break out. Fallen tree damage caused other households to suffer damage including the total loss of one vehicle. A portion of the Baraga County Road Commission Garage was torn off. Estimated property damages for this single event were as high as $200,000.
- December 24, 2015: Strong wind gusts (between 50 and 55 mph) knocked down trees and subsequently caused sporadic power outages across Baraga County. The power outages affected approximately 6,000 Upper Peninsula Power Company (UPPCO) customers. Total property damage was reported to total $5,000.
- July 21, 2016**:** Severe thunderstorms and winds up to 65 mph downed numerous trees across Baraga County. US-41 was blocked by a downed tree south of L'Anse. Total property damage in Baraga County was estimated at $5,000. In Ontonagon County, the Ontonagon Emergency Manager reported dozens of trees downed by winds, including many that fell on homes. Power was out in the Village of Ontonagon for approximately 8 hours. Total damages in Ontonagon County were estimated at $100,000.

Occurrence Probability and Vulnerability

About two to four severe wind events occur a year in Baraga, Marquette, and Ontonagon County. However, future occurrences may increase due to impacts from climate change. Any future public safety risks and/or potential threats to KBIC built structures, natural systems including important crops, wildlife, and plant species, and community member property are difficult to predict due to the highly variable and non-site-specific nature of severe wind events.

Areas near the Lake Superior shoreline are more vulnerable to damage, but severe wind events are far from being localized to that area and can affect inland areas of the region as well. Severe winds tend to impede transportation, causing slowed traffic and impaired control on roadways. All critical facilities are vulnerable from severe winds. Facilities may collapse due to high winds or experience damage from fallen trees or limbs. Tree debris may block roads and cause critical infrastructure outages by pulling down communication and power lines.

Ecosystem habitats and wildlife are also vulnerable to impacts from severe winds. Some harmful effects of wind on the environment include full-grown trees being uprooted and knocked down or large areas of forest land being destroyed. Wildlife species are threatened through loss of habitat or shelter. Aquatic wildlife ecosystems are also disrupted when winds stir up sediments.

Snowstorms and Blizzards

Hazard Description

A snowstorm is a period of rapid snow accumulation that can also be accompanied by ice and sleet formation. Blizzards are a type of snowstorm characterized by low temperatures and high-speed winds of over 35 miles per hour. Blizzard snow typically takes the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet.

Snowstorms and blizzards can both disrupt daily life by creating both a driving hazard, causing power losses, and creating snow accumulation that cannot be cleared in a timely fashion. Rural residents may be unable to access roads for some time after a snowstorm event, which can temporarily isolate individuals and communities. The impact of persistent heavy snow events can last for several days as snow removal requirements over-burden existing equipment, time, and human resources. These hazards also have the potential to result in property damage and loss of life, and the cost of clearing snow can be enormous.

Areas that routinely experience snowstorms and blizzards also typically suffer greater flood risks because thick, accumulated snow cover can rapidly melt off during rainstorms, causing rapid drainage of water within cities, drains, streams, and rivers. Partially melted snow and ice can cause blockages within these water channels, causing liquid waters to back up or divert sideways and over banks where they damage property and roadways.

Michigan's geographic positioning between multiple Great Lakes creates regional weather systems that are drive by "lake effect". This is the process by which cold winter air moving across the Great Lakes picks up moisture form the warmer lake waters. The movement of moisture results in a higher amount of snowfall, and the western Upper Peninsula experiences the most snowstorms and snowfall in Michigan each year due to lake effect snow associated with Lake Superior. This means that, for the KBIC, lake effect snow almost exclusively occurs in areas on or near Lake Superior.

Climate Change Considerations

Climate change is expected to cause an increase in annual precipitation in the Great Lakes region. In winter, this increase in precipitation will lead to more intensive snowfall events despite an overall shortening of the duration of the winter season. Significant snowstorm events resulting in 8 or more inches of snow, higher snowdrifts, and canceled school sessions will become more common due to climate change.

Historical Occurrence

This winter weather event history gathered from the NOAA Storm Events Database includes blizzards, heavy snow events, lake effect snow events, winter storms, and winter weather. Blizzards are recorded if snow accumulation and wind condition criteria are met for a period of three or more hours. "Near-blizzard" or "blizzard-like" conditions that occurs for less than three

hours are entered into this database as either a "winter storm", "heavy snow", or "winter weather".[34]

Injuries and fatalities attributed to winter storms are typically categorized as direct or indirect fatalities/injuries in the Storm Events Database. Examples of direct fatalities and injuries include instances of hypothermia due to individuals being trapped or disoriented in blizzard conditions (e.g., in a home or vehicle) or individuals struck by objects or structures (e.g., roof collapse) impacted by wind or heavy snow accumulation. The major cause of indirect fatalities and injuries due to hazardous winter weather are vehicle accidents caused by slippery roads and/or poor visibility associated with a storm.

Baraga County experienced 219 snowstorms between 1996 and 2019. **Table 9.10** provides a summary of reported snowstorm events that have occurred in the county. Outcomes of these winter weather systems include downed trees, reduced driving visibility and safety, and power outages. For instance, a recent severe winter storm event on November 27, 2019 resulted in an estimated $20,000 in property damages and widespread power outages resulting from the rapid accumulation of 9-10 inches of snow combined with wind gusts up to 40-50 mph. This single event stalled Thanksgiving holiday traffic, downed trees and power poles, and caused the Baraga County offices to close for the day.

There are instances of indirect death due to traffic-related incidents that were impacted by the weather. A winter weather system, including heavy lake effect snow, that occurred on December 5 and 6, 2018 created poor visibility and slick roads and contributed to a fatal car crash near L'Anse Bay. Wind gusts and blowing and drifting snow created white out conditions on March 8, 2017 that led to a three-vehicle accident with major injuries along US-41. Reported property damages at $60,000.

Table 9.10: Reported Snowstorms by Type in Baraga County, 1996-2019

Snowstorm Type	Number of Events	Total Property Damage	Injuries	Deaths
Blizzard	4	$0	0	0
Heavy Snow	30	$0	0	0
Lake Effect Snow	9	$0	0	0
Winter Storm	70	$2,000	0	0
Winter Weather	113	$79,000	0	1
TOTAL	226	$81,000	0	1

More than 300 winter weather events were recorded in Marquette County from 1955-2019 (**Table 9.11**). In total, these snowstorms resulted in over $1 million in estimated property damages and one fatality. White-out conditions at the scene of a minor car accident on February

[34] National Weather Service Instruction 10-1605. March 23, 2016. Operations and Services Performance, NWSPD 10-16. Storm Data Preparation. https://www.ncdc.noaa.gov/stormevents/pd01016005curr.pdf

28, 1996 led to the accidental death of a driver who was standing outside his vehicle on M28. The individual was killed when struck by a passing truck.

More recently, the same winter storm event that caused property damage and power outages in Baraga County on November 27, 2019 also affected Marquette County residents. Higher elevations in the county measured 12-16 inches of snowfall during this single snow event, and UPPCO reported over 40 power poles damaged by the weight of snow and falling trees or branches. Approximately 20 percent of the UPPCO customer based, an estimated 12,000 customers, lost power at least once during this event and crews were dispatched to over 2,000 locations to make repairs. Many Marquette County businesses closed during this event.

A blizzard event on February 24-25, 2019 in Marquette County led to approximately $1 million in damages. Accumulated heavy snows from previous storms and this event caused roof collapses for many businesses and farm buildings and many roads were closed. The roof of the Negaunee Bus Depot collapsed and schools throughout Marquette County were closed on the 25th, including Northern Michigan University.

Table 9.11: Reported Snowstorms by Type in Marquette County, 1996-2019

Snowstorm Type	Number of Events	Total Property Damage	Injuries	Deaths
Blizzard	10	$1,004,000	0	0
Heavy Snow	47	$150,000	0	1
Lake Effect Snow	24	$10,000	0	0
Winter Storm	86	$168,000	0	0
Winter Weather	138	$125,000	0	0
TOTAL	305	$1,457,000	0	1

Ontonagon County experienced 307 reported winter weather events from 1996-2019 (**Table 9.12**). Combined, these storms damaged property valued at $41,000, injured two people, and resulted in one death. A winter storm that occurred on March 24-25, 1996 included rapid snow accumulation, a mix of rain and freezing rain, and frequent wind gusts up to 40 mph. Snowfall reached as high as 30 inches in Ontonagon and 20 inches in L'Anse. Combined, these conditions caused whiteout conditions that were treacherous for drivers and resulted in a fatal traffic accident between two semi-trucks on Highway M28 two miles east of Bergland in Ontonagon County. These whiteouts also resulted in road closures on portions of M28 on the 25th.

Table 9.12: Reported Snowstorms by Type in Ontonagon County, 1996-2019

Snowstorm Type	Number of Events	Total Property Damage	Injuries	Deaths
Blizzard	7	$0	0	0
Heavy Snow	52	$1,000	0	0
Lake Effect Snow	33	$0	0	0
Winter Storm	91	$20,000	2	1
Winter Weather	124	$20,000	0	0
TOTAL	307	$41,000	2	1

Occurrence Probability and Vulnerability

KBIC residents are accustomed to major snow events, which occur regularly every winter. Over 300 events were recorded in a 23-year period between 1996 and 2019. This demonstrates the high probability of future snowstorm events occurring in and impacting the KBIC. According to the KBIC LPT, winter storms occur frequently and present a high risk to vulnerable populations, especially elders and people without transportation.

Depending on the type of snow (wet, heavy versus fine, powdery snow), snowstorms and blizzards may result in a variety of infrastructure problems. Snow accumulations on above ground electric lines may result in power outages, which can vary from several hours to days. Dangerous driving conditions frequently occur during and shortly after a severe snowstorm. Some state and county roads experience drifting snow, which can result in greater vulnerability to accidents. During some snowstorms and blizzards, snow falls in such high amounts that snowplows cannot remove snow from the road. When transportation is disrupted, schools close, emergency services are delayed, some businesses close, and some government services are delayed. More rural areas of the region may experience impassable roads, preventing emergency services from reaching rural residents.

All critical facilities in the KBIC are vulnerable to heavy snows, particularly when roofs are not properly maintained or shoveled off. Roof failures may occur as the weight and volume of snow can cause damage to buildings and homes. Structures with flat roofs or inadequately sloped are more vulnerable to damage and collapse from heavy snow. Heavy snow can also damage trees, particularly dead trees or trees with detached branches which can break off and fall. Wildlife are also vulnerable to snowstorms and blizzards, causing frostbite, hypothermia, and death.

Tornadoes

Hazard Description

A tornado is an intense rotating column of wind extending from the base of a severe thunderstorm to the ground. Tornadoes are well-recognized for their funnel-shape formation. However, funnel clouds only become visible when they pick up enough liquid, dust, and debris

to allow individuals to recognize their pattern. Therefore, a tornado can be present but not yet discernable to nearby persons. Tornadoes can cause catastrophic damage to a limited area or an extensive area, depending on local conditions and unique aspects of the storm system. Tornadoes can have winds of more than 300 miles per hour and be over 1 mile in width, and a strong tornado can level everything in its path.

Advances in severe weather forecasting have decreased the number of tornado-related injuries and fatalities since the 1950s. However, while tornado deaths have decreased, tornado damages have increased in recent years with an increase in the proportion of developed land in the United States. As a result, property damage resulting from tornadoes totals hundreds of millions of dollars annually.

Tornado intensity is measured on the Fujita and Enhanced Fujita Scales, which are based on the extent of the damage caused by a tornado. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita scale (**Table 9.13**). After 2005, the Enhanced Fujita Scale (**Table 9.14**) was utilized. The Enhanced Fujita Scale rates the intensity of a tornado based on damaged caused, not by its size. Tornado size is not necessarily an indication of its intensity.

Table 9.13: Fujita Scale with Associated Damages

F-Scale Number	Intensity	Wind Speed (mph)	Type of Damage
F0	Gale Tornado	40-72	Some damage to chimneys; branches break off trees; shallow-rooted trees blown over; damages to signs.
F1	Moderate Tornado	73-112	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving cars pushed off roadways.
F2	Significant Tornado	113-157	Considerable damage. Roofs torn off homes; mobile homes demolished; large trees snapped or uprooted; light objects can turn into missiles.
F3	Severe Tornado	158-206	Roof and some walls torn off well-constructed homes; most trees uprooted.
F4	Devastating Tornado	207-260	Well-constructed homes leveled; structures with weak foundations blown away; cars thrown; large objects can turn into missiles.
F5	Incredible Tornado	261-318	Strong frame house lifted off foundations and carried considerable distances; automobile sized missiles can fly over 100 meters; trees debarked; steel reinforced concrete structures damaged.

Source: Storm Prediction Center

Table 9.14: Enhanced Fujita Scale with Associated Damages

EF-Scale Number	Intensity Phrase	3 Second Wind Gust	Type of Damage
EF0	Gale	65-85 MPH	Some damage to chimneys; branches break off trees; shallow-rooted trees blown over; damages to signs.
EF1	Moderate	86-110 MPH	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving cars pushed off roadways.
EF2	Significant	111-135 MPH	Considerable damage. Roofs torn off homes; mobile homes demolished; large trees snapped or uprooted; light objects can turn into missiles.
EF3	Severe	136-165 MPH	Roof and some walls torn off well-constructed homes; most trees uprooted.
EF4	Devastating	166-200 MPH	Well-constructed homes leveled; structures with weak foundations blown away; cars thrown; large objects can turn into missiles.
EF5	Incredible	Over 200 MPH	Strong frame house lifted off foundations and carried considerable distances; automobile sized missiles can fly over 100 meters; trees debarked; steel reinforced concrete structures damaged.

Source: Storm Prediction Center

Michigan lies at the northeastern edge of the nation's primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio. Tornadoes occur more frequently in the southern half of Michigan's Lower Peninsula than any other area of the state, which is referred to as Michigan's "tornado alley." Since 1996, Michigan has averaged about 16 tornadoes per year. Tornados in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with air from the polar regions to generate thunderstorms. These thunderstorms can produce the violently rotating columns of wind known as funnel clouds. Winds that converge from different directions, heights, or at different speeds are the source of the spinning pattern that gets concentrated as distinct funnels of wind.

Climate Change Considerations

It is difficult to predict how climate change affects tornado frequency or severity. Understanding the conditions that lead to the occurrence of a tornado is complex and still under study However, there is evidence that a warming atmosphere favors increased occurrence of tornadoes. Tornado records typically only date back to the 1950s. As new tornado events occur and are tracked and recorded, scientists can update their predictions and draw a clearer picture of potential future trends.

Historical Occurrences

From 1950-2019, there were 13 tornado events reported in Baraga, Marquette, and Ontonagon Counties. **Table 9.15** lists these events. The total reported property damages from these tornado events: $350,010.

Table 9.15: Tornado Events in Baraga, Marquette, and Ontonagon Counties, 1950-2019

Date	Magnitude	Description and Location	Est. Property Damage
06/30/1953	F1	No description available; Length of tornado path was 10.9 miles and width of tornado was 500 yards. (Ontonagon County)	$250,000
08/22/1968	F2	Tornado moved through wooded area near Herman leaving a clean-cut path of complete destruction. Funnel moved toward the east. (Baraga County)	No reported damages
08/19/1973	F1	Two buildings demolished. High School damaged (Marquette County)	$2,500
06/20/1979	F0	Brief funnel touchdown seen from aircraft. Trees down near Chief Lake (Marquette County)	No reported damaged
09/08/1980	F0	Narrow path of extreme damage through forest, with some trees twisted out of ground, found several days later. Time estimated from radar data. (Baraga County) Cabin damaged and over 40 acres of trees destroyed. No one witnessed the storm. Time estimated from radar data (Marquette County)	No reported damages (BC); $250 (MC)
08/18/1987	F0	An eyewitness on Old County Road 553 saw an oddly colored V-shaped cloud touch down for approximately 150 yards. A trailer and a storage building were demolished, and windows were blown out of a mobile home. (Marquette County)	$250
05/12/1988	F0	A funnel was seen to touch down briefly in a wooded area. (Ontonagon County)	No reported damages
08/16/1997	F0	A tornado occurred at Northland (40 SW of Marquette). Several 12 to 18-inch diameter trees were uprooted and 4 chairs and a metal frame glass picnic table were blown off a deck of a house. Only one chair was damaged ($10 value). No other objects or buildings were damaged. (Marquette County)	$10
06/10/2000	F1	The tornado touched down in the Escanaba State Forest in northeast Dickinson County and moved	$5,000

		from west to east on a nearly continuous 7.5-mile path through the woods into southern Marquette County. (Marquette County)	
08/19/2011	EF0	Winds were estimated around 85 mph when the tornado touched down at the River Pines RV Park and Campground and moved towards the northeast on the east side of the Ontonagon Golf Course. Reported damages included snapped and uprooted trees, snapped power poles, a flipped boat, minor roof damage, and some structural damage to a garage. (Ontonagon County) A waterspout was observed for 15 to 20 seconds over the Dead River Basin on the afternoon of the 11th. (Marquette County)	$20,000 (OC); No reported damaged (MC)
06/08/2012	EF1	The tornado snapped or uprooted numerous large trees causing some backroads in rural western Marquette County to become impassable. Winds reached an estimated 95 mph. (Baraga & Marquette Counties)	$10,000
07/06/2014	EF0	A tornado touched down in northeast Iron County and then tracked into southwest Marquette County. The tornado downed or snapped off numerous trees along its path. (Marquette County)	$2,000
05/24/2016	EF1	An upper disturbance moving through an unstable air mass created thunderstorm which then produced two tornadoes near on the afternoon of the 24th. (Marquette County)	$60,000

Tornado damage in Ontonagon, August 19, 2011 (Source: NWS Marquette)

Occurrence Probability and Vulnerability

On average, Baraga, Marquette, and Ontonagon Counties experience less than one tornado every five years. Therefore, a tornado event is likely to occur in the future. The region's vulnerability to tornadoes is very high due to their unpredictability and the lack of preparedness in the KBIC. Tornadoes can hit anywhere in the region and forecasting where they may be located is difficult, making all critical facilities and residents vulnerable to being impacted by a tornado.

Hydrological Hazards

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

1. Flood Hazards
    a. Dam Failures
    b. Riverine and Urban Flooding
    c. Shoreline Flooding and Erosion
2. Drought

People living near the Great Lakes are largely impacted by flood hazards. **Dam failures** occur when a dam structure is breached or collapses. This results in downstream flooding when water stored in an impoundment is released rapidly. **Riverine and urban flooding** occurs when low-lying areas adjacent to rivers and lakes can flood due to an intense precipitation events or melting snows. When melting snow or other water runoff collects or pools in low-lying areas, this can ruin infrastructure, obstruct roads, and damage buildings. Urban flooding typically occurs in well-developed urban or suburban areas. It tends to occur due to either a breakdown in infrastructure or inadequate planning and design standards. In other cases, some type of breakdown in an area's pumping or drainage infrastructure may result in a damaging flood. **Shoreline flooding and erosion** is most often the result of high-water levels which remove shoreline sediments that provide structure to beaches and coasts. This hazard typically results in damage to shoreline infrastructure and private property or even a loss of property itself as land erodes away.

Many flood mitigation activities have taken place in recent decades, including separation of combined sewer systems, installation of backflow preventers in houses, and dredging, expansion, and re-design of drainage systems. Throughout the state, communities have learned lessons from previous flood occurrences and taken steps to mitigate flood impacts in the future. More importance is now placed on the preventative role of coordinating land development plans with existing knowledge of local floodplains, wetlands, sewer capacity, and upstream development and hydrology.

Drought is a water shortage caused by unusual hydrologic conditions such as lack of rainfall and it generally lasts for an extended period, usually a season or more in length.

Overlap with Other Sections of Hazard Analysis

Hydrological hazards stem from precipitation patterns, which are affect by the types of events described in the **weather hazards** sections on thunderstorms, severe winter weather, and extreme temperatures. Thunderstorms, snowstorms, and ice/sleet storms produce precipitation that can cause or exacerbate flooding – either immediately or when frozen precipitation melts. Additionally, ice can build up and block critical parts of drainage-ways and cause flooding. During extreme temperatures, freezing events have cause flooding when pipes and water mains have broken, while heat waves may worsen the impact of drought.

Technological hazards can inhibit smooth functioning or drainage on water supply infrastructure and may cause or worsen flooding or drought hazards. For example, sewer pumping and lift stations can go out of operation during a power failure and cause flooding to occur or a reduction in water supply.

Dam Failures

Hazard Descriptions

Dams are structures that stretch across a stream or other water body to control its flow or to convert the energy within the water into more convenient forms, such as electricity. The impounded waters may be used for agriculture, flood-control, fire and farm ponds, irrigation diversion, fish and waterfowl habitat, municipal water supplies, recreation, mine waste retention, or for power generation by hydroelectricity. Some dams have become obsolete and should be removed to restore the natural water flow through the area. Otherwise, neglected dams will eventually fail, and would then be likely to cause a flash flood downstream, through the sudden release of their impounded waters. Some dams are constructed by wildlife instead of humans but can pose similar risks.

Dam failure is the breach or collapse of an impoundment structure resulting in flooding downstream when the enclosed body of water is released. Failure can occur during flood events which cause overflowing of the dam or due to poor operation, lack of maintenance, or vandalism. Most dam failures are considered catastrophic because they occur unexpectedly, with no time for evacuation. These events can result in loss of life, extensive property damage, and damage to natural resources, and these impacts can occur for miles downstream from the dam depending on the amount of water, terrain, and local conditions.

Dams are officially classified into three categories of risk, based upon a wide array of potential impacts that can result from a dam's failure. The categories are as follow:

1. Low hazard potential dam: Failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

2. Significant hazard potential dam: Failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.
3. High hazard potential dam: Failure or mis-operation will probably cause loss of human life.

Dams in Baraga County

There are six dams in Baraga County with three of these listed as having a high hazard potential in the National Inventory of Dams (NID).[35] There are four large dams in Baraga County: Ford Dam, Net River Dam, Six Mile Creek Pond Dam, and the Prickett Hydro Project. The Net River Dam and the Six Mile Creek Pond Dam are MDNR-owned rockfill dams used for recreational purposes, while the Ford Dam was built to create and maintain a water supply and the Prickett Dam is used for hydroelectric power generation.

The Ford Dam is an earthen embankment of approximately 500 feet across the Plumbago Creek valley. Ford Motor Company constructed the dam in 1936 to supply water to the sawmill in Alberta. In 1946 the Michigan Department of Transportation (MDOT) rerouted U.S. 41 across the Ford Dam crest. The dam and nearby buildings and properties were donated to Michigan Technological University in 1954. Presently, the dam serves as the U.S. 41 road service and is used as a water supply impoundment for fire protection. The dam reservoir is used by the public for recreation. Since its construction in 1936, there are no records indicating that the dam has overtopped or caused flooding. The dam is inspected every three years and has undergone recent repairs and maintenance.

The Prickett Hydroelectric Project along the Sturgeon River in Baraga and Houghton Counties is located about 31 miles above the river mouth. The reservoir for the project is about 3.5 miles long and has an area of 810 acres at normal pool elevation. There are 346 square miles of drainage area above the Prickett Dam. The Project includes a main diversion dam of earth embankments; a hollow concrete dam with gate-controlled spillways; a 500-foot intake canal and gate-controlled structure of concrete and earth embankments; two 87-foot-diameter wood stave penstocks, each 80 feet long; an indoor powerhouse with two generating units; and an outdoor substation with one transformer bank.

Dams in Marquette County

The NID lists 41 dams in Marquette County, with 22 of these providing hydropower to Marquette County residents. Five of the hydropower dams are regulated by the Federal Energy Regulatory Commission (FERC). These dams are exempt from state regulations and require emergency action plans in the event of a worst-case dam failure. According to the NID, 22 of the dams in Marquette County pose a significant or high hazardous potential and 92% of the dams with high hazardous potential have an associated Emergency Action Plan in place. Five of Marquette County's dams impound different lengths of the Dead River as it flows east to Lake

[35] Army Corps of Engineers. March 12, 2020. National Inventory of Dams. http://nid.usace.army.mil/

Superior near Presque Isle Park. The dams on the Dead River are the Silver Lake, Hoist, McClure, Forestville, and Tourist Park.

Dams in Ontonagon County

Ontonagon County has several dams within its geopolitical boundaries that have been built over the years for flood control, hydroelectric generation, and recreation. The NID lists 14 total dams located in Ontonagon County, half of which are for hydroelectric generation. Seven are of low hazard potential and four are of high hazard potential. Ontonagon County also has several beaver dams, which have not been inventoried. If beaver dams are a nuisance or appear as if they will fail, the County does have a permit to eradicate the beavers and dams.

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

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

Historical Occurrence

There were approximately 287 dam failures in Michigan between 1888 and 2014. All hydroelectric dams in the county are regularly maintained and have plans in place to deal with emergencies, and UPPCO has worked with the local emergency managers to ensure people understand the need to be prepared to evacuate areas below the dams during floods. Standard operating procedures for each dam are updated at least annually, and regular full-scale exercises are performed to minimize risk and vulnerability.

The most serious dam failure in the three counties the KBIC has land holdings was the Silver Lake Dam failure in 2003. The Silver Lake Dam, located on the Dead River in Marquette County, failed which forced the evacuation of about 2,300 people. The dam failure was attributed to an intensive 48-hour rain event combined with warm weather and frost depth. The dam failure had a domino effect when flood waters caused the subsequent failure of the downstream Tourist Park Dam. The community of Big Bay was isolated from the rest of Marquette County when the CR 510 steel bridge was submerged and cut off by flood waters. The Presque Isle Power Plant was also flooded, which caused it to be shut down for several weeks. This in turn temporarily closed two local mines, which relied on the power plant for electricity.

This forced the temporary layoff of about 1,100 workers. Total estimated damages exceeded $100 million. The dam was rebuilt in 2008 in a manner that would allow the dam to handle higher volumes of water and reduce the chance for future dam failure events.

Smaller dams in Baraga County have a history of failure, including the Lough's Lake failure in 2003, and the Robillard dam failure in 2002. Lough Lake's dam failure resulted in over $200,000 in damaged roadways and drainage structures as well as an environmental degradation to Gomache Creek. Since those two failures, drainage structure improvements have been implemented and are expected to limit the damage of these areas. Mapping inventory efforts are underway for beaver dams, but this is difficult as it is addressed in an informal manner with the road commission due to the dams' threat to roadways.

Beaver Dam Failures

Beaver dam failures are typically small and not reported, but these events are of increasing concern to KBIC. In 1968 a L'Anse beaver dam failure caused a fatality, and Covington has beaver dams that frequently flood the area. On July 18, 2017, a beaver dam collapse around Beaufort Lake and Stagecoach Drive caused a major road washout.[36] Residents of the area knew of the beaver dam and reported the sound of rushing water to 911. Baraga County Road Commission and the Michigamme-Spurr Volunteer Fire Department responded, and alternative travel routes were established.

Stagecoach Road washout due to beaver dam collapse on July 18, 2017 in Baraga County. (Source: ABC 10 News)

Occurrence Probability and Vulnerability

Failure of the Prickett Dam County – a major power generation structure – on the Sturgeon River in Baraga has very low probability but could have moderate-severity impacts downstream. As required, evacuation plans are in place for those affected by failure of power generation dams. If there were a dam failure, it would be a high severity issue for the surrounding communities in

[36] ABC 10. (18 July 2017). "UPDATE: Dam collapse causes major road damage." https://abc10up.com/2017/07/18/flooding-affecting-local-county/

Portage Charter and Chassell Townships in Houghton County, but not specifically reservation lands.

Dam failure is a risk within Ontonagon County because of the large area that would be affected by upstream facility failures. Excessive rainfall and accelerated spring melt-off can influence potential dam failure. Stream reaches below the Victoria Dam and the three hydroelectric dams on the Middle Branch of the Ontonagon River are areas where people could be impacted by a sudden, unanticipated water release. Probability of dam failure is low, but failure of the Victoria Dam would have a high to extreme severity. The 100-year floodplain outlined for riverine and urban flooding in the Village of Ontonagon in the following section is very similar to the inundation that would occur at a full breach of Victoria Dam. There is limited development in areas that would be affected by the failure of the Bond Falls, Bergland, and Cisco Dams; therefore, severity of failure of these dams is predicted to be only moderate.

In Marquette County, the risk of a dam failure is low, particularly because of regulated and regular dam inspections as well as the improvements made to dams on the Dead River. However, if a dam were to failure, vulnerability is high.

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

Riverine and Urban Flooding

Hazard Description

Riverine flooding is defined as a periodic occurrence of overflow of streams and rivers resulting in an inundation (flooding) of the adjacent floodplain. Flooding of land adjacent to streams and rivers is a natural occurrence, but this flooding becomes hazardous when human development, infrastructure, and property encroaches on the floodplain. Rainfall and runoff that would otherwise naturally soak into the ground and slowly reach a river or stream via natural drainage processes now quickly runs off streets, parking lots, and rooftops over non-porous man-made surfaces and through artificial channels and pipes. This poses a risk to structures, infrastructure, property, and people in and near floodplains that are not equipped to handle a large amount of moving or standing water.

Riverine floods are caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams are also a cause of flooding in winter and early spring. Log jams can also cause streams and rivers to be clogged up and backed-up waters to overflow the stream's banks. Either ice jams or log jams can cause dangerous flash flooding to occur if the makeshift dam-effect caused by the ice or logs suddenly

gives way. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on areas with smaller drainage areas. Bank overflows are natural and may occur on a regular basis on river systems that drain large geographic areas and many river basins. Floods on large river systems may extend several days.

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

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

Climate Change Considerations

Climate change increases the number of intense precipitation events in the Great Lakes region. This means acute and severe weather events, including increased snow precipitation during snowstorms and more intensive rainfall during rainstorms, are becoming more common. This increased precipitation volume adds to the drainage burdens of the normal melting and rainfall patterns of the spring season. As a result, both spring and summer flood risks are likely to worsen, as are ice jam related flood risks.

Historical Occurrence

Several areas in the KBIC region are susceptible to riverine and urban flooding. **Table 9.16** lists reported flooding events that have occurred in all three counties. Riverbanks and many areas with inadequate culverts and ditches become overburdened during times of heavy rains or snowmelt, resulting in certain degrees of flooding and washouts. To deal with these risks, storm sewer upgrades, ditch management, and culvert replacements are ongoing. The villages of L'Anse and Baraga are especially prone to flood events.

From 1996-2018, there have been 6 flooding events in Baraga County, one of which resulted in a disaster declaration for multiple counties in the Upper Peninsula. Total damages were estimated at $3.5 million. Ontonagon County has been affected by several minor and major floods, most due to heavy rainfall of significant snowmelt. One of the worst floods in the county was on April 1, 1963, where the Village of Ontonagon experienced a flood that damaged almost all properties

and businesses in the downtown area[37]. A combination of unseasonably warm weather and thick ice left from one of the coldest recorded winters resulted in flooding on the Ontonagon River. The downtown area was flooding with two to three feet of icy water; buildings along the south side of River Street (the downtown corridor) had up to four feet of water. Damage estimates were over $500,000.

Five flooding events in Ontonagon have been reported and details are reported by the NOAA Storm Events Database. Total estimated property damage from these events was estimated at $817,000. Several areas in Ontonagon County are susceptible to riverine and urban flooding. Flooding along the Ontonagon River has a distinct past with occurrences recorded as far back as 1912. Riverbanks and areas with inadequate culverts became overburdened, thus experiencing certain degrees of flooding and washouts. To minimize these risks, upgrading of storm sewers and culvert replacement is an ongoing activity.

Marquette County has approximately 4,000 miles of rivers and creeks and over 1,800 lakes. Combined with heavy snow accumulations and a mean annual rainfall of about 30 inches, this creates favorable conditions for flood related problems. From 1996-2019, there were 29 reported flooding events in Marquette County. Total estimated property damages were $14.780 million.

Table 9.16: Flood Events in Baraga, Marquette, and Ontonagon Counties, 1996-2019

Date	Description and Location	Est. Property Damage
04/20/1996	Flooding due to snow melt along the Sturgeon River and Pequaming Bay closed several roads and did minor property damage. (Baraga and Ontonagon Counties)	$41,700
05/19/1996	Melting of a heavy snowpack combined with heavy rain produced flooding in several areas of western and northern Marquette County. Many county roads were washed out including a culvert on County Road 510. Several roads were flooded, especially along the Michigamme and Peshekee Rivers. Damage estimates from this event were not available.	No damages reported
04/12/2002-04/14/2002	A combination of record setting snowfall, heavy rainfall, and warm temperatures throughout the U.P. promoted a dramatic snow melt event, with nearly 2 feet of snow melting away from April 10-12. This caused streams and rivers to rise and overflow. Many local and county roads were closed due to high water and the high failure potential for other local dams. In Marquette County, rising water levels on the Chocolay, Peshekee, Escanaba, and Michigamme River forced people to evacuate their homes and camps. Hundreds of homes experienced water damage. The high water and increased flow on the Carp River washed out a 65-food section of M-553. In Ontonagon County, M-28 was closed for 3 days near Bergland	$212,000

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

	and Merriweather due to high water. Many secondary roads were closed due to flooding and washouts from flooding creeks and streams. Baraga County experienced flooding on the Sturgeon River and other smaller creeks and streams with flooding of some local roads and structures.	
07/21/2002	Severe thunderstorms occurred during the late afternoon and evening. Some storms produced large hail, high winds, and heavy rain. Tourist Park in Marquette flooded with 3 to 5 inches of water over the roads. (Marquette County)	No damages reported
05/11/2003-05/15/2003	Heavy rainfall caused widespread flooding across the western U.P. Several roads closed and/or washed out, including M-28 in Ontonagon County between Bruce Crossing and Bergland. Flood waters as deep as 3 feet inundated downtown L'Anse as Linden Creek overflooded its banks. Other flooded rivers included the Sturgeon River and the middle branch of the Ontonagon River.	$16 million
04/18/2004-04/19/2004	A storm system on the 18th produced heavy rainfalls and severe thunderstorms, with many areas receiving over 2 inches of rain. The heavy rains caused minor flooding in smaller streams and low-lying areas. Runoff from the precipitation, combined with the melting of lingering snow over higher terrain, caused some flooding of larger rivers over the western half of the U.P. for several days. (Baraga and Marquette Counties)	No damages reported
05/11/2006	In Marquette County, heavy rains (over 6 inches) resulted in widespread flooding across the northern half of the county. Significant road damage occurred on County Road 550 between Big Bay and Marquette, with a washout near County Road KS and a mudslide near Eagles Nest Road. Other smaller creeks inundated County Road 510, Loma Farms Road at the Big Garlic River, Homeier Road near the Yellow Dog River, County Road GGA Bridge at Clark Creek, and Dump Road in Big Bay. The Chocolay River at Harvey exceeded flood stage for 2 days. The DNR public fishing pier on M-28 was flooded, as was a portion of Timber Lane in Harvey, flooding a few properties and a home in the area. Damage to the home was minor and limited to the first floor.	$100,000
04/23/2008	Spring snowmelt caused minor flooding over portions of the Michigamme River from the 23rd into the 30th. Minor flooding occurred along County Road LG during the spring snowmelt. (Marquette County)	No damages reported
05/25/2010	Severe thunderstorms resulted in flash flooding, damaging winds, and large hail in Ontonagon County in the late afternoon of the 25th. The Ontonagon Sheriff's office reported roads in and near Ontonagon washed out due to heavy rainfall of two to	$15,000

	three inches which fell in less than an hour. Flooding on River Street in Ontonagon forced water over the sidewalks and into some area businesses.	
07/19/2010	Severe thunderstorms generated large hail and heavy rain in Marquette on the afternoon of the 19th. There were multiple reports of street flooding in Marquette. (Marquette County)	No damages reported
09/24/2010	Severe storms with heavy rain caused the Sturgeon River to overflow in Baraga County at Halonen Road, seven miles northwest of Baraga. The water was estimated to be one foot deep over the road. (Baraga County)	$1,000
04/28/2013	Rapid melting of significant late season snowpack caused moderate flooding of roads over portions of Baraga County, especially along the Sturgeon River. Minor flooding continued into early May. Some basement flooding was also reported. Governor Rick Snyder declared a state of disaster in Baraga County where over $1.5 million of property damage occurred due to the flooding mainly to roadway infrastructure. (Baraga and Marquette Counties)	$1.5 million
10/17/2016	Heavy rainfall of three to four inches on top of already saturated ground caused flash flooding over portions of Marquette County the night of the 17th. The Michigan State Police reported flash flooding on portions of the Chocolay River from the evening of the 17th into the 18th. Portions of US 41 and M-94 were closed due to washouts or water over the road. Green Garden Road and Magnum Road were also closed due to flooding. Water rescues were performed by firefighters and EMS personnel on Green Garden Road where water levels rose three to four feet into some homes. Ten people and four pets were rescued from the flood waters. In addition, flood water was also reported over M-35 near County Road MU south of Richmond Township and basement flooding was reported in the Gwinn area. Damage from the flooding was estimated near $1.9 million across Marquette County.	$1.9 million
12/30/2017	Strong northwest winds blowing across Lake Superior pushed ice into the mouth of the Chocolay River producing an ice jam. Water backed up behind the ice jam causing flooding in the basements of eight homes along the Chocolay River near Lake Superior. (Marquette County)	$30,000
06/17/2018	Rainfall amounts between two and three inches over approximately five hours caused flooding of several roads from Marquette and Harvey to Negaunee. The Marquette County Road Commission reported the washout and closure of a portion of County Road 601 in Humboldt Township due to the heavy rains. An NWS employee reported the closure of Lakeshore Boulevard in Marquette due to mud and debris	$10,000

	flowing over the street. Several other streets were reported closed in Marquette due to water over the roads. Rescue personnel from the Chocolay Fire and Sheriff departments were evacuating residences along Green Garden Road at the Chocolay River Bridge southeast of Harvey. There was also a picture via social media of water under the bridge in Negaunee, and several residences in Negaunee reported water in the basements due to the heavy rain. (Marquette County)	
06/30/2018	Heavy rains due to a severe thunderstorm caused flooding throughout the county. The Marquette County Central Dispatch reported water over US 41 in south Marquette and five inches of water over M-553 near the Carp River Bridge. (Marquette County)	No damages reported
09/05/2018	Heavy rainfall of 3 to 5 inches from late on the 4th U.P. which continued into the 6th. The Marquette City Police Department reported that sections of Division Street between Furnace Street and Joliet Road were closed due to flooding of the Orianna Brook on the south side of Marquette. Pioneer Road near Harbor View Drive was also closed due to flooding. Runoff from three to four inches of rain on the morning of the 5th caused the brook to rise over its banks. (Marquette County)	$15,000
04/23/2019	Abundant wet snowpack combined with moderate to heavy rain at times caused minor flooding along the Michigamme River near Republic and Witch Lake and along the Middle Branch of the Escanaba near Humboldt from 23rd through the end of the month. Some minor flooding was also reported along the Chocolay River near Harvey from the 18th through the 19th. (Marquette County)	No damages reported
05/20/2019	Runoff from heavy rains of one to three inches from May 18-19th caused minor flooding of the Escanaba River at Humboldt and the Sturgeon River at Alston on the 20th. Minor flooding occurred at the Middle Branch of Escanaba River at Humboldt and caused water to flow over County Road FX for a few hours during the afternoon of the 20th. (Marquette County)	No damages reported
09/24/2019	Thunderstorms dumped heavy rainfall of two to three inches across portions of Baraga County from late evening on the 24th into the early morning of the 25th. The heavy rain caused minor road washouts near Herman on the 25th. This event was designated a flash flood.	$5,000
09/30/2019	Heavy rain of two to three inches from thunderstorms caused flash flooding over portions of Marquette County by the afternoon of the 30th. Heavy rain of two to three inches caused minor street flooding and ponding of water from Marquette's Trowbridge Park west to Ishpeming and National Mine on the afternoon of the 30th.	No damages reported

Flood Insurance in KBIC

Authorized tribal governments with land use authority can participate in the FEMA National Flood Insurance Program (NFIP) and may join the program even if no flood hazard map exists covering all tribal lands. Most communities in the region do not regularly experience severe flooding and participation is not a prerequisite for property owners to purchase flood insurance from private insurers. However, flood insurance is available only in communities that participate in the NFIP.[38] There are no repetitive loss structures on the KBIC Reservation or in Baraga, Ontonagon, or Marquette Counties.

In Baraga County, the Village of Baraga, Village of L'Anse, Arvon Township, and L'Anse Township participate in the NFIP. In Marquette County, Charter Township of Chocolay, Ely Township, Ewing Township, Marquette Township, City of Marquette, Charter Township of Marquette, Powell Township, Republic Township, Skandia Township, West Branch Township, and Sands Township all participate in the NFIP. In Ontonagon County, communities that participate in the FEMA National Flood Insurance Program (NFIP) are Carp Lake Township, Ontonagon Township, and the Village of Ontonagon. The NFIP makes federally supported flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain ordinances. Other communities in all three counties have not been affected by flooding to the extent that participation would be considered necessary and participation is not a prerequisite for property owners to purchase flood insurance from private insurers.

During a flood hazard assessment, FEMA develops for NFIP a Flood Insurance Study and Flood Insurance Rate Map (FIRM). The FIRM is used by lenders to determine flood insurance requirements and by insurance agents to determine flood insurance premium rates for specific properties. The FIRM includes areas within the 100-year flood boundary, which are termed "Special Flood Hazard Areas" (SFHAs). A 100-year flood does not refer to a flood that occurs every 100 years but refers to a flood level with a one percent or greater chance of being equaled or exceeded in any given year.

Occurrence Probability and Vulnerability

Riverine and urban flooding of variable severity is a moderate risk to KBIC. While the entire Reservation is prone to flooding, more populated areas in L'Anse and Baraga could see greater impacts from a hazard event. From 2010 to 2019, three flooding events were reported in Baraga County – a frequency of 0.3 events per year. In the same period, Marquette County reported 11 events (frequency of 1.1) and Ontonagon County reported two (frequency of 0.2). Variability in reporting most likely is due to a greater number of populated areas in Marquette versus the other two counties. Also, future flooding frequency may increase due to climate change. While frequency of events appears low, the event severity has been variable, with monetary damages ranging from no losses up to $1.5 million in losses.

[38] FEMA. Community Status Report Book – Communities Participating in the National Flood Program. www.fema.gov/cis/MI.html

Communities within Ontonagon County have taken steps to prevent loss by upgrading facilities to deal with the flood risk and identifying evacuation areas. Due to the unpredictable river discharge and heavy ice jams, potential for flooding is evident. Within the County, highest probability of occurrence is in the Village of Ontonagon. Severity is low to moderate in most jurisdictions but extreme in the Village of Ontonagon. Specific data regarding impact on other identified flood areas in Ontonagon County are unavailable. Ice jams near the mouth of the river often add to the problem during spring snowmelt. SFHAs along several other rivers have also been identified including the Iron River, Firesteel River, Sleeping River, McCarthy Creek, Cranberry River, Flintsteel River, and Paddy's Creek. A few inland lakes are also affected, including: Lake of the Clouds, Bass Lake, and Clark Lake. McMillan Township, including the community of Ewen, has been affected by flooding of the Ontonagon River, particularly of the Middle Branch at Bond Falls. In Bergland and Matchwood Townships, flooding has occasionally inundated and required closure of Highway M-28. In Marquette County, the Chocolay River and Carp River have been identified as areas vulnerable to flooding. The north and western parts of the Marquette region are also susceptible to flash floods.

A variety of critical facilities and ecosystems are vulnerable to flood impacts. Populated areas near waterways vulnerable to flooding during rain events. Combined with impervious surfaces (e.g., roadways, parking lots, and other hard surfaces), populated areas become even more vulnerable to flooding. Any homes and businesses or industrial facilities that rely on well or septic services may experience operational problems that force closure of the facility. If flood waters cover well heads, the well water is considered contaminated and no longer safe for human consumption. If grinder pumps in septic systems are inundated with water, the septic may overflow in homes, causing additional human health issues. Flooding may also cause significant runoff from populated areas, increasing the vulnerability of surface waters to non-point pollution. Some pollution may be from known and designated clean-up sites, but these locations are not fully separable from surrounding lands during times of flooding.

Shoreline Flooding and Erosion

Hazard Description

Michigan has over 3,200 miles of coastline (the longest freshwater coastline in the world), and about 4.7 million persons live in the state's 41 shoreline counties. Flooding and erosion along the Lake Superior shoreline are typically a result of high-water levels, storm surges, or high winds. These are natural processes that can occur at normal or even low water levels. However, during periods of high water, flooding and erosion are more frequent and serious, causing damage to homes, businesses, roads, water distribution and treatment facilities, and other structures in coastal communities. Storm surges, or seiches, that drive lake water inland over large areas occur when windstorms and differences in barometric pressure temporarily tilt the surface of a lake up at one end—in extreme cases by as much as eight feet.

Shoreline erosion hazards typically involve the loss of property as sand or soil is removed by water action and carried away over time. Erosion effects that are experienced along rivers may

be included in this category of hazard. Shoreline flooding and erosion are natural processes and part of a normal, healthy environment if human construction is not built in areas that are at-risk from and in opposition to these natural shoreline processes.

Lake Superior levels have fluctuated since prehistoric times and accurate measurements of this change are available for the last 160 years. According to the U.S. Army Corp of Engineers, the peaks of this fluctuation have been higher during this century than they were in the past. Current lake levels are over a foot or a half of meter above the average annual (1918-2018). The modern range of fluctuation between periods of high and low water is 1-meter.

The Great Lakes region is slowly recovering from the last glacial period when ice loaded and depressed the land surface. The land is rebounding from the weight of the former glaciers at different rates. The outlet channel to Lake Superior at Sault Ste. Marie is rising more rapidly than most other points along the U.S. shore, resulting in a tilting of the lake. The amount of inundation is greatest at Duluth, Minnesota where as much as 5.4 meters of inundation has occurred over the past 2,000 years. Maximum inundation over this period for the Michigan shore occurred near Ontonagon County where as much as three meters is noted.

Riprap protects the shoreline from erosion along the Village of L'Anse Waterfront.

Climate Change Considerations

Water level variation is a direct result from natural changes in regional climate and will continue to occur. However, the impact from climate change on the magnitude and frequency of water level change remains uncertain. Lake Superior water levels will continue to fluctuate, but the time periods where it is either above or below average levels may become prolonged.

Historical Occurrence

The accumulation and ablation of onshore sand deposits are very diverse and heterogeneous. The Natural Resources Department for KBIC has identified several areas as high-risk erosion areas. High-risk areas are where erosion studies have indicated the erosion hazard line is receding at an average of one foot or more per year over a minimum 15-year period. For these areas, the state has regulations in place with mandatory and recommended setbacks for development. The high-risk erosion area regulations establish required setback distances to protect new structures from erosion for a period of 30 to 60 years, depending on the size, number of living units, and type of construction. High-risk erosion areas were identified in the early 1970s, but recession rates and erosion extent may have changed since the original documentation.

While Ontonagon County has had no reported shoreline flooding or erosion events, storm surges have occurred several times in the past in the region. From 1996-2019, there have been numerous shoreline flooding and erosion events in Baraga County. Four of these events have reported property damages totaling $33,000. In addition, the Sand Point stabilization project was $900,000. This property has eroded whole sections throughout. The Campground shoreline stabilization project was $100,000 for materials and 3 months of wages for DPW. Ojibwa BP shoreline stabilization project in 2019 was $32,000, plus $10,000 for sampling and environmental consultant. Shoreline flooding events in the county may result in the intermittent closure of US 41 between the Villages of L'Anse and Baraga and separates the L'Anse Reservation in half. This occurred on October 27, 2017, when it was closed due to high waves and lakeshore flooding caused by a strong storm so debris could be cleared from the road. In addition to the road closure, parks and sidewalks in downtown L'Anse were also flooding. The storm caused an estimated $20,000 in property damage.

With about 55 miles of shoreline, shoreline flooding and erosion events in Marquette County are highly likely to occur. From 1996-2019, there have been six reported events in the county with estimated property damages totaling an estimated $712,000. Two deaths have also been directly caused by shoreline flooding. On October 24, 2017, a large storm contributed to lakeshore flooding and high winds leading to waves as high as 25 to 30 feet. Two people drowned when they were swept off the Black Rocks in Lake Superior at Presque Isle Park in Marquette. A U.S. Coast Guard helicopter flew in from Traverse City to assist in the search and rescue operation, but the victims were not found. The storm and wave action also caused an estimated $500,000 in damage at the Picnic Rocks Park in Marquette.

Picnic Rocks Park in Marquette, October 24, 2017 (Source: NWS Marquette)

Occurrence Probability and Vulnerability

Erosion is an ongoing and unavoidable process – one that has exceedingly high probability, particularly along the shoreline of Keweenaw Bay near the Villages of Baraga and L'Anse. Erosion has also been identified as an ongoing specific concern in Arvon Township, which has shoreline along Lake Superior. The probability of significant shoreline erosion and flooding is high in shoreline jurisdictions of Ontonagon County. Even though high-risk erosion areas are currently not designated by EGLE following a 2013 update study, both processes are active, ongoing processes within Ontonagon County.

In Marquette County, areas that are more vulnerable to shoreline flooding and erosion are County Roads 550 and 510 and Lakeshore Boulevard due to Lake Superior's high waves and

rain during storm events. To address the high vulnerability and potential loss due to erosion of Lakeshore Boulevard, the City of Marquette has begun to relocate the road.[39]

Although areas along the shoreline of the Villages of Baraga and L'Anse are vulnerable to flooding, drainage systems to manage storm water are continually improving and are expected to limit vulnerability to this hazard. Not all the KBIC touches shoreline; this hazard has a higher likelihood to occur along parts that touch the shoreline. Based off frequency of previous events, an event is likely to occur every 12.6 years.

Drought

Hazard Description

Drought is a water shortage caused by unusual hydrologic conditions such as lack of rainfall and it generally lasts for an extended period, usually a season or more in length. Drought can be a normal part of an area's climate, including areas that have very high or low average rainfall. The level or precipitation or runoff associated with a drought is substantially below an area's norms. The severity of a drought depends not only on its location, duration, and geographical extent, but also on an area's water supply needs for human activities and vegetation.

Drought differs from other natural hazards in several ways. First, there is no exact beginning and end point that is obvious for a drought; the effects may accumulate slowly and linger even after the event is believed to be over. Second, the lack of clearly visible and universal standards to define a drought can make it difficult to confirm in a timely manner if a drought exists and its degree of severity. Third, drought impacts are often less obvious than other natural hazards. Fourth, most communities do not have any contingency plans in place for addressing drought. This lack of pre-planning can hinder support for drought mitigation capabilities.

The severe impacts from droughts on communities and regions include water shortages for human consumption, power generation, industrial and agricultural use, and recreation; drop in quantity and quality of agricultural crops; lower water quality in lakes, rivers, and other water bodies; increase in wildfires; decline in land values; increase in insect infestation, plant disease, and wind erosion, and; possible human impacts such as food shortages, extreme heat, fire, and other health-related problems such as diminished sewage flows and increased pollutant concentrations in surface waters.

Despite thousands of miles of rivers and streams and its surround Great Lakes, Michigan can still experience occasional drought conditions. Most common are agricultural droughts, with severe soil-moisture deficits, which have serious consequences for crop production, particularly when coupled with extreme summer temperatures. Also, various water bodies, both inland lakes and

[39] City of Marquette. (20 April 2020). Lakeshore Boulevard Relocation Project Begins. https://www.marquettemi.gov/2020/04/lakeshore-boulevard-relocation-project-begins/

the Great Lakes, cyclically go through periods of low-water levels. Michigan has emerged from its latest such period and is now experiencing high water levels.

Climate Change Consideration

While the effect of climate change on the Great Lake region has caused an overall increase in precipitation, drought severity has generally been decreasing. Environmental analysists anticipate there will still be drought events and dryer seasonal phases, especially in areas that are more susceptible. Shorter duration seasonal droughts are expected to worsen during the warmer half of the year. The threat and hazards from drought will not disappear and in the long-term is expected to greatly worsen.

Historical Occurrence

Although KBIC has not experienced a drought severe enough to be recorded, the U.S. Midwest has been significantly affected by drought five times since 1981. These wide-ranging droughts have long-term impact on wild flora and fauna, and agriculture. However, there is no record of temporary droughts diminishing groundwater reserves. Even a minor drought will increase wildfire potential and is a major hazard for that reason alone. The entire planning area for Keweenaw Bay Indian Community is equally at risk to drought.

Despite no official drought designation, areas can suffer from a lack of precipitation. In the summer of 2007, the Upper Peninsula experienced long-term drier than normal conditions, which coincided with near record low water levels in the Great Lakes. Closer to normal precipitation rates helped ease the drought in the fall.

Occurrence Probability and Vulnerability

The probability of a drought occurring in the region is low, but with climate change, the risk of an event may increase. Marquette County expects to experience a drought every 20-25 years. If a drought were to occur, all areas in KBIC are vulnerable to drought effects, such as low drinking water supplies in groundwater and drinking wells. Severe droughts can negatively affect drinking water supplies and impact critical facilities. Possible losses to infrastructure include the loss of potable water.

If the length and severity of a drought is great enough, it can have serious consequences for the environment. Droughts can cause a loss of wetlands and lower water levels in lakes, ponds, and rivers. Plant and animal life are also vulnerable to the impacts of droughts through the reduction in drinking water and loss of biodiversity. Drought can also lead to wildfires, which destroy wildlife habitat and alter and area’s ecosystem.

Ecological Hazards

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

1. Wildfires
2. Invasive Species
3. Wildlife Health Hazards
4. Ecosystem Health Hazards

These types of hazards deal with biological ecosystems and their effects on human economy and the built environment. The most well-known ecological hazard is wildfire, which occur naturally, but become dangerous when they threaten human that live in areas where the disaster event will periodically take place. Wildfires can cause damage and threats to human health and life. The Keweenaw Bay Indian Community relies on the land, air, and water to support healthy populations of fish, wildlife, and plants for cultural and subsistence harvest. KBIC has an important role in protecting, defending, and healing the natural environment.

Wildfires

Hazard Description

A wildfire, or wildland fire, is any instance of uncontrolled burning in forests/tree lots, brush, marshes, grasslands, or field lands. They can be caused by nature, such as by lightning strikes, but are most often caused by human carelessness or arson. Factors that contribute to the growth and size of a wildfire include topography, land use, vegetation, amount of combustible fuel present, and weather. Wildfires can be a secondary hazard to drought as low humidity and lack of precipitation are favorable conditions for fires.

The most immediate dangers from wildfires are the potential injury or deaths of persons who live or recreate in the affected area and the destruction or homes, timber, and wildlife. Long-term effects included scorched and barren land, loss of wildlife habitat, soil erosion, landslides, water sedimentation, and loss of recreational opportunities. Increased development in and around rural areas has increased the possibility for loss of life and property from wildfires. Although most wildfires are small (a few acres), any one wildfire can burn out of control under the right conditions and multiply annual burned acreage. There are not enough fire suppression forces available in rural areas to protect every structure from a disastrous wildfire.

According to the Michigan DNR, the main cause (47%) of wildfires in Michigan is burning yard debris, such as grass clippings, leaves, and trash. Most wildfires occur in the spring when days are dry and windy with abundant dead vegetation left after the snow melts. These conditions can spread a wildfire quickly because there is less moisture in the air and the wind carries burning debris to other areas. The dead vegetation makes for good wildfire fuel[40]. Forests cover

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

approximately 55% (20.4 million acres) of Michigan's total land area and provide Michigan with the largest state-owned forest system in the U.S. Additionally, Michigan has the fifth largest quantity of timberland acreage, which includes 19.3 million acres of softwood and hardwoods. While vast forest cover is a boom for industry and recreation, it also makes many areas of Michigan and KBIC highly vulnerable to wildfires.

KBIC is composed of a variety of forest cover types and tree species. The primary cover type is northern hardwoods, with mixed aspen cover types. The forest is currently made up of trees that are approximately the same age, as most timber stands originated around 1930. In years prior, there was a period where the L'Anse Reservation experienced heavy logging, followed by broad, intense wildfires. Since then, fire has been aggressively suppressed from the natural landscape through fire prevention campaigns. This allowed "climax" tree species, such as Sugar maple and Hemlock, to increase in population while the presence of fire-related species like Jack pine, Red pine, and paper birch decreased. If a wildfire were to occur in the Tribal hardwood forests, there would be catastrophic tree stand losses.

The Bureau of Indian Affairs (BIA) is responsible for wildland fire control on Indian trust lands in Michigan, in addition to a Cooperative Agreement between the BIA and Michigan DNR for wildfire protection on Trust lands. KBIC also has a Tribal Wildland Firefighting Crew who provides support for firefighting activities on and off Reservation lands. To further address potential wildland fires, KBIC has established a Fire Management program that is working on increasing capacity and responsibility for fire protection on the Reservation. KBIC also has a Fire Management Plan which addresses the goals and objectives outlined in the Tribe's Integrated Resource Management Plan (IRMP) and acts as a guide to the planning and execution of the fire management program. The Fire Management Plan provides information on wildland fire suppression, prescribed fire, non-fire fuel applications, and emergency rehabilitation and restoration.

Climate Change Considerations

The average wildfire seasons has extended 78 days longer across the United States, and large wildfires burn more than twice the area they did in 1970[41]. Changes in climate have led to hot, dry conditions that may increase fire activity. While there has been an overall increase in precipitation in Michigan, there will still be drought events and drier seasonal phases. Shorter duration seasonal droughts are expected to worsen in the warmer half of the year, which may affect wildfire occurrence. Development trends in Michigan seem to involve increases in wildfire risk over time, and annual cycles of summer drought have been projected by many climate analysts in the coming decades.

Historical Occurrence

From 1860 through 1910, large fires followed heavy timber harvest, but since then there is little documented wildfire incidents on KBIC lands. Over 80% of Baraga, Marquette, and Ontonagon Counties are considered forest cover. These forests are an asset to KBIC for both industry and

[41] Center for Climate and Energy Solutions, https://www.c2es.org/content/wildfires-and-climate-change/

recreation, but it leaves the region highly vulnerable to wildfires. Increased development in and around rural areas have changed the nature of the threat from wildfires. Not only can acres of valuable timber and wildlife habitat be lost, but also life and property. For example, in 1896, the Village of Ontonagon and surrounding rural areas were devastated by a wildfire that destroyed almost every building in the Village.

From May 20 through 25, 2009, a large pinery fire burned 685 acres and brought over 100 firefighters from around the state and region. It burned in mixed pine and damaged retaining walls in the cemetery, a culturally important place for KBIC. There were no injuries on the fire line, but one structure, a mobile home, and a privately-owned skidder were also destroyed.

Snapshot of the Pinery Fire, which burned 685 acres over 5 days in May 2009 (Source: MSU Extension)

From 1985-2013, most wildfires in Marquette County were human caused (86%) while lightning accounted for approximately 14% of wildfires.[42] Exact number of wildfires during that time period is unknown, but some notable fires include the Swanzy Lake Fire of 1986 near K.I. Sawyer, the Cyr Swamp Fire in 1986 south of Gwinn, the Tower Lake Fire in 1999 near Humboldt and Republic Townships, and the Black River Falls fire of 2009 in Ely Township. As of 2013, Marquette County has had the most wildfires than any other county in Michigan. This is of serious concern due to the large wildland-urban interface that is present in the county.

Occurrence Probability and Vulnerability

KBIC lands has an ongoing risk of wildfires due to the tremendous amount of forest cover in the Upper Peninsula and increasing hazard due to urban infringement in rural areas. Development in rural areas can intensify overall damage from wildfires. All areas have some vulnerability to wildfire but varies greatly by location. Ensuring that new development has adequate emergency access and protective buffers is one way to mitigate some of the risk. Within the planning area, the highest risk is in the Sand Plains of Marquette County, a sandy outwash plain between Gwinn and Marquette, where the dominant tree type is jack pine. Nearly a third of all Marquette County fires have occurred in that area.

Natural areas with trees, brush, grass, or field lands are most vulnerable to wildland fire – especially if these natural areas exist near developed or residential areas. Wildfires can lead to structural fires and temporary closures of roads. While most critical facilities and infrastructure are not highly vulnerable to wildfires, a sufficiently long and severe event could disrupt some essential functions due to the potential of wildfires damaging utility lines and delaying emergency response to fires. Wildfires also physically damage natural vegetation, such as trees and wildflowers, and native animals and insect species. Vulnerable native plants and animals

[42] Marquette County Community Wildfire Protection Plan. http://www.co.marquette.mi.us/departments/planning/docs/Marquette_County_Community_Wildfire_Protection_Plan__revised.pdf

may disappear and become replaced by new organisms that were not present before the fire. However, wildfires are a normal ecological phenomenon and serve long-term functions for vegetation and the natural environment. If the fire is not too severe, it serves as a renewal or "cleansing process" of a habitat.

Invasive Species

Hazard Description

While all species should be respected and recognized for their value, there are some that threaten the health and existence of plants and animals of ecological, cultural, or subsistence significance. Invasive species are non-native to the local ecosystem and its introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, or other organisms (e.g., microbes). When an invasive non-native species becomes established on tribal lands, they can stress key native or rare species populations, reduce forage availability, degrade habitats, negatively affect water quality, and disrupt food webs. They can also diminish the availability of culturally significant species upon which tribal members depend.

The introduction of an invasive species is not a natural shift in a species distribution. Human actions, whether intentional or unintentional, are responsible for moving many species globally, enabling them to colonize terrestrial and aquatic habitats far from their origin. Invasive species can be transported into an ecosystem in many ways, such as on animals, vehicles, ships, commercial goods, produce, and clothing. Some non-native species are used as ornamental plants and pets; sometimes these non-native organisms can flourish too well, become invasive and cause unwanted cultural, economic, ecological, or human health impacts.

Certain non-native species are successful in their new habitats because they out-compete native plants or animals and have no natural controls (predators, diseases, etc.). As more adaptable and generalized species are introduced to ecosystems already impacted by human activities, native species are often at a disadvantage to survive in what was previously a balanced ecosystem. While invasive species primarily cause environmental damage and degradation, there are situations in which serious threats to public health due to animal diseases or plant/animal infestation. Invasive species can also cause serious threats to people and wildlife in forests; some invasive insects can cause significant damage to trees (disease or death) and may lead to partial or total tree collapse. Large branches, limbs, or even entire individual trees may fall. If greater number of trees are infested or infected by invasive insects, this can result in losses of entire stands of certain tree species, such as Ash (*Fraxinus*) and American Elm (*Ulmus americana*).

Not all non-native species, which lives outside of its natural habitat, are considered invasive. Some non-native species have become so common and well-integrated that they become naturalized or adopted in their new habitat. Some have no known negative effects, provide fishing and hunting opportunities, or are used for their beneficial qualities. For example, non-native fish species, such as Coho and Chinook salmon, are sport fish in the Great Lakes that are not considered invasive. However, salmon, rainbow trout, and brown trout were introduced and

have invaded habitats, food sources, and other parts of native fishes' environment and are considered invasive from this standpoint.

Billions of dollars are spent each year in the U.S. on invasive species prevention, management, research, early detection and response, and habitat restoration. Invasive species have also economically impacted KBIC in the form of loss of commercial fishing production, loss of recreational fishing, boating and swimming, loss of property values and aesthetics, and increased costs of invasive species management, control, eradication, and restoration of invaded areas. Any kind of pest management aimed at invasive non-native species should be guided by Integrated Pest Management (IPM), which emphasizes prevention of infestation and ecosystem resilience.

Climate Change Considerations

In the Great Lakes region, climate change predictions are for increased water and air temperature, reduced ice cover on lakes, and increased storm events affecting both native and invasive species. There is considerable uncertainty about how climate change will impact specific regions and how it will influence the abundance and distribution of both native and non-native organisms. As seasonal temperatures fluctuate, invasive species can expand their range and establish themselves in previously inhospitable climates. While the definition of invasive species specifically refers to species introduced by humans, to distinguish these patterns from naturally occurring ones, species transported by human action can be more likely to survive as climatic changes occur.

Historical Occurrence

Due to the Upper Peninsula's large amount of forest coverage, lakes, and rivers, both terrestrial and aquatic species have been found throughout the region. There have been over 3,800 reported locations of invasive species, most of which are terrestrial invasive plants[43], and 219 invasive species reported[44]. Invasive species disperse widely across the landscape and administrative boundaries, so it is essential to work cooperatively towards management and control objectives. KBIC is a member of the Keweenaw Invasive Species Management Area (KISMA), a partnership between many organizations throughout Houghton, Keweenaw, and Baraga Counties and the Ottawa National Forest. The goal is to facilitate cooperation and education among federal, state, tribal, local groups and landowners in prevention and management of invasive species across land ownership boundaries. Additionally, other organizations, such as the Iron Baraga Conservation District, Marquette County Conservation District, Superior Watershed Initiative, U.S. Forest Service, and the Upper Peninsula Resource & Development Council amongst others are heavily involved in sustaining native plants and invasive species control.

The KBIC has adaptive management plans for both aquatic and terrestrial species. The Aquatic Invasive Species Management Plan "provides specific information and actions to better prevent,

[43] Midwest Invasive Species Information Network. Data Map by State and County. www.misin.msu.edu
[44] Early Detection & Distribution Mapping System. www.eddmaps.org

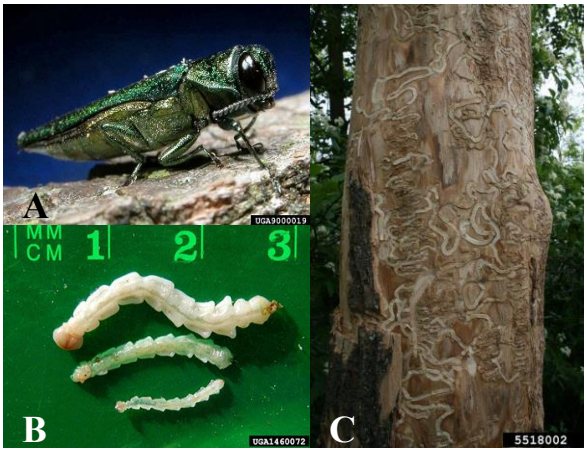
monitor, assess, and control aquatic invasive species in water bodies of interest to the KBIC."[45] The purpose of the Terrestrial Invasive Species Management Plan "is to outline an approach for [KBIC's NRD] to better monitor and address issues of terrestrial invasive species within the reservation and ceded territory."[46] KBIC NRD has made efforts in monitoring and managing both aquatic and terrestrial species, which include the following:

- Sea lamprey control.
- Monitoring for aquatic invasive species in collaboration with USFWS.
- Providing boat washing services at area boat launches.
- Active control of specific plant species, including purple loosestrife, Eurasian water milfoil, swamp thistle, spotted knapweed, and Japanese barberry.
- Restoration projects on and near reservation lands and waters to plant wild rice, pollinator species, and medicinal native plants.

The following are examples of invasive species located on or near the KBIC L'Anse Reservation and are of concern to the KBIC NRD:[47]

Invasive Insects

Emerald Ash Borer (*Agrilus planipennis*): First discovered in southeastern Michigan near Detroit in 2002, this exotic beetle has killed hundreds of millions of ash trees throughout the U.S. Adult emerald ash borers (EAB) feed on ash foliage but cause little damage. The larvae feed on the inner bark of the ash trees, disrupting the tree's ability to transport water and nutrients. Many trees lose approximately 30 to 50% of their canopy in one year and the tree is often killed after 2-3 years of infestation. EAB has not been reported in all Upper Peninsula counties[48], but due to its proliferation in nearby areas, it may have an unreported presence.



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

[45] KBIC. (2015). "Aquatic Invasive Species Management Plan." http://nrd.kbic-nsn.gov/sites/default/files/KBIC%20Final%20AIS%20Plan%20Approved_Merged.pdf
[46] KBIC. (2018). "Terrestrial Invasive Species Management Plan." http://nrd.kbic-nsn.gov/sites/default/files/KBIC%20NRD%20Terrestrial%20Invasive%20Species%20Management%20Plan%20Final%20Draft%206-8-2018.pdf
[47] All images are from www.bugwood.org, unless otherwise noted.
[48] Emerald Ash Borer Story Map. www.aphis.usda.gov/aphis/maps/plant-health/eab-storymap

Spotted Wing Drosophila *(Drosophila suzukii)*: The spotted wing drosophila (SWD) is a small vinegar fly with the potential to damage many fruit crops. It was first detected in Michigan in late September 2010. Unlike most other vinegar flies that require damaged fruit to attack, SWD causes damage when the female flies cut into and lay eggs in healthy fruit. This inspect is a pest of most berry crops cherries, grapes, and other tree fruits, with a preference for softer-fleshed fruit. Given the propensity for this insect to spread and its potential to infest fruit, it is important to learn about monitoring and management of SWD to minimize the risk of larvae developing in fruit and affecting fruit marketability[49].

Adult Female Spotted Wing Drosophila (Hannah Burrack, North Carolina State University)

Invasive Plants

Japanese barberry (*Berberis thunbergii*):[50] Japanese barberry, an ornamental plant widely used in landscaping, was introduced in the U.S. in the late 1800s. Originally from Japan, the ornamental barberry was popular due to its resistance to deer browsing. It also thrives in both full sun and deep shade and leafs out in early spring while also retaining its leaves late into the fall, shading out native plants. Japanese barberry has also been shown to help in the spread of Lyme disease. Research has shown higher densities of adult deer ticks and white-footed mice under barberry than under native shrubs. When deer mice have greater concentrations of larval ticks, more adult ticks become infect with Lyme disease. If barberry is controlled, there typically are fewer mice and ticks present causing infection rates to drop.

Japanese barberry (John Ruter, University of Georgia)

Spotted knapweed (*Centaurea stoebe*): Spotted knapweed is commonly found on dry sandy soil in disturbed areas near roads and abandoned farms or in dry dunes or prairies. It was introduced into the U.S. in the 1890s from Eurasia and can outcompete native plants due to its ability to emit

[49] Rufus Isaacs, Noel Hahn, Bob Tritten, and Carlos Garcia. (2010) MSU Extension Bulletin E-3140. Spotted Wing Drosophila. Michigan State University https://www.canr.msu.edu/ipm/uploads/files/E-3140.pdf
[50] MDNR. (Feb. 2012). Invasive Species – Best Control Practices: Japanese Barberry. Michigan Natural Features Inventory. https://mnfi.anr.msu.edu/invasive-species/JapaneseBarberryBCP.pdf

a chemical into the soil that is toxic to surrounding plants. While it is considered an invasive weed, it is also known for the honey that bees make from its nectar (Star Thistle Honey).

Invasive Aquatic Plants

Eurasian watermilfoil (Chris Evans, University of Illinois)

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

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

Invasive Aquatic Species

Sea lamprey (*Petromyzon marinus*): Sea lamprey were first discovered in the Great Lakes in the 1800s and its introduction into Lake Superior has caused serious decline in fish populations and an alteration of the ecosystem. The lamprey uses its suction cup like mouth to latch onto the skin of a fish and scraps away tissue with its sharp probing tongue and hooked teeth. Secretions in the lamprey's mouth prevent the victim's blood from clotting and the lamprey sucks the blood from the fish. Victims typically die due to excessive blood loss or infection. The sea lamprey has played a significant role in the decline of Lake Superior lake trout, a key predator fish, which has allowed other invasive fish species, such as the alewife, to explode in population. Control efforts to mitigate the impacts of lamprey have been used, but it is still present in the Great Lakes.

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

Dreissenid Mussels (including Zebra Mussels and Quagga Mussels); family *Dreissenidae*:
Dreissenid mussels have been present in the Great Lakes since the late 1980s and were transported to the area via ballast waters from shipping barges. Both mussels can attach to hard surfaces, clogging water intake pipes and fouling other hard-shelled animals such as clams. Zebra mussels have significantly reduced plankton populations, as mussels are filter large volumes of water for food, which can deplete food resources of larval and planktivorous fishes like smelt and alewife. This also results in an increase in water clarity and an increase in aquatic plants. Clear water is aesthetically pleasing, but the clarity indicates that there have been drastic changes at the base of the food web. While more attention has been given to the zebra mussels, quagga mussels have a large spatial extent in the Great Lakes as it can tolerate colder and deeper waters than zebra mussels.

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

Occurrence Probability and Vulnerability

The probability of future occurrence for invasive species for KBIC is high and will rise due to the continual transport of goods and expanding global trade. This has created opportunities for many organisms to be transported to and establish themselves in new countries and regions. There are several invasive species that have yet to be found on KBIC Reservations or the surrounding area, but once established, they are hard to eradicate because most people will not notice their presence until the damage is already done.

The entire population, wildlife and people included, are vulnerable to invasive species because the hazard primarily impacts the environment. The destruction that invasive species have on woodlands and water features impacts all life by diminishing the health and existence of plants and animals of ecological, cultural, or subsistence significance. Some invasive species also have a negative indirect impact on human health, such as the Japanese barberry, which increases tick habitat and human exposure to tickborne diseases. Widespread insect infestations, such as from the Emerald ash borer, can create serious public safety threats and loss of habitat due to dead and dying trees being fire prone (due to their dry, brittle nature) or to partial/total collapse due to high winds or ice/snow accumulation.

Wildlife Health Hazards

Hazard Description

> *"To support, honor, and respect mutual relationships between thriving native fish, wildlife, plant, and human communities by maintaining, enhancing, or restoring ecologically diverse networks of healthy wildlife populations and habitat."* (p. 11) [51]

Wildlife and plants face many challenges, such as land use changes and habitat loss, competition from invasive non-native species, altered ecological processes, and a rapidly changing environment. At the KBIC, land stewardship has fostered a responsibility to treat the environment and wildlife like relatives rather than resources, built on long-term interactions and respectful, sustainable relationships. There is a mutually beneficial relationship between natural communities and people. The health of the environment and wildlife inevitably impacts and affects humans. Because of this coexistence, the impacts from wildlife diseases will affect not only people, but also the sustainability of Earth's ecosystems. Diseases that negatively affect wildlife not only cause declines in wildlife populations, but can increase ecological disturbances, cause loss of human life, and negatively impact local economies and agricultural wellbeing. Diseases can also ultimately result in a loss of biodiversity or sensitive native species, both of which may be irreplaceable.

Wildlife diseases impact a wide range of organisms including birds, fish, bats, and mammals. Humans contribute to the introduction of wildlife diseases through habitat degradation, transporting and introducing invasive non-native species to a new habitat, and exposing wildlife to infections, toxins, and diseases. Emerging infectious diseases that are affecting wildlife can be traced back to wildlife feeding, movement of plants and animals, invasive species, and high-density populations where diseases are easily spread from one organism to another.

In addition to diseases, chemical pollutants can cause significant and long-lasting negative impacts to many organisms. For example, persistent organic pollutants (POPs) are toxic chemicals that negatively affect wildlife and human health and the environment around the world. Wind and water can transport POPs, allowing the pollutants to travel long distances and

[51] KBIC. (2014). "Wildlife Stewardship Plan." http://nrd.kbic-nsn.gov/sites/default/files/WSP12_18_14FINAL1EO%28mh%29v52915.pdf

affect people and wildlife far from where it is originally used and released. POPs persist for a long time in the environment and can accumulate and pass from one species to the next through the food chain. A major route of exposure to humans and wildlife is through the consumption of contaminated food, particularly fish.

Despite restrictions of the use of lead in hunting ammunition and fishing tackle, lead poisoning continues to negatively threaten wildlife health. Lead poisoning can cause long term damage to the nervous, immune, and reproductive system. At high enough concentrations, it can be fatal. The most significant hazard to wildlife is through ingestion of lead bullets/shot, lost fishing sinkers or tackle, and consumption of wounded or dead prey that contain lead fragments from ammunition.

Climate Change Considerations

The impacts of climate change on wildlife health are far ranging. Increasing temperatures, rainfall, and climate variability can degrade habitats, change the geographic ranges of parasites and diseases, and increase competition from invasive species. Insect borne diseases, such as West Nile virus and Lyme disease, do not "die" off in the winter as both mosquitoes and ticks can survive for a longer period due to warmer temperatures. When increasing temperatures are combined with increased rainfall, this may have a significant impact on human and wildlife diseases. In addition to expanding human populations, these changes can aggravate already limited water resources and increase habitat destruction, providing more opportunities for infectious diseases to cross from one species to another.[52] Wildlife health is reflective of the ability of a species to thrive in a changing environment. If species are in poor health, it probably will not survive because it is not able to adapt to any changes to its ecosystem.

Historical Occurrence

Wildlife surveys conducted by the KBIC NRD are important in increasing knowledge of wildlife populations, preserving species diversity, and promoting species conservation on and near the L'Anse Indian Reservation. KBIC NRD has actively monitored for wildlife diseases as part of their annual surveys. Working with GLIFWC, Wisconsin and Michigan DNR, and the BIA, KBIC NRD has monitored the presence of CWD over the course of 7 hunting seasons (2002, 2003, 2007-2011). Avian influenza presence has also been monitored during 3 hunting seasons (2007-2009).

[52] USGS National Wildlife Health Center. "Climate Change and Wildlife Health: Direct and Indirect Effects." https://www.nyfoa.org/application/files/7714/7948/6144/ClimateChangeandWildlife.pdf

Examples of wildlife diseases[53] of concern include the following:

Dear with signs of chronic wasting disease (Source: Terry Kreeger, Wyoming Game and Fish/Chronic Wasting Disease Alliance)

Chronic Wasting Disease (CWD)[54]: CWD is a fatal, neurological illness that affects cervides (members of the deer family, such as white-tailed deer, elk, and moose. It is contagious through animal-to-animal contact or objects contaminated with infected fluids or the carcass of a CWD-infected animal. Currently, CWD is not known to affect humans and livestock, but public health officials still recommend human exposure to CWD infected animals should be avoided. Hunters should also avoid consuming meat from sick animals.

A little brown bat with white-nose syndrome (Source: Marvin Moriaty/USFWS)

White-Nose Syndrome (WNS)[55]: WNS is a disease caused by a cold loving white fungus (*Pseudogymnoascus destructans*) which infects the skin of the muzzle, ears, and wings of hibernating bats. This disease causes bats to come out of hibernation early and causes a severe depletion of fat reserves. Bats are weakened due to the loss of fat and are unable to replenish the lost fat due to lack of food in the winter. Many bats die before spring. WNS is spread by bat to bat contact or by humans who can carry the virus on their clothes into bat caves. WNS is responsible for significant declines in bat species populations across the U.S. since its discovery on the East Coast in 2006. At least one bat species has been listed as Threatened under the Endangered Species Act due to WNS. WNS is not harmful to humans.

West Nile Virus is a mosquito-borne virus that causes meningitis or encephalitis in humans bitten by an infected mosquito. These neurological diseases can be fatal. Humans can also develop flulike symptoms from the virus, but some people may show no symptoms. The virus was first detected in Michigan in 2001 and has been found each year since. The primary hosts for West Nile virus are birds and is typically transmitted from bird-to-mosquito but can infect humans and horses that receive a mosquito bite. The virus can also infect other types of mammals, such as bats, cats, squirrels, and chipmunks, but usually with no symptoms. There are

[53] Descriptions of wildlife diseases are from the KBIC Wildlife Stewardship Plan, unless otherwise noted.
[54] USGS. (2019). "What is chronic wasting disease?" https://www.usgs.gov/faqs/what-chronic-wasting-disease?qt-news_science_products=0#qt-news_science_products
[55] NPS (2017). "What is white-nose syndrome?" https://www.nps.gov/articles/what-is-white-nose-syndrome.htm

vaccines to prevent the virus from sickening horses, but there are no vaccinations for humans, pets, or birds. Other mosquito-borne viruses that can affect humans include Eastern equine encephalitis, which may cause fevers, joint pain, or brain swelling[56], and Zika virus, which can be passed from a pregnant mother to her unborn baby leading to severe brain defects.[57]

Tick borne diseases, such as Lyme disease, can affect canines and humans. Lyme disease is a bacterial infection that sometimes shows up as a "bull's eye" ring around the tick bite location. If untreated, Lyme disease can affect the heart, joints, and nerves. Control of tick populations and reducing exposure mitigates the risk of infection. Wearing protective clothes and clearing of brush are methods to reduce tick exposure. For canines, medications and other preventative measures should be taken to protect dogs from tick bits. Chances of the disease are low when ticks are removed within 24 hours.

Avian botulism is a paralytic bird disease that is caused by ingesting a toxin produced by the bacteria *Clostridium botulinum*. The bacteria are found in soil and requires warm temperatures, a protein source, and lack of oxygen to become active and produce toxins. The ideal environment for the bacteria to grow and produce toxins is in decomposing vegetation and invertebrates. Birds may inadvertently ingest the bacteria when consuming the invertebrates. All bird species are susceptible to botulism, but waterfowl are most often affected. The toxin that is produced by the bacteria affects the nervous system, leaving birds unable to use their wings and legs. Waterfowl become paralyzed and often die due to drowning, predation, or respiratory failure.

Occurrence Probability and Vulnerability

Because of the presence of a variety of diseases, chemical pollutants, and the impact from climate change, there is a high probability of wildlife health issues on and near the Reservation. Much is still needed to learn and understand about how these diseases can be treated and how their spread can be slowed. If left alone, these diseases may lead to a loss of cultural resources, biodiversity, and subsistence opportunities. As stewards of the environment and to continue to respect what ecosystems provide, steps should be taken to address wildlife diseases currently present or that threaten the reservation. Prevention and reduction of wildlife diseases depend upon proactive education, surveillance, monitoring, reporting, and sharing of information by community members.

Ecosystem Health Hazards

Hazard Description

Ecosystem health is a measure of how resilient a system is to changes that may significantly impact its natural or regular state. It is the general condition that an ecosystem is in. A healthy

[56] CDC. (18 December 2019). "Eastern Equine Encephalitis." https://www.cdc.gov/easternequineencephalitis/index.html
[57] MIDHHS. (2020). "Michigan Emerging Disease Issues – Zika Virus." https://www.michigan.gov/emergingdiseases/0,4579,7-186-76711_77491---,00.html

ecosystem can withstand stresses from persistent contamination, anthropogenic changes to ecological processes, or loss of native species. The more resilient an ecosystem is, the less of a negative impact a stressor will have on the ecosystem. Additionally, an ecosystem in strong health is highly diverse, sustains many organisms, and allows these organisms to thrive. However, due to climate change and other anthropogenic impacts, habitat quality is degrading, and many populations of wildlife, fish, and plants are threatened by this. A degraded ecosystem inevitably will negatively impact human wellbeing and the beneficial relationship between natural communities and people. Human impact or human caused disturbances are not always intentional such as loss of habitat due to pollution or recreation. Ecosystem health is also negatively impacted by infrastructure development. People may unintentionally degrade the habitat, which should be ameliorated through education.

The health of an ecosystem largely depends on what is considered desirable or normative for an ecosystem. For example, surface water quality can vary depending on the ecosystem the water body is found in. If it is used for drinking water, the water should have low concentrations of nutrients and meet set water quality standards for human use. However, waters that do have a high concentration of nutrients are not considered unhealthy if it is found in a wetland or other ecosystem where surface waters typically have a higher nutrient concentration.

Currently, there are 384 species that are recognized as beings of cultural importance. As land stewards, people should work to care for the habitat of these beings in an ecologically sound manner for sustainable use of hunting, fishing, and gathering, while enhancing habitats for expanding wildlife, fish, and plant populations.

Climate Change Considerations

Climate change is expected to alter and significantly impact the ecosystem in many ways, including changes in streamflow, soil moisture, flooding, drought, and surface water temperatures. Precipitation is expected to increase in the winter and spring months, which will in turn increase nutrient concentrations, such as nitrogen and phosphorus, into local waterways as fertilizer is typically applied in the fall. Summer and fall precipitation are expected to be more variable, which will result in drier conditions. This will increase evaporation and reduce water stored in the landscape. Sensitive habitats, such as wetlands and riparian areas, may degrade due to extreme events and climatic shifts. Consistently high-water levels in these areas, which provide corridors for wildlife and plants, prevent normal use due to flooding in these pathways. Conversely, low water levels in certain habitats can lead to wildfires in ecosystems that do not necessarily thrive post-fire events.

Surface water temperatures are expected to increase in lakes, rivers, and streams. Increased water temperatures negatively impact many cold-water fish species, such as trout, salmon, and other species of cultural importance. When water temperatures increase, cold-water fish species are

under greater physiological stress leading to declines in population and species distribution.[58, 59] Warmer water temperatures also increase the risk of invasive species, diseases, and parasites in local waterways. This can negatively impact the population and health of cold-water fish species.

Historical Occurrence

The KBIC NRD is responsible for assisting the tribe in protecting, preserving, enhancing, and mitigating natural resources and the environment. The department helps monitor and protect regional ecosystems to ensure that these areas are protected from pollution or damage that can negatively affect Reservation lands. In the KBIC Strategic Plan, the environmental vision seeks to keep the waters of Lake Superior clean, keep Reservation lands clean and free of blight and litter, and manage forests for sustainability and profit, amongst other goals. Regardless of what is done to preserve the environment, it is done in a manner that honors traditions and culture through land preservation. Healthy ecosystems are ones that not only provide resources and place for people, but also those same services for the organisms that live and thrive in the same habitat.

Surface water (Lake Superior) is the main drinking water source for much of the Community. KBIC has collected physical, chemical, and biological data on surface water as it is critical to both human and environmental health. The collected data will be used to set Water Quality Standards to insure the health of water resources and broader community now and for future generations.

The KBIC has approved Treatment as a Sovereign or State (TAS) status under the Clean Air Act and Clean Water Act. Since October 2019[60], the KBIC has reviewed and provided air quality protection recommendations to EGLE and the EPA on permits that may contribute to tribal air quality issues. In April 2020[61,62], the KBIC was granted authority by the EPA to set water quality standards for its reservation enabling KBIC to develop standards that are based on local data and values instead of regional or national standards. Once developed, EPA will review the standards and there will be a public hearing to allow for public input. The approval of both TAS applications promotes tribal self-governance and supports the tribe to continue to protect tribal lands and waters.

[58] Lyons et al. (2010). "Predicted effects of climate warning on the distribution of 50 stream fishes in Wisconsin, U.S.A." *Journal of Fish Biology*, 77, p. 1867-1898. https://doi.org/10.1111/j.1095-8649.2010.02763.x
[59] Williams et al. (2015). "Cold-Water Fishes and Climate Change in North America." *Reference Module in Earth Systems and Environmental Sciences*. https://doi.org/10.1016/B978-0-12-409548-9.09505-1
[60] Huhta, Zelina. (2020, March 2). "EPA Approves KBIC application for TAS in air quality." *The Daily Mining Gazette.* https://www.mininggazette.com/news/local-news/2020/03/epa-approves-kbic-application-for-tas-in-air-quality/
[61] Lindblom, Doug. (2020, April 28). "EPA gives authority to KBIC to develop clean water standards." WLUC-TV6. https://www.uppermichiganssource.com/content/news/EPA-gives-authority-to-KBIC-to-develop-clean-water-standards--570028111.html
[62] EPA. (28, April 2020). "Keweenaw Bay Indian Community Application for Treatment as a State for Water Quality Standards." https://www.epa.gov/mi/keweenaw-bay-indian-community-application-treatment-state-water-quality-standards

Occurrence Probability and Vulnerability

KBIC NRD has taken steps to regularly monitor and assess ecosystem health through a variety of programs, strategies, and outreach opportunities. Ecosystems in the area are under threat from not only direct anthropogenic impacts, but also climate change. Both of which may significantly alter local ecosystems and shift the habitats of native species. All ecosystems in the region are vulnerable to climate change, degradation, and pollution.

Geological Hazards

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

1. Earthquakes
2. Subsidence (Ground Collapse)

Although some states recognize "landslides" as an additional hazard, Michigan's geology and history tends to make it more prone to land subsidence instead. Michigan's two main vulnerabilities to ground movement are therefore identified in the sections on earthquakes and subsidence hazards.

Earthquakes

Hazard Description

Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes or come as a series of tremors over a period of several days. Earthquakes usually occur without warning; however, scientists cannot yet predict exactly when or where an event will occur. Earthquakes tend to strike repeatedly along faults, which are formed where tectonic forces in the Earth's crust cause the movement of rock bodies against each other. Risk maps have been produced which show areas where an earthquake is more likely to occur.

Most areas of the country are subject to earthquakes, including parts of Michigan, and they occur thousands of times a year. Most earthquakes are minor tremors and results in little or no loss of life, property, or essential services. However, earthquakes are dangerous because they can cause severe and sudden loss and devastation without warning. Deaths and injuries are caused indirectly through the collapse of structures. Earthquakes are measured by their magnitude (amount of energy released at the epicenter) and intensity (measure of damage done at one location; essentially the same as "severity" as classified throughout this plan). The Richter Magnitude Scale is commonly used to determine earthquake magnitude, and the Modified Mercalli Intensity Scale is used for intensity. A 5.0 on the Richter Scale is a moderate event, while an 8.0 is a catastrophic event. The Mercalli Intensity Scale describes 12 increasing levels from imperceptible to catastrophic.

Michigan is not located in an area subject to major earthquake activities. Although there are faults in the bedrock of Michigan, they are now considered relatively stable. Earthquakes risks in Michigan are generally low, which means structures or utilities are not necessarily built to withstand even small seismic events. Due to low risk, Michigan may be more vulnerable to an earthquake because of poor preparation.

Historical Occurrence

No severely destructive earthquake has ever been documented in Michigan. However, several mildly damaging earthquakes have been felt since the late 1700s. Earthquake tremors have been felt in the region, with the earliest recorded in 1811. Up to nine tremors from the New Madrid Seismic Zone, which runs from Cairo, Illinois through New Madrid, Missouri to Marked Tree, Arkansas, were reportedly felt in Detroit. Since then, there has been only questionable activity in the Upper Peninsula, occurring in the Keweenaw Peninsula in 1905, 1906, and 1909.[63] While there were explosions and ground shaking felt as far away as Marquette, it is believed to have been from pillars collapsing in local mines.

In the Upper Peninsula, most seismic activity is mining related. For example, on January 12, 2015, a 2.3 magnitude earthquake (Richter Scale) was reported about 6 kilometers southeast of Negaunee in Marquette County. It was caused by mining exploration near the area. In 1998, a 3.6 magnitude earthquake (Richter Scale) occurred near Bergland Township in Ontonagon County. The USGS reports that it was caused by a mine collapse. It was felt as far as White Pine, approximately 12 miles from Bergland.

Occurrence Probability and Vulnerability

There is a very low – nearly zero – probability of an earthquake occurring anywhere in the Upper Peninsula with no documented faults nearby. Severity would also be low, as any physical effect of an incident on KBIC would be weak and indirect. Any detectable earthquakes in Baraga, Marquette, or Ontonagon Counties would most likely be caused by mining exploration or underground mines. Due to the low probability of an earthquake, no critical facilities nor areas are considered vulnerable from the impacts of an earthquake.

Subsidence (Ground Collapse)

Hazard Description

Subsidence is depressions, cracks, and sinkholes in the ground surface that can threaten people and property. When there is a collapse or lowering of a land surface, it can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities due to the solution of limestone or other soluble materials, such as salt and gypsum, by groundwater. Overtime, the dissolution of rock into groundwater can create a void

[63] Mack, Julie (2015, May 3). "7 facts about earthquakes in Michigan." MLive. https://www.mlive.com/news/kalamazoo/2015/05/5_facts_about_earthquakes_in_m.html

that may be subject to sudden and catastrophic collapse, causing a sinkhole. Human-induced subsidence is caused mainly by groundwater withdrawal, drainage of organic soils, and underground mining. In the U.S., these activities have caused more than 17,000 square miles of surface subsidence, with groundwater withdrawal as the primary culprit.

In Michigan, the greatest risk of subsidence is associated with underground mining. Mine subsidence is a geologic hazard that can occur with little or no warning. It occurs when the ground surface collapses into underground mine areas. Strain from geological movements, additional surface loading, and vibrations from truck traffic and other industrial machinery can cause the ground above and around old mines to sink and collapse. Industrial or residential developments that are near or above active or abandoned mines are threatened by subsidence due to their proximity to underground cavities. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life.

The legacy of underground mining can be felt throughout the state. Many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. Unfortunately, records of abandoned mines are often unreliable and sometimes non-existent; it is often difficult to determine exactly where the mines were located. Many areas throughout the state may have been developed over abandoned mines and may not be aware of it. While underground mining has fueled economic growth in many parts of the state, it has left a legacy or threat of subsidence. Old, abandoned mines will eventually begin to collapse under their own weight or human neglect and oftentimes can swallow up whatever is built upon them.

In Michigan, state regulations make the owner of mineral rights responsible for capping and maintaining fencing around old, abandoned mines. The surface owner is then responsible for any open holes or shallow test pits, which could be filled with water. The county mine inspector is responsible for monitoring compliance and for smaller gravel pits and closed/abandoned mines.

Historical Occurrence

Michigan has a rich mining heritage and a wide variety of mineral resources, most notable of which are copper ore, iron ore, sand, gravel, coal, salt, oil, and gas. Underground mining has occurred on a significant scale throughout Michigan's history. Michigan's Lake Superior region has been home to significant copper mining operations since the mid-1800s. Mining activity ended in 1960s, when the last shipment of copper sent out.

There are over 800 underground mines in Michigan, with more than 2,300 or other openings. Many mines were opened in the 1840s and even though many mine sites have been inspected by a county mine inspector, some are still unknown and/or unmarked. There are very limited records of the locations of shafts, and the extent of underground minds and proximity to surface to the surface may be unknown. A Michigan Abandoned Underground Mine Inventory was completed in late 1998 and is currently housed at the J.R. Van Pelt and Opie Library at Michigan Technological University in Houghton, MI.[64] This inventory includes information about the location of shafts and mine extent however copies of the report are limited to the DNR and

[64]Michigan Underground Abandoned Mine Inventory. https://researchworks.oclc.org/archivegrid/data/717282963

County Mine Inspectors. Distribution is limited to prevent the materials from becoming guides to potentially dangerous locations.

In Marquette County, the Rope's Gold Mine Access Road Cave-in occurred on December 31, 1987. Old mine workings collapsed and resulted in a cave-in that was approximately 6,000 square feet with a depth of about 40 feet. Only one minor injury occurred. In 1997, there was a subsidence event in Ishpeming where a garage was built over an old well. A 25 feet deep by 10 to 15 feet in diameter hole formed. No injuries were reported. The garage was removed, and the hole was filled with sand. Mining continued until the mine closed in 1991 due to falling gold prices and when needed repairs were too costly. There has not been a significant subsidence event in Baraga and Ontonagon Counties. While there have been minor cave-ins near Alberta (L'Anse Township) and in Spurr Township, most known open shafts throughout the region have been fenced. In Marquette County, it is believed that all caved areas resulting from underground mining have been identified and fenced.

Occurrence Probability and Vulnerability

Probability of a significant subsidence event is low based on known past incidents, but the possibility of unknown occurrences may mean probability is higher than expected. The KBIC does not have the extensive mining history of other areas in the Western U.P. Only a slight risk exists because of unknown hazards. In consideration of current remediated conditions of Baraga County's small number of mine shafts, probability of subsidence is very low. Severity would likely be low to moderate depending on the site.

Vulnerability is greatest in Ontonagon County in areas near M-64 and M-107, which include Carp Lake Township, Greenland Township, Matchwood Township, and Rockland Township, due to historic copper mining sites that are present in these locations. Vulnerability to a subsidence event in Marquette County is highest in Champion Township, Ely Township, Forsyth Township (areas near M-35), City of Ishpeming (US 41/M-28), Ishpeming Township, Michigamme Township, Negaunee, Republic Township, Richmond Township, and Tilden Township. All these locations have historical iron mining sites that have the potential for ground collapse.

Although some incidents may cause private property damage, other may affect roads and other critical infrastructure. Vulnerable roadways that are in proximity to or overlaying abandoned mines should have been identified and marked as under threat. Other critical infrastructure vulnerable to subsidence include water supply and underground pipelines.

Technological Hazards: Industrial Hazards

Technological hazards are the result of the manufactured environment. This section covers many related types of events that stem from breakdowns or weaknesses in the industry and the built environment. The following outlines the significant industrial hazards that are covered in this section:

1. Scrap Tire Fires
2. Structural Fires
3. Hazardous Materials: Fixed Site Incidents
4. Hazardous Materials: Transportation Incidents
5. Petroleum and Gas Pipeline Accidents

Unlike ordinary fires and wildfire events, scrap tire fires are a special case of industrial hazard as these types of fires involve toxic smoke and chemical residues that have more in common with hazardous material incidents. This is also the case for structural fires, as it considers various types of large fires that occur among important buildings or structures. This hazard analysis focuses on larger-scale fires that have greater potential to affect an entire community, either through a fire's magnitude or through the vital nature of the facilities or resources that it affects.

The other hazards listed, specifically dealing with hazardous materials, cover a wide array of extremely hazardous substances across diverse situations that typically involve industrial or warehousing operations. Fixed site incidents include a consideration of fire-related industrial accidents and explosions, even if these did not involve a hazardous substance. The emphasis is on events of a relatively large magnitude, particularly those that resulted in a community states of emergency, evacuations, impairment or loss of economically significant or critical facilities, or multiple causalities.

Overlap with Other Sections of Hazard Analysis

Various types of structural, scrap tire, and industrial fires may be caused by other large-scale disaster events, such as lightning strikes which cause direct ignition of structure fires and the destruction caused by tornadoes could also lead to a fire. Additionally, wildfires have a clear potential to ignite structures and scrap tire piles. A structural fire involving a critical facility has the potential to cause infrastructure failures, energy emergencies, flooding, wildfires, dam failures, and transportation accidents.

Scrap Tire Fires

Hazard Description

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

Michigan generates approximately 10 million scrap tires each year. Whole tires are banned from disposal in Michigan landfills due to their associated problems. Stockpiled tires can be breeding grounds for mosquitoes and can be homes to snakes and other small mammals (rats, opossums,

raccoons). Although responsible means of tire storage and disposal have become more common, tire dumps of the last 40 years still present environmental and safety hazards.

Historical Occurrence

There are no licensed scrap tire facilities on the KBIC Reservation. However, there are known sites that need remediation. Power Dam is a 28-acre property that is restricted to tribal members for residential or business lease. Fifty percent of the site is forested while the other half is occupied with residential and businesses. Highway US-41 divides the property into east and west. One residence and two outbuildings are located to the east. Four residences with one outbuilding, junkyard, a fish shop building, self- storage building, and a small fireworks stand are located to the west. The focus the Phase I Environmental Assessment completed in was the larger western portion and location of the junkyard. The junkyard covers approximately 11 acres of the property and consists of: old vehicles, storage tanks, drums and containers with unknown contents, batteries, heavy machinery, farm machinery, tires, gas tanks, oil filters, vehicle engines, miscellaneous vehicle parts, and scrap metal. In 2020, KBIC Natural Resources Department obtained a grant from EGLE to remove an estimated 800 scrap tires from the Power Dam junkyard.

L'Anse Warden Electric Plant presents some risk of fire due to its storage and burning of a large stockpile of scrap railroad ties and shredded tires, treated as biomass fuel, and stored at the facility. There are currently no licensed scrap tire facilities in Ontonagon County, nor known incidents of scrap tire fires. Marquette County does not have any scrap tire piles, but tire dealers and solid waste transfer stations may sometimes have a hundred or more tires on site. In all counties, there is the possibility of illegal dumping sites.

The KBIC NRD regularly hosts public tire drop off events where residents of Baraga County can drop off tires for free. This public service can help reduce the risk of scrap tire fire incidents in residential yards throughout the Reservation.

Occurrence Probability and Vulnerability

There have been no reported scrap fire tire incidents in KBIC. An additional but unknown risk exists due to the possibility of unknown and unlicensed storage areas. Occurrence probability is low due to some regulation of scrap tire collection sites. However, a possible event could occur at unregistered site on private property. Because of the low occurrence probability, the associated vulnerability is also low.

Structural Fires

Hazard Description

In terms of average annual loss of life and property, structural fires—often referred to as the "universal hazard" because they occur in virtually every community—are by far the most common hazard facing most communities in Michigan and across the country. Each year in the

United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to some sources, structural fires cause more property damage and loss of life than all types of natural disasters combined. Direct property losses due to fire exceed $9 billion per year, and much of that figure is the result of structural fires. It is estimated that 46.3 percent of accidental fires occur through neglect or carelessness with items such as candles, cigarettes, pipes, cigars, matches, lighters, and fireworks – especially when in the hands of children. Another major cause is improper use or maintenance of items such as clothes dryers, holiday decorations, and cooking equipment. Many structural fires can be prevented through awareness and education.

Historical Occurrence

Structural fires are of special concern in the urban Upper Peninsula regions because many of the buildings were built in the early 1900s or before. Many of these older homes, as well as numerous camps and cabins in the woods, are also heated by wood-burning stoves, placing them at additional risk. Homes also fall vacant and become dilapidated over time, decreasing maintenance and monitoring and increasing fire risk, which becomes an even greater problem with absentee property ownership. The Upper Peninsula has several fire departments available to respond, along with mutual aid agreements with neighboring jurisdictions, to deal with structural fires. Education and functional fire detectors can often mitigate the loss from this hazard.

On May 27, 2019, a deadly barn fire at a major egg-producing local farm occurred in Pelkie, killing 3,000 hens, and incurring estimated damage of $250,000. The fire took over four hours to put out. Although volunteer firefighters from Pelkie, L'Anse, and Baraga all responded to the fire, two barns and a semi-trailer were also damaged.

Pelkie Barn destroyed after structural fire on May 27, 2019 (Source: Upper Michigan Source)

In 2008 there were 31 fires reported in Baraga County resulting in $180,600 in damage. Of the total fires, 16 percent were considered arson or were suspicious. In 2002, Ontonagon County had 33 fires resulting in $1,405,250 of damage and 26 fires in 2003 resulting in $200,630 of damage. Michigan has a relatively high fire death rate at 12.3 deaths per million people, whereas the national rate is 10.9 per million (both as of 2016). In Marquette County, data was unavailable.

Rural areas face similarly high risk of structure fires but for different reasons. Limited fire response resources may be close, but police and ambulance response times frequently exceed 30 minutes. The distance of these support services and more extensive firefighting capability (including modernized equipment with appropriate storage) exacerbates the severe nature of rural structure fires.

Occurrence Probability and Vulnerability

Due to an older housing stock, compact development in downtown areas, and remote development, much of the western Upper Peninsula is susceptible to fire. Severity is highest in the cities and villages with large housing complexes. Baraga County has multiple fire departments with mutual aid agreements in place to respond to structural fires. Education and operational fire detectors can often mitigate the loss from this type of hazard. KBIC provides smoke alarms at community outreach events and home visits. They are also included in NRD's Healthy Home Kits. L'Anse has a fire rating of 4, with a trained volunteer department and equipment. However, more rural communities away from the hydrant systems of the township can lead to slow response time and require supplying water.

Historically, the frequency of fires in Baraga County is 38 per year based on an average from 2002 to 2003 occurrences, so probability is very high in most areas. Average property losses per year for the same period were $2,641,050. Frequency of fires in Ontonagon County is 29.5 per year based on an average of 2002-2003 statistics. As demonstrated by losses recorded in 2002 and 2003, the damage incurred by structural fires varies greatly from year to year. Unfortunately, local fire departments do not maintain archived records of previous loss, making an estimate of vulnerability difficult and unreliable.

Zoning ordinances in certain areas can help reduce vulnerability to fires by improving safety and reducing potential losses from fires. Examples include property setbacks and road width requirements to allow easy access for emergency vehicles. Vulnerability to structural fires is high for low-density rural areas due to long travel or response time by responders. Additionally, rural fire departments find it difficult to recruit and sustain volunteer firefighters as the population ages. Required training has greatly increased which has made recruitment and retention also difficult.

Hazardous Materials: Fixed Site Incident

Hazard Description

A fixed site incident is an uncontrolled release of hazardous materials from a stationary location, capable of posing a risk to health, safety, property, and the environment. Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials or substances pose a threat to life, health, property, and environment if released because of their chemical, physical, or biological nature. Hazardous materials are carefully regulated by the government to reduce risk, but accidental releases can occur during the manufacture, transport, storage, use, and disposal of the

materials. Areas at highest risk are within a one- to five-mile radius of identified hazardous material sites. Many communities have detailed response plans in place to mitigate the harm to people, property, and the environment from hazardous materials.

As new technologies have developed, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities. Hazardous materials, if released, pose a potential risk to life, health, property, or the environment due to their chemical, physical, or biological nature. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

Hazardous materials are highly regulated by federal and state agencies to reduce the risk to the public and environment. Despite precautions to ensure careful handling during the manufacture, transport, storage, use, and disposal of these materials, accidental releases do occur. Areas at highest risk are within a one to five-mile radius of identified hazardous material sites. Many communities have detailed response plans in place to mitigate the harm to people, property, and the environment from hazardous materials.

Historical Occurrences

There are only a few facilities within KBIC with supplies of Extremely Hazardous Substances that require reporting under the Superfund Amendments and Reauthorization Act (SARA) Title III. Title III identifies what steps facilities, the State, and local communities must take to protect the public from hazardous materials accidents. There are 24 licensed hazardous waste generators and 19 registered storage tanks on the L'Anse Reservation[65]. The substances are traced from cradle to grave, so the exact inventory, use, and consumption are monitored in cooperation with the EPA and Michigan EGLE.

Facilities within Baraga County that must report under Title III include water treatment facilities that store chlorine, and a telephone office with minor amounts of sulfuric acid. Besides these Title III sites, a risk is posed by industrial manufacturing and utility companies – namely CertainTeed and L'Anse Warden Electric Company, located in the Village of L'Anse. CertainTeed is also listed under the EPA's Toxic Release Inventory (TRI).

In Marquette County, the County Landfill holds monthly household hazardous wastes collection at four sites from spring through fall. The collections aim to reduce the amount of hazardous materials that enter the landfill, prolonging its life and reducing risk of contamination. As of 2018, Marquette County has six facilities listed under in the EPA's TRI. Two are within 10 miles of tribal lands: Marquette Board of Light & Power and the old Presque Isle Power Plant[66].

[65] KBIC. Integrated Resource Management Plan 2002-2012. http://nrd.kbic-nsn.gov/sites/default/files/KBIC-IRMP-2002-2012.pdf

[66] US EPA. TRI for Tribal Communities Dashboard. https://edap.epa.gov/public/extensions/TRI_Tribal_Communities_Dashboard/TRI_Tribal_Communities_Dashboard.html

Occurrence Probability and Vulnerability

Probability of a fixed-sited incident is very low, but severity, if an event were to occur, can range from moderate to high. If an event were to occur, it has the potential of severe impacts over large geographic areas and to populated areas near sites or facilities with hazardous materials.

Areas vulnerable to a fixed site incident include the following communities: Village of L'Anse, Ishpeming Township, Michigamme Township, Champion Township, Hampton Township, and Gwinn Township. These areas are more vulnerable than other locations in the region due to the presence of a TRI facility within the municipality. Ecosystems and sensitive habitats are also vulnerable to toxic releases as it can destroy wildlife habitat in or around the area where the release occurs.

Hazardous Materials: Transportation Accident

Hazard Description

Due to the extensive use of chemicals in society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments daily through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. Areas at greatest risk are those within one to five miles from major transportation routes.

Michigan has had numerous hazardous material transportation accidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material can adversely impact the life safety and/or health and well-being of those in the area surrounding the accident site. Statistics show that most hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure.

Michigan has not had a large-scale, serious hazardous material transportation incident but has had numerous small-scale material transportation incidents that required a response by local fire department and hazardous material teams, and many events also required evacuations and other protective actions.

Historical Occurrences

Highway M-28 is a major transportation route for trucks traveling to and from Canada. The types and amounts of hazardous materials transported on trucks traveling this route are often unknown. While there are State and Federal restrictions on the transport of hazardous materials, this information is not required to be passed on to the local units of government potentially affected by a transportation accident. However, Emergency Services receives notices for passage of anhydrous ammonia trucks passing through the county. The Upper Peninsula has many miles of

shoreline susceptible to shipping accidents on Lake Superior. Railway transport of hazardous materials like ethanol, liquid propane, sodium hydroxide, and ammonium nitrate does occur within the region. Rail operators typically have hazardous response plans in case of an emergency.

Clean-up process post tanker truck spill on US 41 in Chassell Township, Houghton County on February 3, 2018 (Source: EPA)

On February 3, 2018, a tanker truck on US HWY 41 at the Sturgeon River Bridge in Chassell Township in Houghton County. was involved in a multi-vehicle accident causing the truck to overturn. One of the vehicles in the car accident suffered a fatality. The tanker was carrying clear diesel fuel and gasoline that leaked onto the road surface and migrated onto the frozen surface of the Sturgeon River. The release volume was estimated at 4,000 gallons of gasoline and 400 gallons of diesel.

Fatal traffic accident on US 41 between the Villages of Baraga and L'Anse on August 26, 2019. (Source: WLUC TV6)

On August 26th, 2019, a fatal collision involving a semi-truck and a passenger vehicle spilled fuel in a L'Anse portion of US-41. 140 gallons of fuel was spilled on the road. Road traffic was re-routed through Bruce Crossing due to the inability to create a local detour around the crash for six hours.

While there have been no incidents in Ontonagon County, the county has many miles of shoreline susceptible to shipping accidents on Lake Superior. This is similar in Marquette County. However, there have been no hazardous material accidents in either county.

Occurrence Probability and Vulnerability

While hazardous material transportation accidents are more common than other hazardous material incidents, the probability of a transportation accident is low based on history, but there is a considerable risk. This is due to the high level of trucking traffic, proximity to shipping channels, and gasoline transmission lines within the county. Areas most vulnerable and have a higher probability of experiencing an accident are corridors near major transportation routes, including US 41, M-26, and M-38, and the immediate shorelines of Lake Superior. Damage estimates for the previous events are unavailable, but potential severity of an events could range from low to extreme, largely dependent on type and quantity of chemicals released. Property damage is general low for most incidents but could be moderate if the accident occurs in a

populated area. Clean-up costs can be significant particularly when the spill affects air quality, soil surrounding the area, or drinking water.

Petroleum and Natural Gas Incidents

Hazard Description

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

Michigan is both a major consumer and producer of natural gas and petroleum products. Michigan is the largest residential liquefied petroleum gas market in the nation due mostly to high residential and commercial propane consumption. The state has a single petroleum refinery but a large network of product pipelines. More than 78% of the overall home heating market uses natural gas as its primary fuel. Michigan also has the greatest underground natural gas storage capacity in the nation and supplies natural gas to neighboring states during high-demand winter months. The state has a highly developed and extensive gas and petroleum network, representing every sector of the two industries – from wells and production facilities, to cross-county transmission pipelines that bring the products to market, storage facilities, and finally to local distribution systems.

While petroleum and natural gas industries have historically had a fine safety record, and pipelines are the safest form of transportation for these products, the threat of fires, explosions, ruptures, and spills still exists. In addition to these hazards, there is a danger of hydrogen sulfide (H_2S) release. Hydrogen sulfide is not only an extremely poisonous gas but is also explosive when mixed with air at temperatures of 500 degrees Fahrenheit or above.

Northern Natural Gas has a large natural gas pipeline that delivers natural gas to markets in Houghton County, Baraga County, Ontonagon County, and surrounding areas. Propane storage facilities include Northern Oil, Ferrellgas, and LaCourt. Northern Natural Gas has a large natural gas pipeline that delivers natural gas to markets in Ontonagon County and surrounding areas. The pipeline runs across the southern portion of Ontonagon County and has a spur that heads north to the Village of Ontonagon. There are two propane storage facilities in Ontonagon County including the Settler's Coop in Bruce Crossing and FerrellGas in Ontonagon. Natural gas is primarily provided by SEMCO Energy Gas Company, with some parts of Marquette County serviced by DTE Energy. The county also has two major continental pipelines used for transporting crude oil and natural gas. They are in Wells Township, a sparsely populated township.

Historical Occurrence

There is risk of a natural gas pipeline incident in the Great Lakes Region due to aging transmission lines or sabotage. However, no historical occurrences have been recorded. Natural gas transmission lines present the greatest risk due to their remoteness, which may allow a leak to go undetected for an extended period. Though it is not uncommon for minor pipeline leaks to occur, the probability of a significant incident is low, and the same is true for petroleum events. A single-tank petroleum explosion could happen on any site where one is located, but probability of either type of fuel event is otherwise very low in rural areas away from natural gas lines. Severity in most areas would be low to moderate.

Consequences of a natural gas pipeline leak are mostly ecological or environmental, as pipelines are located underground and generally in sparsely developed areas, but evacuations are necessary for residents in the immediate surroundings due to the possibility of inhalation or an explosion. There has been no known petroleum or natural gas incident in Ontonagon County. In Baraga County on December 23, 2016, 1,200 people in the village of L'Anse went without natural gas service after a driver collided with a Semco Energy gas line station in the early morning. The accident caused damage to the gas line and a subsequent fire. Service was restored the next day.

Occurrence Probability and Vulnerability

Probability of a propane incident is low throughout the region, though possible where storage facilities exist; severity would generally be expected to be low to moderate. A single-tank petroleum explosion could happen on any site where one is located, but probability of either type of fuel event is otherwise very low in rural areas away from natural gas lines. Consequences of a natural gas pipeline leak are mostly ecological or environmental, as pipelines are located underground and generally in sparsely developed areas. However, evacuations are necessary for residents in the immediate surroundings due to the possibility of inhalation or an explosion.

Infrastructure Hazards

The following list summarizes the broad types of infrastructure problems covered in this section:

1. Infrastructure Failure and Secondary Technological Hazards
2. Transportation Accidents

Although various industrial hazards involve certain types of infrastructure (e.g., pipelines) and their breakdown, the section titled infrastructure failures and secondary technological hazards focuses on the interruptions in critical life-sustaining infrastructure, such as electricity and water supplies. For example, an electrical black out affects all sectors of society including communications, commerce, government, education, health care, public safety, emergency services, food and water supply, and sanitation.

While technical systems become more efficient, they sometimes become more vulnerable to failures. Many industrial systems operate close to their full capacity and maximum efficiency during times when everything is functioning smoothly and predictably. When something in the

operating environment breaks down, as in the case of a disaster or system failure, the system has issues operating outside relatively narrow parameters. The system then become more vulnerable to failure. System management can help, but it still has issues of its own, including lack of ways to overcome coordination problems, interdependencies, and lack of knowledge of system management flexibility.

The section on transportation accidents involves any of the major modes of transportation systems within the county.

Infrastructure Failures and Secondary Technological Hazards

Hazard Description

Michigan's citizens are dependent on public and private utility infrastructure to provide essential life-supporting services, such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm draining, communications, and transportation. When one or more of these utility systems fail due to disaster or other cause, it can have devastating consequences, even if it is over a short period of time. When infrastructure failures occur due to a natural hazard event, this is considered a secondary or cascading technological hazard. For example, during power outages, people can die in their homes during periods of extreme heat or cold if immediate mitigation actions are not taken. When water or wastewater treatment systems in a community are inoperable, serious public health issues can arise and actions must be taken immediately to prevent outbreaks of diseases. If storm drainage systems fail from damage or capacity overload, serious flooding can occur.

All these situations can lead to disastrous public health and safety consequences if immediate actions are not taken. It is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) who are most heavily impacted by an infrastructure failure. If the failure involves one or more system, whole communities and possibly entire regions can be severely impacted.

The risk of infrastructure failure grows each year, as physical and technological infrastructure becomes more complex and the interdependency between various facets of infrastructure (e.g., pipelines, telecommunications lines, and roads) become more intertwined. Additionally, more vulnerable and aging infrastructure (e.g., electrical components, bridges, roads, sewers, etc.) needs repair. Because of this, large-scale disruptions in various components of infrastructure are likely. Major disruptions could lead to widespread economic losses, limit security, and altered ways of life.

Many of the hazards considered in this plan could result in infrastructure failures and any resulting infrastructure failures are dangerous in the KBIC due to its harsh climate and remoteness. KBIC is served by a several systems, including power, water treatment, and phone, and loss of any or all of these systems can have a detrimental impact on daily functions of the community. Failure of infrastructure or utilities includes anything from water treatment failure to power outages, which is the most common type of failure and produces a minor interruption of

everyday life but has the potential to cause severe problems over a long period of time. While power outages are usually of a short duration—up to a few hours—the implications of an extended outage could affect the health and safety of the community.

Historical Occurrences

Baraga, Marquette, and Ontonagon Counties are serviced by a variety of electric providers. They are the following: Upper Peninsula Power Company (UPPCO), We Energies, Marquette Board of Light and Power (Marquette County only), Ontonagon REA (Baraga and Ontonagon Counties), Alger-Delta Cooperative Electric Association (Marquette County only), and Xcel Energy (Ontonagon County only). Two jurisdictions have municipal electric services: City of Negaunee and Village of L'Anse. The loss of power to the grid for the area can affect the entire region. Due to the rural nature of the Upper Peninsula, trees can fall on power lines in remote locations causing a delay in restoration of service. Trimming trees adjacent to power lines is one way to decrease this risk. Water and wastewater systems, and phone serves can also be affected by failure due to aging facilities. Creating redundant systems and outfitting them with generators lessens the impact of such failure. Frequency of power outages is estimated at two per year based on previous incidents.

Failure of US 41 is a large transportation infrastructure threat to the western Upper Peninsula. An incident preventing passage over the portion of highway in Baraga County would separate people on the western side from the eastern and would result in long detours and delays.

Water treatment and sewer facilities can also experience contamination and/or other problems that can impact the community's operations. According to Baraga County Road Commission engineer Douglas Mills, a fiber optics line was burned during a bridge fire, resulting in cellphone outages. Loss of communications can become a crisis in an emergency.

In July 2004, Marquette County experienced a major water main failure. A 16-inch diameter pipe ruptured close to the footing of the City of Marquette's water treatment center. Water gushed out of the city's pipe grid at 9,000 gallons per minute, drained both of water towers (500,000 gallons), and eliminated water pressure throughout the city. City officials had to briefly shut down power units to prevent overheating (water cooled system). A boil water advisory was put into effect for several days.

Occurrence Probability and Vulnerability

Based on previous occurrences of power loss and communication failure – the best indicators of infrastructure failure – probability is high throughout the region, with an estimated frequency of 2 events per year. Numerous factors contribute to the impact of an infrastructure failure, including services affected, weather conditions, response capabilities, and time of day. However, overall severity is low throughout the area. Probability of future occurrences is similar across the western Upper Peninsula, but the severity from failures may be more pronounced in populated areas, where communities are more reliant on commuting and systems served by utilities. Necessary contingency planning is required and established through a group of emergency officials that continue to meet regularly.

All critical facilities and communities are vulnerable to infrastructure failures. Loss of electrical power, natural gas, or water treatment can cause an immediate significant threat to life, safety, public health, and the environment. Some facilities in all counties have partial or backup power sources (e.g., standby generators), such as the Ojibwa Casino, Baraga County Memorial Hospital, and other medical facilities. However, the overall lack of back-up power at other facilities may cause severe problems for persons who are at home that rely on medical equipment for survival. Power outages also affects food storage and safety at home residences, which can lead to sickness or lack of food at homes.

Transportation failures or outages can cause significant traffic delays. In Baraga County, if US 41 between the Villages of L'Anse and Baraga was closed due to a transportation accident or flooding, it has significant negative impacts on travel and emergency response. There is an alternative route; however, it adds over two hours of additional travel time and could result in fatalities in emergency situations. This leaves the surrounding communities and most of the western UP vulnerable to significant delays in travel and emergency response.

Transportation Accidents

Hazard Description

Transportation accidents can occur on land, air, or water. The one commonality all transportation accidents share is that they can result in mass casualties. Although automobile crashes tragically kill many hundreds of Michigan residents each year, this analysis focuses on the types of accidents that are large enough in scale to potentially cause an emergency of disaster-level situation. A major land transportation accident in Michigan has the potential to create a local emergency or to seriously strain or overwhelm local response and medical services. It can involve a commercial intercity passenger bus, a local public transit bus, or a school bus. Air transportation accidents can result in tremendous numbers of deaths and injuries, and major victim identification and crash scene management problems. Water transportation accidents that can involve marine passenger ferries, may require significant underwater rescue and recovery efforts that few local jurisdictions may be equipped or trained to handle. If any of these accidents were to occur in a rural community, an event can easily overwhelm the available resources in these areas.

Michigan has 19 airports with commercial passenger service[67], 72 local bus transit systems serving 89 million passengers, 19 marine passenger ferry services and 3 intercity rail passenger corridors composed of 586 miles of track and serving 22 communities. The Great Lakes region is serviced by an Indian Trails regional passenger bus service, which provides inter- and intrastate transportation. There are routes and stops in both Baraga and Marquette Counties. Other transportation services provided include the following: school buses, casino buses, and transit services provided by the senior center.

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

Historical Occurrence

While there has been minor transportation accident within the region, there is no history of a large passenger transportation accident.

Occurrence Probability and Vulnerability

The risk of a large-scale passenger transportation accident is limited by the types of services operating. There is a risk of accidents involving those limited services, but mitigating potential accidents is difficult due to unpredictability. Some methods that are feasible are general emergency response planning and promotion of awareness of hazard intersections, roadways, and driving conditions. The low volume of commercial passenger traffic indicates any potential incident is likely to be isolated and of a small-scale; therefore, probability is low and severity low to moderate. Both factors are mostly uniform throughout the county, but, regarding over-the-road traffic, probability is higher along the same major roadways presenting an increased hazardous materials threat. The probability of an event is low, but if an accident were to occur, the severity would be high, particularly in communities that are located along major transportation routes.

However, vulnerability to even a small, isolated event can be considered high since mitigating potential accidents is difficult due to their unpredictability. With commercial bus stops, the Sawyer International Airport in Marquette County, and an influx of tourists throughout the year, the region is vulnerable to transportation accidents as it can affect many people. Emergency response plans, awareness of hazardous intersections and roadways, and exercises with responding agencies and medical facilities are ways to prepare for this type of hazard.

Human-Related Hazards

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

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

Although civil disturbances are usually handled by the state, local, or tribal police, some types of unrest may be related to broader patterns of criminal activities. Emergency management typically deals with recognized disasters and emergency events rather than social problems more broadly. Most civil disturbance events are rooted in other human circumstances. The most probable circumstances may involve reaction to other emergency or disaster events, which may be poorly handled by responders or governmental agencies. There are few recent historical records of such incidences escalating to the point of a civil disturbance emergency in Michigan.

Public health emergencies have taken on new importance recently, with the rise in concern about global pandemic illnesses. Travel is so rapid and widespread that quickly detecting and containing outbreaks of serious, even lethal, contagious diseases has been considered necessary and given higher priority by numerous levels of government and their partnering agencies.

Various natural and technological hazards have the potential to cause significant public health concerns. For example, weather hazards, such as extreme temperatures, flooding, and drought, can affect the quality of drinking water in an area and increase the risk of contagious illness and food contamination.

Terrorism is one of the potential causes of widespread threats to public health, as well as certain types of civil disturbance. In many cases, it may not be immediately clear if an incident was motivated by political causes, some other form or protest, criminal enterprises, or personal neurosis. It is recommended that human-related hazards be studied together since terrorism and civil disturbances can lead to public health emergencies and other hazards covered in this plan, such as infrastructure failures, transportation accidents, and hazardous materials incidents.

Civil Disturbances

Hazard Description

Civil disturbances, though rare, typically involve protests, hooliganism, riots, and insurrection. Places that may be subject to or impacted by these types of disturbances include government buildings, military bases, universities, businesses, nuclear power plants, and critical service facilities, such as police and fire stations.

Protest, including political protests and labor disputes, usually contain some level of formal organization or shared discontent. They are usually orderly, lawful, and peaceful. However, some may become threatening, disruptive, and even deliberately malicious. When protests become malicious and there is destruction of property, interruption of services, interference with lawful behaviors, use of intimidation or civil rights violations, and threats/actual acts of violence, then it is considered a civil disturbance.

Another kind of civil disturbance is hooliganism, which is relatively unorganized and involves individual or collective acts of deviance inspired by the presence of crowds. Individuals take advantage of situations where there is anonymity and confusion, allowing them to behave in an unlawful or unusually expressive way that is normally considered publicly unacceptable. These individuals may be under the influence of illegal drugs and alcohol and may include criminals and persons with mental illnesses who may either be reacting with extreme hostility to the crowding, noise, and disorder. Common problems include destruction of property, assault and disorderly conduct, and criminal victimization.

Hooliganism and protests that become disorderly may result in riots. Riots may stem from motivations of protest but lacks organization. These events tend to involve violent gatherings of persons whose level of shared values and goals are not alike to allow their collective concerns or efforts to unite in a relatively organized manner.

Lastly, insurrection involves the deliberative collective effort to disrupt or replace the established authority of a government or its representatives by persons within a society or under its authority. Prison uprisings may fall into this category, but it can also be classified as a riot or protest.

Historical Occurrence

Civil disturbances are relatively uncommon in Michigan. Similarly, there have been no recorded civil disturbance events in Baraga, Ontonagon, or Marquette Counties in recent history. Marquette County is home to several universities and federal, state, and local offices. In the past decade there have only been minor concerns affecting the general population, including small disputes, protests, or disagreements. Historically, there have been large-scale strikes during the mining days, but in recent years the only disturbances have been small-scale peaceful protests to war.

Occurrence Probability and Vulnerability

The risk for a civil disturbance exists in Baraga, Ontonagon and Marquette Counties because of governmental, educational, and other activities in the area. The probability of an incident is very low throughout the county but perhaps slightly higher in populated areas. If a civil disturbance were to occur, the impact is typically local to the community the incident occurs in. Vulnerable critical facilities include tribal owned facilities (Donald A LaPointe Health & Education Center, NRD offices, etc.); county facilities (courthouses, post offices, etc.); local area schools, Northern Michigan University, and community colleges, and local community centers. KBIC and other community events, such as the Annual Maawanji'iding, are at risk for civil disturbance.

Public Health Emergencies

Hazard Description

A public health emergency is the result of widespread and/or severe epidemic, contamination incident, or other situation that presents a danger to or otherwise negatively impacts the general health and well-being of the public. Public health emergencies include disease epidemics, food or water contamination, extended periods without adequate water and sewer services, and harmful exposure to chemical, radiological, or biological agents. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, many people. An additional effect of public health emergencies is the number of "worried well," individuals who think they are unwell, who can overwhelm the system by seeking treatment. The greatest emerging public health threat is the intentional release of a radiological, chemical, or biological agent with the potential to adversely impact many people.

Michigan has had several large-scale public health emergencies in recent history, but nothing that has caused widespread severe injury or death. There have been instances of infrastructure failure (widespread loss of water and sewer service in northern Michigan in 1994) and disease threats (foot-and-mouth disease and the West Nile encephalitis virus). Most recently, the Coronavirus disease (COVID-19) global pandemic has infected over 63,000 Michigan residents and has resulted in 5,947 deaths (as of June 30, 2020). This number continues to increase due to the highly contagious character of COVID-19. No area in Michigan is immune to public health emergencies and areas with high population concentrations are more vulnerable to the threat.

Additionally, more vulnerable members of society – elderly, children, impoverished individuals, and persons in poor health – are at higher risk than the general population.

Exposure to Hazardous Materials

Exposure to hazardous materials can occur through accident, deliberate action, misuse of a product, or through natural means. Most common risks of exposure to materials are chemical in nature but can also be biological or radiological. Many materials are used in industry or in households. Household hazardous wastes come from everyday products that are used in the home, garden, or yard. Oil-based paints, antifreeze, household cleaners, and pesticides are a few examples. Household hazardous wastes are corrosive, toxic, flammable, or reactive. When hazardous waste is improperly disposed of, such as in the trash, down the sink, or into a storm drain, it poses a threat to water quality, human health, and wildlife. Electronic waste that is improperly handled can pose human and environmental risk of exposure to lead and mercury. In addition to electronic waste, lead and mercury exposure may be due to legacy use of these heavy metals in household items such as paint, thermometers, dental fillings, and electric switches. Exposure to lead and mercury have long lasting negative health effects, such as memory loss, tremors, neuromuscular changes (e.g., weakness, atrophy), and lack of coordination of movements amongst other symptoms.

Persistent or "forever" chemicals in the environment are also harmful to ecosystem and human health. Per- and polyfluoroalkyl substances (PFAS) are a group of human-made chemicals used by a wide range of industries and consumers. PFAS are resistant to grease, oil, water, and heat. Because of its characteristics, PFAS has been used in water-resistant fabrics, cleaning products, paints, and fire-fighting foams.[68] PFAS has also been found in cookware and food packaging. Its prevalence and persistence have resulted in environmental contamination and accumulation in humans and animals. While the understanding of how PFAS ultimately impacts living beings, research has shown that bioaccumulation of certain kinds of PFAS may cause serious health conditions. These chemicals have caused developmental, reproductive, liver and kidney, and immunological effects on laboratory animals. Epidemiological studies have shown similar impacts to humans.

Individual Wells, Public Water Services, and Sewer Facilities

Many KBIC residents live in rural areas that are not serviced by public sewer and/or water. The contamination of individual wells and the failure of individual septic systems presents the potential for public health emergencies. Coliform bacteria, high nitrates, and arsenic in water wells are common public health risks. Coliform bacteria are associated with animal wastes, sewages, and surface water. Nitrates are a naturally occurring form of nitrogen found in soil and groundwater. High concentrations of nitrates in drinking water can be toxic to infants and young animals. Elevated nitrate concentrations in groundwater and wells are typically associated with excessive fertilizers, sewage disposal systems, farm runoff, municipal wastewater and sludge,

[68] U.S. Food and Drug Administration. (20 December 2019). "Per and Polyfluoroalkyl Substances (PFAS)." https://www.fda.gov/food/chemicals/and-polyfluoroalkyl-substances-pfas

and industrial wastes. Arsenic is also naturally occurring; exposure to high levels of arsenic poses serious health effects because it is a known human carcinogen.

KBIC Public Works meets with Indian Health Services (HIS) Sanitation Deficiency System (SDS) on a yearly basis to address septic, well, and water upgrade projects. NRD also is available for residential well testing.

Public water and sewer facilities are prone to public health emergencies such as broken or frozen lines that cause a loss in service, or system pressure loss that requires boil-water advisories due to potential water contamination. Any disruption in service is typically a secondary hazard because of a different hazard altogether. Extreme cold, subsidence, flooding, infrastructure failure, and sabotage are a few examples of what can cause a disruption in water or sewer service.

Drug and Substance Abuse Epidemic

As defined by the CDC, an epidemic is "the occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time."[69] While it is not an infectious disease outbreak, deaths due to drug overdoses are now greater than deaths due to car crashes in Michigan.[70] The state has the 14th highest overdose death rate in the country. In 2017, there were 2,686 drug overdose deaths in Michigan and was 12.1% higher than drug overdose deaths in 2016[71]. Deaths due to synthetic opioids, such as fentanyl and tramadol, increased by 48.5% from 2016 to 2017. In Keweenaw Bay Indian Community, the Substance Abuse Program served 128 clients in FY2018 with 32% alcohol related, 26% Methamphetamine related, and 16% Opioid related. After one year, the alcohol and opioid related instances dropped to 29% and 11% respectively, however Methamphetamine use increased to 38%. Many deaths are not reported as overdoses due to families requested that an autopsy not be performed. Jurisdictional issues arose in Baraga County that caused autopsies not to be performed for several years for tribal members living on the L'Anse Indian Reservation.

Most Michigan communities are underequipped to address the needs for people who have an opioid addiction and effects from this drug epidemic. This includes a lack of nearby drug treatment programs, medication-based treatment services, and transportation capability to get people who want help the necessary services they need.

The Western Upper Peninsula Health Department (WUPHD) is responsible for addressing and trying to prevent public health emergencies within Baraga county and Houghton, Gogebic, Keweenaw, and Ontonagon counties. It does so by distributing public information for both preparedness and notification, establishing a regional hotline in the event regular telephone system are overwhelmed. They also distribute and administer vaccines or countermeasures, if

[69] Epidemic Disease Occurrence. Center for Disease Control and Prevention. https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html
[70] "Opioid addiction: Michigan counties struggle to meet the need for treatment." Michigan News – University of Michigan. https://news.umich.edu/opioid-addiction-michigan-counties-struggle-to-meet-the-need-for-treatment/
[71] Drug Overdose Deaths in Michigan, 2016-2017. Michigan Department of Health and Human Services. https://www.michigan.gov/documents/mdhhs/Drug_Overdose_Deaths_MI_2016-2017_649230_7.pdf

necessary. The WUPHD also protects and treats emergency responders and has the sole power of quarantine should it become necessary. The KBIC Health Clinic regularly works with the WUPHD.

COVID-19 Pandemic Response

During the Covid-19 Pandemic, the KBIC Health System has remained open to provide continued coverage to our community. Employees and patients are screened for temperature and Covid-19 symptoms before entering the health center. Universal masking is implemented with physical distancing at least 6 feet apart. Covid-19 testing is available for patients with symptoms and asymptomatic patients. Public waiting areas have hand sanitizer and tissue available with seating distanced at least 6 feet apart.

Historical Occurrence

The most likely public health threat in the Great Lakes Region is influenza-type illnesses, which is the most common communicable disease, with an average mortality rate of 14.2 per 100,000 Western U.P. residents from 2015-2017.[72] Michigan's average mortality rate is 14.3. However, influenza, which can be widespread, rarely becomes a public health emergency.

There is potential in KBIC, as in all areas, for a larger disease outbreak as an isolated event or secondary to flooding or another type of incident. However, while awareness and planning have been carefully considered, an epidemic of sufficient magnitude could overwhelm the facilities that are equipped to deal with this type of emergency. Shortages of supplies, hospital rooms, and medical professionals due to a disease outbreak or pandemic can cause significant harm to the public. Medical facilities in the area include the following:

- Baraga County: Baraga County Memorial Hospital, which has a 24-hour emergency department and the KBIC Medical Clinic, which provides a variety of health services, including primary, chronic, dental, and urgent care, and traditional healing.
- Marquette County: UP Health System – Marquette is a Level II Trauma Center with 307-beds (37 special care), a variety of health services, and a 24-hour emergency department; UP Health System – Bell (Ishpeming) has a 24-hour emergency department and 25-beds. Other medical centers include Peninsula Medical Center in Marquette, Teal Lake Medical Center in Negaunee, and two Upper Great Lakes Family Health Centers, one in Gwinn and the other at K.I. Sawyer.
- Ontonagon County: Aspirus Ontonagon Hospital and Clinic is an 18-bed critical access hospital with 24-hour emergency treatment; Upper Great Lakes Ontonagon Family Health Center Clinic offers primary care services.

Isolated incidents of hazardous materials contamination may also pose a localized public health threat as exemplified by the 2012 Chassell mercury spill detailed in the Hazardous Materials – Fixed Site section. This incident was determined to have had no significant public health impact.

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

On the other hand, a local manufacturer could release hazardous substances that may present an airborne public health threat. EPA Superfund and other remediation sites, including those detailed in the Hazardous Materials – Fixed Site section, are being addressed as potential public health contamination threats.

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

There is no recent history of widespread public health emergencies in KBIC. Small incidences of flu outbreaks and similar sicknesses do occur, but the extent of the emergencies have been limited. There is potential for infectious disease outbreaks, such as chlamydia, hepatitis C, and Lyme disease (highest number of cases in nearby Dickinson County to the south).[73] The Upper Peninsula is also at risk for substance abuse, foodborne illnesses, and water contamination emergencies. The potential for disease outbreaks and contamination may be isolated events or as events secondary to flooding or other incidents. Alcohol abuse is of concern in the Upper Peninsula. In Michigan, the top five counties with the highest binge drinking rates are in the Upper Peninsula[74].

Of increasing threat are opioid and meth-related issues. In the Upper Peninsula there is a high rate of children born with neonatal abstinence syndrome (NAS) because of addiction[75]. In the Upper Peninsula, babies are treated for NAS at a higher rate than anywhere else in Michigan—29 per 1,000 births in 2016. There are no NICU treatment centers in the county to deal with a rising concern of addicts and those seeking treatment. The Upper Peninsula Substance Enforcement Team (UPSET) is a multi-jurisdictional narcotics task force that serves all of the Upper Peninsula's counties, and collaborates with local, state, and federal agencies to assist with local or state police in apprehension. They are the only federally trained and certified Clandestine Lab Team in the Upper Peninsula dealing with methamphetamine response. In 2016, UPSET West was formed to support an increased UPSET team, which targets the Western Upper Peninsula in increased narcotics enforcement. Since 2016, UPSET West detectives have made 48 felony arrests, but are fighting a growing meth supply as heroin supply decreases[76].

Occurrence Probability and Vulnerability

[73] Upper Peninsula Community Health Needs Assessment 2018. http://www.wupdhd.org/wp-content/uploads/2018/08/Upper-Peninsula-Community-Health-Needs-Assessment-2018-Second-Edition-1.pdf
[74] Detroit Free Press 2015. https://www.freep.com/story/opinion/contributors/raw-data/2015/04/24/binge-drinking-us-county/26332545/
[75] Detroit Free Press 2018. https://www.freep.com/story/news/local/michigan/2018/05/03/opioid-epidemic-drug-addicted-babies/335398002/
[76] Keweenaw Report 2019. http://www.keweenawreport.com/featured/upset-west-reducing-heroin-supply-meth-use-growing/

Public health emergencies can arise from a wide range of causes and exhibit varying levels of severity. In the KBIC and all counties the probability of a public health emergency is likely, as some health emergencies are currently occurring within the region (e.g., opioid and meth-related health emergencies and influenza type illnesses). The severity of a public health emergency, such a disease pandemic, is unpredictable and could potentially be extreme. A large magnitude epidemic could overload facilities that are inadequately deal with this type of emergency, such as long-term care facilities and rural medical centers. The drug and substance abuse epidemic are an ongoing problem within the region. There currently are no facilities that can assist individuals with an addition, leaving them vulnerable to drug related health emergencies.

All individuals are vulnerable to the hazards of an epidemic, but vulnerable populations are at higher risk of succumbing to an epidemic (e.g., elderly, impoverished individuals, and persons in poor health). The remoteness of the area could also be problematic during a large-scale emergency. Areas in the region with the greatest susceptibility to the most types of public health emergencies are populated areas along state highways, including the Villages of Baraga, L'Anse, and Ontonagon and the cities of Marquette, Negaunee, and Ishpeming. However, events dealing with natural resource contamination could affect these populated but originate in rural outlying areas. Public health emergencies tend to be widespread rather than confined to a specific location. Vulnerable locations include any public gathering areas, such as schools, long-term care facilities, hospitals, restaurants, community centers, etc. The KBIC and the three counties all have at least one of these vulnerable critical facilities.

Public health emergencies have secondary impacts that may create further vulnerable situations that were otherwise not expected. For example, a pandemic or smaller disease outbreak, such as influenza, could result in large percentages of employees taking sick leave or mandated quarantine action (i.e., shelter-in-place mandates), removing workers from their place of employment and thus impacting productivity in the economy or in emergency response capability. Any hazardous event that would have secondary public health implications would significantly disrupt or halt the normal business activities of an impacted community. However, these measures should be taken if it lessens or slows the impact of a public health emergency.

Sabotage and Terrorism

Hazard Description

Terrorism is the use of violence by individuals or groups to achieve political goals by creating fear, while sabotage is any kind of deliberate action, such as obstruction, disruption, or destruction, for political or military gain. Both can take many forms, including the following: bombings; assassinations; organized extortion; use of nuclear, chemical, and biological weapons; information warfare, such as hacking or release of classified information; ethnic, religious, and gender intimidation (hate crimes); advocacy for overthrowing local, state, or federal government, and the disruption of legitimate scientific research or resource-related activities (eco-terrorism). The goal of terrorists is to frighten as many people as possible, not necessarily to cause the

greatest damage possible. Media coverage allows terrorists to affect a much larger population than those who are directly attacked.

Sabotage and terrorism are long-established strategies that are practiced by many groups in many nations. The U.S. is not only threatened by international terrorists or saboteurs, but also by home-grown domestic terrorist groups including racist, ecological, and extreme anti-abortion groups. Non-terrorist criminal activity may resemble terrorism or sabotage, but it lacks a political objective. These crimes are typically routine, individual crimes, but they may impact large portions of the population. Some of these attacks may require resources that are not available to local law enforcement agencies. Non-terrorist criminal activities may include mass shootings, random sniper attacks, infrastructure sabotage, and cyberattacks.

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

1. **Nationalist terrorists** act in support of a culture or ethnic group. Typically, they are fighting on behalf of national populations that wish to have an independent government but are currently ruled by another country. They tend to direct their attacks against the "occupying power" but may also attack other nations that support their enemies. These terrorists claim to speak for their entire national group, but usually only represent a small minority of extremists.
2. **Religious extremist terrorists** are violent adherents of a specific religion. They tend to be especially committed because they believe their violent actions are supported by their deity. Religious terrorists see themselves fighting a battle of ultimate good against pure evil, in which any action is justified.
3. **Left wing terrorists** attempt to force society to change to match their goals and values. They tend to target the government, power institutions, and symbols of authority. Socialist and Communist terrorists of this type were a threat in the late 1960s and 1970s but have weakened in recent decades.
4. **Right wing terrorists** see themselves as fighting for traditional values against an invading group and/or against a tyrannical government. In the U.S., these terrorists are associated with anti-immigration, white supremacy, anti-government, and Christian Identity movements. Only the most extreme elements of these movements have become terrorist, but they have carried out a substantial portion of the recent attaches. Right wing groups tend to target members of hated ethnic or religious minorities, or government employees.
5. **Single-issue terrorists** are not committed to an all-encompassing belief system, but rather are intensely concerned with one cause. Common causes for these terrorists include animal-rights, environmentalism, and opposition to abortion. They tend to target property or individuals rather than attempting to cause massive casualties.

Because sabotage and terrorism objectives are so widely varied, the potential targets are also widely varied. Virtually any public facility, place of public assembly, or business engaged in controversial activities can be considered a potential target. Large computer systems operated by

government agencies, financial institutions, large businesses, healthcare facilities, and universities are at risk.

Historical Occurrence

Although few sabotage or terrorism events have occurred in the Upper Peninsula, the region is not immune to this problem. For example, a terrorism threat occurred in Houghton County at Michigan Technological University (MTU). MTU is a science and engineering research university and is susceptible to attacks on its offices, laboratories, and computer systems. An early 2000s bomb scare on campus was ultimately linked to eco-terrorism. At 3:30 am on November 5, 2001, Michigan Tech public safety officers discovered two bombs on the Michigan Tech campus while they were on routine patrol. The bombs consisted of five-gallon containers, filled with a presumably flammable liquid, attached to ignition devices. One bomb was found outside of the U.J. Noblet Forestry Building, and one was outside of the adjacent U.S. Forest Service laboratory. Local law enforcement officials evacuated a four-block area and performed a thorough search of all other campus buildings. The Michigan State Police Bomb Squad in Negaunee and agents from the FBI and the federal Alcohol, Tobacco, and Firearms agency in Marquette were called in, and the bombs were disarmed by 2:00 pm without incident. Though no one has claimed responsibility for planting the devices, members of eco-terrorism groups were suspected. Self-identified members of the Earth Liberation Front had sent threatening e-mails to the university earlier in the year after it was announced that MTU had received a two million-dollar grant for research that included genetic manipulation of trees. The Earth Liberation Front and its sister organization, the Animal Liberation Front, have used similar methods to damage or destroy genetic research projects at other educational institutions around the country, including Michigan State University's Agriculture Hall where $900,000 in fire and water damage was caused by arsonists in 1999.

SECTION 10: Risk Assessment

The hazard profiles presented in the *Hazard Analysis* section were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its "How-to" guidance document titled Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA Publication 386-2). It relies heavily on historical and anecdotal data, literature review, stakeholder input, and professional and experienced judgment regarding observed and/or anticipated hazard impacts. It also carefully considers the findings in other relevant plans, studies and technical reports.

This section will include the following components:

- Differential Vulnerability
- Hazard Extent
- Hazard Profiling Concept of Planning
- Hazard Risk Analysis Methodology
- Hazard Priority Risk Index and Ranking
- Hazard Summary

Differential Vulnerability

Currently, there is no reliable way to accurately estimate costs associated with many hazards that affect the Keweenaw Bay Indian Community (KBIC). Numerous variables can affect the vulnerability of the county to hazards, including climate, location, scale, and time of day. Time of year also affects vulnerability. The population in the KBIC and surrounding region varies by season, and response capabilities are often compromised in winter. Although the KBIC is susceptible to many types of hazards, locations throughout the region varies in its level of vulnerability to certain hazards. Vulnerability to most fire hazards, weather hazards, flooding due to spring runoff, and all technological and societal hazards have been determined to be similar for all KBIC. Subsidence is of note because it can occur in most jurisdictions, but the most at-risk areas are in scattered locations.

Hazard Extent

Table 10.1 describes the extent of each hazard identified for KBIC. The extent of a hazard is its severity or magnitude, as it relates to the community.

Table 10.1: Hazard Extent in the KBIC Reservation

Weather Hazards	
Extreme Temperatures	Extreme heat event extent is measured through the heat index, which is temperature in relation to the percentage of humidity.
Fog	The extent of fog is measured by area and number of roads and vehicles affected by a fog event, as fog itself is not hazardous.
Hail	Hail extent is defined by the size of the hail stone.

Ice and Sleet Storms	The extent of ice and sleet storms can be classified by meteorological measurements and by evaluating its societal impacts.
Lightning	The frequency of cloud-to-ground lightning flashes per square mile can be used as a method to measure extent.
Severe Winds	The extent of a severe wind event is measured by speed of wind recorded.
Snowstorms and Blizzards	The extent of winter storms can be measured by the amount of snowfall received (in inches).
Tornadoes	Tornado hazard extent is measured by historic tornadoes per county in Michigan provided by the NCEI and MSP, as well as the Fujita/Enhanced Fujita Scale (Tables 5.19 and 5.10).
Hydrological Hazards	
Drought	Drought extent is defined by the U.S. Drought Monitor classifications, which included abnormally dry, moderate drought, severe drought, extreme drought, and exceptional drought (in ascending order). The most severe drought condition is exceptional.
Dam Failures	Dam Failure extent is defined using the Michigan Department of Environment, Great Lakes, and Energy under Dam Safety criteria.
Riverine and Urban Flooding	Flood extent is measured by the duration and magnitude of an event.
Shoreline Flooding and Erosion	The extent of erosion can be defined by the rate (in feet) of erosion that occurs according to the Michigan Department of Environment, Great Lakes, and Energy – Coastal Management.
Ecological Hazards	
Wildfires	Wildfire extent is measured by the spatial extent and duration of the event.
Invasive Species	Invasive Species extent is measured by the spatial extent affected by this hazard.
Wildlife Health Hazards	Wildlife health is measured by the number of species impacted by a disease.
Ecosystem Health Hazards	Ecosystem health hazards are measured by their impact area and the number of species affected.
Geological Hazards	
Earthquakes	Earthquake extent can be measured the Modified Mercalli Intensity (MMI) scale and the distance of the epicenter from Houghton County. It was determined that this hazard does not threaten the Upper Peninsula.
Subsidence (Ground Collapse)	Subsidence is measured by total displacement material volume from the event, as well as monetary damages.
Technological (Industrial) Hazards	
Scrap Tire Fires	The extent of scrap tire fires is measured in spatial extent of the event and duration of the burn.
Structural Fires	Structural fire hazard extent is measured in area affected by the hazard, fatalities as well as monetary damages incurred.

Hazardous Materials: Fixed Site Incidents	Extent is measured by the spatial extent of the event and volume of material lost
Hazardous Materials: Transportation Accident	Extent is measured by volume of material lost, as well as proximity to major transportation routes
Petroleum and Natural Gas Incidents	Extent is measured by the spatial extent of an incident, and volume of material lost
Infrastructure Hazards	
Infrastructure Failures and Secondary Technological Hazards	Hazard extent is measured by number of clients affected by infrastructure failures, and the duration.
Transportation Accidents	Extent is measured by fatalities, number of vehicles involved, damage incurred, and areal extent of detour
Human Related Hazards	
Civil Disturbances	Extent is measured by potential economic losses through damage to or disruption of operations of governmental facilities or other commercial businesses.
Public Health Emergencies	Public health emergency extent is measured by percentage of the population affected by the hazard.
Sabotage and Terrorism	Extent is measured by the area affected by the hazard, type of facility threatened, and the potential number of injuries or fatalities resulting from an event.

Hazard Profiling Concept of Planning

The method used to rank the hazards, vulnerabilities and risks includes the following:

- A public survey that was released for 30 days online with paper copies being made available at the KBIC NRD offices, website, and on the WUPPDR website.
- A public comment period after the draft was released and before plan adoption
- Government and institution survey released for added input into the plan
- The Local Planning Team reviewed the profile and ranked the overall risk for the county
- The risk profile was circulated among the staff at the Western U.P. Planning & Development Region for comment

A risk assessment identifies the characteristics and potential consequences of a disaster, how much the community could be affected by the disaster, and the impact on community assets.

Hazard Priority Risk Index and Ranking

In order to draw some meaningful planning conclusions on hazard risk for the community, the results of the hazard profiling process were used to generate regionwide hazard classifications

according to a "Priority Risk Index" (PRI). The purpose of the PRI, described further below, is to categorize and prioritize all potential hazards for the KBIC as high, moderate or low risk. Combined with the asset inventory and quantitative vulnerability assessment provided in the next section, the summary hazard classifications generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes, and more specifically, the identification of hazard mitigation opportunities for stakeholders to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for KBIC is based principally on the PRI, a tool used to measure the degree of risk for identified hazards in a planning area. The PRI is used to assist the Local Planning Team (LPT) in gaining consensus on the determination of those hazards that pose the most significant threat to KBIC based on a variety of factors. The PRI is not scientifically based but is rather meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks to KBIC based on standardized criteria. The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time and duration). Each degree of risk has been assigned a value (1 to 4) and an agreed upon weighting factor, as summarized in **Table 10.2**.

To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the example equation below:

PRI VALUE = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) +

(WARNING TIME x .10) + (DURATION x .10)]

According to the weighting scheme, the highest possible PRI value is 4.0. Applying the weighting scheme to KBIC, the highest score of 3.3 was given to snowstorms and blizzards, and shoreline flooding and erosion. Prior to being finalized, PRI values for each identified hazard were reviewed and accepted by the members of the LPT.

It should be noted that due to data gaps in the region, FEMA's HAZUS was unable to be utilized in estimating potential losses from hazards. To improve model accuracy and future hazard mitigation planning, KBIC will seek to update hazard data with flood boundaries, flood depth grids, and asset inventories.

Key Definitions for Prioritized Risk Index Categories

Probability – a guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.

Magnitude/Severity – indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability assessment gives information that is helpful in making this determination for each community.

Warning Time – plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.

Duration – relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

Table 10.2: Priority Risk Index Summary Table

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

PRI Results

Table 10.3 summarizes the degree of risk assigned to each category for all initially identified hazards based on the application of the PRI. Assigned risk levels were based on the detailed hazard profiles developed for this section, as well as input from the Local Planning Team (LPT). The results were then used in calculating PRI values and making final determinations for the risk assessment.

Table 10.3: Summary of PRI Results for the Keweenaw Bay Indian Community

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Weather Hazards						
Extreme Temperatures	Highly Likely	Limited	Large	More than 24 hours	Less than one week	2.3
Fog	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.3
Hail	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	2.5
Ice and Sleet Storms	Likely	Minor	Large	12 to 24 hours	Less than 6 hours	2.7
Lightning	Highly Likely	Minor	Small	Less than 6 hours	Less than 6 hours	1.6
Severe Winds	Highly Likely	Limited	Small	Less than 6 hours	Less than 24 hours	2.9
Snowstorms and Blizzards	Highly Likely	Critical	Large	12 to 24 hours	Less than one week	3.3
Tornadoes	Unlikely	Critical	Negligible	Less than 6 hours	Less than 6 hours	2.3
Hydrological Hazards						
Dam Failures	Possible	Critical	Small	6 to 12 hours	Less than 24 hours	2.6
Riverine and Urban Flooding	Highly Likely	Critical	Moderate	6-12 hours	Less than one week	3.0
Shoreline Flooding and Erosion	Highly Likely	Limited	Small	Less than 6 hours	More than one week	3.3
Drought	Possible	Minor	Large	Less than 6 hours	More than one week	2.2
Ecological Hazards						
Wildfires	Likely	Limited	Small	12-24 hours	Less than 24 hours	3.0

Hazard	Category/Degree of Risk					
	Probability	**Impact**	**Spatial Extent**	**Warning Time**	**Duration**	**PRI Score**
Invasive Species	Highly Likely	Limited	Large	More than 24 hours	More than one week	3.1
Geological Hazards						
Earthquakes	Unlikely	Critical	Small	Less than 6 hours	Less than 6 hours	1.5
Subsidence (Ground Collapse)	Highly Likely	Limited	Small	Less than 6 hours	Less than 6 hours	1.6
Technological (Industrial) Hazards						
Scrap Tire Fires	Unlikely	Minor	Small	Less than 6 hours	Less than 24 hours	1.9
Structural Fires	Highly Likely	Critical	Small	Less than 6 hours	Less than 24 hours	3.0
Hazardous Materials: Fixed Site Incidents	Likely	Minor	Small	12-24 hours	More than one week	2.7
Hazardous Materials: Transportation Accident	Possible	Limited	Small	Less than 6 hours	More than one week	2.8
Petroleum and Natural Gas Incidents	Possible	Limited	Moderate	Less than 6 hours	Less than one week	2.8
Infrastructure Hazards						
Infrastructure Failures & Secondary Technological Hazards	Likely	Critical	Moderate	Less than 6 hours	More than one week	2.8
Transportation Accidents	Highly Likely	Critical	Negligible	Less than 6 hours	Less than 6 hours	1.9
Human Related Hazards						
Civil Disturbances	Unlikely	Minor	Negligible	Less than 6 hours	Less than 24 hours	1.4
Public Health Emergencies	Highly Likely	Catastrophic	Moderate	12 to 24 hours	More than one week	3.2
Sabotage and Terrorism	Unlikely	Catastrophic	Negligible	Less than 6 hours	Less than one week	2.0

The conclusions drawn from the hazard profiling process, including the PRI results and input from the LPT, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk and Low Risk (**Table 10.4**). For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout the Great Lakes region. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately and is described in the Vulnerability Assessment section. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or unprecedented magnitudes is still possible in some cases and their assigned classification will continue to be evaluated during future updates.

Table 10.4: Conclusions on Hazard Risk for KBIC

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

Hazard Summary

Although many of the hazards identified can and do occur throughout the Great Lakes region, the highest priority hazards include:

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

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

SECTION 11: Hazard Mitigation

This section of the Plan provides the blueprint for Keweenaw Bay Indian Community (KBIC) to reduce potential exposure and losses identified as concerns in the Risk Assessment portion of this plan. The Local Planning Team reviewed the risk assessment to identify and develop these actions. This section includes:

- Overview of Mitigation Strategy Development
- Review and Update of Mitigation Goals and Objectives
- Capability Assessment
- Mitigating Hazards in Keweenaw Bay Indian Community
- Mitigation Resources
- Updating the Keweenaw Bay Indian Community Hazard Mitigation Plan

Overview of Mitigation Strategy Development

In formulating KBIC's mitigation strategy, a wide range of activities were considered in order to help achieve the general countywide goals in addition to the specific hazard concerns of each participating jurisdiction (again, for more details on the specific activities discussed and considered by the Local Planning Team, please see the summary of the second Mitigation Advisory Committee meeting in Section 3: Planning Process). In general, hazard mitigation actions are commonly broken into four different categories and were thoroughly explained and discussed at the Mitigation Strategy LPT Meeting:

Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.

Structure and Infrastructure Projects (SIP) - These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.

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

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

The intent of the Mitigation Strategy is to provide KBIC and its municipal jurisdictions with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a listing of proposed actions deemed necessary to meet those goals and reduce the impact of natural hazards. It is designed to be comprehensive and strategic in nature.

In being comprehensive, the development of the strategy included a thorough review of all hazards and identifies far-reaching policies and projects intended to not only reduce the future impacts of hazards, but also to assist the county and municipalities achieve compatible economic, environmental and social goals. In being strategic, the development of the strategy ensures that all policies and projects are linked to established priorities and assigned to specific departments or individuals responsible for their implementation with target completion deadlines. When necessary, funding sources are identified that can be used to assist in project implementation.

The first step in designing the mitigation strategy includes the identification of countywide Mitigation Goals. Mitigation Goals represent broad statements that are achieved through the implementation of more specific, action-oriented objectives listed in each jurisdiction's Mitigation Action Plan. These actions include both hazard mitigation policies (such as the regulation of land in known hazard areas through a local ordinance), and hazard mitigation projects that seek to address specifically targeted hazard risks (such as the acquisition and relocation of a repetitive loss structure).

The second step involves the identification, consideration and analysis of available mitigation measures to help achieve the identified mitigation goals. This is a long-term, continuous process sustained through the development and maintenance of this plan, beginning with the Local Planning Team during the first meeting. Alternative mitigation measures will continue to be considered as future mitigation opportunities become identified, as data and technology improve, as mitigation funding becomes available, and as this Plan is maintained over time.

The third and last step in designing the Mitigation Strategy is the creation of the local Mitigation Action Plans (MAPs), which are provided separately in Section 9: Actions Plans. The MAPs represent unambiguous plans for action and are the most essential outcome of the mitigation planning process. They include a prioritized listing of proposed hazard mitigation actions (policies and projects) for each of KBIC's local jurisdictions along with accompanying information such as those agencies or individuals assigned responsibility for their implementation, potential funding sources and an estimated target date for completion. The MAPs provide those individuals or agencies responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring progress over time. The cohesive collection of actions listed in each jurisdiction's MAP also can serve as an easily understood menu of mitigation policies and projects for those local decision makers who want to quickly review their jurisdiction's respective element of the KBIC's Plan.

In preparing their own individual Mitigation Actions Plans, each jurisdiction considered their overall hazard risk and capability to mitigate natural hazards as recorded through the risk and capability assessment process, in addition to meeting the adopted countywide mitigation goals and the unique needs of their community. Prioritizing mitigation actions for each jurisdiction was based on the following five (5) factors: (1) effect on overall risk to life and property; (2) ease of implementation; (3) political and community support; (4) a general economic cost/benefit review, and (5) funding availability.

Development of Mitigation Goals

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

Goal 1	Work to improve existing local government policies and codes to reduce the impacts of natural hazards.
Goal 2	Design and implement specific mitigation measures to protect vulnerable public and private properties.
Goal 3	Increase the protection of critical facilities and infrastructure from hazard threats through retrofit projects for existing facilities and innovative design standards for new facilities.
Goal 4	Enhance public education programs to promote community awareness of natural hazards and the hazard mitigation techniques available to reduce their impact
Goal 5	Improve stormwater and watershed management through enhanced local government programs, policies, and practices.
Goal 6	Enhance the Community's storm evacuation procedures through increased intergovernmental coordination between Keweenaw Bay Indian Community, surrounding counties, regional entities, and the State of Michigan.
Goal 7	Increase the Community's emergency management capabilities through sustained system and technology improvements.
Goal 8	Promote volunteer involvement in emergency preparedness and response through increased citizen awareness and training activities.

Note: A stated objective of the Disaster Mitigation Act of 2000 is to improve the coordination of risk reduction measures between state and local government authorities. Linking local and state mitigation planning goals is an important first step. It has been determined by the KBIC Local Planning Team that the above goal statements are consistent with the State of Michigan's current mitigation planning goals as identified in the State Hazard Mitigation Plan disseminated by the Michigan Emergency Management and Homeland Security Division.

Capability Assessment

The purpose of conducting an assessment is to determine the unique set of capabilities to accomplish mitigation. Reviewing capabilities helps in identifying what resources are currently

available to reduce losses and where there are gaps that can be filled through the planning process. There are four key types of capabilities that will be discussed:

- Planning and Regulatory,
- Administrative and Technical,
- Financial, and
- Education and Outreach

Each type of capability may include laws, regulations, policies, programs, staff, funding, or cooperative agreements. They are specific to pre- and post- disaster policies, programs, and resources, but may go beyond mitigation.

The KBIC recognizes that strong mitigation strategies incorporate both hazard risk and capability. The Local Planning Team has identified the planning and regulatory, administrative and technical, financial, and outreach capabilities below as available resources to implement the mitigation plan.

Planning and Regulatory

Planning and regulatory capabilities refer to the ordinances, policies, laws, plans, and programs that KBIC uses to guide physical development and growth. There are many types of mitigation strategies that are expressed through plans and programs, such as building codes, land-use plans, and natural resource stewardship programs.

KBIC's primary planning and regulatory capabilities are its tribal code and constitution. The Tribe is expanding its planning and regulatory capability by developing an integrated resource management plan update. Overall planning and regulatory capabilities are limited, but what is in place generally supports hazard mitigation (**Table 11.1**).

Table 11.1: KBIC Plans and Regulatory Capabilities

Tool/Program	Status			Effect on Loss Reduction	Comments
	In Place	Date Adopted or Updated	Under Development		
Hazard Mitigation Plan			X		
Emergency Operations	X				
Strategic Plan	X	2005			
NFIP	X				Arvon Twp., Village of Baraga, L'Anse Twp., Village of L'Anse

Floodplain Regulations					
Zoning Regulations					
Economic Development Plan	X				Integrated into the IRMP
Capital Improvements Plan					
Building Code					
Community Wildfire Protection Plan	X				
Wildlife Stewardship Plan	X	2014			
Integrated Resource Management Plan	X	2012			

Administrative and Technical

Administrative and technical capabilities refer to the KBIC government's staff, skills, and tools that can be used for mitigation planning and implementation (**Table 11.2**). The Tribe has housing specialists that maintain existing residences and plan for new ones, geographic information systems mapping expertise, environmental specialists, and an emergency manager primarily focused on police and fire response.

Table 11.2: KBIC Staff Capacity and Skills

Staff/Personnel Resources	Yes	No	Department	Comments
Planners	X			Planning services are contracted as needed
Geographic Information Systems Experience	X			GIS services are contracted as needed
Engineers or professionals trained in building and/or infrastructure construction practices	X			Engineer and professional services are contracted as needed
Emergency Manager	X		KBIC Fire and Emergency Management	
Floodplain Manager		X		
Housing Specialists	X		KBIC Ojibwa Housing	

Grants Manager	X		Each Department manages their own grants	
Environmental Specialists	X		KBIC Natural Resources Dept	
Forestry Specialist	X		KBIC Forestry Department	Activities include monitoring forest growth and health; Tree/shrub planting for habitat enhancement

Financial

Financial capabilities refer to resources to fund mitigation actions. The costs associated with implementing mitigation activities vary. Some mitigation actions, such as outreach efforts, require little to no costs other than staff time and current operating budgets. Others, like structural projects, will require significant investment, grants, and other types of outside assistance.

FEMA Mitigation Funding

FEMA is an important partner in funding hazard mitigation activities for many Tribes. There are three primary programs Tribes can access for hazard mitigation: Hazard Mitigation Assistance Grants fund mitigation plans and projects that reduce disaster losses and prevent loss of life and property from future damages. There are three grants under the Hazard Mitigation Assistance umbrella: The Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program. The Hazard Mitigation Assistance Cost Share Guide explains the match requirements for each grant program. Each grant has its own Tribal mitigation plan requirement. Visit the Plan Requirement page for more details. Public Assistance Category C-G funds permanent work to repair damaged infrastructure and publicly owned buildings and facilities. Under this program, FEMA pays no more than 75 percent of the project cost and the Tribe is responsible for the remaining 25 percent. A Tribal mitigation plan is required to access Public Assistance Category C-G funds if the Tribe wishes to apply directly to FEMA. The Fire Management Assistance Grant Program provides grants for equipment, supplies, and personnel costs for the mitigation, management, and control of fires. Under this program, FEMA pays 75 percent of the project cost and the Tribe is responsible for the remaining 25 percent.

Currently KBIC does not have any sources of revenue earmarked for mitigation activities or projects except through the Natural Resources Department. Mitigation projects in the past have been funded through the Great Lakes Restoration Initiative, U.S. Department of Agriculture Natural Resources Conservation Service, U.S. Bureau of Indian Affairs, and others (**Table 11.3**). This plan was funded by the FEMA Pre-Disaster Mitigation grant program. KBIC is interested in

pursuing FEMA funding for future mitigation projects. The Tribe anticipates that it will largely meet its local match using in-kind donations and staff time. For larger projects, the Tribe will explore using a portion of the operating budget as a cash match.

Table 11.3: KBIC Funding Resources

Financial Resources	Available Funding Source?	Existing or Potential funding?	Comments
Tribal Operating Budget	Yes		
Capital Improvement Programming	Yes		KBIC General Fund
Great Lakes Restoration Initiative		Yes	
Partnering arrangements or intergovernmental agreements	Yes		
Utility Service Fees			
FEMA Hazard Mitigation Grant Funds	Yes	Yes	
FEMA Pre-Disaster Mitigation Funds	Yes	Yes	Pre-Disaster Mitigation funds were granted to fund the development of this mitigation plan. They are available annually.
USDA Rural Development Programs	Yes	Yes	
BIA Housing Improvement Programs	Yes		
US EPA Water Quality Grants	Yes		
Private donations and non-profit grants	Yes		

Outreach and Education

Outreach and education capabilities are programs and methods that could be used to encourage risk reduction behavior change and communicate hazard-related information. The KBIC has strong outreach programs that can be leveraged to communicate the risk assessment and mitigation strategies. For example, Tribal Water Day is an annual meeting that the Natural Resources Department uses to educate the community about the work that they are doing involving water, such as their shoreline and wildlife restoration work at Sand Pointe.

Mitigating Hazards in Keweenaw Bay Indian Community

KBIC has developed a mitigation strategy based on the hazard priority list provided in the Risk Assessment. The Local Planning Team has considered the following mitigation actions and projects to address hazard impacts and vulnerabilities.

Snowstorms and Blizzards

1) Blizzards are expected to occur more frequently and with greater impact due to climate change. A serious event can cause power outages and limit emergency response.
    a. Potential Actions:
        i. Improve resiliency for community facilities that are designated as shelters during emergencies by installing backup generators.
        ii. Plan for and maintain adequate road and debris clearing capabilities.
        iii. Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages.
        iv. Organize outreach to vulnerable populations.
        v. Establish accessible heating centers throughout the community.

Shoreline Flooding and Erosion

1) While shoreline erosion is a major issue, there is a lack of legacy data that can be used for decision making and calculating the rate of erosion over time.
    a. Potential Actions:
        i. Use GIS to identify and map erosion hazard areas.
        ii. Develop and maintain a database to track community vulnerability to erosion.
        iii. Use GIS to identify concentrations of at-risk structures.
        iv. Use improved mapping to educated residents about unexpected risks.
        v. Use data to model future erosion potential based on rising lake levels.

Public Health Emergencies

1) Most public health emergencies, such as an influenza type pandemic, drug or substance abuse issue, or natural resource contamination, adversely impact or has the potential to adversely impact many people.
    a. Potential Actions:
        i. Protect vulnerable individuals who are at higher risk for severe illnesses during pandemics by reducing rates of exposure.
        ii. Educate and empower individual responsibility to slow transmission of highly infectious illnesses.
        iii. Educate public about the signs and symptoms of illness or drug/substance abuse and what to do if they become infected or know someone who is struggling with abuse.

iv. Establish a strategy between KBIC and other local agencies that address the local opioid epidemic by identifying potential causes and paths towards opioid misuse and overdose.
v. Monitor lakes and streams of high priority to KBIC in cooperation with other agencies for contaminants or other pollutants that negatively impact water and public health.
vi. Promote equitable community resilience projects that address potential public health impacts from climate change, such as increasing access to health care and reducing reliance on fossil fuels.

Invasive Species

1) Due to the Upper Peninsula's large amount of forest coverage, lakes, and rivers, both terrestrial and aquatic invasive species have been found throughout the region.
    a. Potential Actions:
        i. Educate public about invasive species with emphasis on preventing new invasions and why this is important.
        ii. Inspection and sanitation of recreational and professional equipment that touches or encounters surface waters.
        iii. Monitor lakes and streams of high priority to KBIC in cooperation with other management agencies for the purpose of early detention of new populations and source waters.
        iv. Implement a rapid response plan that provides guidance to those who have discovered a new population of invasive species.
        v. Direct management (where possible) of existing populations of invasive species to prevent spread to other areas or bodies of water and minimize impacts.
        vi. Employ existing laws and regulations to minimize spread of invasive species.
        vii. Coordinate with other agencies and organizations regarding education, information, monitoring, and management to increase efficiency and economy in implementation of the plan.
        viii. Review new research findings on specific invasive species and participate in basic research as opportunities arise.
        ix. Conduct periodic review of local plans and their implementation and complete an analysis of progress and areas where adaptations are warranted.

Riverine and Urban Flooding

1) Riverbanks and many areas with inadequate culverts and ditches are overburdened, resulting in certain degrees of flooding and washouts. The villages of L'Anse and Baraga are especially prone to flood events.
    a. Potential Actions:

i. Implement project to reduce stormwater and snow melt runoff by installing, rerouting, or increasing the capacity of the storm drainage system. Increasing drainage or absorption capacities with detention and retention basins, relief drains, spillways, drain widening/dredging or rerouting, logjam and debris removal, and extra culverts in flood-prone areas.

2) Flooding risk on U.S. 41 due to high water levels on Lake Superior limits evacuation routes and cuts off the western Tribal population from the eastern, where critical and essential facilities are located.
    a. Potential Actions:
        i. Elevate the road.
        ii. Install culvert to improve flow.
        iii. Establish Class A road to reroute traffic through when the road is blocked.

Wildfires

1) KBIC has an ongoing risk of wildfires due to the tremendous amount of forest cover in the Upper Peninsula and increasing hazard due to urban infringement in rural areas.
    a. Potential Actions:
        i. Map and assess the community's vulnerability to wildfire through GIS mapping to facilitate analysis and planning decisions.
        ii. Revitalize and maintain cultural use of fire as a stewardship tool.
        iii. Use prescribed burns in marsh habitats to encourage young plant communities.
        iv. Establish fuel breaks to slow the spread of catastrophic fire.
        v. Identify people (tribes, elders, community members) who have knowledge and stories about fire practices.
        vi. Establish buffer zones around wild rice beds or other sensitive communities to prevent effects of disturbance.

Structural Fires

1) Due to an older housing stock, compact development in downtown areas, and the accumulation of debris around residential and non-residential structures much of the community is susceptible to fire.
    a. Potential Actions:
        i. Create defensible space (buffers) around residential and non-residential structures through a hazardous fuels reduction program.

Severe Winds

1) Severe wind events are concentrated on the Lake Superior shoreline, but they can also occur throughout the community, usually resulting in downed trees and extensive debris.
    a. Potential Actions:

i. Survey cultural site locations ahead of time so when a disturbance occurs it is easier to act (by removing hazardous tree and debris) but be mindful about how this information is stored and shared.

Mitigation Resources

There are two types of resources: existing institutional establishments, such as government agencies and continuing programs, and funding sources to undertake specific projects. The following list is intended to provide examples of funding sources for both current and future mitigation projects and should not be considered comprehensive. Potential new sources for mitigation funding should be added as identified. Project specific funding options are included in the respective Action Items identified in Section 12. The following mitigation funding and resources can be found with further detail in Appendix D.

Federal		
Economic Development Administration	U.S. Department of Agriculture	U.S. Department of Transportation
Federal Emergency Management Agency	U.S. Department of Energy	U.S. Small Business Administration
U.S. Army Corps of Engineers	U.S. Department of Health & Human Services	U.S. Department of Housing and Urban Development
U.S. Department of the Labor		

State		
Environment, Great Lakes, and Energy	Michigan Department of Natural Resources	Michigan Economic Development Corporation
Michigan Department of Transportation		

Other - Local		
Copper County Habitat for Humanity - Homeownership Program	Baraga-Houghton-Keweenaw Community Action Agency	Superior Watershed Partnership and Land Conservancy
Hancock Salvation Army	Habitat for Humanity Menominee River	Superior Health Foundation
Duck Lake Riparians' Association	Keweenaw Community Foundation	Portage Health Foundation
Keweenaw Land Trust	Keweenaw Economic Development Alliance	Western Upper Peninsula Planning & Development Region (WUPPDR)

Other - National		
Community Restoration and Resiliency	National Low-Income Housing Coalition	Rebuilding Together
First Nations Development Institute	Bureau of Indian Affairs	Volunteer Organizations Active in Disasters (VOAD)

Updating the 2020 Keweenaw Bay Indian Community Hazard Mitigation Plan

This section is intended to provide discussion on how communities will continue public participation in the plan maintenance process. It will also contain a description of plan monitoring, evaluating, and updating for keeping the plan current and updated within five years.

The Keweenaw Bay Indian Community Hazard Mitigation Plan is a living document that will provide guidance for reducing hazard impacts to the community for future generations. The plan will be monitored and evaluated for updates to keep it accurate and current over the next five years. Integrating the plan into existing and future planning efforts will ensure that it remains useful.

As part of the plan review, an internal evaluation of the benefits or avoided losses of mitigation activities will be part of the assessment. Each item in Section 12 has an agency or multiple departments/organizations that are responsible for managing projects and reviewing their progress to ensure that mitigation actions are addressed. Each agency will close out projects as outlined by the specific funding source. If the source is Tribal funds or staff time, the responsible agency will assess project results and outcomes.

Throughout of the development of the 2020 Keweenaw Bay Indian Community Hazard Mitigation Plan, the Community has made a concerted effort to collect feedback from the public, tribal and nontribal government, and agencies. Moving forward residents will continue to be notified of any plan updates and be invited to provide feedback through the incorporation of hazard mitigation into other planning documents.

The Hazard Mitigation Plan will be updated every five years to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene a Local Planning Team representing local agencies and concerned parties to evaluate progress and update the plan in accordance with FEMA regulations. The LPT will review the plan to determine the sections that need to be updated or modified based on changing conditions or alterations to Federal requirements. It is recommended that public participation will include surveys, charettes, and other community presentations at regularly scheduled meetings. Goals, objectives, and strategies will also be reviewed to determine whether they thoroughly address new or changing conditions.

SECTION 12: Action Plan

This section highlights the five-year action plan set out by the Local Planning Team for Keweenaw Bay Indian Community to reduce the community's vulnerability and risk to local hazards based on their capability. The final step in the mitigation process is to build upon the general recommendations for mitigation activities suggested in Section 11 and identify specific action items for KBIC.

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

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

Action Item 1: Reduction of Human and Wildlife Impacts to Shoreline Erosion

Areas of Lake Superior experience bank erosion problems due to human and wildlife impacts. Numerous mitigation efforts have corrected problems, but some areas have an ongoing need for stabilization.

Responsible Agency:	KBIC-Natural Resources Department (NRD), KBIC Public Works, KBIC Realty, Baraga County Road Commission
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	FEMA Pre-Disaster Mitigation Program, U.S. Army Corps of Engineers, Michigan Economic Development Corporation (MEDC), BIA, NRCS-USDA, EPA, and staff time
Benefits:	The Community will benefit by reduction of erosion and sedimentation that result in damage to property and degradation of water quality.

Action Item 2: Wild Rice Restoration

Wild rice is used in the daily lives of community members, as well as, ceremonies, and feasts. It is also recognized as a preferred source of food for migrating waterfowl and has high ecological value for both wildlife and fish habitat. It can also help to maintain water quality by securing

loose soil, tying up nutrients, and slowing winds across shallow wetlands. The amount of wild rice throughout the Great Lakes region has declined from historic levels due mainly to water fluctuations from hydro dams and degradation of water quality from logging and shoreline development over the past century. The long-term goal is to develop harvestable self-sustaining wild rice populations on the reservation and within the ceded territory for future generations.

Responsible Agency:	KBIC-NRD
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	National Oceanic and Atmospheric Administration, United States Environmental Protection Agency, State of Michigan, MDNR, BIA, Native American Agricultural Fund, Food Co-ops, USDA, and staff time
Benefits:	The ecological importance of wild rice habitat is an indicator of a high-quality, high-functioning, and biodiverse ecosystem around the Lake Superior Basin. It is also important for community members to have increased access to traditional foods.

Action Item 3: Drainage Improvements and Maintenance

As an ongoing project in the Community, and throughout Baraga County, the Baraga County Road Commission has had an active role in upgrading roads and replacing inadequate culverts in response to previous problems and to mitigate future flood problems

Responsible Agency:	Baraga County Road Commission, KBIC-NRD, KBIC Public Works (for tribal roads), and KBIC Realty
Deadline:	Ongoing
Cost:	Varies by Project
Potential Funding Sources:	FEMA, MDOT, Road Commission operating budgets, NRCS-USDA, Federal Highway Transportation (FHT), HUD Imminent Threat, HUD ICDBG, HUD IHBG, GLRI-EPA, and NOAA
Benefits:	Inspection and maintenance of the existing drainage system will prevent flooding caused by plugged culverts, while upgrading of identified culverts and roads will ensure mitigation of future problems.

Action Item 4: Green Infrastructure Installation

Green infrastructure is a cost-effective, resilient approach to managing wet weather impacts that provides many community benefits. While single-purpose gray stormwater infrastructure—conventional piped drainage and water treatment systems—is designed to move urban

stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.

Stormwater runoff is a major cause of water pollution in the region. When rain falls on roofs, streets, and parking lots in cities and communities bordering Lake Superior, the water cannot soak into the ground as it should. Stormwater drains through gutters, storm sewers, and other engineered collection systems and is discharged into nearby water bodies. The stormwater runoff carries trash, bacteria, heavy metals, and other pollutants from the built landscape. Higher flows resulting from heavy rains also can cause erosion and flooding in streams, damaging habitat, property, and infrastructure.

Responsible Agency:	KBIC Natural Resources Dept
Deadline:	Ongoing
Cost:	Varies by Project
Potential Funding Sources:	FEMA, MDNR, EGLE Coastal Zone Management Program, EPA, NOAA, and staff time
Benefits:	When rain falls in natural, undeveloped areas, the water is absorbed and filtered by soil and plants. Stormwater runoff is cleaner and less of a problem. Green infrastructure uses vegetation, soils, and other elements and practices to restore some of the natural processes required to manage water and create healthier urban environments. At the city or county scale, green infrastructure is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, stormwater management systems that mimic nature soak up and store water.

Action Item 5: Wildlife Diseases

Wildlife inventory and monitoring plays a large role in KBIC's ability to assess environmental conditions, set management priorities, and to carry out ongoing management activities in an effective manner. The Wildlife Program collects data throughout the L'Anse Reservation and regionally on waterfowl, frogs and toads, sand hill cranes, songbirds, mammals, turtles and salamanders. The program has also monitored wildlife for health-related issues such as chronic wasting disease and avian influenza. Continued monitoring is important to calculate the impact due to a changing climate and other factors.

Responsible Agency:	KBIC Natural Resources Dept
Deadline:	Ongoing
Cost:	Varies by Project
Potential Funding Sources:	NOAA, EPA, EGLE Coastal Zone Management Program, MDNR, BIA, APHIS USDA, USFWS, and staff time

Benefits:	Benefits includes assessing environmental conditions, set management priorities, and a healthier wildlife population.

Action Item 6: Brownfield Restoration

Due to the historical industrial and commercial activity and land use as well as activities such as illegal dumping, environmental impacts are present or suspected to be present on some of these KBIC lands. Properties where environmental impacts are known or suspected to be present are referred to as "brownfield sites", or simply "brownfields". Remediation of the identified brownfields is an ongoing project priority with the Natural Resources Department

Responsible Agency:	KBIC Natural Resources Department, KBIC Realty, and KBIC Public Works
Deadline:	Ongoing
Cost:	Varies by Project
Potential Funding Sources:	EPA, USDA, and staff time
Benefits:	Brownfields are a public and environmental health hazard. Remediation of the site mitigates risk to people and wildlife as well as reducing toxic run-off.

Action Item 7: Sewer Infrastructure for Housing

Installation of a sewer system in Harvey on the Marquette Reservation.

Responsible Agency:	KBIC Housing and KBIC Public Works
Deadline:	2021
Cost:	$786,000
Potential Funding Sources:	HUD IHBG, IHS SDS, EPA, USDA, HUD ICDBG, and HUD Imminent Threat
Benefits:	Improvements to the sewer system would provide sanitary waste disposal for 40 homes, casino, and one community center.

Action Item 8: Watershed Assessment for Stream Infrastructure

This project will assess the condition of the road/stream crossings for aquatic organism passage and watershed connectivity.

Responsible Agency:	KBIC Natural Resources Department, Baraga County Road Commission, MDNR, NRCS, and Superior Watershed Partnership
Deadline:	Ongoing
Cost:	Varies per project

Potential Funding Sources:	BIA, NRCS, Baraga County Road Commission, USFWS, and staff time
Benefits:	Improves watershed health and connectivity.

Action Item 9: Expand staff capacity for Hazard Mitigation

Many projects have been highlighted by the KBIC Hazard Mitigation Plan. Increasing staff capacity and training at the Natural Resources Department to manage the projects will help see them to fruition.

Responsible Agency:	KBIC
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	KBIC General Fund, FEMA, BIA, EPA, USDA, IHS
Benefits:	More projects from the planning process will be completed.

Action Item 10: Backup generators for Critical Facilities

Some critical facilities do not have backup power which could cause a cascade effect if a disaster were to occur. Stabilizing these systems is essential to community resilience. More information can be added here after the public comment period.

Responsible Agency:	KBIC
Deadline:	Ongoing
Cost:	Varies by location
Potential Funding Sources:	FEMA Pre-disaster mitigation, HUD, IHS, USDA, HUD Imminent Threat
Benefits:	With backup power, critical facilities would be stable even during and after a disaster.

Action Item 11: Drainage Database, Infrastructure, and Maintenance Improvements

As an ongoing project in the county, the County Road Commission has had an active role in upgrading roads and replacing inadequate culverts in response to previous problems and to mitigate future problems. Keweenaw Bay Indian Community is working closely with tribal and non-tribal government agencies to work on this ongoing need. The Natural Resources Dept will also continue to maintain and upgrade databases as needed while monitoring beaver dam problems.

Responsible Agency:	KBIC Natural Resources Dept, Baraga County Road Commission, KBIC Realty, and KBIC Public Works
Deadline:	Ongoing

Cost:	Variable by Project
Potential Funding Sources:	FEMA, USDA, HUD, HUD Imminent Threat, BIA, and staff time
Benefits:	With more data available for decision-making, infrastructure design, development, and maintenance can be completed with minimal loss.

Action Item 12: Zeba Water Tower and Generator

The Zeba water tower is the main drinking water source for 107 homes nearby. Currently, the water tower is failing. To mitigate this issue, a new water storage tower needs to be installed to ensure that there is no disruption in service. A generator will also be installed to provide backup power to the tower.

Responsible Agency:	KBIC Public Works
Deadline:	Ongoing
Cost:	$1.704 million for tower; $85,000 for generator
Potential Funding Sources:	Indian Health Services Sanitation Deficiency Systems and KBIC
Benefits:	Purchasing and installing a permanent generator for the water tower would assure continuity of operations during an electrical outage. The Zeba community experiences multiple electrical outages each year.

Action Item 13: Seiche Early Warning System

Storm surges, or seiches, that drive lake water inland over large areas occur when windstorms and differences in barometric pressure temporarily tilt the surface of a lake up at one end—in extreme cases by as much as eight feet. It is important to create a forecast and warning system to alert boaters and beachgoers about seiches as they develop across Lake Superior.

Responsible Agency:	Keweenaw Bay Indian Community
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	NOAA, and FEMA
Benefits:	Risk is reduced to boaters and beachgoers. This also helps protect campers and other KBIC assets such as docks, infrastructure (power lines), the welcoming center, and the campground caretaker’s home.

Action Item 14: Fish Hatchery Relocation

The fish hatchery facility is located on the bay in Pequaming, Michigan and is extremely vulnerable to rising lake levels. An alternate location may be identified through a planning process and cost-benefit analysis.

Responsible Agency:	KBIC Natural Resources Dept
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	FEMA Pre-Disaster Mitigation, BIA, USDA, MEDC, and Native American Agricultural Fund
Benefits:	Relocation of critical facilities out of inundation areas due to lake level rise will reduce the cost of shoreline armoring and possible total loss of infrastructure.

Action Item 15: Coordination and Collaboration between County and Tribal Agencies

Hazards and emergencies resulting from them have regional impacts that do not follow political boundaries. To improve disaster response and mitigate local hazards throughout the region, KBIC seeks to continue to work with Baraga County. This will help improve coordination of hazard mitigation and emergency response between all local response agencies.

Work with Baraga County in mitigating local hazards and disaster response throughout the region.

Responsible Agency:	KBIC Agencies, Road Commission, and County Emergency Services
Deadline:	Ongoing
Cost:	Staff time
Potential Funding Sources:	FEMA and local operating budgets
Benefits:	Increased coordination between local response agencies will lead to more efficient use of resources and clearly defined responsibilities for responders. This will lead to faster, more effective, and less costly response and recovery.

Action Item 16: Facility Assessments with Energy Audits

Energy audits, or also known as an energy assessment, is a comprehensive analysis of a facility's energy use, its health, and the safety of its occupants. KBIC would work with a local energy auditor to complete a comprehensive analysis of Tribal facilities to identify and resolve energy use, cost, or efficiency concerns. Audits can also identify and eliminate health and safety problems, such as air leaks, moisture issues, and insufficient insulation. Energy audits provide

recommendations towards reducing energy use and costs. Additionally, audit findings will also guide future renewable opportunities for KBIC.

Responsible Agency:	KBIC and Committee for Alternative and Renewable Energy (CARE)
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	USDA Rural Energy for America Program, EGLE Community Energy Management Incentive Program, and BIA-TEDC
Benefits:	Energy efficiency can dramatically reduce overall operating costs and emissions.

Action Item 17: Household Hazardous Waste Collection Program

The project aims to collect household hazardous waste from KBIC members and non-members throughout Baraga County.

Responsible Agency:	KBIC Natural Resources Department
Deadline:	Ongoing
Cost:	Variable
Potential Funding Sources:	NOAA, EPA, GLRI, EPA, Tribal funds, and staff time
Benefits:	Hazardous waste is a public health risk to humans, plants, wildlife, and water quality. Collecting household hazardous waste also keeps toxins that eventually leach into Lake Superior.

Action Item 18: Legacy Mining and Stamp Sand Remediation

Stamp mills from legacy mining dumped stamp sand into Keweenaw Bay. This stamp sand was carried southward by the Keweenaw Current and deposited at Sand Point. Further north in Lake Superior, Buffalo Reef and Torch Lake is a natural spawning ground for lake trout and whitefish. Mine tailings from over 30 years of copper stamp mill production were deposited off the town of Gay, Michigan. The tailings are migrating towards Buffalo Reef and are threatening the spawning ground. These two sites have ongoing projects for restoration and remedial dredging operations, respectively.

Responsible Agency:	KBIC Natural Resources Dept
Deadline:	Ongoing
Cost:	Variable by Project
Potential Funding Sources:	EPA, Army Corps of Engineers, State of Michigan, BIA, MEDC, and staff time

Benefits:	The impact of stamp sand in the Western Upper Peninsula cannot be overstated. Benefits include habitat restoration, public health, and environmental health risk reduction.

Action Item 19: Explore Land Use Designation and Zoning

Currently, land use and zoning categories on KBIC lands has designations that are incompatible. To address this, incompatible uses will need to be separated, while allowing new kinds of land use that do not interfere with old uses. By doing so, this will help preserve community character all while taking into consideration cultural and traditional land uses

Responsible Agency:	KBIC Real Estate Office
Deadline:	Ongoing
Cost:	Staff Time
Potential Funding Sources:	Operating budget
Benefits:	Preservation of cultural and historical land uses.

Action Item 20: Development of Water Quality Standards for the Keweenaw Bay Indian Community

Water quality standards for the KBIC would provide place-based benchmarks that specifically address the needs and problems that residents face. Federal standards are too broad to address issues that are present on KBIC lands.

Responsible Agency:	KBIC Natural Resources Department
Deadline:	Ongoing
Cost:	Varies by contractor
Potential Funding Sources:	EPA, Tribal funds, and staff time
Benefits:	Standards would be developed according to the publics needs in place of following federal standards that are broader. Federal standards do not represent a smaller community.

Action Item 21: Installation of Boat Washing and Fish Cleaning Stations at Buck's Marina

The use of recreational boats at Buck's Marina can be a significant pathway for the spread of aquatic invasive species. One method to decontaminate boats and trailers is to use a pressure washer to spray and clean any material off before and after launch. Pressurized washing with heated water can help remove potential aquatic invasive species and kill invertebrates, plants, and diseases.

Individuals who utilize the marina would also benefit from a fish cleaning station. A station would provide a convenient location for people to clean their catch prior, reduce and reuse fish waste for compost, and keeps areas around the marina clean.

Responsible Agency:	KBIC
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	FEMA, First Nations Development Institute, Private Foundations, and MEDC
Benefits:	This project will limit the introduction and establishment of aquatic invasive species in local waterways. A fish cleaning station allows for the collection of food waste for composting.

Action Item 22: Update Regional Plans to Integrate Climate Resiliency, Adaptation, and Hazard Mitigation

During updates to KBIC plans and regulations, KBIC will consider actions and recommendations that divert new development from identified hazards, include development standards that ensure adequate fire and emergency access, require buried utility lines, and promote open space requirements that protect properties from flooding.

As local land use plans, comprehensive plans, zoning, building codes, and other plans and regulations become due for revision, appropriate hazard mitigation provisions will be considered and incorporated.

Responsible Agency:	KBIC Organizations and Agencies
Deadline:	Ongoing as plans are reviewed
Cost:	Staff time
Potential Funding Sources:	EPA, BIA, FEMA, USDA, and organization/agency operating budgets
Benefits:	Community members will benefit from plans that protect new development from known hazards and by awareness of methods of protecting their lands from known priority hazards

Action Item 23: Adopt Hazard Mitigation Plan and Update Regularly

By adopting the Keweenaw Bay Indian Community Hazard Mitigation Plan, the Community recognizes the need to incorporate hazard mitigation activities into everyday decisions at the government and local level. The Emergency Manager will be reviewing the plan regularly to determine whether revisions are needed.

The Hazard Mitigation Plan will be updated every five years to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene a Local Planning Team representing local agencies and concerned parties to evaluate progress and update the plan in accordance with FEMA regulations. The LPT will review the plan to determine the sections that need to be updated or modified based on changing conditions or

alterations in Federal requirements. Goals, objectives, and strategies will also be reviewed to determine whether they thoroughly address new or changing conditions.

The public will be notified of any plan updates, and copies will be made available at all local government offices and online if feasible. The public will be provided with and notified of comment opportunities during all interim and five-year plan updates.

Responsible Agency:	KBIC NRD and Emergency Management
Deadline:	Ongoing
Cost:	Staff Time
Potential Funding Sources:	Operating Budget
Benefits:	The adoption of the Hazard Mitigation Plan commits KBIC to working on mitigation efforts within its boundaries. Through implementation of mitigation strategies in the Plan, the Community will be actively working to prevent future problems throughout the region.

Action Item 24: Disaster Debris Management

Develop a plan for the management of debris from natural disasters.

Responsible Agency:	KBIC NRD
Deadline:	2022-2023
Cost:	Unknown
Potential Funding Sources:	EPA
Benefits:	To help the whole community prepare for, respond to, and begin short-term actions to recover from a disaster or an incident.

Action Item 25: Purchase Land for Landscape Connectivity and Establishing Wildlife Corridors

Habitat fragmentation is a large threat to ecosystem biodiversity. Unconnected patches of habitat typically have lower levels of plant and wildlife biodiversity than habitats that are connected by corridors. To protect and increase biodiversity, KBIC plans to purchase land to create wildlife corridors to help maintain viable ecosystems as well as fish, wildlife and plant populations and facilitate the movement and adaptation of wildlife populations. Additionally, landscape connectivity gives the Tribe more flexibility when implementing land use and zoning regulations when jurisdiction is contiguous.

Responsible Agency:	KBIC Real Estate Office
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	FEMA, EPA, BIA, GLRI, USFWS

Benefits:	Landscape connectivity and wildlife corridors not only benefit fish, wildlife, and plant populations, but also significantly increase the health of the local ecosystem.

Action Item 26: Establish Conservation Easements

A conservation easement is a voluntary agreement between landowners and either a land trust or government agency that protects the conservation values of a property. The kinds of use that is allowable is limited; no use can threaten land conservation. Types of land use that is allowable is determined through an agreement between the landowner and land trust. The landowner does retain the rights to own and use the land, sell it, and pass it on. KBIC aims to have discussions with private, state, federal, tribal, business, and conservation landowners on mutual benefits of easement.

Responsible Agency:	KBIC
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	Staff time, USDA, NRCS, and NAWCA
Benefits:	Conservation easements are important for increasing land base for practicing treaty rights and landscape connectivity, climate resilience, and adaptation projects

Action Item 27: Build Relationships with Regional Recycling Facilities to Reduce Overlap and Establish Composting

Develop a sustainable program within KBIC and coordinate with regional facilities to provide for the best protection of the environment.

Responsible Agency:	KBIC-NRD and Waste Advisory Board
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	MI EGLE, EPA, HIS, BIA, MEDC, and private foundations
Benefits:	By building relationships with regional recycling facilities and reducing waste, this directly supports the KBIC goal to Reduce, Reuse, Recycle, and Respect.

Action Item 28: Public Information / Education Program

Public information is the key to mitigating many of the potential hazards in Keweenaw Bay Indian Community. Several projects can help to educate the public on potential hazards and how to protect themselves from hazards. Recommended projects include preparing and gathering education materials on hazards affecting the Community and how people can help with

mitigation. These materials should be organized and made available at government offices, schools, and other easily accessible public facilities as well as on the internet. Topics to focus on include safe open burning, community hazard awareness, preparedness, and resiliency, and invasive species.

Responsible Agency:	KBIC
Deadline:	Ongoing
Cost:	Unknown; staff time, cost of materials, and printing
Potential Funding Sources:	Staff time, FEMA, Michigan Invasive Species Grant Program, and other federal and state sources
Benefits:	Organizing locally applicable materials and making them available to the public ensures that the message is getting out. Through use of newspapers and the internet, the public is easily informed, and the message can be made consistent. This action item helps inform the public and assists people who want to learn more about property protection and how to reduce their risk.

Action Item 29: Identify and Inventory Datasets for Quantitative Hazard Analysis

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

Responsible Agency:	KBIC Natural Resources Dept
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	FEMA and NSF
Benefits:	Comprehensive risk assessment including both qualitative and quantitative analysis.

Action Item 30: Improved Emergency Response, Equipment, and GIS

Conduct ongoing reviews of response plans and programs to keep emergency contacts up to date, ensure critical facility information is current, and to identify and incorporate new and improved methods of warning and response. Continue development and maintenance of GIS resources. Adequacy of shelter facilities, response equipment, and training can be evaluated during ongoing reviews of response plans and updated as needed.

Responsible Agency:	KBIC Emergency Services

Deadline:	Ongoing – incorporate into annual emergency plan revision process
Cost:	Staff time
Potential Funding Sources:	FEMA
Benefits:	Emergency plans that are up to date and incorporate all available methods of warning and response will be most effective in emergency situations thus mitigating loss from hazards. These plans serve as an effective tool in determining equipment needs on an annual basis while an integrated Geographic Information System will provide a comprehensive inventory of KBIC assets for hazard and emergency management.

Action Item 31: Proposed All-Season Route: US41 to M-38 Connector

Between Baraga and L'Anse, US41 is vulnerable to transportation accidents, spills, and Lake Superior. If such an accident occurs, rerouting turns a 5-mile drive between villages to 100 miles. It also cuts off timely access to the Baraga County Memorial Hospital.

Responsible Agency:	Keweenaw Bay Indian Community, Baraga County, Baraga County Road Commission, and MDOT
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	FEMA Pre-Disaster Hazard Mitigation Grant and MDOT
Benefits:	Development of alternative transportation routes (Class A) will aid in safety and savings for the entire community

Action Item 32: Equipment needs for KBIC Solid Waste Facility

Replace worn equipment to keep up with increased demands of waste disposal, especially related to COVID situation and increased household waste.

Responsible Agency:	KBIC Solid Waste Facility
Deadline:	Ongoing
Cost:	$387,970
Potential Funding Sources:	USDA, BIA, and HUD
Benefits:	Proper waste disposal equipment will ensure that the Solid Waste Facility can continue to process waste in an efficient and safe manner.

Action Item 33: Food Sovereignty

Food sovereignty is the ability to feed the community and feed them well. It is a state of being in which a community can have a safe, culturally acceptable and nutritionally adequate diet through a sustainable food system that promotes community self-reliance and social justice. The local ecosystem is a rich and vast garden where foods and medicines are found throughout the forests and waters. Food sovereignty education and outreach initiatives are critical to restoring and strengthening the KBIC. Practices to restore and protect local environments, economies, and cultures are just some activities that can help strengthen not only food sovereignty within the KBIC, but within local communities as well.

Responsible Agency:	KBIC
Deadline:	Ongoing
Cost:	Unknown
Potential Funding Sources:	First Nations Development Institute, Native American Agriculture Fund, USDA, ANA, staff time, IHS, and various private foundations
Benefits:	Ensures subsistence availability for the community.

Appendix

Appendix A: KBIC Capability Assessment

Appendix B: KBIC Governance Structure

Appendix C: KBIC Critical Facilities and Cultural Assets

Appendix D: Mitigation Funding and Resources

Appendix E: KBIC Letter to Commit Match

Appendix F: Public Participation

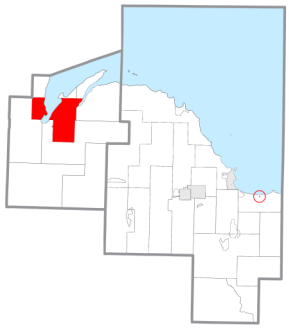
Appendix G: Meeting Materials

Appendix H: FEMA Document Review

Appendix I: Plan Adoption

Appendix A: KBIC Capability Snapshot

Keweenaw Bay Indian Community
2020-2025
Hazard Mitigation Plan



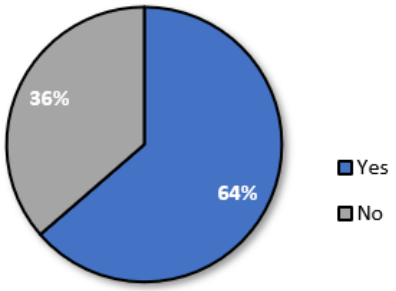
FAST FACTS

Area: 18,811 acres	**Climate:** Humid Continental	**Growing Season:** 115 days	**Population:** 3,062
Housing: 1,791	**Average Household Income:** $44,656	**Poverty Rate:** 17.2%	**Disability:** 38.2%

PUBLIC SURVEY SUMMARY

Respondents are very concerned about snowstorms and blizzards, invasive species, extreme hot or cold temperatures, ice and sleet storms, and severe winds. Respondents were asked whether they have taken actions to make their home or community more resistant to hazards. Just over a quarter of respondents (27.8%) said yes. Information on property located in the floodplain, flood frequency, and flood insurance was also collected. According to the respondents, the most effective ways to receive hazard emergency management information are by social media, radio, phone, and government websites.

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



DISASTER DELCARATIONS

KBIC has experienced two federal disaster declarations since 1953. Both are from 2020 and related to the COVID-19 pandemic. Baraga (7), Marquette (10), and Ontonagon (7) Counties have had numerous federal disaster declarations.

KBIC Disaster Declarations

Event	Declaration Date
COVID-19 (EM-3455-MI)	March 13, 2020
COVID-19 Pandemic (DR-4494-MI)	March 27, 2020

Source: FEMA

DATA SOURCES

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

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

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

HAZARD RANKING

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

High Risk

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

Moderate Risk

- Infrastructure Failures and Secondary Technological Hazards
- Petroleum and Natural Gas Incidents
- Hazardous Materials: Transportation Accidents
- Hazardous Materials: Fixed Site Incidents
- Ice and Sleet Storms
- Dam Failures
- Hail

Low Risk

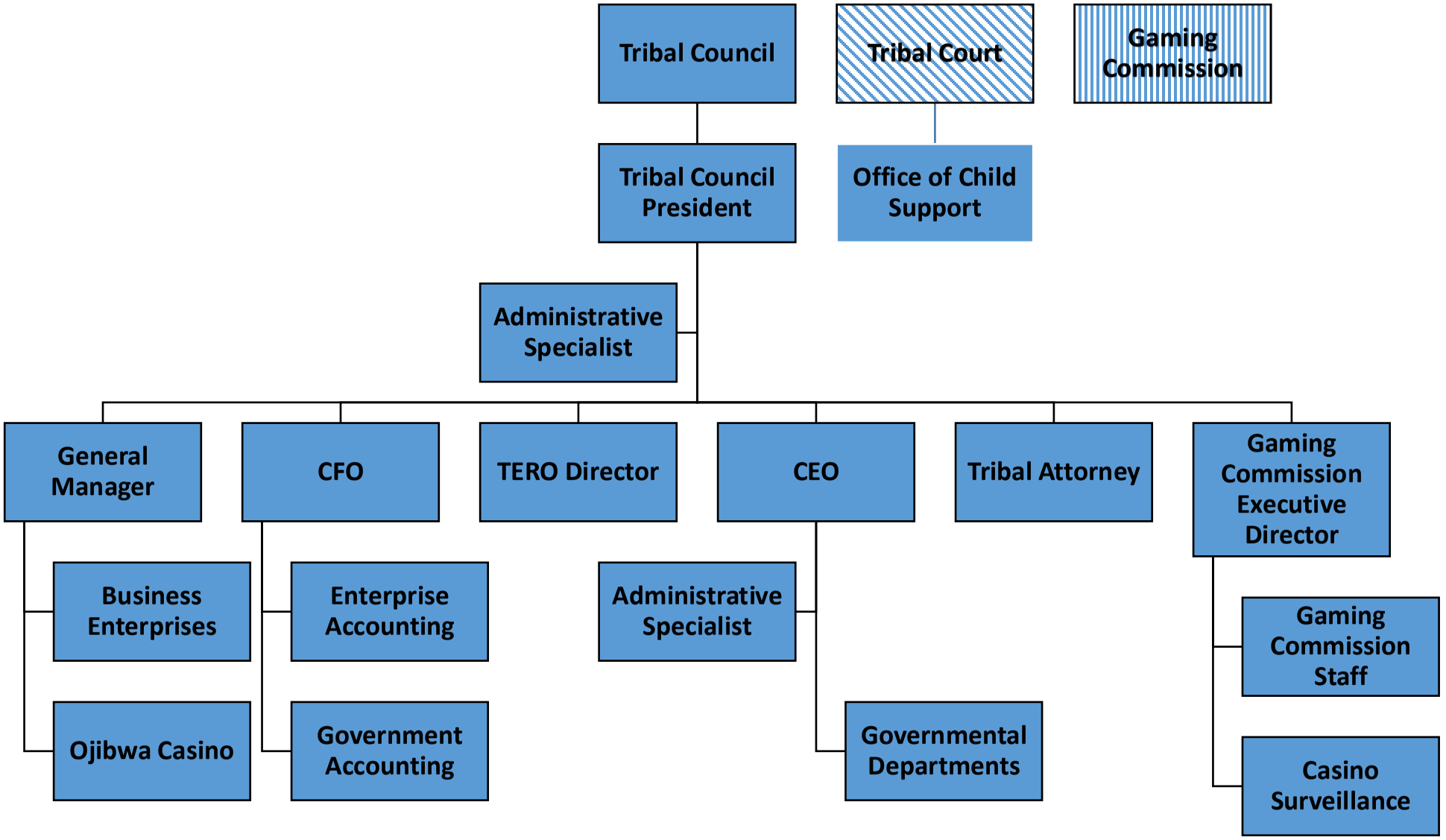
- Tornadoes
- Fog
- Extreme Temperatures
- Drought
- Sabotage and Terrorism
- Transportation Accidents
- Scrap Tire Fires
- Subsidence (Ground Collapse)
- Lightning
- Earthquakes
- Civil Disturbances

ACTION PLAN

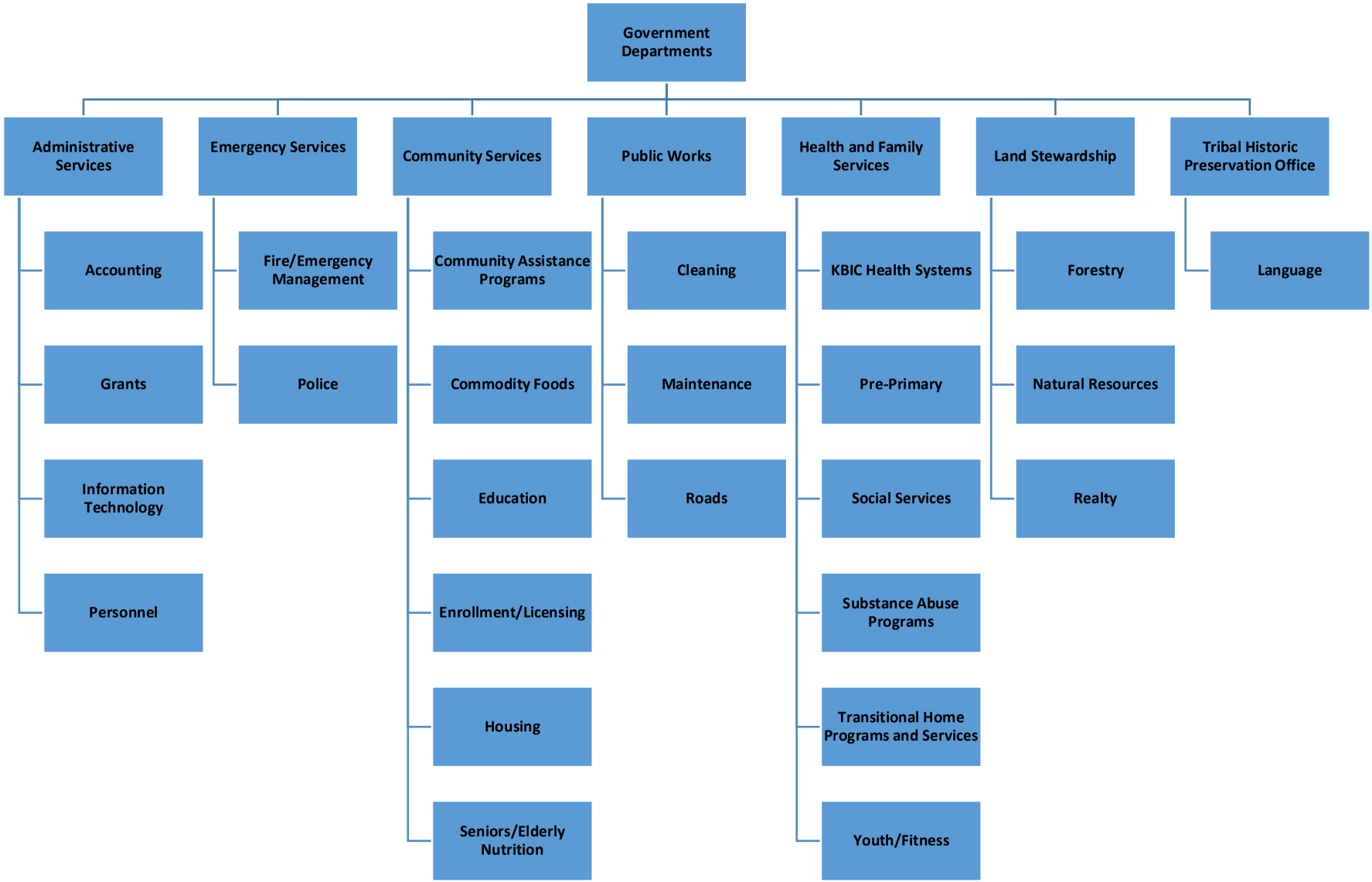
5-year action plan set out by Local Planning Team to reduce the community's vulnerability and risk to local hazards based on their capability. Identified specific action items for KBIC. All activities are consistent with the eight mitigation goals outlined in the hazard mitigation plan:

Action Item	Deadline	Cost
Reduction of Human and Wildlife Impacts to Shoreline Erosion	Ongoing	Unknown
Wild Rice Restoration	Ongoing	Unknown
Drainage Improvements and Maintenance	Ongoing	Varies
Green Infrastructure Improvements	Ongoing	Varies
Wildlife Diseases	Ongoing	Varies
Brownfield Restoration	Ongoing	Varies
Sewer Infrastructure for Housing	2021	$786,000
Watershed Assessment for Stream Infrastructure	Ongoing	Varies
Expand Staff Capacity for Hazard Mitigation	Ongoing	Unknown
Backup Generators for Critical Facilities	Ongoing	Varies
Drainage Database, Infrastructure, and Maintenance Improvements	Ongoing	Varies
Zeba Water Tower and Generator	Ongoing	$1.789 million
Seiche Early Warning System	Ongoing	Unknown
Fish Hatchery Relocation	Ongoing	Unknown
Coordination and Collaboration between County and Tribal Agencies	Ongoing	Staff Time
Facility Assessments with Energy Audits	Ongoing	Unknown
Household Hazardous Waste Collection Program	Ongoing	Varies
Legacy Mining and Stamp Sand Remediation	Ongoing	Varies
Explore Land Use Designation and Zoning	Ongoing	Staff Time
Development of Water Quality Standards for KBIC	Ongoing	Varies
Installation of Boat Washing and Fish Cleaning Station and Buck's Marina	Ongoing	Unknown
Update Regional Plans to Integrate Climate Resiliency, Adaptation, and Hazard Mitigation	Ongoing	Staff Time
Adopt Hazard Mitigation Plan and Update Regularly	Ongoing	Staff Time
Disaster Debris Management	2022-2023	Unknown
Purchase Land for Landscape Connectivity and Establishing Wildlife Corridors	Ongoing	Unknown
Establish Conservation Easements	Ongoing	Unknown
Build Relationships with Regional Recycling Facilities to Reduce Overlap and Establish Composting	Ongoing	Unknown
Public Information/Education Program	Ongoing	Unknown; Staff Time
Identify and Inventory Datasets for Quantitative Hazard Analysis	Ongoing	Unknown
Improved Emergency Response, Equipment, and GIS	Ongoing	Staff Time
Proposed All-Season Route: US41 to M-38 Connector	Ongoing	Unknown
Equipment needs for KBIC Solid Waste Facility	Ongoing	$387,970
Food Sovereignty	Ongoing	Unknown

Appendix B: KBIC Governance Structure



Note: The Tribal Court has been made a separate branch by Constitutional amendment, Article IX Judicial branch. The Gaming Commission has been established through Tribal Code, Title Eighteen. Government Accounting, Gaming Commission staff, and Tribal Court staff follow the Personnel Policy. Business Enterprises will follow the Enterprises Employment Manual. Casino Surveillance and Ojibwa Casino employees from Baraga and Marquette follow the Ojibwa Casinos Employment Manual.


Government Departments
Administrative Services
Accounting
Grants
Information Technology
Personnel
Emergency Services
Fire/Emergency Management
Police
Community Services
Community Assistance Programs
Commodity Foods
Education
Enrollment/Licensing
Housing
Seniors/Elderly Nutrition
Public Works
Cleaning
Maintenance
Roads
Health and Family Services
KBIC Health Systems
Pre-Primary
Social Services
Substance Abuse Programs
Transitional Home Programs and Services
Youth/Fitness
Land Stewardship
Forestry
Natural Resources
Realty
Tribal Historic Preservation Office
Language

Appendix C: KBIC Critical Facilities and Cultural Assets

INDICATE ALL LOCATIONS THAT ARE VACANT AND/OR UNOCUPIED AND DATE OCCURRED

PREPARED BY
Tribal First
P.O. Box 609015
San Diego, CA 92160 858-541-1900

SQ. FEET

KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

Real Property Trend Factor: 0.89%
Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
1		AIRPORT TERMINAL BUILDING	27,810 SQ. FT.	Class: C	No	1985	2010	EQ:	Yes	Yes	Yes	*2015*	*$4,125,839*	*$0*	*$0*	*$4,125,839*
Your Location 4-1		VACANT 198 AIRPORT ROAD NEGAUNEE MI 49866 Stories: 2	AIRPORT TERMINAL BUILDING	MASONRY CONST/WOOD ROOF Notes: Building is Vacant. Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$4,125,839	$0	$0	$4,125,839
Lat: 46.531331		Lng. -87.557651		Valuation Type: Stated Value												
2		AIRPORT TERMINAL BUILDING	5,003 SQ. FT.	Class: C	No	1985	2010	EQ:	Yes	Yes	Yes	*2015*	*$843,269*	*$0*	*$0*	*$843,269*
Your Location 5-1		VACANT 198 AIRPORT ROAD NEGAUNEE MI 49866 Stories: 1	AIRPORT TERMINAL BUILDING Pct. Sprnkl: 0	MASONRY CONST/WOOD ROOF Notes: Building was vacant. Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$843,269	$0	$0	$843,269
Lat: 46.531331		Lng. -87.557651		Valuation Type: Stated Value												
3		BINGO HALL	9,600 SQ. FT.	Class: S	No	1995	2010	EQ:	Yes	Yes	Yes	*2015*	*$1,375,172*	*$144,460*	*$0*	*$1,519,632*
Your Location 6-1		795 MICHIGAN AVENUE BARAGA MI 49908 Stories: 1	BINGO HALL 08-09 RC UPDATE Pct. Sprnkl: 0	ALL STEEL Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$1,387,411	$144,980	$0	$1,532,391
Lat: 46.779287		Lng. -88.498696														
4		CAMPGROUND ARBOR	240 SQ. FT.	Class:	No			EQ:	Yes	Yes	Yes	*2015*	*$0*	*$12,196*	*$0*	*$12,196*
Your Location 7-1		US 41 NORTH BARAGA MI 49908	CAMPGROUND ARBOR	UNKNOWN Notes: Treated 6x8 Construction Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$0	$12,240	$0	$12,240
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP													
5		3 TOILET BLDGS AT	1,002 SQ. FT.	Class: CB	No	1998	2010	EQ:	Yes	Yes	Yes	*2015*	*$153,944*	*$0*	*$0*	*$153,944*
Your Location 2-1		CAMPGROUNDS & SHOWER US 41 NORTH BARAGA MI 49908 Stories: 1	2-TOILET BUILDING AT CAMPGROUNDS & SHOWER 08-09 RC UPDATE,09-10 RC UPDATE	CONCRETE BLOCK Notes: Metal Roof; 3 stalls Women, 3 stalls men, 4 sinks, 2 50-gallon hot water heaters. Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$155,314	$0	$0	$155,314
Lat:		Lng.	Pct. Sprnkl: 0 Geocode Notes: Could not map this address. Found: ZIP													

INDICATE ALL LOCATIONS THAT ARE VACANT AND/OR UNOCUPIED AND DATE OCCURRED

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KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

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Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
6		CAMPGROUND BLEACHERS	0 SQ. FT.	Class: A	No			EQ:		Yes	Yes	Yes	*2015*	*$0*	*$5,000*	*$0*	*$5,000*
Your Location 8-1		US 41 NORTH BARAGA MI 49908	CAMPGROUND BLEACHERS 4 SETS OF ALUMINUM BLEACHERS	NON COMB STEEL FRAME Notes: Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$0	$5,000	$0	$5,000
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP														
9		CAMPGROUND HOUSE	1,800 SQ. FT.	Class: D	No	2001	2010	EQ:		Yes	Yes	Yes	*2015*	*$181,169*	*$0*	*$0*	*$181,169*
Your Location 9-1		two family frame residential structure US 41 NORTH BARAGA MI 49908 Stories: 1	CAMPGROUND HOUSE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Multi family dwelling. Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$182,781	$0	$0	$182,781
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP														
9	A	Storage buildings	256 SQ. FT.	Class: D	No	2006	2010	EQ:		Yes	Yes	Yes	*2015*	*$4,014*	*$0*	*$0*	*$4,014*
Your Location 9-2		(2) Storage Buildings US 41 NORTH BARAGA MI 49908 Stories: 1	Storage buildings Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: There are two pre-fabricated storage buildings here at the Campgournd House. Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$4,050	$0	$0	$4,050
Lat:		Lng.															
10		2 PAVILLIONS AT CAMPGROUND	1,728 SQ. FT.	Class: D	No	2005	2010	EQ:		Yes	Yes	Yes	*2015*	*$166,418*	*$0*	*$0*	*$166,418*
Your Location 1-1		US 41 NORTH BARAGA MI 49908 Stories: 1	2 PAVILLIONS AT CAMPGROUND 07-08 RC UPDATE / 08-09 RC UPDATE	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Costs shown are combined for two identical pavillions at this locaiton.				Flood: Rent Notes:		Yes	Yes	Yes	2016	$167,899	$0	$0	$167,899
Lat:		Lng.	Pct. Sprnkl: 0 Geocode Notes: Could not map this address. Found: ZIP	Alarms:													

INDICATE ALL LOCATIONS THAT ARE VACANT AND/OR UNOCUPIED AND DATE OCCURRED

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KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

Real Property Trend Factor: 0.89%
Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
12		CASINO & HOTEL COMBINED	56,844 SQ. FT.	Class: M	Yes	1990	2010	EQ:		Yes	Yes	Yes
Your Location 10-1		Casino 60% Motel 40% Frame Const. 16449 MICHIGAN AVENUE BARAGA MI 49908 Stories: 2	CASINO & HOTEL Pct. Sprnkl: 50	MIXED NON-COMB/COMB Notes: Casino - Metal Frame - 34,392 sqft Hotel - Wood Frame - 28,452sqft Year Built is estimated. Alarms: Hotel Portion was sprinklered, the Casino portion was not.				Flood: Rent Notes:		Yes	Yes	Yes
Lat:		Lng.	Geocode Notes: Precision: Nearest Numbered Block Nearest Address: [800-899] Michigan Ave Baraga, Lat: 46.77925 Lng: -88.49705									

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$7,974,845*	*$10,324,769*	*$2,109,625*	*$20,409,239*
2016	$8,045,821	$10,361,938	$3,050,996	$21,458,755

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
13		CASINO MAINTENANCE GARAGE	6,000 SQ. FT.	Class: D	No	2005	2010	EQ:		Yes	Yes	Yes
Your Location 11-1		797 MICHIGAN AVENUE BARAGA MI 49908 Stories: 1	CASINO MAINTENANCE GARAGE 09-10 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat: 46.779289		Lng. -88.498537										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$433,932*	*$3,049*	*$0*	*$436,981*
2016	$437,794	$3,060	$0	$440,854

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
14		CASINO STORAGE BUILDING - INDUSTRIAL PARK	3,200 SQ. FT.	Class: D	No	2007	2010	EQ:		Yes	Yes	Yes
Your Location 12-1		Maintenance Storage Bldg 388 OJIBWA INDUSTRIAL PARK BARAGA MI 49908 Stories: 1	CASINO STORAGE BUILDING - INDUSTRIAL PARK Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year built is an estimate. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP									

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$173,807*	*$12,196*	*$0*	*$186,003*
2016	$175,354	$12,240	$0	$187,594

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
15		WAREHOUSE / FOOD DISTRIBUTION/GARAGE	3,384 SQ. FT.	Class: M	No	1980	2010	EQ:		Yes	Yes	Yes
Your Location 75-1		Metal Skin - Food Distribution 16613 SKANEE ROAD LANSE MI 49946 Stories: 1	WAREHOUSE / FOOD DISTRIBUTION/GARAGE 08-09 RC UPDATE,09-10 RC UPDATE Pct. Sprnkl: 0	MIXED NON-COMB/COMB Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP									

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$243,235*	*$94,213*	*$0*	*$337,448*
2016	$245,400	$94,552	$0	$339,952

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KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

Real Property Trend Factor: 0.89%
Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
15	A	FOOD DISTRIBUTION/GARAGE Metal Skin - Food Distribution 16613 SKANEE ROAD LANSE MI 49946 Stories: 1	768 SQ. FT. WAREHOUSE / FOOD DISTRIBUTION/GARAGE 08-09 RC UPDATE,09-10 RC UPDATE	Class: D ALL COMB (WOOD FRAME) Notes: Metal skin, frame building. Not currently on the SOV. Part of the Food Distribution Center at this location.	No	2003	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes
Your Location 75-2		Lat: Lng.	Pct. Sprnkl: 0	Alarms:								
		Geocode Notes: Precision: ZIP Code										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$74,081*	*$0*	*$0*	*$74,081*
2016	$74,740	$0	$0	$74,740

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr				Zone	Real Prop	Pers Prop	BI / Rents
15	B	40 KW SOLAR SYSTEM 16613 SKANEE ROAD 40 KW SOLAR SYSTEM LANSE MI 49946	0 SQ. FT. 40 KW SOLAR SYSTEM	Class: S ALL STEEL Notes: for a free standing 40 KW Solar System Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes
		Lat: Lng. Geocode Notes: Precision: ZIP Code										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$81,000*	*$0*	*$0*	*$81,000*
2016	$81,721	$0	$0	$81,721

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr				Zone	Real Prop	Pers Prop	BI / Rents
17		NIIWIN AKEAA COMMUNITY CENTER 111BEARTOWN ROAD BARAGA MI 49908	26,151 SQ. FT. NIIWIN AKEA COMM. CTR / OJIBWA COMM. COLLEGE	Class: S ALL STEEL Notes: Alarms:	Yes			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes
Your Location 13-1			Pct. Sprnkl: 100%									
		Lat: 46.851956 Lng. -88.486888										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$4,200,389*	*$514,277*	*$0*	*$4,714,666*
2016	$4,237,772	$516,128	$0	$4,753,900

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr				Zone	Real Prop	Pers Prop	BI / Rents
20		FIREFIGHER BUILDING / TWO SHEDS (3) separate structures here 15911 Diamond Hill Road Lanse MI 49946 Stories: 1	1,192 SQ. FT. FIREFIGHTER BUILDING / TWO SHEDS	Class: M MIXED NON-COMB/COMB Notes: Three buildings here at this corrected address: Firefighters office bldg. Frame 32x24 A Frame Shed 20x14 and a small block shed 12x12. The two smaller sheds are used to house receiveing and monitoring equipment from the radio tower. See photo. Alarms:	No	2010		EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes
Your Location 18-1		Lat: Lng. Geocode Notes: Precision: ZIP Code										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$123,858*	*$0*	*$0*	*$123,858*
2016	$124,960	$0	$0	$124,960

INDICATE ALL LOCATIONS THAT ARE VACANT AND/OR UNOCUPIED AND DATE OCCURRED

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KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

Real Property Trend Factor: 0.89%
Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
21		PUBLIC WORKS OFFICE	960 SQ. FT.	Class: D	No	2002	2010	EQ:		Yes	Yes	Yes	*2015*	*$125,615*	*$50,000*	*$0*	*$175,615*
Your Location 31-1		Small Frame Office 16376 OJIBWA INDUSTRIAL PARK ROAD BARAGA MI 49908 Stories: 1	PUBLIC WORKS OFFICE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$126,733	$50,090	$0	$176,823
Lat:		Lng.	Geocode Notes: Precision: ZIP Code														
22		PUBLIC WORKS FLEET GARAGE	1,800 SQ. FT.	Class: D	No	1998	2010	EQ:		Yes	Yes	Yes	*2015*	*$161,483*	*$150,000*	*$0*	*$311,483*
Your Location 32-1		Service Repair Garage 16382 OJIBWA INDUSTRIAL PARK ROAD BARAGA MI 49909 Stories: 1	PUBLIC WORKS FLEET GARAGE 08-09 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: On the attached photo, this bulding is the one on the right. The one on the left is the Casino Storage Building. Drawing of all structures at this location attached. Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$162,920	$150,000	$0	$312,920
Lat:		Lng.	Geocode Notes: Precision: City														
23		GREEN BUILDING	2,278 SQ. FT.	Class: D	No	1960	2010	EQ:		Yes	Yes	Yes	*2015*	*$306,311*	*$30,491*	*$0*	*$336,802*
Your Location 26-1		DOWNTOWN GARAGE / COLLEGE Residence now classroom 325 SUPERIOR AVENUE BARAGA MI 49908 Stories: 2	GREEN BUILDING DOWNTOWN GARAGE / COLLEGE 08-09 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. This structure includes both SOV 26-1 and 27-1 Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$309,037	$30,601	$0	$339,638
Lat: 46.777516		Lng. -88.489373															
27		GREEN HOUSE SHED	96 SQ. FT.	Class: D	No	2000	2010	EQ:		Yes	Yes	Yes	*2015*	*$1,975*	*$0*	*$0*	*$1,975*
Your Location 28-1		Prefab Storage Bldg 325 SUPERIOR AVENUE BARAGA MI 49908 Stories: 1	Storage Building Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes	2016	$1,993	$0	$0	$1,993
Lat: 46.777516		Lng. -88.489373															

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Personal Property Trend Factor: 0.36%

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Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents
30		OJIBWA CASINO II	26,958 SQ. FT.	Class: S	No	2002	2010	EQ:	Yes	Yes	Yes
Your Location		105 ACRE TRAIL	OJIBWA CASINO II	ALL STEEL				Flood:	Yes	Yes	Yes
30-1		MARQUETTE MI 49855		Notes:				Rent Notes:			
		Stories: 2	Pct. Sprnkl: 0%	Alarms:							
Lat: 46.482202		Lng. -87.242816									
30	A	Storage Building	120 SQ. FT.	Class: D	No	2005	2010	EQ:	Yes	Yes	Yes
Your Location		Storage Bldg	Storage Buidling	ALL COMB (WOOD FRAME)				Flood:	Yes	Yes	Yes
30-1		105 ACRE TRAIL		Notes: Simple Storage building on the back				Rent Notes:			
		MARQUETTE MI 49855	Pct. Sprnkl: 0%	of the Casino							
		Stories: 1		Alarms:							
Lat: 46.482202		Lng. -87.242816									
31		DONALD LAPOINTE HEALTH	13,232 SQ. FT.	Class: D	Yes	1996	2010	EQ:	Yes	Yes	Yes
Your Location		CENTER	DONALD LAPOINTE HEALTH	ALL COMB (WOOD FRAME)				Flood:	Yes	Yes	Yes
17-1		2-Story Frame Medical Office	CENTER	Notes: SOV is showing two separate				Rent Notes:			
		102 SUPERIOR AVENUE	07-08 VALUE CHANGED TO	buildings here. There is only one plus a							
		BARAGA MI 49908	REFLECT ACCURATE RC	small storage building.							
		Stories: 2	Pct. Sprnkl: 100%	Alarms:							
Lat: 46.779536		Lng. -88.487875									
31	A	DONALD LAPOINTE HEALTH	128 SQ. FT.	Class: D	No	2005	2010	EQ:	Yes	Yes	Yes
Your Location		CENTER SMALL STORAGE	DONALD LAPOINTE HEALTH	ALL COMB (WOOD FRAME)				Flood:	Yes	Yes	Yes
17-1		BLDG	CENTER SMALL STORAGE	Notes: This is a small storage building.				Rent Notes:			
		This is a small storage Building	BLDG	SOV has two large Health Center buildings							
		102 SUPERIOR AVENUE		at this location and there is only one. I							
		BARAGA MI 49908	Pct. Sprnkl: 0	have made this SOV location number to be							
		Stories: 1		the Storage Building that was the only							
Lat: 46.779536		Lng. -88.487875		second building here. That there were no							
				other buildings here was confirmed by the							
				apprasier and by Mr. LaPointe the projects							
				manager for the tribe.							
				Alarms:							

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$4,065,461*	*$8,499,854*	*$7,731,082*	*$20,296,397*
2016	$4,101,644	$8,530,453	$7,995,914	$20,628,011
2015	*$2,298*	*$0*	*$0*	*$2,298*
2016	$2,318	$0	$0	$2,318
2015	*$3,770,261*	*$1,027,490*	*$2,083,573*	*$6,881,324*
2016	$3,803,816	$1,031,189	$2,731,680	$7,566,685
2015	*$308,528*	*$0*	*$0*	*$308,528*
2016	$311,274	$0	$0	$311,274

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Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
31	B	DONALD LAPOINTE HEALTH CENTER 102 SUPERIOR AVENUE BARAGA MI 49908	0 SQ. FT. ORDINARY PAYROLL 180 DAYS	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$0* $0	*$0* $0	*$1,351,235* $1,317,300	*$1,351,235* $1,317,300
Your Location 17-1		Lat: 46.779536 Lng. -88.487875															
32		EARLY HEAD START Metal but with a frame addition 2492 SKANEE ROAD LANSE MI 49946 Stories: 1	15,516 SQ. FT. EARLY HEAD START 08-09 RC UPDATE Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:	No	1984	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$2,077,462* $2,095,951	*$121,960* $122,399	*$0* $0	*$2,199,422* $2,218,350
Your Location 34-1		Lat: Lng. Geocode Notes: Could not map this address. Found: ZIP															
32	A	Stroage Buildings (2) prefab storage buildings at this loc 2492 SKANEE ROAD LANSE MI 49946 Stories: 1	176 SQ. FT. EARLY HEAD START 08-09 RC UPDATE Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: (2) pre-fabricated storage buildings at the Early Headstart loc. Alarms:	No	2005	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$3,196* $3,224	*$0* $0	*$0* $0	*$3,196* $3,224
Your Location 34-2		Lat: Lng. Geocode Notes: Precision: ZIP Code															
33		TRAILER PARK TRAILER PARK LANSE MI 49946	0 SQ. FT. WATER TOWER	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$139,269* $140,508	*$0* $0	*$0* $0	*$139,269* $140,508
Your Location 35-1		Lat: Lng. Geocode Notes: Could not map this address. Found: ZIP															
34		LIGHTHOUSE LIGHTHOUSE ROAD BARAGA MI 49908 Stories: 2	2,780 SQ. FT. LIGHTHOUSE Pct. Sprnkl: 0	Class: C MASONRY CONST/WOOD ROOF Notes: Year Built is an estimate. Building is in very good shape and has been well maintained. Alarms:	No	1935	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$395,428* $398,947	*$0* $0	*$0* $0	*$395,428* $398,947
Your Location 36-1		Lat: Lng. Geocode Notes: Could not map this address. Found: ZIP															

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Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
35		LIGHTHOUSE GARAGE	266 SQ. FT.	Class: D	No	1975	2010	EQ:		Yes	Yes	Yes
Your Location 37-1		LIGHTHOUSE ROAD BARAGA MI 49908 Stories: 1	LIGHTHOUSE GARAGE 07-08 RC UPDATE / 08-09 RC UPDATE	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Detached Garage - frame.				Flood: Rent Notes:		Yes	Yes	Yes
Lat:		Lng.	Pct. Sprnkl: 0 Geocode Notes: Could not map this address. Found: ZIP	Alarms:								

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$16,704*	*$0*	*$0*	*$16,704*
2016	$16,853	$0	$0	$16,853

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
37		MAINTENANCE GARAGE	2,016 SQ. FT.	Class: D	No	2002	2010	EQ:		Yes	Yes	Yes
Your Location 39-1		388 OJIBWA INDUSTRIAL PARK BARAGA MI 49908 Stories: 1	MAINTENANCE GARAGE 08-09 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP									

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$148,421*	*$24,393*	*$0*	*$172,814*
2016	$149,742	$24,481	$0	$174,223

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
38		MAINTENANCE GARAGE BY THE PINES	1,008 SQ. FT.	Class: D	No		2010	EQ:		Yes	Yes	Yes
Your Location 40-1		Metal exterior, frame building 503 HIGHWAY US 41 BARAGA MI 49908 Stories: 1	MAINTENANCE GARAGE BY THE PINES 08-09 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat: 46.787130		Lng. -88.477165										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$80,867*	*$12,196*	*$0*	*$93,063*
2016	$81,587	$12,240	$0	$93,827

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
39		MARINA	150 SQ. FT.	Class:	No			EQ:		Yes	Yes	Yes
Your Location 41-1		503 HWY US 41 BARAGA MI 49908	ALL LANDINGS/POLES/FLOATING DOCKS/FISH FLOATER	UNKNOWN Notes: 5' x 2' Each Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat: 46.787130		Lng. -88.477165										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$0*	*$48,783*	*$0*	*$48,783*
2016	$0	$48,959	$0	$48,959

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents
40		MARINA ANCHOR POLE/FLOATING DOCKS	0 SQ. FT.	Class: D	No			EQ:		Yes	Yes	Yes
Your Location 42-1		503 HWY US 41 BARAGA MI 49908	ANCHOR POLE/FLOATING DOCKS	ALL COMB (WOOD FRAME) Notes: Alarms:				Flood: Rent Notes:		Yes	Yes	Yes
Lat: 46.787130		Lng. -88.477165										

Year	Real Property	Personal Property	BI / Rents	Totals
2015	*$0*	*$6,099*	*$0*	*$6,099*
2016	$0	$6,121	$0	$6,121

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Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
42		MARINA GARAGE	576 SQ. FT.	Class: D	No		2010	EQ:	Yes	Yes	Yes	*2015*	*$28,983*	*$0*	*$0*	*$28,983*
Your Location 43-1		Maintenance Storage Building 503 HWY US 41 BARAGA MI 49908 Stories: 1	MARINA GARAGE 07-08 RC UPDATE / 08-09 RC UPDATE	ALL COMB (WOOD FRAME) Notes: Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$29,241	$0	$0	$29,241
Lat: 46.787130		Lng. -88.477165														
45		MARINA TRAILER	560 SQ. FT.	Class: D	No	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$33,939*	*$12,196*	*$0*	*$46,135*
Your Location 46-1		503 HWY US 41 BARAGA MI 49908 Stories: 1	MARINA TRAILER 07-08 RC UPDATE / 08-09 RC UPDATE,09-10 RC UPDATE	ALL COMB (WOOD FRAME) Notes: Caretaker's residence. Small mobile home - 40x14 Year Built is estimated.				Flood: Rent Notes:	Yes	Yes	Yes	2016	$34,241	$12,240	$0	$46,481
Lat: 46.787130		Lng. -88.477165	Pct. Sprnkl: 0	Alarms:												
45	A	MARINA Storage Buildings	192 SQ. FT.	Class: D	No	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$3,654*	*$0*	*$0*	*$3,654*
Your Location 46-2		503 HWY US 41 BARAGA MI 49908 Stories: 1	Storage Buildings 07-08 RC UPDATE / 08-09 RC UPDATE,09-10 RC UPDATE	ALL COMB (WOOD FRAME) Notes: By the Caretaker's residence. Two small 8x12 storage buildings. Year Built is estimated.				Flood: Rent Notes:	Yes	Yes	Yes	2016	$3,687	$0	$0	$3,687
Lat: 46.787130		Lng. -88.477165	Pct. Sprnkl: 0	Alarms:												
46		FISH HATCHERY	3,232 SQ. FT.	Class: D	No	2005	2010	EQ:	Yes	Yes	Yes	*2015*	*$471,829*	*$62,809*	*$0*	*$534,638*
Your Location 20-1		Metal Laboratory Office PEQUAMING ROAD LANSE MI 49946 Stories: 1	FISH HATCHERY 07-08 VALUE CHANGED TO REFLECT ACCURATE RC Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$476,028	$63,035	$0	$539,063
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP													
47		FISH HATCHERY	1,260 SQ. FT.	Class: S	No	1950	2010	EQ:	Yes	Yes	Yes	*2015*	*$77,756*	*$60,979*	*$0*	*$138,735*
Your Location 21-1		PEQUAMING ROAD LANSE MI 49946 Stories: 1	FISH HATCHERY Pct. Sprnkl: 0	ALL STEEL Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$78,448	$61,199	$0	$139,647
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP													

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Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
48		NATURAL RESOURCE GENERATOR BUILDING	320 SQ. FT. NATURAL RESOURCE GENERATOR BUILDING 07-08 VALUE CHANGED,09-10 RC UPDATE	Class: D ALL COMB (WOOD FRAME)	No	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$21,931*	*$0*	*$0*	*$21,931*
Your Location 47-1		PEQUAMING ROAD LANSE MI 49947 Stories: 1	Pct. Sprnkl: 0	Notes: Year Built is estimated.Small Maintenance Storage bulding. Note, this value is for the structure only and does not include the generator housed within.				Flood: Rent Notes:	Yes	Yes	Yes	2016	$22,126	$0	$0	$22,126
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP	Alarms:												
49		FISH HATCHERY GARAGE	1,040 SQ. FT. FISH HATCHERY GARAGE 07-08 RC UPDATE / 08-09 RC UPDATE,09-10 RC UPDATE	Class: A NON COMB STEEL FRAME	No			EQ:	Yes	Yes	Yes	*2015*	*$119,012*	*$31,404*	*$0*	*$150,416*
Your Location 22-1		PEQUAMING ROAD LANSE MI 49948		Notes: Metal Pole				Flood: Rent Notes:	Yes	Yes	Yes	2016	$120,071	$31,517	$0	$151,588
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP	Alarms:												
50		FISH HATCHERY STORAGE	256 SQ. FT. FISH HATCHERY STORAGE	Class: D ALL COMB (WOOD FRAME)	No			EQ:	Yes	Yes	Yes	*2015*	*$67,337*	*$0*	*$0*	*$67,337*
Your Location 23-1		PEQUAMING ROAD LANSE MI 49949		Notes:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$67,936	$0	$0	$67,936
Lat:		Lng.	Geocode Notes: Could not map this address. Found: CITY	Alarms:												
50	A	FISH HATCHERY Office	528 SQ. FT. FISH HATCHERY STORAGE	Class: D ALL COMB (WOOD FRAME)	No	2010	2010	EQ:	Yes	Yes	Yes	*2015*	*$79,191*	*$0*	*$0*	*$79,191*
Your Location 20-2		Frame Office Building New PEQUAMING ROAD LANSE MI 49949 Stories: 1	Pct. Sprnkl: 0	Notes: This building was close to being completed at this location. It is a frame office building 22x24 photo attached.				Flood: Rent Notes:	Yes	Yes	Yes	2016	$79,896	$0	$0	$79,896
Lat:		Lng.		Alarms:												
51		New Day Treatment Center	10,808 SQ. FT. NEW DAY TREATMENT CENTER / SMOKE SHACK / STORAGE 09-10 RC UPDATE	Class: D ALL COMB (WOOD FRAME)	Yes	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$1,014,784*	*$24,393*	*$0*	*$1,039,177*
Your Location 48-2		2 wing Frame facility with a full basement L2407 NO BREWRY ROAD LANSE MI 49946 Stories: 2	Pct. Sprnkl: 50	Notes: Year Built is an estimate				Flood: Rent Notes:	Yes	Yes	Yes	2016	$1,023,816	$24,481	$0	$1,048,297
				Alarms:												

The above location is continued on the next page.

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Lat:		Lng.														
51	A	Storage Buildings	264 SQ. FT.	Class: D	Yes	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$4,622*	*$0*	*$0*	*$4,622*
Your Location 48-1		(2) Prefabricated Storage buildings L2407 NO BREWRY ROAD LANSE MI 49946 Stories: 1	NEW DAY TREATMENT CENTER / SMOKE SHACK / STORAGE 09-10 RC UPDATE Pct. Sprnkl: 50	ALL COMB (WOOD FRAME) Notes: Year Built is an estimate Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$4,663	$0	$0	$4,663
Lat:		Lng.														
52		OLDPOST BUILDING - LIBRARY	2,860 SQ. FT.	Class: CB	No	1950	2010	EQ:	Yes	Yes	Yes	*2015*	*$485,653*	*$12,196*	*$0*	*$497,849*
Your Location 49-1		Brick Library 409 SUPERIOR AVENUE BARAGA MI 49908 Stories: 1	OLD POST BUILDING - LIBRARY Pct. Sprnkl: 0	CONCRETE BLOCK Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$489,975	$12,240	$0	$502,215
Lat: 46.777045		Lng. -88.489728														
54		PINES CONVENIENCE & GAS	6,298 SQ. FT.	Class: CB	No			EQ:	Yes	Yes	Yes	*2015*	*$1,181,360*	*$917,606*	*$1,324,687*	*$3,423,653*
Your Location 51-1		503 HIGHWAY US 41 BARAGA MI 49908	PINES CONVENIENCE & GAS	CONCRETE BLOCK Notes: Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$1,191,874	$920,909	$1,375,187	$3,487,970
Lat: 46.787130		Lng. -88.477165														
58		PLANNING & DEV BUILDING W/BREEZEWAY	1,193 SQ. FT.	Class: D	No	1985	2010	EQ:	Yes	Yes	Yes	*2015*	*$203,332*	*$36,588*	*$0*	*$239,920*
Your Location 55-1		805 US HIGHWAY 41 BARAGA MI 49908 Stories: 1	PLANNING & DEV BUILDING WITH BREEZEWAY Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$205,142	$36,720	$0	$241,862
Lat: 46.772199		Lng. -88.491586														
59		RADIO STATION / OPTICAL OFFICE	2,808 SQ. FT.	Class: D	No	2002	2010	EQ:	Yes	Yes	Yes	*2015*	*$391,656*	*$134,155*	*$0*	*$525,811*
Your Location 57-1		805 US HIGHWAY 41 BARAGA MI 49908 Stories: 1	RADIO STATION / OPTICAL OFFICE 09-10 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$395,142	$134,638	$0	$529,780
Lat: 46.772199		Lng. -88.491586														

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KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

Real Property Trend Factor: 0.89%
Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
60		TRANSMITTER BUILDING	400 SQ. FT.	Class: D	No	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$23,619*	*$182,939*	*$0*	*$206,558*
Your Location 59-1		20x20 heavy duty frame power/transmission Bldg 47166 PARADISE HOUGHTON MI 49931 Stories: 1	TRANSMITTER BUILDING 07-08 VALUE CHANGED,09-10 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is an estimate Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$23,829	$183,598	$0	$207,427
Lat: 47.092445		Lng. -88.559420														
60	A	RADIO TOWER	0 SQ. FT.	Class:	No			EQ:	Yes	Yes	Yes	*2015*	*$65,631*	*$0*	*$0*	*$65,631*
		47168 PARADISE ROAD HOUGHTON MI 49931	RADIO TOWER	UNKNOWN Notes: Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$66,215	$0	$0	$66,215
Lat: 47.092528		Lng. -88.559469														
60	B	Office	1,066 SQ. FT.	Class: D	No	2009	2010	EQ:	Yes	Yes	Yes	*2015*	*$119,598*	*$0*	*$0*	*$119,598*
		Office Building 47168 PARADISE ROAD HOUGHTON MI 49931 Stories: 1	Office building Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Not currently listed on the SOV at this radio tower location in 47166 Paradise Rd., Houghton, Mi Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$120,662	$0	$0	$120,662
Lat: 47.092528		Lng. -88.559469														
61		SENIORS	10,253 SQ. FT.	Class: M	No	1985	2010	EQ:	Yes	Yes	Yes	*2015*	*$1,631,028*	*$61,443*	*$0*	*$1,692,471*
Your Location 60-1		208 MAIN AVENUE BARAGA MI 49908 Stories: 1	SENIORS 08-09 RC UPDATE Pct. Sprnkl: 0	MIXED NON-COMB/COMB Notes: Year Built is estimated. 50% would be around 1985. New addition would be about 2005. Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$1,645,544	$61,664	$0	$1,707,208
Lat: 46.783795		Lng. -88.487916														
62		SENIORS GARAGE	576 SQ. FT.	Class: D	No	2001	2010	EQ:	Yes	Yes	Yes	*2015*	*$28,185*	*$3,660*	*$0*	*$31,845*
Your Location 61-1		Residential - detached type garage 208 MAIN AVENUE BARAGA MI 49908 Stories: 1	SENIORS' GARAGE 08-09 RC UPDATE Pct. Sprnkl: 0	ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Nice, frame two bay detached garage Alarms:				Flood: Rent Notes:	Yes	Yes	Yes	2016	$28,436	$3,673	$0	$32,109
Lat: 46.783795		Lng. -88.487916														

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63		SEWAGE LIFT PUMP - POW WOW GROUNDS WHIRL-L-GIG ROAD LANSE MI 49946	0 SQ. FT. SEWAGE LIFT PUMP - POW WOW GROUNDS	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$22,313* $22,512	*$0* $0	*$0* $0	*$22,313* $22,512
Your Location 62-1		Lat: Lng.	Geocode Notes: Could not map this address. Found: ZIP														
64		SEWER LIFT STATION BLDG - WHIRL-L-GIG/ZEBRA RD WHIRL-L-GIG ROAD LANSE MI 49946	0 SQ. FT. SEWER LIFT STATION BUILDING - WHIRL-L-GIG/ ZEBA RD	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$3,282* $3,311	*$30,491* $30,601	*$0* $0	*$33,773* $33,912
Your Location 63-1		Lat: Lng.	Geocode Notes: Could not map this address. Found: ZIP														
65		SOCIAL SERVICE BLDG #2 Frame office building M-38 BARAGA MI 49908 Stories: 1	768 SQ. FT. SOCIAL SERVICE BUILDING 2 Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Year Built is estimated. This building is one of three office buildings here. The other two are attached. Alarms:	No	2001	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$106,597* $107,546	*$12,196* $12,240	*$0* $0	*$118,793* $119,786
Your Location 64-1		Lat: Lng.	Geocode Notes: Could not map this address. Found: STREET														
66		SOCIAL SERVICE BUILDING 3 M-38 BARAGA MI 49908 Stories: 1	768 SQ. FT. SOCIAL SERVICE BUILDING 3 Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Year Built is estimated. This building is attached to another just like it. Alarms:	No	2001	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$106,586* $107,535	*$12,196* $12,240	*$0* $0	*$118,782* $119,775
Your Location 65-1		Lat: Lng.	Geocode Notes: Could not map this address. Found: STREET														
67		SOCIAL SERVICE BUILDING - MAIN M-38 BARAGA MI 49908 Stories: 1	768 SQ. FT. SOCIAL SERVICE BUILDING - MAIN Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:	No	2001	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$106,597* $107,546	*$12,196* $12,240	*$0* $0	*$118,793* $119,786
Your Location 66-1		Lat: Lng.	Geocode Notes: Could not map this														

The above location is continued on the next page.

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Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
		address. Found: STREET														
69		LAW ENFORCEMENT	5,800 SQ. FT.	Class: D	No	1995	2010	EQ:	Yes	Yes	Yes	*2015*	*$652,910*	*$69,761*	*$0*	*$722,671*
Your Location		5258 US 41	LAW ENFORCEMENT	ALL COMB (WOOD FRAME)				Flood:	Yes	Yes	Yes	2016	$658,721	$70,012	$0	$728,733
68-1		BARAGA MI 49908		Notes: Wood Joists - Metal skin. Was a				Rent Notes:								
		Stories: 1	Pct. Sprnkl: 0	retail store but has been converted to an												
Lat:		Lng.	Geocode Notes: Could not map this	office building for the Tribal Police. Year												
			address. Found: ZIP	Built is estimated.												
				Alarms:												
70		LAW ENFORCEMENT CANOPY	2,080 SQ. FT.	Class: S	No	1995	2010	EQ:	Yes	Yes	Yes	*2015*	*$181,218*	*$0*	*$0*	*$181,218*
Your Location		5258 US 41	LAW ENFORCEMENT CANOPY	ALL STEEL				Flood:	Yes	Yes	Yes	2016	$182,831	$0	$0	$182,831
69-1		BARAGA MI 49908	07-08 RC UPDATE / 08-09 RC	Notes: Year Built is estimated.				Rent Notes:								
		Stories: 1	UPDATE	Alarms:												
Lat:		Lng.	Pct. Sprnkl: 0													
			Geocode Notes: Could not map this													
			address. Found: ZIP													
73		ADMINSTRATION BUILDING	11,760 SQ. FT.	Class: S	No	2004	2010	EQ:	Yes	Yes	Yes	*2015*	*$1,655,426*	*$121,960*	*$0*	*$1,777,386*
Your Location		Metal Office Bldg 16 foot high	ADMINISTRATION BUILDING	ALL STEEL				Flood:	Yes	Yes	Yes	2016	$1,670,159	$122,399	$0	$1,792,558
3-1		16429 BEARTOWN ROAD	08-09 RC UPDATE	Notes: Year Built is estimated.				Rent Notes:								
		BARAGA MI 49908	Pct. Sprnkl: 0%	Alarms:												
		Stories: 1														
Lat:		Lng.	Geocode Notes: Could not map this													
			address. Found: ZIP9													
75		TRIBAL CONSTRUCTION	3,678 SQ. FT.	Class: S	No	1978	2010	EQ:	Yes	Yes	Yes	*2015*	*$354,534*	*$31,404*	*$0*	*$385,938*
Your Location		Metal Service Garage - 2 story	TRIBAL CONSTRUCTION	ALL STEEL				Flood:	Yes	Yes	Yes	2016	$357,689	$31,517	$0	$389,206
71-1		on one side.		Notes: Year Built is estimated.				Rent Notes:								
		222 N MAIN	Pct. Sprnkl: 0	Alarms:												
		BARAGA MI 49908														
		Stories: 2														
Lat: 46.783594		Lng. -88.487911														

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76		TRIBAL CONSTRUCTION BIG GARAGE	4,992 SQ. FT. TRIBAL CONSTRUCTION BIG GARAGE	Class: S ALL STEEL	No	1976	2010	EQ:		Yes	Yes	Yes	*2015*	*$127,352*	*$62,809*	*$0*	*$190,161*
Your Location 72-1		Metal Skin over frame large equipment barn	Notes:					Flood:		Yes	Yes	Yes	2016	$128,485	$63,035	$0	$191,520
		222 N MAIN	Alarms:					Rent Notes:									
		BARAGA MI 49908	Pct. Sprnkl: 0														
		Stories: 1															
Lat: 46.783594		Lng. -88.487911															
77		TRIBAL CONSTRUCTION SMALL GARAGE	400 SQ. FT. TRIBAL CONSTRUCTION SMALL GARAGE	Class: D ALL COMB (WOOD FRAME)	No	1980	2010	EQ:		Yes	Yes	Yes	*2015*	*$14,787*	*$0*	*$0*	*$14,787*
Your Location 73-1		222 N MAIN	08-09 RC UPDATE	Notes: Year Built is estimated. Small Frame Storage Building 24x16				Flood:		Yes	Yes	Yes	2016	$14,919	$0	$0	$14,919
		BARAGA MI 49908	Pct. Sprnkl: 0					Rent Notes:									
		Stories: 1		Alarms:													
Lat: 46.783594		Lng. -88.487911															
77	A	TRIBAL CONSTRUCTION GARAGE	576 SQ. FT. TRIBAL CONSTRUCTION SMALL GARAGE	Class: D ALL COMB (WOOD FRAME)	No	2008	2010	EQ:		Yes	Yes	Yes	*2015*	*$19,036*	*$0*	*$0*	*$19,036*
Your Location 73-2		New frame garage at this loc	08-09 RC UPDATE	Notes: Small Frame garage Storage Building 24x24 not currently listed on SOV				Flood:		Yes	Yes	Yes	2016	$19,205	$0	$0	$19,205
		222 N MAIN	Pct. Sprnkl: 0					Rent Notes:									
		BARAGA MI 49908		Alarms:													
		Stories: 1															
Lat: 46.783594		Lng. -88.487911															
78		TRIBAL COURT / OUTPATIENT	3,848 SQ. FT. TRIBAL COURT / OUTPATIENT	Class: D ALL COMB (WOOD FRAME)	No	2007	2010	EQ:		Yes	Yes	Yes	*2015*	*$526,182*	*$48,783*	*$0*	*$574,965*
Your Location 74-1		US 41 NORTH	08-09 RC UPDATE	Notes: 65% court office, 35% medical office. Year Built is estimated.				Flood:		Yes	Yes	Yes	2016	$530,865	$48,959	$0	$579,824
		BARAGA MI 49908	Pct. Sprnkl: 0					Rent Notes:									
		Stories: 1		Alarms:													
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP														
79		NORTH & SOUTH TUB CRAFT BUILDING/PUBLIC WORKS	18,900 SQ. FT. NORTH & SOUTH TUB CRAFT BUILDING/PUBLIC WORKS	Class: S ALL STEEL	No	1995	2010	EQ:		Yes	Yes	Yes	*2015*	*$1,058,063*	*$1,300,000*	*$0*	*$2,358,063*
Your Location 33-1		16364 OJIBWA INDUSTRIAL PARK ROAD	07-08 RC UPDATE / 08-09 RC UPDATE	Notes: Year Built is estimated.				Flood:		Yes	Yes	Yes	2016	$1,067,480	$1,300,000	$0	$2,367,480
		BARAGA MI 49908		Alarms:				Rent Notes:									
		Stories: 1	Pct. Sprnkl: 0														
Lat:		Lng.	Geocode Notes: Precision: ZIP Code														

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80		USDA AGRICULTRUAL BUILDING Office Building - Frame 16403 OJIBWA INDUSTRIAL PARK BARAGA MI 49908 Stories: 1	2,620 SQ. FT. USDA AGRICULTURAL BUILDING 08-09 RC UPDATE Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:	No	2004	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$375,564* $378,907	*$0* $0	*$0* $0	*$375,564* $378,907
Your Location 75-1		Lat: Lng.	Geocode Notes: Precision: ZIP Code														
81		WATER PLANT - BAYSHORE ROAD 16614 PEQUAMING ROAD LANSE MI 49946 Stories: 1	884 SQ. FT. WATER PLANT - BAYSHORE ROAD NEWLY CONSTRUCTED Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Year Built is estimated. Alarms:	No	1990	2010	EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$98,696* $99,574	*$376,855* $378,212	*$0* $0	*$475,551* $477,786
Your Location 77-1		Lat: Lng.	Geocode Notes: Could not map this address. Found: ZIP														
82		EDP- BARAGA CASINO 297A MICHIGAN AVENUE BARAGA MI 49908	0 SQ. FT. EDP - BARAGA CASINO	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$0* $0	*$800,000* $800,000	*$0* $0	*$800,000* $800,000
Lat: 46.779290		Lng. -88.508573															
82	A	EDP - HARVEY CASINO M-28 HARVEY MI 49855	0 SQ. FT. EDP - HARVEY CASINO	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$0* $0	*$648,018* $650,351	*$0* $0	*$648,018* $650,351
Lat:		Lng.	Geocode Notes: Could not map this address. Found: STREET														
84		RADIO TOWER PEQUAMING ROAD LANSE MI 49855	0 SQ. FT. RADIO TOWER	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:		Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$19,688* $19,863	*$0* $0	*$0* $0	*$19,688* $19,863
Your Location 78-1		Lat: Lng.	Geocode Notes: Precision: ZIP Code														

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85		RADIO TOWER	0 SQ. FT.	Class:	No			EQ:		Yes	Yes	Yes	*2015*	*$63,007*	*$0*	*$0*	*$63,007*
			RADIO TOWER	UNKNOWN				Flood:		Yes	Yes	Yes	2016	$63,568	$0	$0	$63,568
Your Location 78-2		BARAGA MI 49855		Notes:				Rent Notes:									
				Alarms:													
Lat:		Lng.	Geocode Notes: Cannot map due to missing address information														
86	A	MAINTENANCE BUILDING	2,880 SQ. FT.	Class: S	No	1990	2010	EQ:		Yes	Yes	Yes	*2015*	*$190,107*	*$12,196*	*$0*	*$202,303*
		Metal Skin, wood joisted maint	MAINTENANCE BUILDING	ALL STEEL				Flood:		Yes	Yes	Yes	2016	$191,799	$12,240	$0	$204,039
Your Location 79-2		storage bldg.	08-09 RC UPDATE	Notes: Year Built is estimated.				Rent Notes:									
		M38	Pct. Sprnkl: 0	Alarms:													
		BARAGA MI 49908															
		Stories: 1															
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP														
88		BANK	1,160 SQ. FT.	Class: D	No	1970	2010	EQ:		Yes	Yes	Yes	*2015*	*$36,678*	*$0*	*$0*	*$36,678*
		M-28	BANK BUILDING	ALL COMB (WOOD FRAME)				Flood:		Yes	Yes	Yes	2016	$37,004	$0	$0	$37,004
		HARVEY MI 49855		Notes: Year Built is estimated.				Rent Notes:									
		Stories: 1	Pct. Sprnkl: 0	Building is vacant and abandoned. Holes in the walls and roof. The Bank occupancy does not apply at this time. Occupancy at best would be would be storage only. I have classed it as a low quality maiintenance storage building.													
Lat:		Lng.	Geocode Notes: Could not map this address. Found: STREET	Alarms:													
89		LAW ENFORCEMENT, POLE	1,440 SQ. FT.	Class: D	No		2010	EQ:		Yes	Yes	Yes	*2015*	*$84,560*	*$12,196*	*$0*	*$96,756*
		BARN	LAW ENFORCEMENT, POLE	ALL COMB (WOOD FRAME)				Flood:		Yes	Yes	Yes	2016	$85,313	$12,240	$0	$97,553
		Maintence Bldg Metal over wood	BARN	Notes:				Rent Notes:									
		5258 US 41	08-09 RC UPDATE	Alarms:													
		BARAGA MI 49908	Pct. Sprnkl: 0														
		Stories: 1															
Lat:		Lng.	Geocode Notes: Could not map this address. Found: ZIP														

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90		WATER STATION 388 OJIBAWA INDUSTRIAL PARK BARAGA MI 49946	0 SQ. FT. WATER STATION	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:	Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$0* $0	*$30,491* $30,601	*$0* $0	*$30,491* $30,601
Lat:	Lng.	Geocode Notes: Could not map this address. Found: ZIP														
103		EDP - TRIBE VARIOUS BARAGA MI 49908	0 SQ. FT. EDP - TRIBE	Class: UNKNOWN Notes: Alarms:	No			EQ: Flood: Rent Notes:	Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$0* $0	*$864,947* $868,061	*$0* $0	*$864,947* $868,061
Lat:	Lng.	Geocode Notes: Could not map this address. Found: ZIP														
104		EVEN START DEPT. Residence type office building 755 MICHIGAN AVENUE (M38) BARAGA MI 49908 Stories: 1	3,168 SQ. FT. EVEN START DEPT. Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: The square footage of this building was nearly double that previously shown, however, the extra footage found was due to the building having a basement. Also, a percentage of the first floor occupancy was a built in garage. Alarms:	No	1976	2010	EQ: Flood: Rent Notes:	Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$247,092* $249,291	*$6,099* $6,121	*$0* $0	*$253,191* $255,412
Lat: 46.779276	Lng. -88.502332															
106		RENTAL Residence - rental GOVT. LOT 2 SEC. 19 T51N. R32W 15660 PEQUAMING ROAD L'ANSE MI 49946 Stories: 1	944 SQ. FT. RESIDENTAL RENTAL Pct. Sprnkl: 0	Class: D ALL COMB (WOOD FRAME) Notes: Alarms:	No	1992	2010	EQ: Flood: Rent Notes:	Yes Yes	Yes Yes	Yes Yes	*2015* 2016	*$93,204* $94,034	*$9,898* $9,934	*$5,000* $5,000	*$108,102* $108,968
Lat:	Lng.	Geocode Notes: Could not map this address. Found: ZIP														

INDICATE ALL LOCATIONS THAT ARE VACANT AND/OR UNOCUPIED AND DATE OCCURRED

PREPARED BY
Tribal First
P.O. Box 609015
San Diego, CA 92160 858-541-1900

KEWEENAW BAY INDIAN COMMUNITY

Includes B & M

Real Property Trend Factor: 0.89%
Personal Property Trend Factor: 0.36%

May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs	Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
107		OUTPATIENT SERVICES	1,895 SQ. FT.	Class:	No	1990		EQ:	Yes	Yes	Yes	*2015*	*$0*	*$26,915*	*$0*	*$26,915*
		202 US HWY 41	OUTPATIENT SERVICES	UNKNOWN				Flood:	Yes	Yes	Yes	2016	$0	$27,012	$0	$27,012
		BARAGA MI 49908		Notes: Brick & Wood Construction				Rent Notes:								
		Stories: 1		Alarms:												
Lat: 46.781618		Lng. -88.484172														
108		ALL EQUIPMENT	0 SQ. FT.	Class: E	No			EQ:	Yes	Yes	Yes	*2015*	*$0*	*$1,000,000*	*$0*	*$1,000,000*
		VARIOUS	ALL EQUIPMENT	EQUIP (CONTRACT OR MOBILE)				Flood:	Yes	Yes	Yes	2016	$0	$1,000,000	$0	$1,000,000
		BARAGA MI 49908		Notes:				Rent Notes:								
				Alarms:												
Lat:		Lng.		Valuation Type: [X] RCV [ ] ACV												
109		INDUSTRIAL PARK	0 SQ. FT.	Class: S	No			EQ:	Yes	Yes	Yes	*2015*	*$0*	*$65,057*	*$0*	*$65,057*
		OJIBWA INDUSTRIAL PARK	OJIBWA COMMUNITY	ALL STEEL				Flood:	Yes	Yes	Yes	2016	$0	$65,291	$0	$65,291
		BARAGA MI 49908	COLLEGE	Notes:				Rent Notes:								
				Alarms:												
Lat:		Lng.														
110		SEAVOY DWELLING	800 SQ. FT.	Class: D	No			EQ:	Yes	Yes	Yes	*2015*	*$34,424*	*$0*	*$0*	*$34,424*
		15684 PEQUAMING ROAD	DWELLING	ALL COMB (WOOD FRAME)				Flood:	Yes	Yes	Yes	2016	$34,730	$0	$0	$34,730
		L'ANSE MI 49946		Notes: Mobile HOme				Rent Notes:								
				Alarms:												
Lat:		Lng.	Geocode Notes: Precision: ZIP Code	Valuation Type: Replacement Cost												
111		SEAVOY SHED	200 SQ. FT.	Class: D	No			EQ:	Yes	Yes	Yes	*2015*	*$5,738*	*$0*	*$0*	*$5,738*
		15684 PEQUAMING ROAD	SHED	ALL COMB (WOOD FRAME)				Flood:	Yes	Yes	Yes	2016	$5,789	$0	$0	$5,789
		L'ANSE MI 49946		Notes:				Rent Notes:								
				Alarms:												
Lat:		Lng.	Geocode Notes: Precision: ZIP Code													
113		EARLY CHILDHOOD	9,809 SQ. FT.	Class:	Yes	2010		EQ:	Yes	Yes	Yes	*2015*	*$1,724,718*	*$103,141*	*$0*	*$1,827,859*
		EDUCATION CENTER	EARLY CHILDHOOD	UNKNOWN				Flood:	Yes	Yes	Yes	2016	$1,740,068	$103,512	$0	$1,843,580
		112 COLLEGE ROAD	EDUCATION CENTER	Notes:				Rent Notes:								
		BARAGA MI 49908		Alarms:												
		Stories: 1	Pct. Sprnkl: 100													
Lat:		Lng.	Geocode Notes: Precision: ZIP Code													

INDICATE ALL LOCATIONS THAT ARE VACANT AND/OR UNOCUPIED AND DATE OCCURRED

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May 17, 2016

Loc #	2nd Id	Address, City, Zip	Occupancy	Construction	Auto Spklr	Year Built	Year Apprs		Zone	Real Prop	Pers Prop	BI / Rents	Year	Real Property	Personal Property	BI / Rents	Totals
115		KBIC SOLID WASTE FACILITY	4,672 SQ. FT.	Class: S	No			EQ:		Yes	Yes	Yes	*2015*	*$500,000*	*$10,000*	*$0*	*$510,000*
		162780 OJIBWAS INDUSTRIAL	WASTE TRANSFER STATION	ALL STEEL				Flood:		Yes	Yes	Yes	2016	$504,450	$10,036	$0	$514,486
		PARK RD.		Notes: fabricated steel				Rent Notes:									
		BARAGA MI 49908		Alarms:													
Lat:		Lng.	Geocode Notes: Precision: ZIP Code														
115	A	KBIC SOLID WASTE FACILITY	576 SQ. FT.	Class: D	No			EQ:		Yes	Yes	Yes	*2015*	*$30,000*	*$10,000*	*$0*	*$40,000*
		162780 OJIBWAS INDUSTRIAL	SCALE HOUSE	ALL COMB (WOOD FRAME)				Flood:		Yes	Yes	Yes	2016	$30,267	$10,036	$0	$40,303
		PARK RD.		Notes:				Rent Notes:									
		BARAGA MI 49908		Alarms:													
Lat:		Lng.	Geocode Notes: Precision: ZIP Code														

	Year	Real Property	Personal Property	BI / Rents	Totals
GRAND TOTALS:	2015	*$46,249,710*	*$28,299,403*	*$14,605,202*	*$89,154,315*
SPRINKLERED:	2015	*$18,689,619*	*$11,994,070*	*$4,193,198*	*$34,876,887*
UNSPRINKLERED:	2015	*$27,560,091*	*$16,305,333*	*$10,412,004*	*$54,277,428*
EARTHQUAKE:	2015	*$46,249,710*	*$28,299,403*	*$14,605,202*	*$89,154,315*
FLOOD:	2015	*$46,249,710*	*$28,299,403*	*$14,605,202*	*$89,154,315*

	Year	Real Property	Personal Property	BI / Rents	Totals
GRAND TOTALS:	2016	$46,617,105	$28,389,475	$16,476,077	$91,482,657
SPRINKLERED:	2016	$18,855,956	$12,037,248	$5,782,676	$36,675,880
UNSPRINKLERED:	2016	$27,761,149	$16,352,227	$10,693,401	$54,806,777
EARTHQUAKE:	2016	$46,617,105	$28,389,475	$16,476,077	$91,482,657
FLOOD:	2016	$46,617,105	$28,389,475	$16,476,077	$91,482,657

SIGNED / ACCEPTED BY: _____

DATE: _____

IMPORTANT, PLEASE READ PRIOR TO PROVIDING YOUR SIGNATURE ACKNOWLEDGEMENT

Scheduled Equipment – Please identify the Scheduled Equipment locations (if any) and select either Replacement Cost or Actual Cash Value as the valuation type by checking the appropriate box. If a valuation is not selected, Actual Cash Value will be the denoted valuation in the event of a loss.

Appendix D: Mitigation Funding and Resources

Mitigation Funding & Resources **Created: October 31th, 2019**

Federal Resources

Economic Development Administration (EDA): Provides grants and technical assistance to generate new employment, help retain existing jobs and stimulate industrial and commercial growth.

Economic Development Assistance: The U.S. Dept. of Commerce solicits applications from applicants in rural and urban areas to provide investments that support construction, non-construction, technical assistance, and revolving loan fund projects under EDA' Public Works and Economic Adjustment Assistance programs.

Additional Information: https://www.grants.gov/web/grants/view-opportunity.html?oppId=279842

Planning Program & Technical Assistance Programs: Develop Economic Development plans, studies, and analysis to build capacity, resiliency, and prosperity, particularly in an economically distressed area or region.

Additional Information: https://www.grants.gov/web/grants/view-opportunity.html?oppId=301960

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

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

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

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

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

Additional Information: https://restoreyoureconomy.org/

Environmental Protection Agency (EPA): Protect human and environmental health

Brownfields Program: Sub-programs include funding to conduct research and to provide training and technical assistance to communities, Targeted Brownfield Assessments, through funding to clean up and sustainably reuse contaminated properties.

Additional Information: https://www.epa.gov/brownfields

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Additional Information: https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html

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

Additional Information: https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html#Hazard_Mitigation

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National Flood Insurance Program: Community participation in the National Flood Insurance Program is mandatory for homeowners, business owners, and renters to purchase flood insurance. Insurance claims can be paid if a federal disaster in not declared by the president. Cost of insurance is based where property is located in the floodplain (Special Flood Hazard Area).

Additional Information: https://www.fema.gov/news-release/2006/07/20/fact-sheet-national-flood-insurance-program-nfip

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

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

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

Additional Information: https://www.michigan.gov/msp/0,4643,7-123-72297_60152_69727_69730_69734-15282--,00.html

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

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

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

Floodplain Management Services: Educate individuals on flood hazards and the actions they can take to reduce property damage and prevent the loss of life. Foster public understanding of the options for dealing with flood hazards and promote prudent use and management of the nation's floodplains

Additional Information: Contact Detroit District Area Office: (313) 226-5013

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Emergency Watershed Protection Program: Provides technical and financial assistance to preserve life and property threatened by excessive erosion and flooding from natural disasters. Owners, managers, and users of public, private, or tribal lands are eligible.

Additional Information:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/

Emergency Watershed Protection Program – Floodplain Easements: Purchase floodplain easements as an emergency measure to restore, protect, maintain, and enhance floodplain functions.

Additional Information:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/landscape/ewpp/?cid=nrcs143_008216

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

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

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

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

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

Additional Information: https://www.rd.usda.gov/files/ReConnect_Program-Factsheet.pdf

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

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

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

Additional Information: https://www.rd.usda.gov/files/RD_REDI_FactSheet_6519.pdf

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Additional Information: https://www.hud.gov/info/disasterresources

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

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

Rural Gateway: The Rural Gateway is an information clearinghouse providing technical assistance, training workshops, and peer learning and resource sharing to support rural housing and economic development.

Additional Information: https://www.hudexchange.info/programs/rural/

U.S. Department of the Interior (DOI): responsible for management and conservation of most federal land and natural resources

Invasive and Noxious Plant Management: Funds may be used on public, State county, and private lands for approved projects that prioritize and target undesirable plant species or group of species to be controlled or contained within a specific geographic area.

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

Plant Conservation and Restoration Management: Provides leadership in identifying, maintaining, and restoring Western native plant communities on public lands. Focus on more diverse forbs and grasses for the restoration of wildlife habitats and rehabilitation after wildfires. Improve habitat for western big-game winter range and migration corridors, and recovery of lands damaged by wildfire.

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

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

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

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

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

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

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

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

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

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

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

Additional Information: https://disasterloan.sba.gov/ela/Information/EIDLLoans

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

Additional Information:
https://disasterloan.sba.gov/ela/Information/HomePersonalPropertyLoans

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

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

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

Additional Information: https://disasterloan.sba.gov/ela/Information/MREIDLLoans

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State Resources

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

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-151085--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-151086--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-492719--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-498017--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314499--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314500--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314490--,00.html

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Scarp Tire Cleanup Grants: To assist property owners and local units of government with the proper removal of abandoned scrap tires and scrap tires at collection sites. Priority will be given to scrap tires accumulated prior to January 1, 1991, and to collection sites that pose an imminent threat to public health, safety, welfare, or the environment.

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314505--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-495979--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314506--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314515--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314509--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314512--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-492720--,00.html

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

Additional Information: https://www.michigan.gov/egle/0,9429,7-135-3307_3515-314495--,00.html

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

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

Additional Information: https://www.michigan.gov/invasives/0,5664,7-324-71276_92000---,00.html

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

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

Additional Information:
https://www.michigan.gov/documents/mdot/FHWA_Emergency_Relief_program_outline_Michigan_022113_418318_7.pdf

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

Additional Information: https://www.michigan.gov/mdot/0,4616,7-151-9621_17216_54903-227096--,00.html

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

Additional Information:
https://www.michigan.gov/documents/mdot/Guidelines_for_Applicants_623329_7.pdf

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

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

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

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Michigan Community Revitalization Program: Promotes community revitalization.

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

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Other

Local Resources & Programs

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

Additional Information: http://baragacountyfoundation.org/

Baraga, Houghton, and Keweenaw Community Action Agency: Has programs such as Western Upper Peninsula Food Bank, weatherization, emergency programs, Commodity Supplemental Food Program (CSFP), The Emergency Food Assistance Program (TEFAP), transportation, furnace and chimney cleaning/minor roof repairs and much more.

Additional Information: 926 Dodge St. Houghton, MI 49931 | (906) 482-5528
http://www.keweenaw.org/list/member/community-action-agency-houghton-71 ;
http://bhkcaa.org/index.html

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

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

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

Additional Information: https://www.dicsami.org/

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

Additional Information: http://www.ducklakeriparians.org/index.cfm

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

Additional: http://www.gocaa.org/index.cfm?fuseaction=dep_list

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

Additional Information: Tom Bremer (715) 554-0177

Habitat for Humanity Menominee River: Build and repair homes in Iron and Dickinson County. Make home improvements such as repairs and replacements of roofs, furnaces, water heaters, septic systems, and siding.

Additional Information: http://www.habitatmr.com/index.html

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

Additional Information: https://centralusa.salvationarmy.org/hancock

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

Additional Information: (906) 486-8121

Keweenaw Community Foundation: Strengthen all aspect of the Keweenaw and assist donors in achieving their philanthropic goals. Various grant applications are available.

Additional Information: http://keweenawcommunityfoundation.org/

Keweenaw Economic Development Alliance: Private-public partnership local economic development organization serving Baraga, Houghton, and Keweenaw Counties. Provides leadership and staffing to implement the Keweenaw Economic Dev. Strategic Plan with the goals of fostering business growth, improving infrastructure, revitalizing our communities, developing and attracting talent, and enhancing cultural and recreational opportunities.

Additional Information: https://kedabiz.com/about/

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

Additional Information: http://www.keweenawlandtrust.org/about.php

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

Additional Information: https://www.lakesuperiorcdc.com/

Portage Health Foundation: Offers grants and sponsorships for projects implementing and promoting health education, health research, community health, healthcare leaders and access to care. Also raises funds to help those in need after disasters.

Additional Information: http://phfgive.org/grants.php

Superior Health Foundation: Assists in meeting unmet health needs through education, programs, and research on illness prevention and health promotion. Several grants are provided through the foundation for non-profit health-centered organizations.

Additional Information: http://superiorhealthfoundation.org/

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

Additional Information: https://superiorwatersheds.org/projects

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

Additional Information: https://www.wuppdr.org/

Other

National Resources & Programs

Community Restoration & Resiliency: Keep America Beautiful Community Restoration and Resiliency Fund benefits Keep America Beautiful Affiliates that serve communities directly affected by natural and environmental disasters. The fund provides immediate and long-term support for initial and ongoing cleanup efforts and helps rebuild vital public spaces: parks, greenways, community gateways, Main Street/downtown areas, open spaces, and more. Funds will help improve resiliency physically — as green infrastructure — and socially — to build community.

Additional Information: https://www.kab.org/

Grants for Indigenous Peoples: Seventh Generation Fund is an Indigenous identity-based organization dedicated to the self-determination of Native Peoples and tribal sovereignty. It mobilizes financial, technical, and informational resources directly to Native communities to empower action. Grant awards in several categories ranging from $250 to $50,000. An organization may apply for a single large grant per year, with the possibility of additional Traveling Song Initiative or Mini-Grants.

Additional Information: http://www.7genfund.org/apply-grant

National Low-Income Housing Coalition: The National Low-Income Housing Coalition is dedicated solely to achieving socially just public policy that assures people with the lowest incomes in the United States have affordable and decent homes.

Additional Information: https://nlihc.org/issues/disaster

Planning for Post Disaster Recovery - Next Generation: American Planning Association provides tools and guidance with briefing papers, case studies, a comprehensive report, and model pre-event recovery ordinance.

Additional Information: https://www.planning.org/research/postdisaster/

Rebuilding Together: Rebuilding Together helps people and communities in need by bringing together its national network of local Rebuilding Together affiliates, corporate and individual donors, skilled trades individuals and associations, and almost 100,000 volunteers each year.

Additional Information: www.rebuildingtogether.org

Voluntary Organizations Active in Disasters: Association of organizations that mitigate and alleviate disaster impact. The website has a list of national partners that provide various services and programs for communities affected by disasters.

Additional Information: https://www.nvoad.org/voad-members/national-members/

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

Appendix E: KBIC Letter to Commit Match

KEWEENAW BAY INDIAN COMMUNITY

Keweenaw Bay Tribal Center
16429 Beartown Road
Baraga, Michigan 49908
Phone (906) 353-6623
Fax (906) 353-7540

November 21, 2018

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

Dear Mr. Wuorenmaa:

The Keweenaw Bay Indian Community (KBIC) understands that WUPPDR intends to apply, or already has, for Federal Emergency Management Agency (FEMA) funding to update the KBIC Hazard Mitigation Plan beginning in late 2018 or early 2019. The funding source, the Hazard Mitigation Grant Program, requires a nonfederal local share of at least 25 percent of the total project budget.

As KBIC will benefit significantly from this project through a plan of action to mitigate future hazards and disasters, as well as through establishment of eligibility for future FEMA pre- or post-disaster funding, KBIC commits to a local cost share not to exceed $2,500. This amount may be provided through in-kind services (facilitated and documented with assistance from KBIC emergency management staff), a cash contribution, or a combination of both.

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

Sincerely,

Warren C. Swartz, Jr.
President

Appendix F: Public Participation

2019 Keweenaw Bay Indian Community Public Survey

We need your help!

Keweenaw Bay Indian Community is currently drafting their five-year hazard mitigation plan as required by the Federal Emergency Management Agency (FEMA). The Western Upper Peninsula Planning & Development Region (WUPPDR) have been contracted to work with a local planning team and draft the Tribal Hazard Mitigation Plan. Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. This survey provides an opportunity for you to share your knowledge and participate in the hazard mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that help lessen the impact and risk of future hazard events to your community.

You can either fill out the attached paper survey or participate online at:
https://www.surveymonkey.com/r/KBICHazMitPublicInput

Although participation in this survey is optional, we strongly encourage you to respond. All responses will be kept confidential. **Please respond by July 19, 2019.** If you have questions regarding this survey or would like to learn about more ways that you can participate in the planning process, please contact:

Rachael Pressley, Assistant Regional Planner
WUPPDR
(906) 482-7205 ext. 116
rpressley@wuppdr.org

Paper surveys can be dropped off at:
KBIC Natural Resources Department (Attn: Dione Price)
14359 Pequaming Rd.
L'Anse, MI 49946

Thank you for your time and participation!

Natural Hazard Information

1. Where do you live?

☐ Arvon Township	☐ Baraga Township	☐ Covington Township
☐ L'Anse Township	☐ Spurr Township	☐ Village of Baraga
☐ Village of L'Anse	☐ L'Anse Reservation	☐ Off Reservation Trust

☐ Outside Baraga County; please specify: _____

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

☐ Yes ☐ No

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

3. How concerned are you about the following hazards affecting your home and community?

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
WEATHER HAZARDS					
Extreme Weather Temperatures (hot/cold)	☐	☐	☐	☐	☐
Fog	☐	☐	☐	☐	☐
Hail	☐	☐	☐	☐	☐
Ice and Sleet Storms	☐	☐	☐	☐	☐
Lightning	☐	☐	☐	☐	☐
Severe Winds (Windstorms)	☐	☐	☐	☐	☐
Snowstorms and Blizzards	☐	☐	☐	☐	☐
Tornados	☐	☐	☐	☐	☐
GEOLOGIC HAZARDS					
Earthquakes	☐	☐	☐	☐	☐
Landslide /Mudslide	☐	☐	☐	☐	☐
Subsidence (sink holes or ground collapse)	☐	☐	☐	☐	☐
HYDROLOGICAL HAZARDS					
Dam Failure	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐
Flooding due to precipitation event or snowmelt	☐	☐	☐	☐	☐

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

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

   ☐ Yes ☐ No

   IF YES, please explain:

5. Is your home located in a floodplain? ☐ Yes ☐ No ☐ Don't know

6. Does your street or home flood regularly during significant rain events? ☐ Yes ☐ No

   IF YES, provide cross street name and/or specific location(s) on street:

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

   ☐ 1 time ☐ 2 times ☐ 3 times ☐ 4 times ☐ 5 or more times

8. Do you have flood insurance? ☐ Yes ☐ No; ***please indicate reason(s) below*** ☐ Don't know

   ☐ Not Located in a floodplain
   ☐ Too expensive
   ☐ Property never floods
   ☐ Property is elevated or otherwise protected
   ☐ Insurance company will not provide
   ☐ Never considered / didn't know about it
   ☐ Other (specify):

   _____

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

   ☐ Newspaper
   ☐ Television
   ☐ Schools
   ☐ Radio
   ☐ Internet – Social Media (Facebook or Twitter)
   ☐ Internet – Government Website Postings
   ☐ Phone
   ☐ Mailings
   ☐ Public Forums / Meetings
   ☐ Newsletters/Fact Sheet
   ☐ Other (specify): _____
   _____
   _____

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

11. Several community-wide activities can reduce our risk from hazards. In general, these activities fall into one of six broad categories. Please tell us how important you think each one is for your community to consider doing:

Category	Very Important	Somewhat Important	Not Important
1. **Prevention** Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning & zoning, building codes, open space preservation, and floodplain regulations.	☐	☐	☐
2. **Property Protection** Modification or removal of existing buildings to protect them from a hazard. Examples include government purchase, relocation, raised elevation, and structural retrofits (updates).	☐	☐	☐
3. **Natural Resource Protection** Preservation or restoration of the functions of natural systems while minimizing hazard losses. Examples include floodplain protection, forest management, and slope stabilization.	☐	☐	☐
4. **Structural Projects** Modification of the natural conditions for or progression of a hazard. Examples include dams, levees, seawalls, detention/retention basins, channel modification, retaining walls, and storm sewers.	☐	☐	☐
5. **Emergency Services** Protection of people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of emergency facilities.	☐	☐	☐
6. **Public Education and Awareness** Informing of citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach, school education, library materials, and demonstration events.	☐	☐	☐

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

THANK YOU FOR YOUR PARTICIPATION!

PRESS RELEASE

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

Release Date: June 14, 2019

Keweenaw Bay Indian Community Hazard Mitigation Plan – Public Input Survey

Hazard mitigation is any action taken before, during or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. Officials in Keweenaw Bay Indian Community Natural Resources Department along with Emergency Services and the Office of Planning and Development are contracting with the Western Upper Peninsula Planning & Development Region to update the Tribal Hazard Mitigation Plan.

We are asking that any community resident take a short online survey. The paper survey is available at the Pines, Tribal Center, Ojibwa Seniors Center and Ojibwa Housing. The online survey is available www.wuppdr.org/surveys and will be available until Friday, July 19, 2019.

The survey link is as follows:

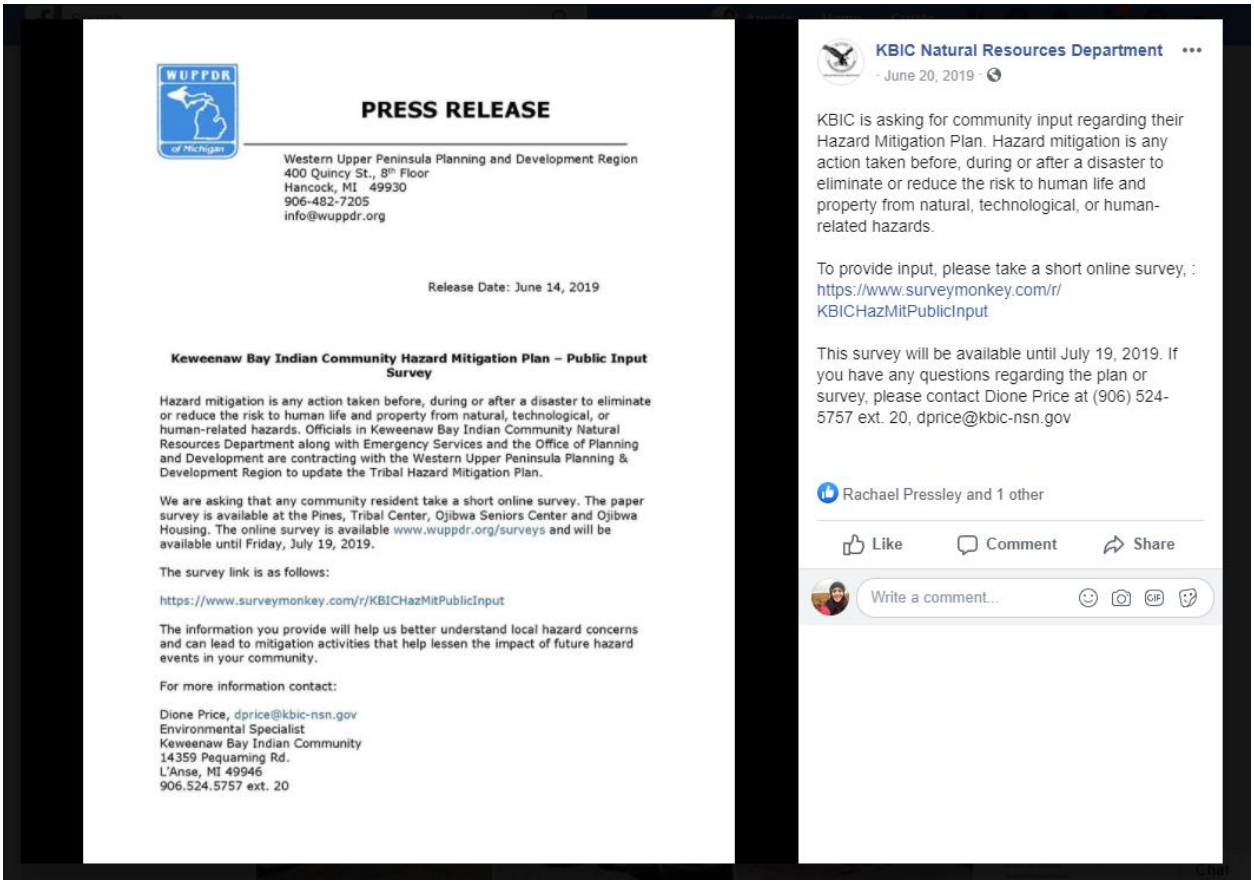
https://www.surveymonkey.com/r/KBICHazMitPublicInput

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

For more information contact:

Dione Price, dprice@kbic-nsn.gov
Environmental Specialist
Keweenaw Bay Indian Community
14359 Pequaming Rd.
L'Anse, MI 49946
906.524.5757 ext. 20

Public Survey press release and notification on social media:



PRESS RELEASE

Western Upper Peninsula Planning and Development Region
400 Quincy St., 8th Floor
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The information you provide will help us better understand local hazard concerns and can lead to mitigation activities that help lessen the impact of future hazard events in your community.

For more information contact:

Dione Price, dprice@kbic-nsn.gov
Environmental Specialist
Keweenaw Bay Indian Community
14359 Pequaming Rd.
L'Anse, MI 49946
906.524.5757 ext. 20

KBIC Natural Resources Department
June 20, 2019 ·

KBIC is asking for community input regarding their Hazard Mitigation Plan. Hazard mitigation is any action taken before, during or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards.

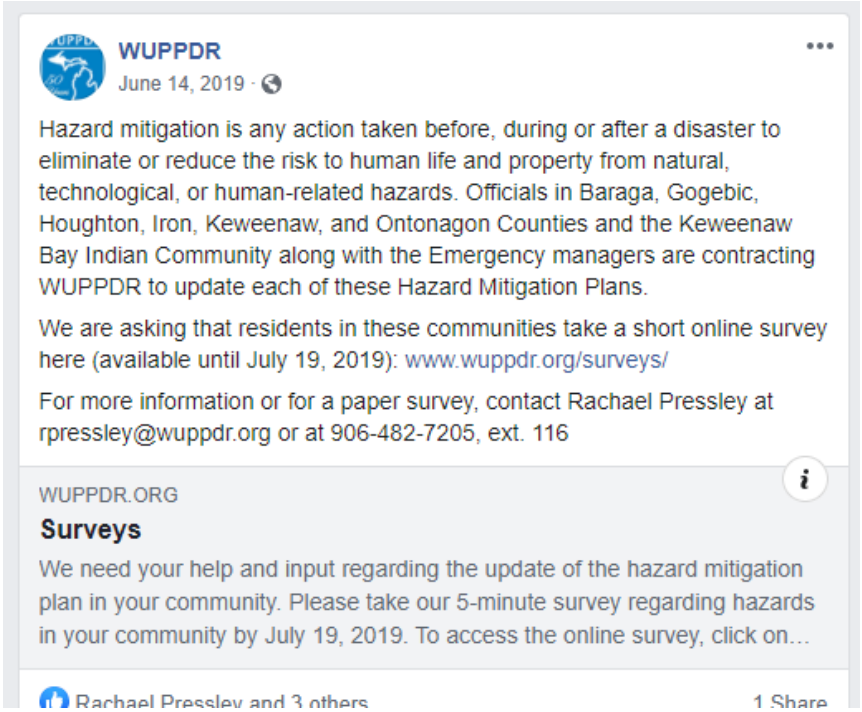
To provide input, please take a short online survey, : https://www.surveymonkey.com/r/KBICHazMitPublicInput

This survey will be available until July 19, 2019. If you have any questions regarding the plan or survey, please contact Dione Price at (906) 524-5757 ext. 20, dprice@kbic-nsn.gov

Rachael Pressley and 1 other

Like Comment Share

Write a comment...



WUPPDR
June 14, 2019 ·

Hazard mitigation is any action taken before, during or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. Officials in Baraga, Gogebic, Houghton, Iron, Keweenaw, and Ontonagon Counties and the Keweenaw Bay Indian Community along with the Emergency managers are contracting WUPPDR to update each of these Hazard Mitigation Plans.

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

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

WUPPDR.ORG

Surveys

We need your help and input regarding the update of the hazard mitigation plan in your community. Please take our 5-minute survey regarding hazards in your community by July 19, 2019. To access the online survey, click on…

Rachael Pressley and 3 others 1 Share

Results of 2019 Keweenaw Bay Indian Community Hazard Mitigation Survey – Summary

The community received 18 responses to the 2019 Keweenaw Bay Indian Community Hazard Mitigation Plan Public Survey. Printed copies of the survey were available to residents at a variety of locations through the community. The survey was also accessible online with notices published in the Keweenaw Bay Indian Community Newsletter.

All respondents were residents of the Keweenaw Bay Indian Community. The majority (27.78% or 5 people) live in the Village of L'Anse and Baraga Township.

When asked if they or someone in their household directly experienced a hazard in the Keweenaw Bay Indian Community over the last 5 years, 38.9% (7 people) said yes. The most commonly mentioned hazard that their household experienced was flooding (50.0%). Other answers included windstorms, thunderstorms and snowstorms.

Respondents were asked how concerned they were about the following potential hazards that could affect their home and community in the next five years. The most commonly mentioned hazard that their house experienced was snowstorms and blizzards at 77.8%. The other top hazards that concerned members were invasive species (55.6%), extreme weather temperatures (50.0%), ice and sleet storms (50.0%), and severe winds (50.0%). The respondents were either not very concerned or not concerned at all about earthquakes (38.9%), landslide/mudslide (35.3%), and fog (27.8%).

Respondents were also asked whether they had taken actions to make their home or community more resistant to hazards. Less than half (27.8%; 5 people) said yes and 4 explained what they had completed. Responses include the following:

- Develop personal fire safety and disaster plans, know the county disaster plan, and prepared a disaster kit
- Recycle more and take green initiative steps
- Home improvements such as installing a sump system

11 respondents (64.7%) said that their home was not located on a floodplain, while 3 (17.7%) did not know if their property was on a floodplain. Most respondents (77.8%) said that their street or home do not flood regularly with significant rain events and only 4 responded yes. However, the survey went on to ask them about specific cross streets and how many times it flood in the past year. Three locations in the Baraga Township were mentioned. Out of 8 people who answered, their listed location flooded:

1 time	5 (62.0%)
2 times	1 (12.5%)
3 times	0
4 times	1 (12.5%)
5 or more times	1 (12.5%)

Most who responded, reported not having flood insurance (83.3%; 15 people). The top reasons listed for not having coverage was because they were not located in a floodplain (50.0%), they never considered/didn't know about it (21.4%), property never floods (14.3%), and property is elevated or otherwise protected (14.3%). One stated that their insurance company will not provide flood insurance.

When asked what the most effective ways are to receive information during or immediately following a hazard emergency (they could check all that apply), 14 people (77.8%) said social media, 10 (55.6%) said radio, and 10 (55.6%) said phone. Other responses say they use their television (50.0%), and government websites (27.8%). No respondents said they use newspaper, mailings, or public forums/meetings.

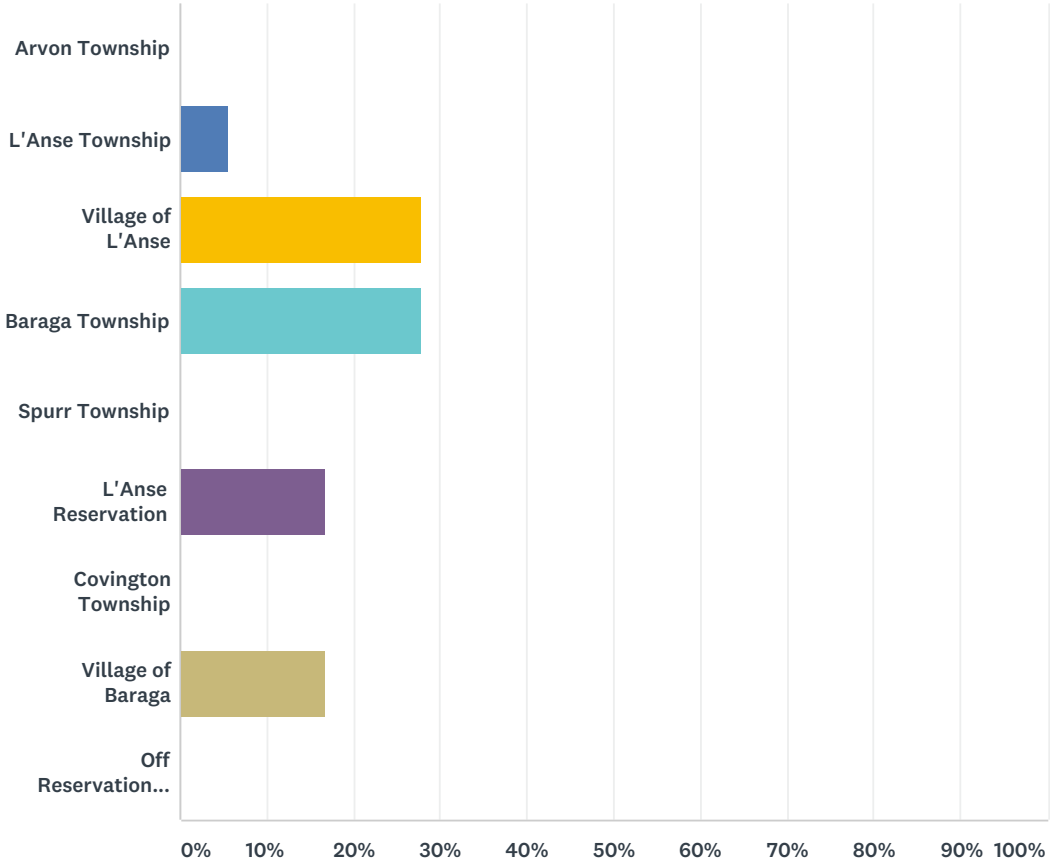
Question 14 in the survey was a comment box asking for input about steps or projects local government could take to reduce or eliminate the risk of hazard damages. These data area also attached to this survey summary.

Attached:

Q14 In your opinion, what are some steps or projects your local government could take to reduce or eliminate the risk for future hazard damages to your community? 10 Comments

Q1 Where do you live?

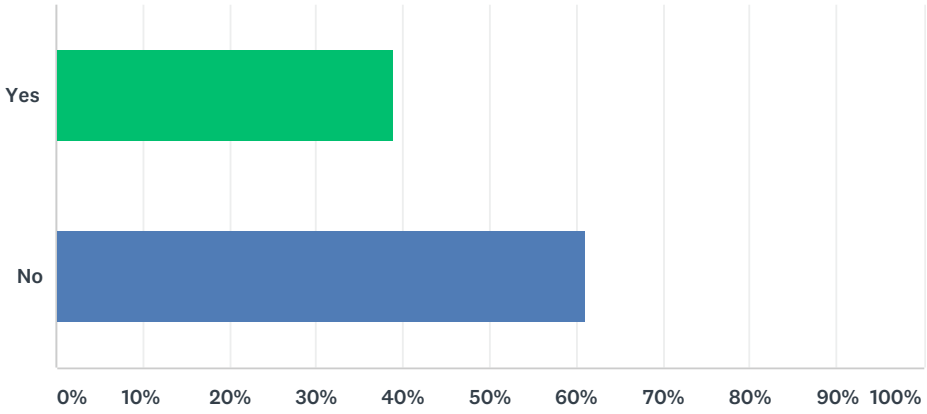
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Arvon Township	0.00%	0
L'Anse Township	5.56%	1
Village of L'Anse	27.78%	5
Baraga Township	27.78%	5
Spurr Township	0.00%	0
L'Anse Reservation	16.67%	3
Covington Township	0.00%	0
Village of Baraga	16.67%	3
Off Reservation Trust	0.00%	0
TOTAL		18

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

Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	38.89%	7
No	61.11%	11
TOTAL		18

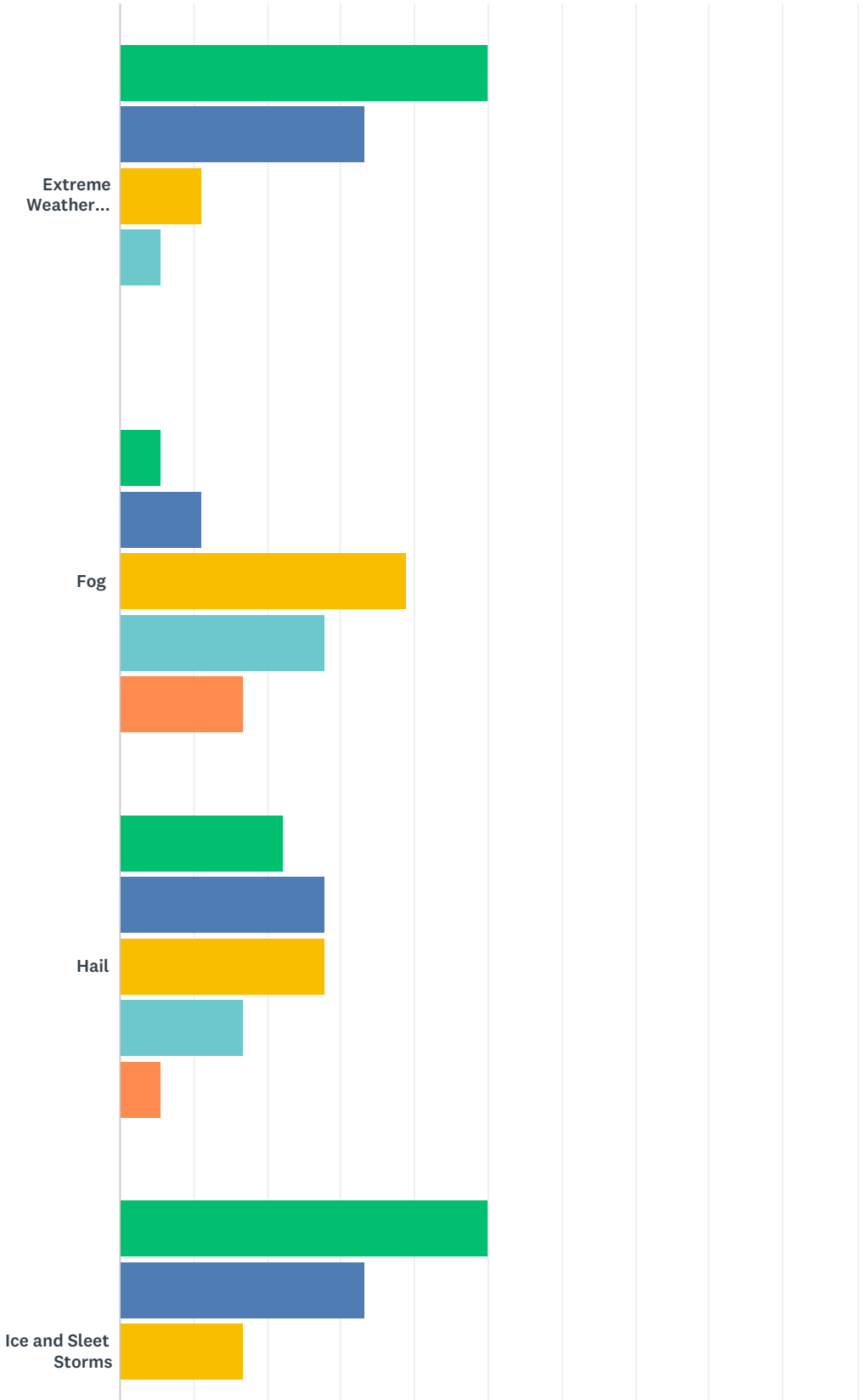
Q3 IF YES, which hazard(s) have you or someone in your household experienced in the past five (5) years?

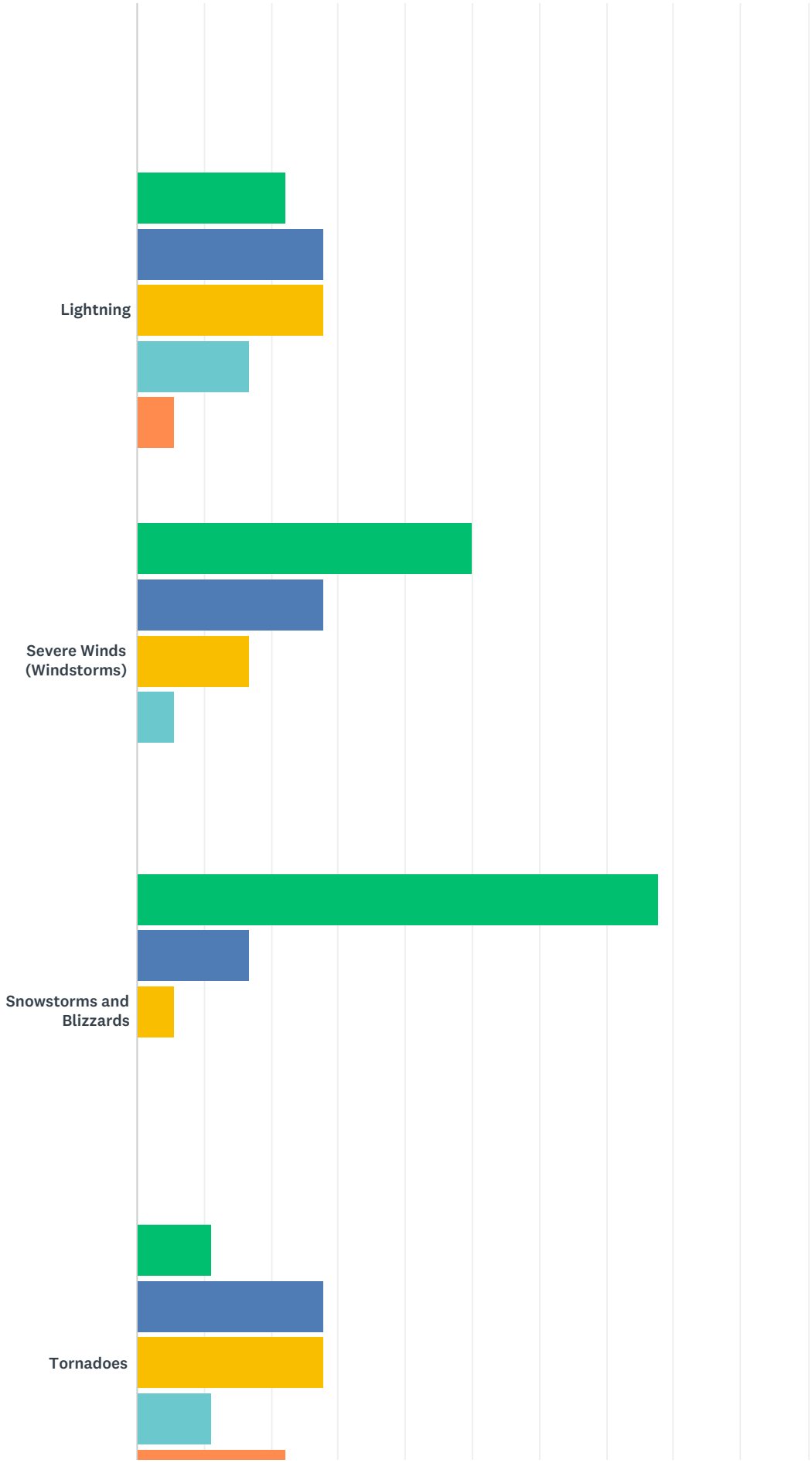
Answered: 10 Skipped: 8

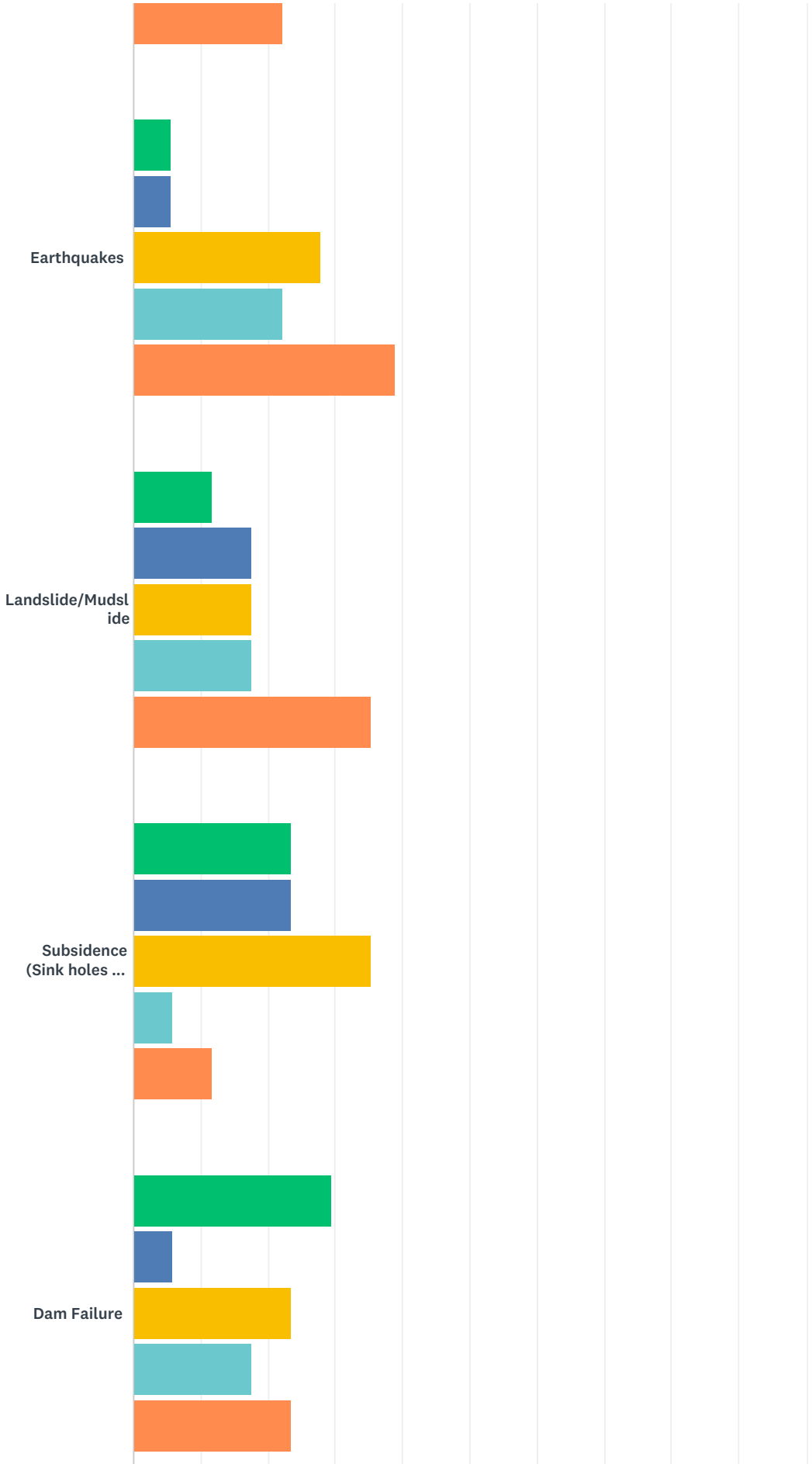
#	RESPONSES	DATE
1	flood	7/2/2019 11:10 AM
2	N/A	6/24/2019 7:36 AM
3	N/A	6/21/2019 11:27 PM
4	windstorm, flood	6/21/2019 11:46 AM
5	Fathers day flood of 2018, seiches, several 100-year rain events creating road washouts.	6/21/2019 8:40 AM
6	severe windstorm, sever thunderstorm, sever snowstorm	6/20/2019 4:13 PM
7	flood	6/20/2019 4:12 PM
8	Flooding from winter snow melting and rain.	6/20/2019 4:06 PM
9	Severe snowstorm 2019.	6/20/2019 4:00 PM
10	NA	6/20/2019 3:59 PM

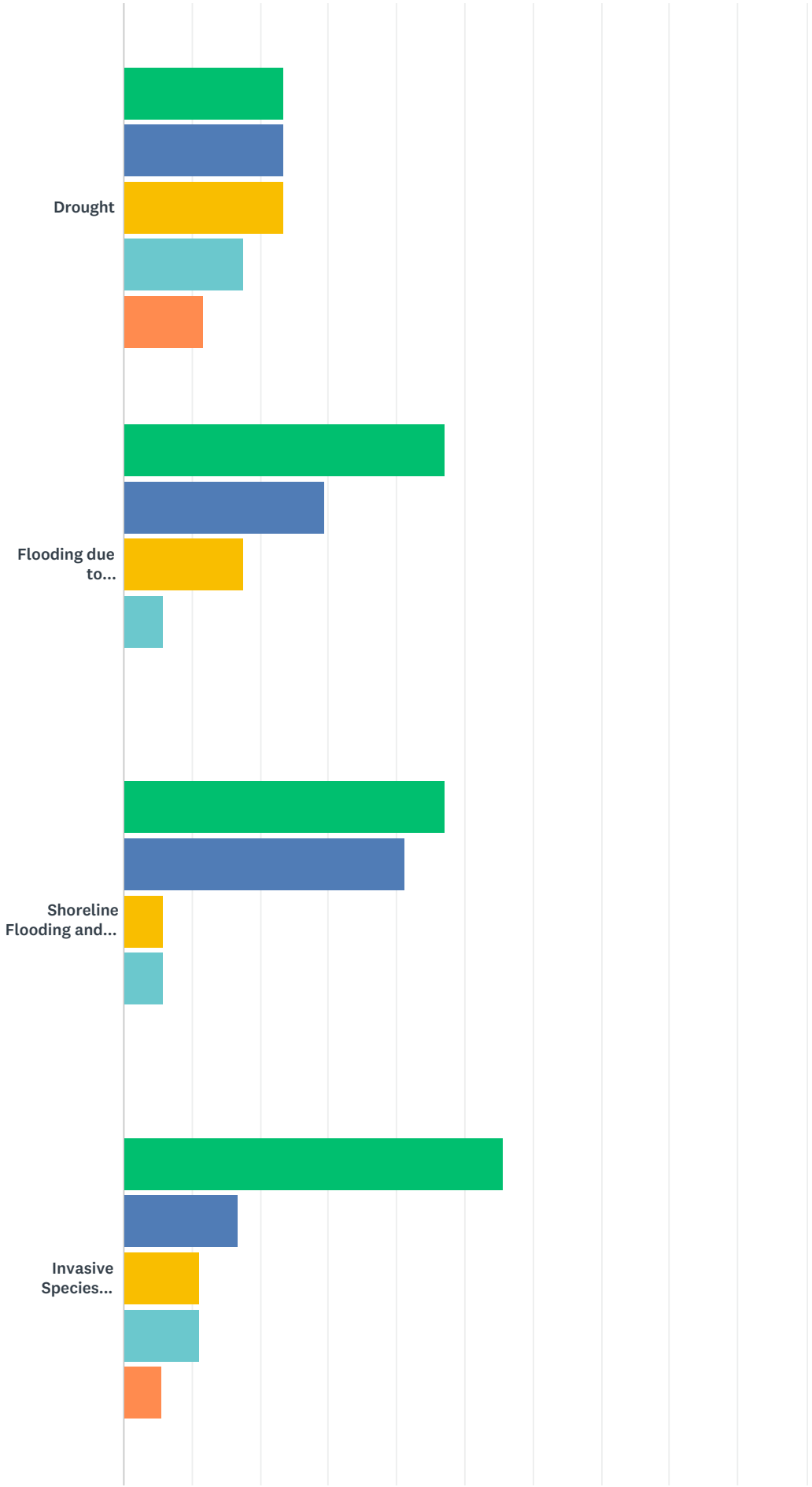
Q4 How concerned are you about the following hazards affecting your home and community in the next five (5) years?

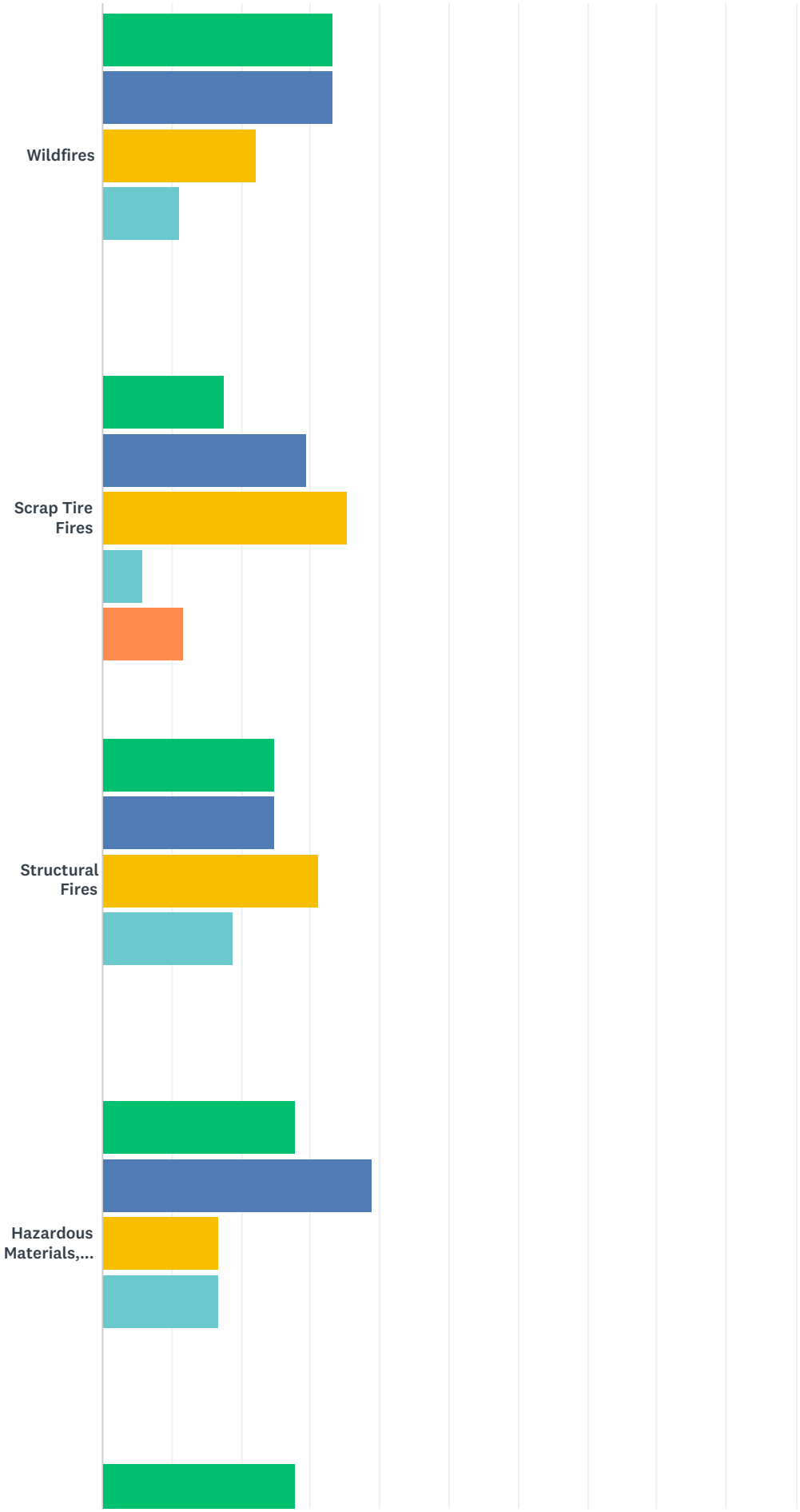
Answered: 18 Skipped: 0

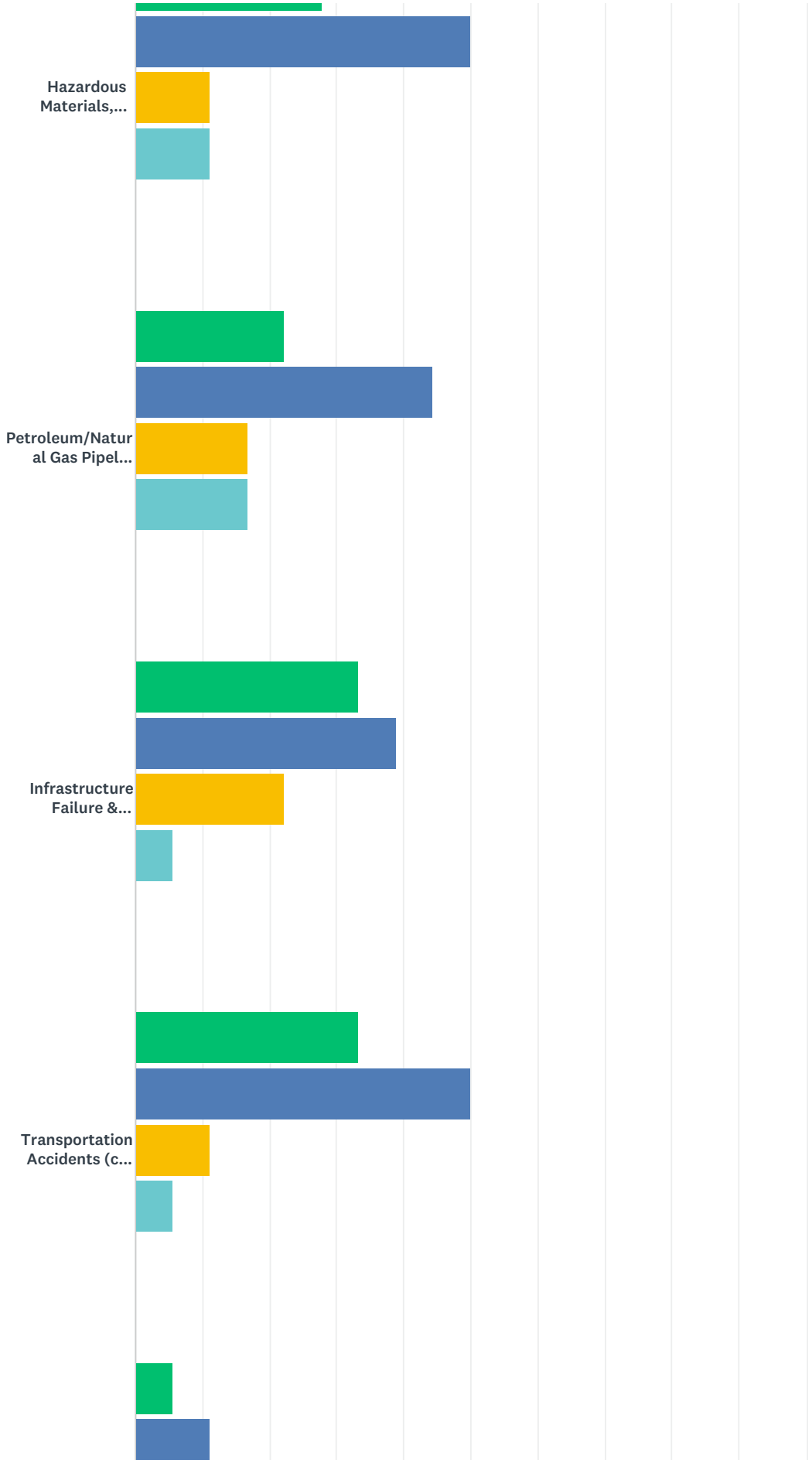


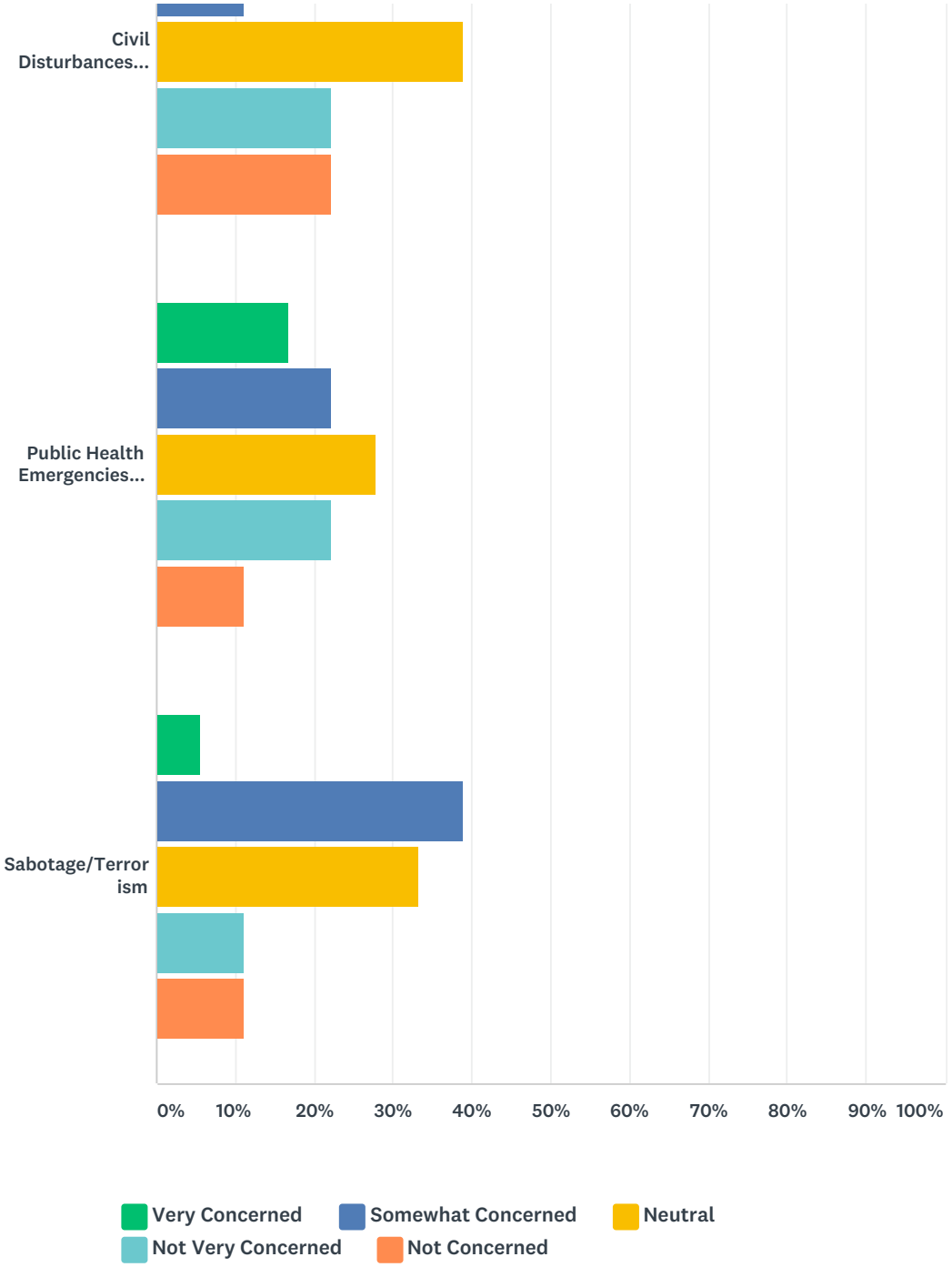

Lightning
Severe Winds (Windstorms)
Snowstorms and Blizzards
Tornadoes


Earthquakes
Landslide/Mudslide
Subsidence (Sink holes ...
Dam Failure


Drought
Flooding due to...
Shoreline Flooding and...
Invasive Species...


Wildfires
Scrap Tire Fires
Structural Fires
Hazardous Materials,...


Hazardous Materials,...
Petroleum/Natural Gas Pipel...
Infrastructure Failure &...
Transportation Accidents (c...

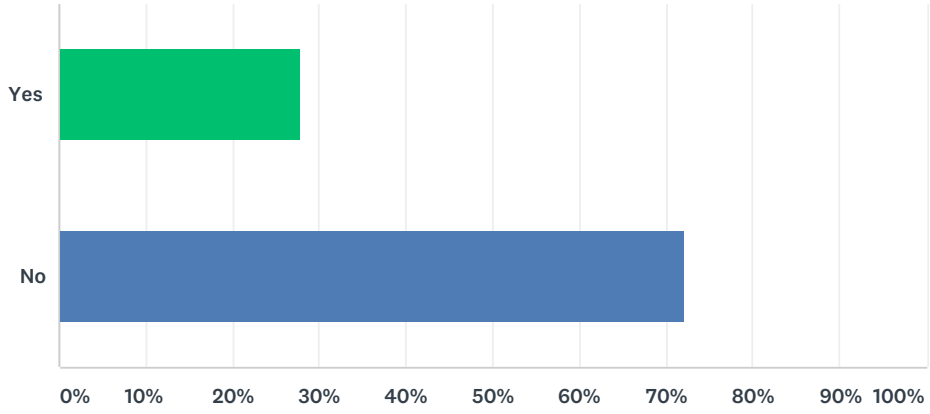


	VERY CONCERNED	SOMEWHAT CONCERNED	NEUTRAL	NOT VERY CONCERNED	NOT CONCERNED	TOTAL
Extreme Weather Temperatures (hot/cold)	50.00% 9	33.33% 6	11.11% 2	5.56% 1	0.00% 0	18
Fog	5.56% 1	11.11% 2	38.89% 7	27.78% 5	16.67% 3	18
Hail	22.22% 4	27.78% 5	27.78% 5	16.67% 3	5.56% 1	18
Ice and Sleet Storms	50.00% 9	33.33% 6	16.67% 3	0.00% 0	0.00% 0	18
Lightning	22.22% 4	27.78% 5	27.78% 5	16.67% 3	5.56% 1	18

Severe Winds (Windstorms)	50.00% 9	27.78% 5	16.67% 3	5.56% 1	0.00% 0	18
Snowstorms and Blizzards	77.78% 14	16.67% 3	5.56% 1	0.00% 0	0.00% 0	18
Tornadoes	11.11% 2	27.78% 5	27.78% 5	11.11% 2	22.22% 4	18
Earthquakes	5.56% 1	5.56% 1	27.78% 5	22.22% 4	38.89% 7	18
Landslide/Mudslide	11.76% 2	17.65% 3	17.65% 3	17.65% 3	35.29% 6	17
Subsidence (Sink holes or ground collapse, mine-related or not)	23.53% 4	23.53% 4	35.29% 6	5.88% 1	11.76% 2	17
Dam Failure	29.41% 5	5.88% 1	23.53% 4	17.65% 3	23.53% 4	17
Drought	23.53% 4	23.53% 4	23.53% 4	17.65% 3	11.76% 2	17
Flooding due to precipitation event or snowmelt	47.06% 8	29.41% 5	17.65% 3	5.88% 1	0.00% 0	17
Shoreline Flooding and Erosion	47.06% 8	41.18% 7	5.88% 1	5.88% 1	0.00% 0	17
Invasive Species (Emerald Ash Borer/Asian Carp)	55.56% 10	16.67% 3	11.11% 2	11.11% 2	5.56% 1	18
Wildfires	33.33% 6	33.33% 6	22.22% 4	11.11% 2	0.00% 0	18
Scrap Tire Fires	17.65% 3	29.41% 5	35.29% 6	5.88% 1	11.76% 2	17
Structural Fires	25.00% 4	25.00% 4	31.25% 5	18.75% 3	0.00% 0	16
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	27.78% 5	38.89% 7	16.67% 3	16.67% 3	0.00% 0	18
Hazardous Materials, Transportation-related (e.g. waste spill from traffic accident)	27.78% 5	50.00% 9	11.11% 2	11.11% 2	0.00% 0	18
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	22.22% 4	44.44% 8	16.67% 3	16.67% 3	0.00% 0	18
Infrastructure Failure & resulting hazards (e.g. power outage)	33.33% 6	38.89% 7	22.22% 4	5.56% 1	0.00% 0	18
Transportation Accidents (car crashes)	33.33% 6	50.00% 9	11.11% 2	5.56% 1	0.00% 0	18
Civil Disturbances (rioting)	5.56% 1	11.11% 2	38.89% 7	22.22% 4	22.22% 4	18
Public Health Emergencies (disease epidemic)	16.67% 3	22.22% 4	27.78% 5	22.22% 4	11.11% 2	18
Sabotage/Terrorism	5.56% 1	38.89% 7	33.33% 6	11.11% 2	11.11% 2	18

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

Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	27.78%	5
No	72.22%	13
TOTAL		18

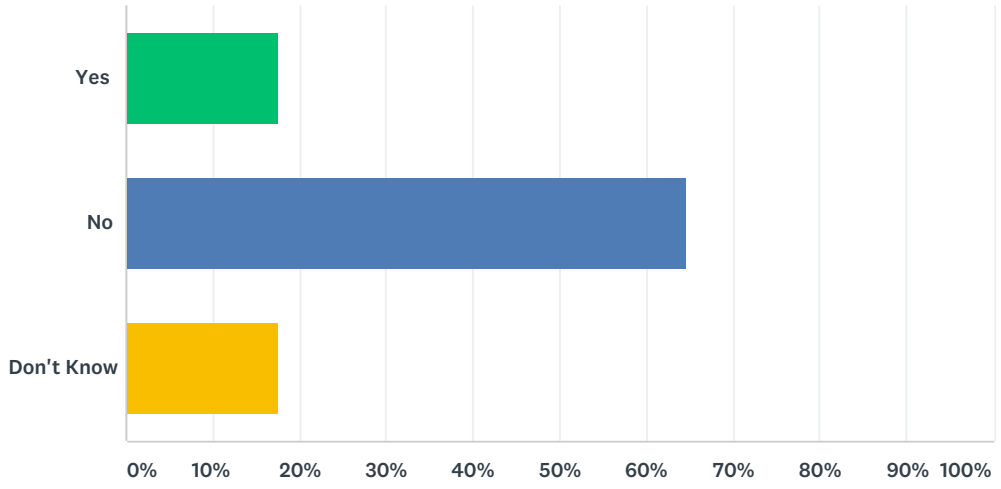
Q6 IF YES, please explain:

Answered: 8 Skipped: 10

#	RESPONSES	DATE
1	N/A	6/24/2019 7:36 AM
2	N/A	6/21/2019 11:27 PM
3	help whenever I can.	6/21/2019 8:40 AM
4	Fire safety plan, know county disaster plan, prepared a disaster kit & have a plan	6/20/2019 7:23 PM
5	Personally, I have been taking steps to recycle more and just the general go green initiatives	6/20/2019 4:20 PM
6	n/a	6/20/2019 4:06 PM
7	NA	6/20/2019 3:59 PM
8	Installed sump system to battle flooding.	6/20/2019 3:52 PM

Q7 Is your home located on a floodplain?

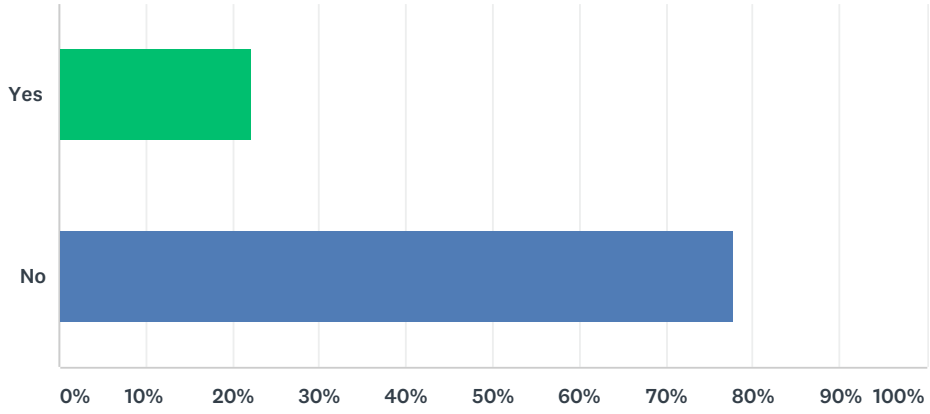
Answered: 17 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	17.65%	3
No	64.71%	11
Don't Know	17.65%	3
TOTAL		17

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

Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	22.22%	4
No	77.78%	14
TOTAL		18

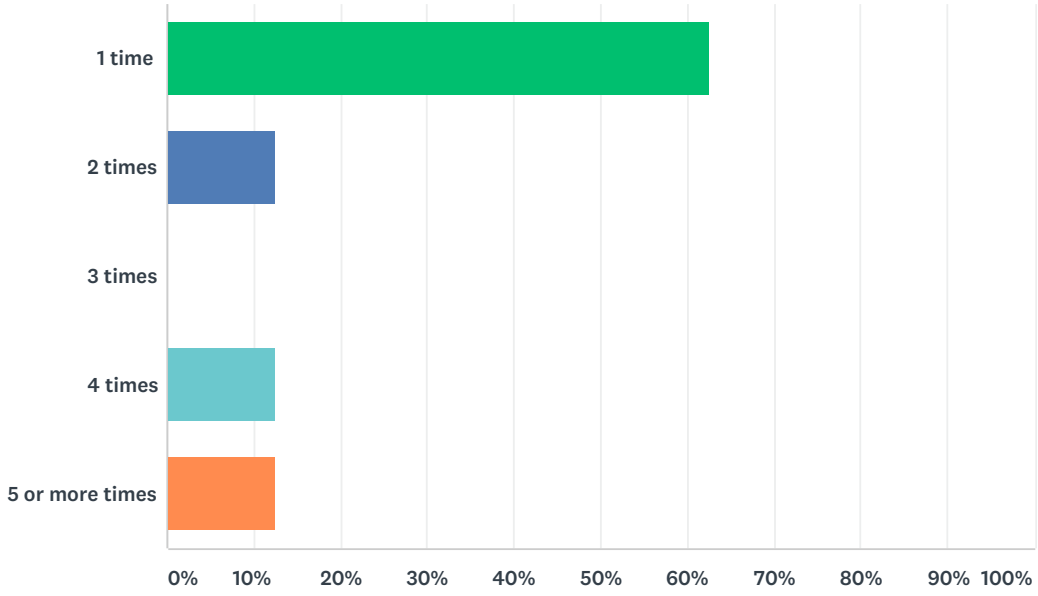
Q9 IF YES, what are the closest major cross streets to this location?

Answered: 7 Skipped: 11

#	RESPONSES	DATE
1	N/A	6/24/2019 7:36 AM
2	N/A	6/21/2019 11:27 PM
3	Mission and Tangen Road in Baraga Township on the L'Anse Indian Reservation.	6/21/2019 8:40 AM
4	n/a	6/20/2019 4:06 PM
5	M38	6/20/2019 4:00 PM
6	NA	6/20/2019 3:59 PM
7	Michigan Avenue & Bear Town Rd.	6/20/2019 3:52 PM

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

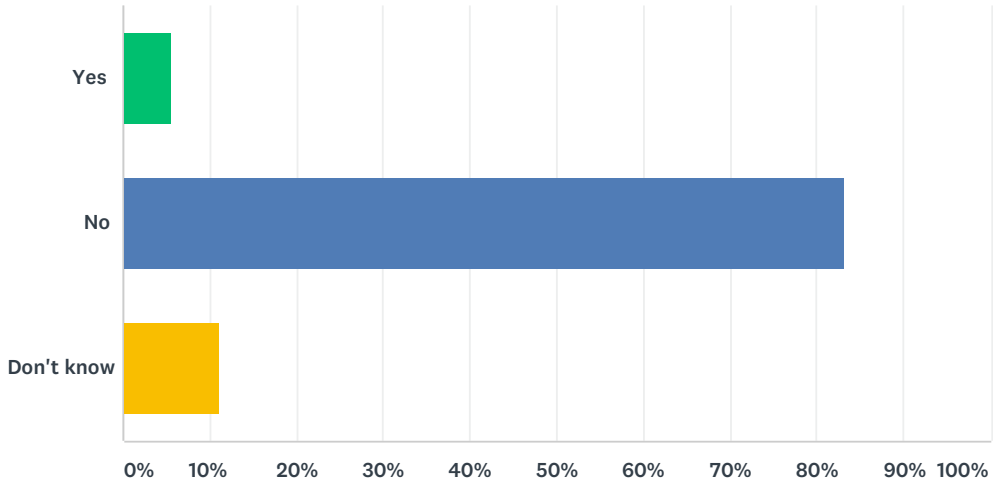
Answered: 8 Skipped: 10



ANSWER CHOICES	RESPONSES	
1 time	62.50%	5
2 times	12.50%	1
3 times	0.00%	0
4 times	12.50%	1
5 or more times	12.50%	1
TOTAL		8

Q11 Do you have flood insurance?

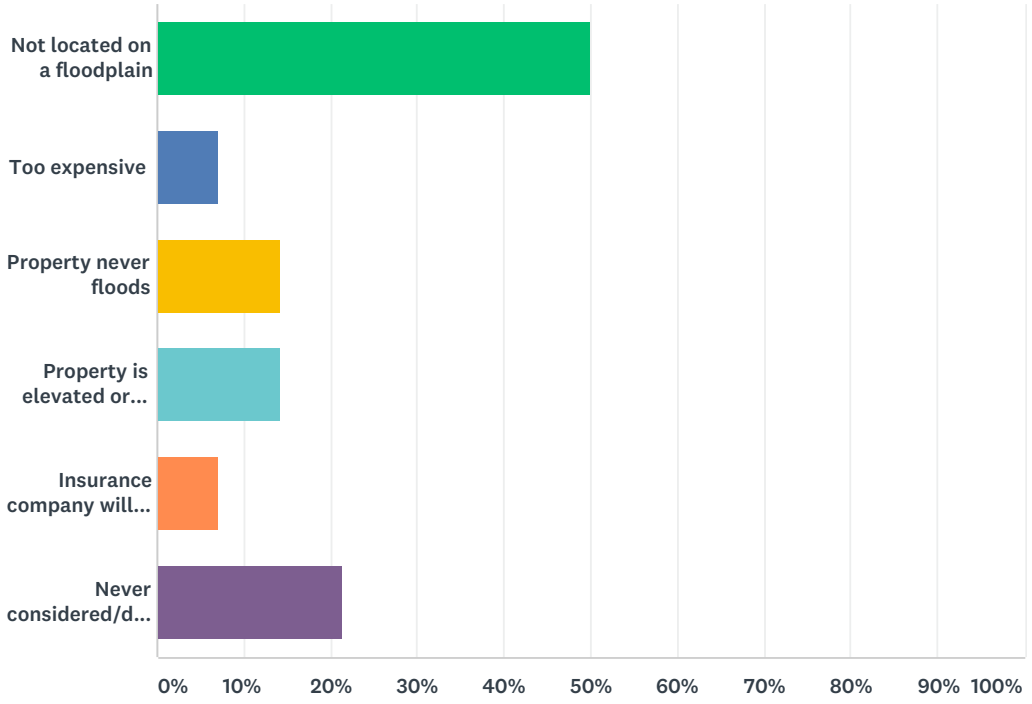
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	5.56%	1
No	83.33%	15
Don't know	11.11%	2
TOTAL		18

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

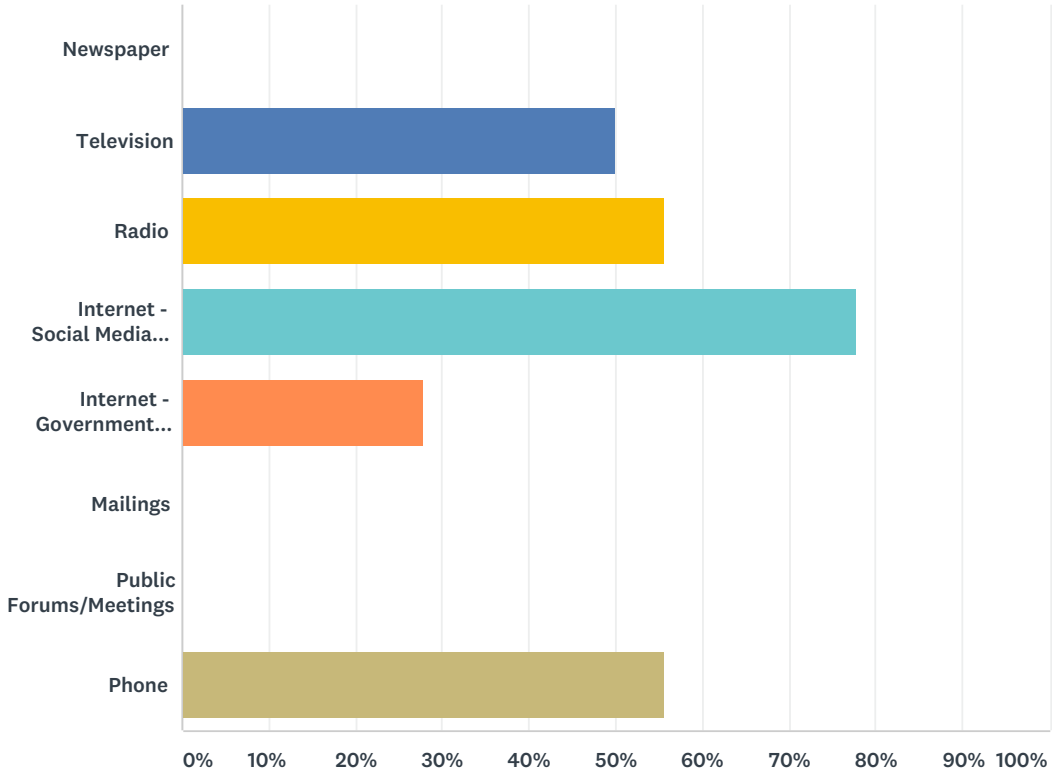
Answered: 14 Skipped: 4



ANSWER CHOICES	RESPONSES	
Not located on a floodplain	50.00%	7
Too expensive	7.14%	1
Property never floods	14.29%	2
Property is elevated or otherwise protected	14.29%	2
Insurance company will not provide	7.14%	1
Never considered/didn't know about it	21.43%	3
Total Respondents: 14		

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

Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Newspaper	0.00%	0
Television	50.00%	9
Radio	55.56%	10
Internet - Social Media (Facebook or Twitter)	77.78%	14
Internet - Government Website Postings	27.78%	5
Mailings	0.00%	0
Public Forums/Meetings	0.00%	0
Phone	55.56%	10
Total Respondents: 18		

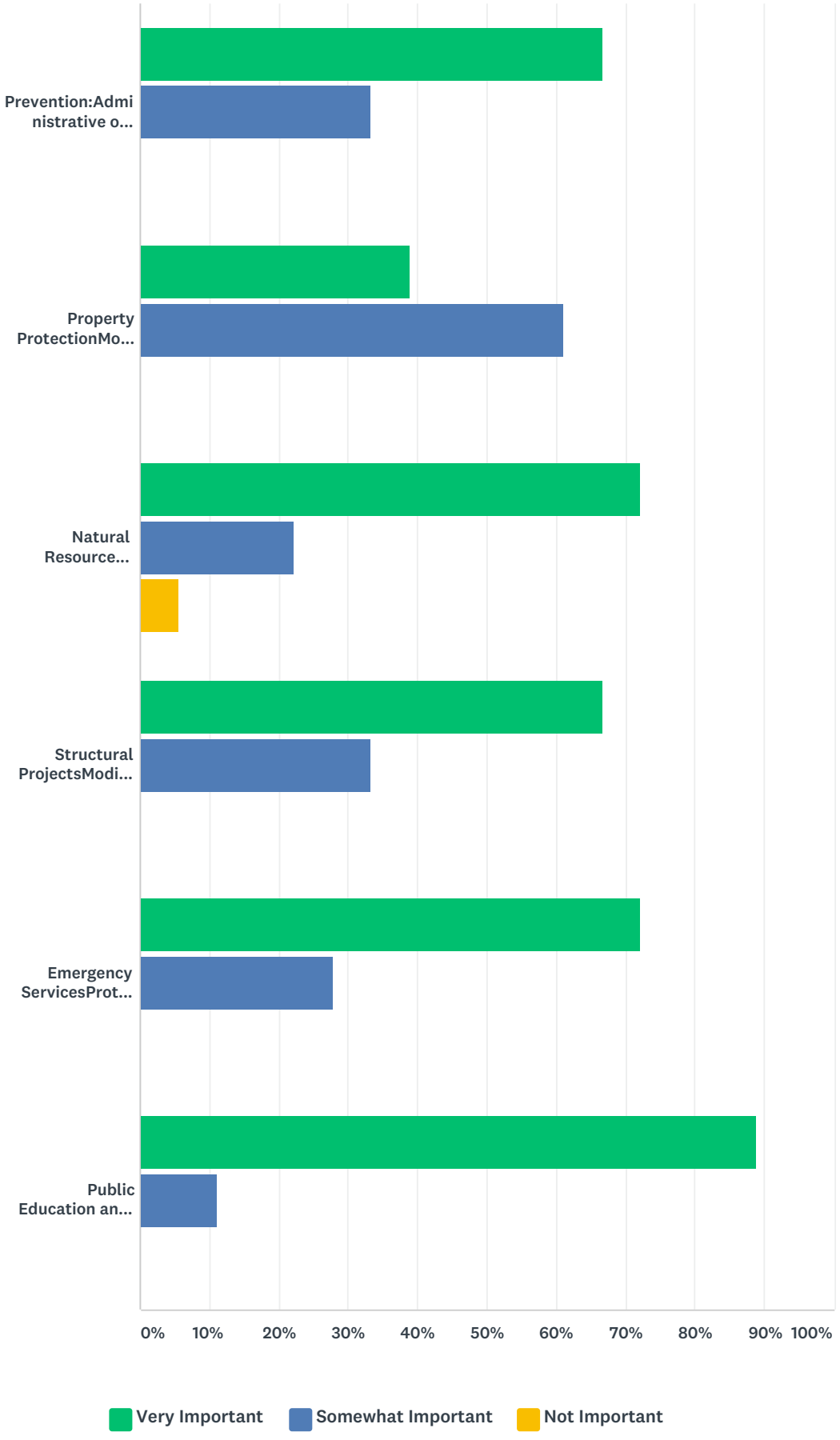
Q14 In your opinion, what are some steps or projects your local government could take to reduce or eliminate the risk for future hazard damages to your community?

Answered: 10 Skipped: 8

#	RESPONSES	DATE
1	Build up the banks around the head of the bay to prevent the road be covered over with lake water. Have a set place for residents to go in case their area floods.	6/24/2019 9:04 AM
2	Awareness	6/24/2019 7:36 AM
3	Limit plastic products for disposal, mandatory recycling	6/21/2019 11:27 PM
4	plan for these events and start making changes	6/21/2019 11:46 AM
5	Recognize climate change and take precautions as advised by scientists.	6/21/2019 8:40 AM
6	More preparedness activities, raise awareness, make community aware of what to do if a disaster occurs, form an active disaster action team in our county, make public aware of disaster plan for county.	6/20/2019 7:23 PM
7	be more environmentally conscious about their projects. prime example, use Houghton and how it is built. all hill and what do they do get rid of the trees for large parking lots creating the event back in 2017	6/20/2019 4:20 PM
8	Make sure the culverts are sufficient for the amount of water that rushes through. Educate people on the concerns of these various hazards. Provide information on places offering affordable coverage/ policies.	6/20/2019 4:06 PM
9	Newer culverts or larger ones through the town. Routine cleaning of drains.	6/20/2019 4:00 PM
10	NOT SURE	6/20/2019 3:59 PM

Q15 Several community-wide activities can reduce our risk from hazards. In general, these activities fall into one of six broad categories. Please tell us how important you think each one is for your community to consider doing:

Answered: 18 Skipped: 0


Prevention:Administrative o...
Property ProtectionMo...
Natural Resource...
Structural ProjectsModi...
Emergency ServicesProt...
Public Education an...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Very Important
Somewhat Important
Not Important

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	TOTAL
Prevention:Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning & zoning, building codes, open space preservation, and floodplain regulations.	66.67% 12	33.33% 6	0.00% 0	18
Property ProtectionModification or removal of existing buildings to protect them from a hazard. Examples include purchase, relocation, raised elevation, and structural retrofits (updates)	38.89% 7	61.11% 11	0.00% 0	18
Natural Resource ProtectionPreservation or restoration of the functions of natural systems while minimizing hazard losses. Examples include floodplain protection, forest management, and slope stabilization.	72.22% 13	22.22% 4	5.56% 1	18
Structural ProjectsModification of the natural conditions for or progression of a hazard. Examples include dams, levees, seawalls, detention/retention basins, channel modification, retaining walls, and storm sewers.	66.67% 12	33.33% 6	0.00% 0	18
Emergency ServicesProtection of people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of emergency facilities.	72.22% 13	27.78% 5	0.00% 0	18
Public Education and AwarenessInforming of citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach, school education, library materials, and demonstration events.	88.89% 16	11.11% 2	0.00% 0	18

Q16 Additional comments:

Answered: 2 Skipped: 16

#	RESPONSES	DATE
1	Done	6/21/2019 11:27 PM
2	NA	6/20/2019 3:59 PM

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

Answered: 10 Skipped: 8

#	RESPONSES	DATE
1	Build up the banks around the head of the bay to prevent the road be covered over with lake water. Have a set place for residents to go in case their area floods.	6/24/2019 9:04 AM
2	Awareness	6/24/2019 7:36 AM
3	Limit plastic products for disposal, mandatory recycling	6/21/2019 11:27 PM
4	plan for these events and start making changes	6/21/2019 11:46 AM
5	Recognize climate change and take precautions as advised by scientists.	6/21/2019 8:40 AM
6	More preparedness activities, raise awareness, make community aware of what to do if a disaster occurs, form an active disaster action team in our county, make public aware of disaster plan for county.	6/20/2019 7:23 PM
7	be more environmentally conscious about their projects. prime example, use Houghton and how it is built. all hill and what do they do get rid of the trees for large parking lots creating the event back in 2017	6/20/2019 4:20 PM
8	Make sure the culverts are sufficient for the amount of water that rushes through. Educate people on the concerns of these various hazards. Provide information on places offering affordable coverage/ policies.	6/20/2019 4:06 PM
9	Newer culverts or larger ones through the town. Routine cleaning of drains.	6/20/2019 4:00 PM
10	NOT SURE	6/20/2019 3:59 PM

2019 Tribal Hazard Mitigation Local Government/Institutions Survey

The Western Upper Peninsula Planning and Development Region is drafting the Hazard Mitigation Plan for Keweenaw Bay Indian Community. Adoption of the plan is required by the Federal Emergency Management Agency (FEMA) as a pre-condition for organization and/or local government to apply for federal mitigation grant funding.

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

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

Contact rpressley@wuppdr.org with any questions.

Thank you for your time and participation!

2019 Tribal Hazard Mitigation Local Government/Institutions Survey

Local Government/Establishment: _____

Completed by: _____

1. Please specify the degree to which you think your jurisdiction is at risk of the following hazards occurring:

Hazards	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
WEATHER HAZARDS					
Extreme Weather Temperatures (hot/cold)	☐	☐	☐	☐	☐
Fog	☐	☐	☐	☐	☐
Hail	☐	☐	☐	☐	☐
Ice and Sleet Storms	☐	☐	☐	☐	☐
Lightning	☐	☐	☐	☐	☐
Severe Winds (Windstorms)	☐	☐	☐	☐	☐
Snowstorms and Blizzards	☐	☐	☐	☐	☐
Tornados	☐	☐	☐	☐	☐
GEOLOGIC HAZARDS					
Earthquakes	☐	☐	☐	☐	☐
Landslide /Mudslide	☐	☐	☐	☐	☐
Subsidence (sink holes or ground collapse)	☐	☐	☐	☐	☐
HYDROLOGICAL HAZARDS					
Dam Failure	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐
Flooding due to precipitation event or snowmelt	☐	☐	☐	☐	☐
Shoreline Flooding and Erosion	☐	☐	☐	☐	☐
ECOLOGICAL HAZARDS					
Invasive Species (Emerald Ash Borer/Asian Carp)	☐	☐	☐	☐	☐
Wildfires	☐	☐	☐	☐	☐
INDUSTIRAL HAZARDS					
Scrap Tire Fires	☐	☐	☐	☐	☐
Structural Fires	☐	☐	☐	☐	☐
Hazardous Materials, Fixed Site (e.g. buildings or industrial site)	☐	☐	☐	☐	☐
Hazardous Materials, Transportation-Related (e.g. waste spill from traffic accident)	☐	☐	☐	☐	☐
Petroleum/Natural Gas Pipeline Incident (e.g. rupture/leak resulting in outage)	☐	☐	☐	☐	☐

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

For any of the hazards in the table for which you responded **"very"** or **"somewhat concerned,"** are there any that you feel would cause particularly severe property damage or loss of life if they occurred? Please explain.

2. Is your government agency/institution involved in any hazard mitigation projects? ☐ Yes ☐ No

   IF YES, please explain:

3. What hazard mitigation activities/projects has your government agency/institution implemented since 2013? **If any**, please describe:

4. Has your agency applied for any mitigation funding from federal, state, local, and/or private sources since 2013?

☐ Yes ☐ No

IF YES, please explain:

IF YES (on question 4), was the funding request successful? ☐ Yes ☐ No

5. What are the most important community assets to protect from damage during a hazard event?

6. How is growth and development in the community contributing to natural hazard events?

7. What activities will assist the community in reducing risk and preventing loss from future natural hazard events?

8. Do you see any gaps in the current system for reducing risk? ☐ Yes ☐ No
Do you see new ways for agencies, organizations, or individuals to participate/coordinate to reduce risk from hazards?

9. How, if at all, does your institution educate the public concerning mitigation and preparedness projects, programs and activities?

- ☐ Newspaper
- ☐ Television
- ☐ Radio
- ☐ Internet – Social Media (Facebook or Twitter)
- ☐ Internet – Website Postings
- ☐ Mailings
- ☐ Public Workshops / Meetings
- ☐ Other (specify): _____
  _____
  _____

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

THANK YOU FOR YOUR PARTICIPATION!

Western Upper Peninsula Planning & Development Regional Commission

400 Quincy St., 8th Floor, Hancock, MI 49930

906-482-7205 info@wuppdr.org

News Release

Release Date: July 1, 2020

Media Contact:
Rachael Pressley, Assistant Regional Planner
906.482.7205 ext. 116
rpressley@wuppdr.org

Keweenaw Bay Indian Community Hazard Mitigation Plan available for review

Keweenaw Bay Indian Community has recently worked with the Western UP Planning and Development Region (WUPPDR) to develop the Keweenaw Bay Indian Community Hazard Mitigation Plan. Hazard mitigation is any action taken before, during or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. The plan's purpose is to identify hazard risks throughout the community and to become better prepared for them.

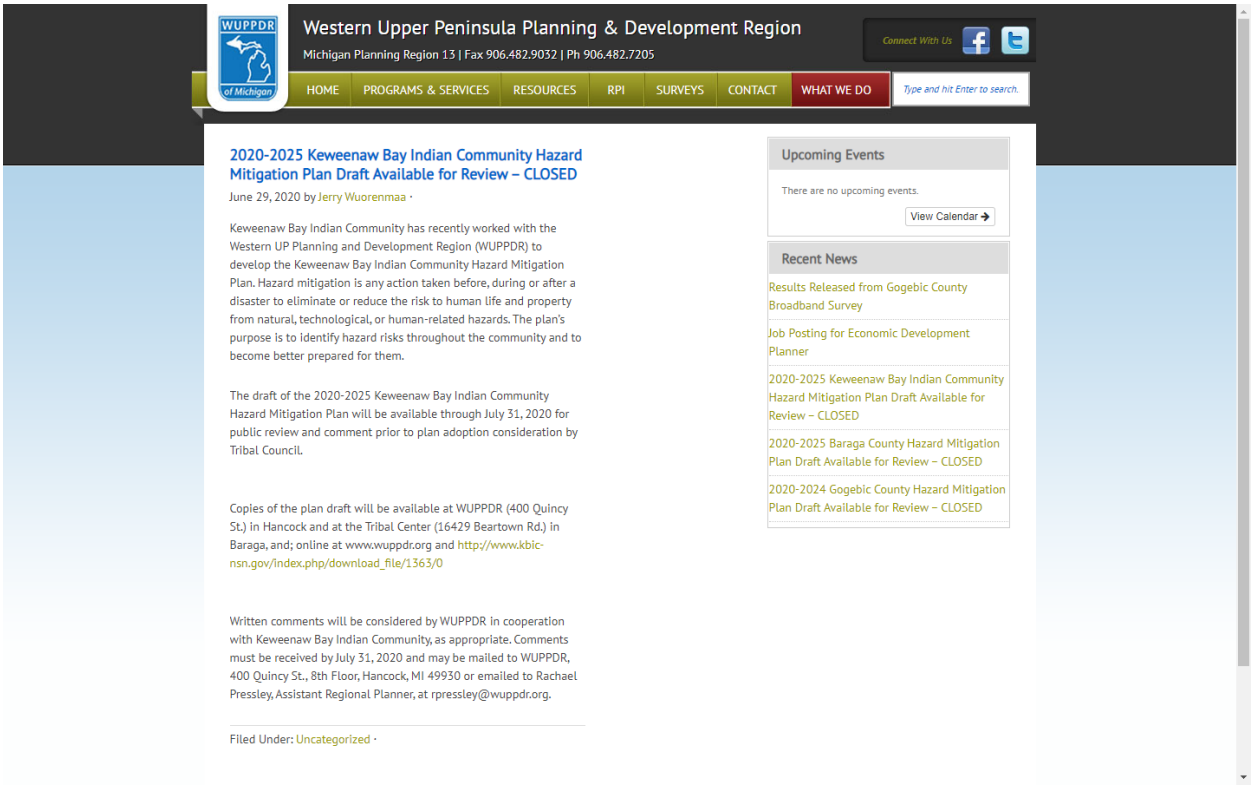
The draft of the 2020-2025 Keweenaw Bay Indian Community Hazard Mitigation Plan will be available through July 31, 2020 for public review and comment prior to plan adoption consideration by Tribal Council.

Copies of the plan draft will be available at WUPPDR (400 Quincy St.) in Hancock and at the Tribal Center (16429 Beartown Rd.) in Baraga, and; online at www.wuppdr.org and http://www.kbic-nsn.gov/index.php/download_file/1363/0

Written comments will be considered by WUPPDR in cooperation with Keweenaw Bay Indian Community, as appropriate. Comments must be received by July 31, 2020 and may be mailed to WUPPDR, 400 Quincy St., 8th Floor, Hancock, MI 49930 or emailed to Rachael Pressley, Assistant Regional Planner, at rpressley@wuppdr.org.

###

Public comment press release and screenshots:



Appendix G: Meeting Materials

Tribal Hazard Mitigation Plan Update – Local Planning Team
May 2019

AGENDA

Introductions
Overview of the process
- Grant application approved
- Defining hazard mitigation
- Defining the planning requirements
- Benefits of the plan development

Draft work plan
Review Draft Community Profile
Review Hazard Profiles
Review Public & Government/Institution Survey

Action: Submit past/present/future mitigation activities to Project Coordinator (rpressley@wuppdr.org)

Next meeting (August 2019): Survey results, review mitigation strategies, and update recommendations/implementation goals

WUPPDR Hazard Mitigation Team:
Executive Director – Jerald Wuorenmaa, jwuorenmaa@wuppdr.org
Project Coordinator – Rachael Pressley, rpressley@wuppdr.org
Planning Support – Angela Yu, ayu@wuppdr.org
GIS Support – Alanna Mingay, amingay@wuppdr.org
Hazard Mitigation Intern – Celine Carus

Keweenaw Bay Indian Community 2020 Tribal Hazard Mitigation Plan
Local Planning Team Meeting #1 – May 8, 2019 (9:00am)
Ojibwa Casino (Chippewa Room), 16449 Michigan Ave, Baraga, MI 49908

Last Name	First Name	Representing	Email Address	Phone
Verissimo	Luis	KBIC	LMVerissimo@kbic.com	—
Dakota	Dale	KBEC	dale@kbic-nsn.gov	201-1257
Misegan	Duane	KBTPD	duane@kbic-nsn.gov	353-6626
Ravindran	Evelyn	KBIC-NRD	eravindran@kbicnsn.gov	524-5757
Mills	Doug	Baraga CRC	dmills@baragacountyroads.org	524-7270
Chosa	Thomas	KBIC Fire & Emergency mgt.	tchosa@kbicnsn.gov	906-201-1740
Price	Dione	KBIC - NRD	dprice@kbic-nsn.gov	906-524-5757 x 20
Gauthier	Serene	KBIC - NRD	sgauthier@kbic-nsn.gov	906 524-5757 x14

Hazard Analysis Worksheet – Keweenaw Bay Indian Community

Name & email:	Representing Organization:

Hazard: Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.
Location: The geographic areas in the tribal planning area that are affected by the hazard.
Extent: the strength or magnitude of the hazard.
Impact: the consequence or effect of the hazard on the tribal government and its assets.
Probability: a numerical index of risk; it is a measure of the likelihood that the undesirable event will occur.

Hazard	Location	Maximum Extent	Impact	Probability of Future Events (Perceived)	Historical Occurrences
Extreme Temperature					
Fog					
Hail					
Ice/Sleet Storms					
Lightning					

Severe Winds					
Snowstorms & Blizzards					
Tornadoes					
Dam Failures					
Riverine and Urban Flooding					
Shoreline Flooding and Erosion					
Drought					
Wildfires					
Invasive Species					

Earthquakes					
Subsidence					
The hazards listed below are optional and not required by FEMA for the Tribal Hazard Mitigation Plan					
Scrap Tire Fires					
Structural Fires					
Hazardous Materials: Fixed Site Incidents					
Hazardous Materials: Transportation Incidents					
Petroleum & Gas Pipeline Accidents					
Infrastructure Failure & Secondary Technological Hazards					

Transportation Accidents					
Civil Disturbances					
Public Health Emergencies					
Sabotage and Terrorism					

Worksheet Instructions:
Split into small groups to discuss the worksheet; each person should fill out whatever part of the worksheet that they feel most comfortable with; Write extra comments or information at the bottom of this page and submit worksheet to WUPPDR by end of meeting.
Location – note whether the hazard is present on tribal lands; if the hazard is localized, please write the hazards specific location
Maximum Extent – how is the hazard measured in your organization and list the extent of the hazard
Impact – List specific vulnerable agencies/populations/property that might be more susceptible to the hazard
Probability of Future Events: Quantitative or Qualitative probability ex: Based on previous knowledge there is a 10% likelihood of the event happening over the next five years OR the hazard is 'highly-likely' to occur
Historical Occurrences: Name and date of historical incident
Comment Box:

Tribal Hazard Mitigation Plan Update – Local Planning Team
November 2019

AGENDA

Introductions
Survey Results
Risk Assessment
Mitigation Action Plan

- Goals
- Past Mitigation Activities
- Current Projects
- Future Recommendations

Final Plan Adoption Process

Action: Review Draft when released and submit comments to Rachael Pressley (rpressley@wuppdr.org)

WUPPDR Hazard Mitigation Team:
Executive Director – Jerald Wuorenmaa, jwuorenmaa@wuppdr.org
Project Coordinator – Rachael Pressley, rpressley@wuppdr.org
Planning Support – Angela Yu, ayu@wuppdr.org
GIS Support – Alanna Mingay, amingay@wuppdr.org
Hazard Mitigation Intern – Celine Carus

Mitigation Goals Worksheet

Example Goal:

Permanently eliminate or reduce long-term risks to people and property from natural hazards so that the Tribal Government assets such as transportation, infrastructure, commerce, and tourism can be sustained and strengthened. This can be accomplished through collaborative efforts/activities amongst agencies within the Keweenaw Bay Indian Community.

2013 Mitigation Goals: Ontonagon County

Goal #1: Protect lives and property within Ontonagon County from all known hazards while focusing on priority hazards.

Goal #2: Identify feasible projects throughout the County that will help mitigate future problems.

Goal #3: Be proactive in protecting public facilities and critical facilities through up-to-date response plans and upgrades as needed.

Goal #4: Educate citizens in order to encourage self-help and the mitigation of hazards on private property.

Mitigation Goals – Gogebic County

Goal #1	Work to improve existing local government policies and codes to reduce the impacts of natural hazards.
Goal #2	Design and implement specific mitigation measures to protect vulnerable public and private properties.
Goal #3	Increase the protection of critical facilities and infrastructure from hazard threats through retrofit projects for existing facilities and innovative design standards for new facilities.
Goal #4	Enhance public education programs to promote community awareness of natural hazards and the hazard mitigation techniques available to reduce their impact.
Goal #5	Improve stormwater management through enhanced local government programs, policies and practices.
Goal #6	Enhance the county's storm evacuation procedures through increased intergovernmental coordination between Gogebic County, its municipalities, and the State of Michigan.
Goal #7	Increase the County's emergency management capabilities through sustained system and technology improvements.
Goal #8	Promote volunteer involvement in emergency preparedness and response through increased citizen awareness and training activities.

Keweenaw County Mitigation Goals

Goal 1: Protect lives and property within Keweenaw County from all known hazards while focusing on priority hazards.

Goal 2: Identify feasible projects throughout the County that will help mitigate future problems.

Goal 3: Be proactive in protecting public facilities and critical facilities through proper maintenance and upgrades.

Goal 4: Educate citizens in order to encourage self-help and the mitigation of hazards on private property.

Appendix H: FEMA Document Review

Appendix I: Plan Adoption