

Appendix C: Community Engagement Resources

Tribal community engagement may form the backbone of tribal adaptation efforts. Several resources have been developed or identified through this adaptation planning project, which may be tailored and used by Michigan Tribes as they each pursue unique adaptation planning for their respective communities, lands, and waters.

These resources include:

- A. Adapt: Collaborative Tribal Climate Adaptation Planning – Community Outreach Booklet
- B. Climate Change At-A-Glance Infographic
- C. Traditional Knowledge Interview Questions
- D. Traditional Knowledge Interview Guidance Document
- E. Extreme Precipitation Scenario Planning Document
- F. Qualitative Vulnerability Assessment Tools

Adapt

Collaborative Tribal Climate Adaptation Planning



Inter-Tribal Council of Michigan, Inc.

Climate Change

At a glance

2016



GREAT LAKES: PAST AND FUTURE



Surface water temperatures have risen by about 3F° since 1995, with the largest change in Lake Superior (+3.2F°).



Ice cover has decreased by 62-79% between 1973-2010. Lake effect snowfall may decline after mid-century (2050).

Data source: Great Lakes Sciences and Assessments, 2016
Image source: NASA Earth Observatory 2013

PAST: TEMPERATURE



The annual average temperature has increased by about 2 F° over the past century, with a 9-day decrease in frost days (cold season) between 1958-2012.

PAST: PRECIPITATION



The annual average amount of precipitation has increased by about 11% over the past century, with a 37% increase in the number of heavy storms during the last 50 years.

FUTURE: TEMPERATURE



The annual average temperature may increase by about 4-6 F° by 2050, with an increase in the growing season of about 1 month.

FUTURE: PRECIPITATION



Heavy storms may continue to increase in number and intensity. Winter precipitation may fall more often as rain, while snow depth may decrease.

Inter-Tribal Adaptation Planning

Whereas, the Tribal leaders...recognize the vital importance of the health and quality of the Great Lakes, inland waters, air, geography, ecosystems, plants, and wildlife to the physical, cultural, and economic welfare and future of all of our citizens;

Whereas, climate change poses a grave and immediate threat to the environment, quality of life, and economy for all of our citizens...
Tribal-State Climate Accord 2009

Tribes in Michigan are currently experiencing the impacts of climate change: warmer average annual air and surface water temperatures, more volatile weather with extreme precipitation events, decreases in duration and extremity of winter temperatures, and increases in duration of summer temperatures.

Changes in climate and weather patterns are accelerating, with an expected increase in mean annual temperature of 5.5 to 6 degrees Fahrenheit by mid century (2041 - 2070; GLISA 2016). These changes impact Tribes in Michigan both directly and indirectly, with potential and undefined impacts on natural features, public health, built-infrastructure, energy, and the ability of tribal communities to maintain cultural ways of life. Now is the time to evaluate and plan for climate change with adaptation strategies that mitigate degradation or losses in tribal resources.

This document offers a snapshot of the results of a cooperative effort among the Inter-Tribal Council of Michigan, Inc., and nine federally-recognized Tribes in Michigan:

- Bay Mills Indian Community (BMIC)
- Lac Vieux Desert Band of Lake Superior Chippewa (LVD)
- Grand Traverse Band of Ottawa and Chippewa Indians (GTB)
- Little River Band of Ottawa Indians (LRB)
- Little Traverse Bay Bands of Odawa Indians (LTBB)
- Match-E-Be-Nash-She-Wish Band of Potawatomi - Gun Lake Tribe (GLT)
- Pokegenek Bodewadmik - Pokagon Band of Potawatomi (PBP)
- Saginaw Chippewa Indian Tribe (SCIT)
- Sault Ste. Marie Tribe of Chippewa Indians (SSMT)

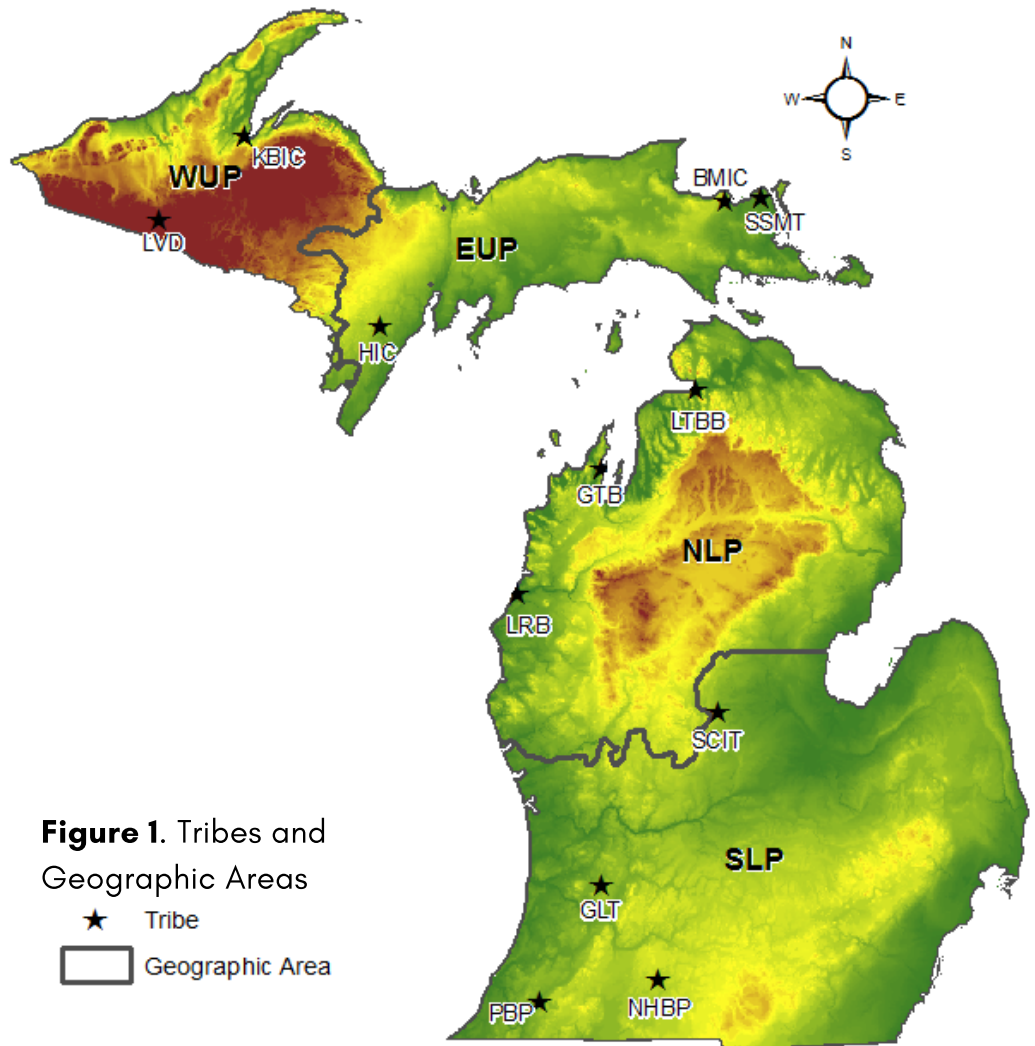
The Inter-Tribal Council of Michigan (ITCMI) is a consortium of federally recognized tribes in Michigan and works across reservation

...continued on page 4

Overview

boundaries and treaty ceded territories to provide technical assistance with human health and resource protection efforts to member Tribes.

Through this project, ITCMI facilitated a tribal-led process of analyzing climate projections at mid-century, assessing the vulnerability of key tribal resources, developing planning resources, and identifying adaptation strategies across jurisdictional boundaries to benefit Tribes in Michigan as they face a changing climate.



For the purposes of this project, the State of Michigan was subdivided into four climatic and ecologic regions: Western Upper Peninsula (WUP), Eastern Upper Peninsula (EUP), Northern Lower Peninsula (NLP), and Southern Lower Peninsula (SLP); see Figure 1. Tribes located within each region may experience similar climate changes and related challenges based on regional climates and geographies. Natural Resource and Environmental staff from participating Tribes in Michigan worked together with ITCMI to conduct vulnerability assessments for identified resources in a true learning collaborative, contributing to and learning from each others' expertise and perspectives.

This project has served to connect tribally-driven climate change vulnerability assessments, identification of climate sensitive tribal assets, and the development of adaptation strategies to support tribal decision-making and prevent or minimize climate change impacts on important tribal resources. This work would not have been possible without the dedication of participating Tribe staff, who contributed their time and expertise in service of the Tribes.

Community and Traditional Knowledges



Anishinaabek Ways

Anishinaabek cultures and ways are inter-woven with the lands, waters, plants, fish, and wildlife of this region. Where would our communities be without manoomin – the food that grows on the water? How would our societies have survived without subsistence hunting, fishing, and gathering of traditional foods and medicines? What would our communities look like without our relationships with local animals, fish, and plants?

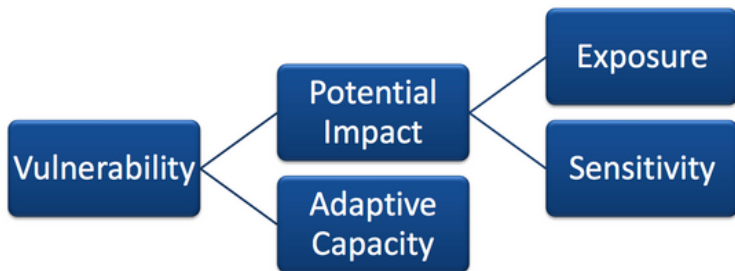
Tribal communities maintain important traditional and community knowledge regarding local plants and animals, lands and waters, seasons and cycles – including recent changes in climate and impacts on natural resources. Traditional Knowledge (TK) refers to the bodies of knowledge, practices, and beliefs that have been developed and shared across generations.

TK is sustained today by Anishinaabek communities, with ongoing relationships with the lands, waters, and other beings of this region.

Tribal communities can use TK to guide tribal adaptation efforts. Community and traditional knowledge is vital in identifying local climate impacts, important resources, and ways to protect important tribal resources for current and future generations.

TK may be included in tribal climate adaptation planning by the inclusion of community members in the planning process: one-on-one conversations, formal interviews, community workshops, community feasts, and working with tribal elder, cultural, natural resource, youth, and other advisory committees. It is important to consider the rights, risks, and means of protections involved in working with community members and TK, as discussed in *Guidelines for Considering Traditional Knowledges in Climate Change Initiatives* (Climate and Traditional Knowledges Workgroup 2014).

Vulnerability Assessment



Assessing Vulnerability

Vulnerability to climate change is the likelihood that climate-driven changes will have an adverse impact on a species, habitat, or system (part Glick et al. 2011). Vulnerability is a function of a species' or system's:

- **Sensitivity:** how a species or system is likely to be affected by a given change in climate
- **Exposure:** how much of a change in climate and related impacts a species or system is likely to experience
- **Adaptive capacity:** a species or system's ability to minimize or manage its sensitivity, exposure, or potential impact to climate changes

Figure 2. Vulnerability assessment graphic (adapted from Glick et. al. 2011)

From: Williams et al. 2008, Glick et al. 2011, Schneider et al. 2007

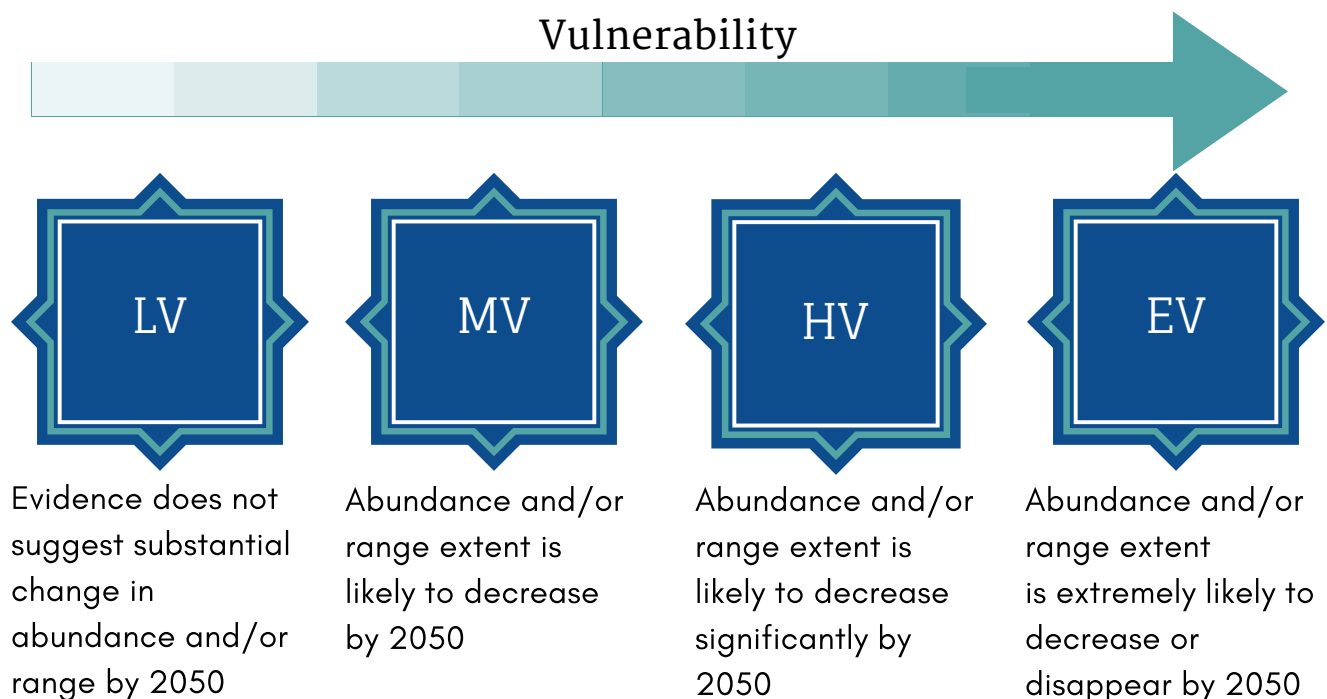
Results

Assessment Findings

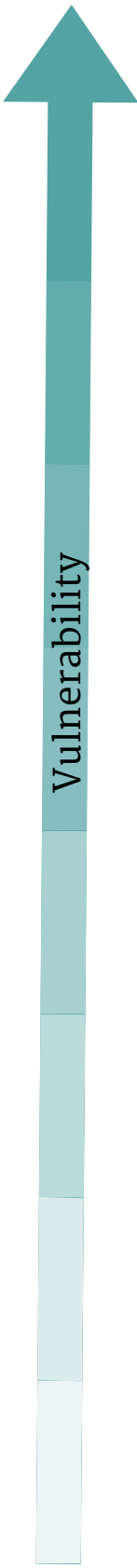
Vulnerability assessments were conducted for 124 individual species across the four geographic regions, using Nature Serve's Climate Change Vulnerability Index and geospatial analysis. These assessments addressed mid-century impacts (to the year 2050) using Nature Serve's Climate Wizard data and Dr. David Notaro's climate projections (University of Wisconsin - Madison).












Uncertainty is an important aspect of vulnerability assessment, especially in this broad-scale vulnerability assessment project. The process was characterized by uncertainty, with ITCMI and tribal staff drawing from a wide variety of scientific and technical literature sources, community and traditional knowledge, and local natural resource management experience. The results are meant to be updated as new information and perspectives are included in tribal adaptation efforts.

Vulnerability was ranked on a scale of: extremely vulnerable (EV), highly vulnerable (HV), moderately vulnerable (MV), and less vulnerable (LV). Uncertainty was captured in a confidence rating on a scale of Low to Very High. Assessment findings are summarized on the following page, according to the scale below. Many species were categorized under different levels of vulnerability and uncertainty across the four geographic regions assessed. The following page presents the most vulnerable ranking received by each species in any geographic region. Detailed information with confidence ratings can be found in the final project report.



Results



	  	<p>Bog rosemary, Northern wild rice, Southern wild rice</p> <p>Snowshoe hare, Moose</p> <p>Lake sturgeon</p>
	 	<p>Black ash, Black spruce, Bulrush sedge, Fringed polygala, Labrador tea, Large cranberry, Northern white cedar, Paper birch, Partridge berry, Pipsissewa, Small cranberry, Yellow lady's slipper</p> <p>Walleye</p>
	  	<p>Elm, Beech, Balsam fir, Broadleaf arrowhead, Trillium, Goldthread, Hemlock, Ladyfern, Lowbush blueberry, Pin cherry, Pin lady's slipper, Sugar maple, Sweetgale, Sweetgrass, Tamarack, White pine, Yellow birch, etc.</p> <p>American beaver, American marten, Fisher, Common loon, Ruffed grouse, Spruce grouse, Sharp-tailed grouse</p> <p>Brook trout, Burbot, Lake trout, Lake herring, Whitefish</p>
	  	<p>Basswood, Bearberry, Bigtooth aspen, Blue cohosh, Boneset, Jack in the pulpit... White water lily, Winterberry</p> <p>Badger, Black bear, Mink, Bobcat, Coyote, Cottontail rabbit, Elk, Gray wolf, Porcupine, Bald eagle, Loon, Blue heron, Mallard, Sandhill crane, Snapping turtle, etc.</p> <p>Northern pike, Perch, Smelt, Muskellunge, Black crappie, Bluegill, Longnose/White sucker, Large/Smallmouth bass</p>

For detailed information with confidence ratings by geographic area, see the final project report.

Icons: Gan Khoun Lay and Jens Tarning from Noun Project

Adaptation



Goals & Strategies

With these vulnerability assessments, tribal resource managers, leaders, and community members may identify and prioritize adaptation goals and strategies.

Adaptation goals may focus on resilience and/or transition. The goal of **resilience** is to improve the ability of a species, resource, or system to remain the same (for the most part) despite changes in climate. The goal of **transition** is to assist the species, resource, or system's ability to track, or to move with, climate changes.

Adaptation strategies are identified and then implemented to accomplish adaptation goals. Adaptation strategies have been developed for specific species, ecosystems, water resources, roads and buildings. These strategies include standard Best Management Practices (BMPs) that Tribes in Michigan may already be using, small changes to current BMPs or current practices, and entirely new efforts.



Adaptation

Adaptation Strategies

A selection of adaptation strategies identified through this process are listed below. Establishing a tribal climate adaptation committee composed of tribal members to guide adaptation strategies may contribute to the adaptation process overall. A complete listing of adaptation strategies can be found in the final project report.

SPECIES & NATURAL FEATURES



- Monitor species populations, phenology, and habitat
- Improve and protect habitat, biodiversity, and ecosystem services
- Improve and protect habitat connectivity to increase resilience and allow species to track climate changes and move to more suitable habitat



- Identify and protect climatic refugia: places where species may persist despite loss of habitat



- Adjust harvesting techniques or times to accommodate changes in growth, flowering, or rearing-young

- Share harvesting and other traditional knowledge across communities

BUILT INFRASTRUCTURE



- Conduct built infrastructure vulnerability assessments to identify sensitivities and thresholds for failure, e.g. freeze-thaw impacts on roadways

- Monitor built infrastructure to decrease probability of emergency actions due to failure, e.g. road wash-outs due to heavy precipitation event runoff



- Implement best land use planning strategies in constructing or upgrading infrastructure, including use of green infrastructure

- Upgrade built infrastructure to accommodate new climate characteristics, e.g. increased runoff from heavy precipitation events



- Implement alternative energy to reduce long term costs, reliance on fossil fuel energy, and decrease greenhouse gas emissions

These strategies may be tailored to the unique needs of each Tribe's lands, waters, ecosystems, infrastructure, and priorities. Selected adaptation strategies may be integrated into existing resource management efforts, plans (e.g. housing, transportation, natural resources), and protocols, and/or compiled in tribal climate adaptation plans.

Moving Forward

Adaptation Planning

Preparing for climate change is a process, not an outcome. Climate adaptation and other management plans are often called "living documents" with good reason – the resources and systems that they deal with are complex, changing, and characterized by (at least some) uncertainty. Planning documents require review and revision as situations change and as more information becomes available. This is especially true with climate change, where new information arises often and where species and resources are actively responding to changes happening now.

Consistent with traditional Anishinaabek ways of working in circles, paying attention to responses, and adjusting actions accordingly, **adaptive management** offers a framework for climate adaptation planning and management in the face of uncertainty. The process of adaptive management is shown in Figure 3.



Whether the Tribe is creating a new Climate Adaptation Plan or integrating adaptation strategies into existing management plans or protocols, the success of tribal climate adaptation depends on:

- Support and involvement of tribal leadership, staff, and community
- Full implementation and integration of adaptation strategies in tribal operations
- Use of an iterative process (e.g. adaptive management) to monitor, evaluate, and revise the adaptation objectives and strategies on a regular basis

Climate adaptation offers a way for Tribes in Michigan to reinforce cultural, political, and economic sustainability and protect natural features for current and future generations.

Figure 3. Adaptive Management
Adapted from Walters 1986 and Holling 1978

Michigan Tribal Climate Change Adaptation Project Partners:

Bay Mills Indian Community

Grand Traverse Bay Band of Ottawa and Chippewa Indians

Lac Vieux Desert Band of Lake Superior Chippewa Indians

Little River Band of Ottawa Indians

Little Traverse Bay Bands of Odawa Indians

Match-E-Be-Nash-She-Wish Band of Potawatomi – Gun Lake Tribe

Pokegenek Bodewadmik – Pokagon Band of Potawatomi

Saginaw Chippewa Indian Tribe


Sault Ste. Marie Tribe of Chippewa Indians





About this document


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Climate Change At-A-Glance Infographic



CLIMATE CHANGE
AT A GLANCE
MICHIGAN TRIBAL CLIMATE ADAPTATION PROJECT



PAST: TEMPERATURE
The annual average temperature has increased by about 2 F° over the past century, with a 9-day decrease in frost days (cold season) between 1958-2012

PAST: PRECIPITATION
The annual average amount of precipitation has increased by about 11% over the past century, with a 37% increase in the number of heavy storms during the last 50 years. 


FUTURE: TEMPERATURE
The annual average temperature may increase by about 4-6 F° by 2050, with an increase in the growing season of about 1 month.

FUTURE: PRECIPITATION
Heavy storms may continue to increase in number and intensity. Winter precipitation may fall more often as rain, while snow depth may decrease. 


GREAT LAKES
Surface water temperatures have increased by about 3F° since 1995. Ice cover decreased by 62-79% between 1973-2010..

FOR MORE INFORMATION
Contact your Tribal Natural Resource and Environmental Departments and the Inter-Tribal Council of Michigan, Inc. 

Data from Great Lakes Integrated Sciences and Assessments, 2016

Traditional Knowledge Interview Questions: Climate Change

These questions were created by Dr. David Pearson (Laurentian University) and modified by the Inter-Tribal Council of Michigan for the collection of Traditional Knowledge related to weather, climate, and impacts on traditional ways of life for Tribes in Michigan. It may be most appropriate to offer asemaa to interviewees, when asking for the interview. These questions are best asked in a conversational format, with *examples* shared by the interviewer as needed. It is important to document interviewee statements as-is, so that their knowledge is recorded without interpretation.

Informed Consent: Miigwech for talking with me today. I'm here to learn about changes in weather, climate, and important resources in the community. You are free to choose not to answer any of these questions – and you do not have to share any information that you feel uncomfortable sharing. The information that you do share will be kept confidential and will help guide the Tribe's Climate Adaptation Plan. (*Information specific to project/uses; If interview is tape-recorded and/or an honorarium is provided, address these here*). This interview will only take about 30 minutes, unless you'd like to talk longer. Before we begin, do you have any concerns or questions?

Landscape

1. During your life, have you noticed any changes on the land in this area? *Examples: changes in the woods, kinds and numbers of trees or plants, the places that you'd expect to find them, the time of year that they flower/fruits ripen, or anything that has disappeared or appeared*
2. Have you noticed any changes in the lakes, rivers, creeks, shoreline, or wetlands in this area? *Examples: changes in water levels, temperature, smell, color, or water plants; erosion, size*
3. Have you noticed any changes in animals, birds, or insects? *Examples: change in the kinds, numbers, size or health; change in the places and dates that you'd expect to find them, changes in their behavior*
4. Has the gathering, hunting, or fishing changed in the community? *Examples: change in the kinds, number, size, or health; important dates; change in hunt/fish/gathering ways*
5. Can you share any Anishinaabemowin (language) or stories about the plants, animals, or other beings of this area?

Weather

6. Have you noticed any changes in the seasons during your life? Winter? Springtime? Summer or fall? *Examples: temperatures, snowfall, snowpack, first/last snow, lake ice, rain/storms, runoff, drought, season length, impact on plants/wildlife*

Infrastructure

7. Have changes in weather or seasons affected homes and other buildings? Power lines, roads, drinking water? *Examples: changes in flooding from rainstorms. Follow-up: What have people done about these changes?*
8. Have there been any emergencies or other problems in your community that were caused by weather? *Follow-up: Are any of those problems different from the past?*

Health

9. Have you noticed any health problems in the community that might be caused by changes in weather or the environment? *Examples: diseases carried by insects, heat-related illness, or respiratory problems from allergies or mold?*
10. Is there anything else that you would like to add?

Guidelines for Conducting Traditional Knowledge Interviews

This document was created by the Great Lakes Indian Fish and Wildlife Commission: Guidelines for Conducting Traditional Ecological Knowledge Interviews, and modified by the Inter-Tribal Council of Michigan, Inc.

Introduction

Anishinaabek bimaadiziwin (ways of life) are inter-woven with the lands, waters, plants, fish, and wildlife of this region. Anishinaabek culture and values may form the foundation of tribal natural resource and environmental management through the integration of Traditional Knowledges.

Traditional Knowledges (TK) refer to the bodies of gikendaasowin (knowledge), bimaadiziwin (practices/lifeways), and beliefs that have been developed and shared across generations. TK may be shared orally through dibaajimowinan (oral histories), aadizookaanan (sacred stories), nagamonan (songs), and ceremonies. Traditional Ecological Knowledge (TEK) and Traditional Phenological Knowledge (TPK) are subsets of TK, which are based on Anishinaabek relationships with, and observations of, the environment. Tribal communities maintain TK regarding local plants and animals, lands and waters, seasons and cycles – including recent changes in climate, human land use, and impacts on natural resources. TK is sustained today by Anishinaabek communities with ongoing relationships with the lands, waters, and other beings of this area.

Natural resources maintain physical and spiritual roles in Anishinaabek ways, fulfilling both physical and spiritual needs of the Anishinaabek. The spiritual roles of natural resources involve reciprocity, where the Anishinaabek show respect and make offerings as a necessary part of obtaining benefits from a resource. TK includes knowledge on what constitutes proper respect for and healthy relationships with particular natural resources, such as harvesting techniques, best management practices, species habitat and distribution, and explanations of the impacts of certain actions or events. TK is developed in an adaptive way, where knowledge and practices are applied, compared, and adjusted over years and generations.

TK holders are people who have learned from years of experience: from years of first-hand resource harvesting, observations of family or community members working with a resource, and/or listening to elders' teachings about a resource. TK holders may be tribal elders or cultural leaders; it should also be noted that communities may have diverse criteria for elder and cultural leader status.

TK Interview Process

Permission from the tribal Board or Council and a tribal Institutional Review Board (IRB) may be required before working with TK and conducting interviews. The Board or Council and IRB should be given information on the project purpose and methods including: the scope of the project, what type of information the project will be documenting, why that information is useful, how the information will be used during the project, how the information will be stored during and after the project, who will maintain ownership of the interview information, and whether or not the information is intended to be used after the project. The risks, benefits, and any compensation to interviewees should be discussed, as well as the informed consent statement that will be shared with each interviewee (see Information TK-Holders Need to Know).

Beginning in a Good Way

Asemaa is one of the four most common nookwezigan, or sacred herbs used by the Anishinaabek for health and healing, cleansing, and other ceremonial purposes: asemaa (tobacco), bashkodejibik (sage), wiingashk (sweetgrass), and giizhikaandagoons (cedar leaves). Asemaa is used when offering prayers and asking for help in fulfillment of the reciprocity. An Anishinaabe sharing their knowledge is a gift: through the act of explaining his or her experiences, he or she is providing years' worth of information that someone else would have to experience to gain the same level of knowledge.

Offering asemaa demonstrates humility by *acknowledging* one's need for help and *honoring* the wisdom that will be shared. The proper use of asemaa indicates to both the TK-holder and the spirits that may be associated with the people or topics that will be discussed that the knowledge will be respected by those seeking it. It may be most appropriate to offer additional gifts, such as a stipend for the interviewee's time, mileage, per diem, food, or other gifts.

Approaching Anishinaabe TK-Holders

Staff may know Anishinaabek with TK and directly contact those individuals. Staff may also reach out to Boards, Committees, and Tribal Historic Preservation Officers (THPOs) as a first step in identifying potential TK-holders. Once TK-holders have been identified, they may reference other harvesters or elders during or after the interview.

Asemaa may be offered to an Anishinaabe TK-holder when asking whether an interview can be conducted and again before the interview is conducted. Each community and individual TK-holders have different preferences for the proper manner of offering asemaa. However, the most widely accepted method of asking an Anishinaabe for help is to offer a pinch of loose tobacco or kinnickinnick with one's left hand. The tobacco or kinnickinnick may be tied in cloth, for later use.

In asking for an interview, explain the project details: what type of information the project will be documenting, why that information is useful, how the information will be used during the project, how the information will be stored, and whether or not the information is intended to be used after the project. The TK-holder may agree to be interviewed or may decline the request, and should be treated with respect in each outcome.

Information TK-Holders Need to Know Before Interviewing

A brief statement of informed consent is recommended, which clarifies: the scope of the project, what information or input the project involves, how the interview transcript and information obtained from the interview will be used, the risks and benefits involved in the TK-holder's participation, and the ability of the TK-holder to choose *not* to answer any question or to end the interview with no negative consequences.

It is important to emphasize that any information shared for a project is owned by the TK-holder. The Tribe will only use the information as authorized to do so. Any compensation for the interview needs to be explained (e.g. a social security number is required for tax purposes) before recording necessary interviewee information for payment. Any additional questions or concerns that a TK-holder has should be addressed before the interview occurs. Honest, respectful communication about how the information will be used, with emphasis the TK-holder's ownership and control of the information provided, will foster good will towards the project and relationship between interviewer and interviewee.

Suggestions for Effective TK Interviews

It is likely for small talk to occur before the interview begins, as the interviewee and interviewer get comfortable. Bringing beverages and light snacks can help ease any tension and reinforce the reciprocal way of Anishinaabek culture; the TK-holder is feeding one with knowledge and one should feed them with food or drinks.

It is important to remember that there is a history of tribal knowledge being abused by early anthropologists and ethnographers, as well as the knowledge holders. Such scholars used traditional knowledge with little to no acknowledgement to the tribal members, often times passing off TK as their own. Recorded knowledge has been presented in culturally insensitive ways that reinforced the ideas that tribal cultures were “primitive” or “dying”. Taboo subjects were sometimes published without consent from the information provider. As such, it is important to respect what information is shared during the interview as well as what information is not shared. The interviewee should never feel like she or he is being pressured or bullied into answering a given question.

Interview questions should be broad to allow for self-editing answers. Some topics may be considered off-limits to record, such as aadizookaanan (sacred stories) or even references to the sacred stories. TK-holders may prefer to keep specific knowledge “off the record,” such as the location of a resource that may only have enough output for one person’s harvest. The manner and detail in which one can respond to a broad question helps ensure that an interviewee will share only what they believe is appropriate to be shared. Having broad questions will also allow the interviewee to feel comfortable with informal questions and counters the sentiment “I don’t know anything,” which many respond with when asked to provide information about a resource.

Broad questions also help reduce the total number of questions to be included in the interview, which supports the casual nature of the interview. Long lists of interview questions may be intimidating for interviewees. Follow-up questions can be asked for additional clarification, but working without a list results in more organic conversation and information. A list can also be perceived as being too impersonal for some elders. Another way to reinforce the casual nature is to refer to the interview appointment or interview itself as a “visit” or a “chance to sit and talk.”

The length of each interview will be determined by the TK-holder and by the amount of information she or he chooses to share with you. It is not unusual to have to schedule additional interviews with the same individual for a number of reasons. It may be that an elder is tired of talking for the day but wants to share more information, or for last minute community obligations may arise. An additional follow up meeting should be offered to the TK-holder when she or he is sent the interview transcript in case of transcript edits that need to be made or additional information to be included if the interview was recorded.

If the interview is **recorded**, double check that recording is acceptable and let the TK-holder know where and how the recording will be stored. Do not record the interview until given approval by the TK-holder to begin. Try to ensure that there is limited background noise that the microphone can pick up. Be sure that the microphone is pointed toward the speaker(s). If the background noise at the interview location is particularly audible, record 10 to 15 seconds of the room without anyone speaking to identify the background noise later during the audio editing process.

If the interview is **not recorded**, be prepared to take detailed notes. In all interview notes, write TK-holder statements verbatim (as-spoken) to avoid interpretation and misunderstanding of the knowledge being shared.

When the interview is over, once again reiterate how the information from the interview will be used in the project and any other future uses. It is often useful to ask if there are uses that the TK-holder does *not* want his or her TK used for. If the interview was recorded, explain how the recording will be stored, who will have access to it, and what will happen to the recording once the project is completed. The interviewees have the right to determine what happens with the transcripts/notes and any recordings of their interviews as well as the TK shared during the interview. Asking if the TK-holder would like a copy of the recording, or if the recording should be kept after the project is completed also acknowledges the TK-holders ownership of TK shared in the interview.

Transcript review is an opportunity for the interviewee to determine what information is shared and used. Ask the interviewee how he or she would prefer to review the interview transcript/notes. Although some TK holders may decline reviewing the transcript, each recorded interview needs to be transcribed in order to ensure accuracy of the information shared and as an accessible reference for later use when creating project deliverables.

Follow Up

Following-up with the TK-holder after the interview is important to: 1) allow TK-holder review of the interview transcripts, and 2) maintain the relationship and build trust with the TK-holder, as a respected member of the tribal community and holder of TK whose role/importance extends beyond this particular project.

The follow-up may be in-person, with the same casual nature as the TK interview. Bringing an offering of asemaa, food, and/or drink may be most appropriate.

When reviewing an interview transcript, some information may need clarification or additional information may be useful for the project goals or deliverables. If such information is needed, the TK-holder can provide it, if she or he deems it appropriate to share. The transcript review also provides another opportunity to ensure that the TK-holder approves of the information shared. If there is any information that she or he wants deleted, edited, or added to, then she or he can do so as the owner of such information. Any information edited or removed from the transcript by the interviewee after review must not be used in any way for the project or future use. Finally, if any information from the interview is intended to be used for another purpose besides the project under which the interview took place, contact the TK-holder and ask for her or his permission to do so.

Extreme Precipitation Summary

Changes in Extreme Precipitation

Intensity

The frequency and intensity of severe storms has increased. This trend will likely continue as the effects of climate change become more pronounced.

The amount of precipitation falling in the heaviest 1% of storms increased by 37% in the Midwest from 1958 to 2012.

The amount of precipitation falling during intense multi-day events has increased dramatically.

Frequency

Heavier storms are projected to increase in frequency at a faster rate than storms that are less intense.

Timing

The clustering of precipitation into heavier storms and the polarization of wet and dry seasons can allow for a greater chance of both extreme precipitation and prolonged dry periods by extending the time between rainfalls.

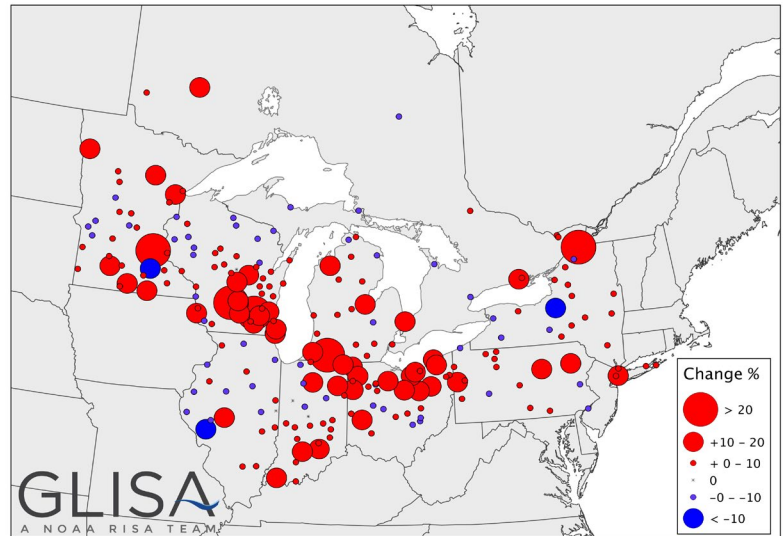
In Michigan's LP, precipitation totals during the fall and spring have increased in most locations, while summer and winter precipitation totals have remained relatively stable. In Michigan's UP, fall precipitation has increased while all other seasons have experienced a decrease in precipitation.

Form

Warmer winter temperatures will lead to less precipitation falling as snow, and more precipitation falling as rain and/or freezing rain.

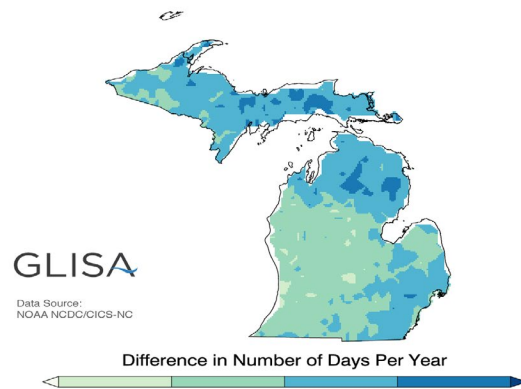
Annual lake effect snow has increased downwind of Lakes Superior and Michigan, and in the future lake effect precipitation is projected to increase although the LP may experience more rain than snow.

Observed Changes (%) in the Intensity of the 1% Heaviest Precipitation Days (1951-1980 vs. 1981-2010)



Southwest Michigan and select locations across central lower Michigan experienced the greatest increases in the state for their increased rate of precipitation falling in the top 1% heaviest precipitation days.

Projected Change in Days with Heavy Precipitation
Period: 2041-2070 | Higher Emissions: A2



Michigan's UP and northern parts of the LP are projected to experience up to 2 more days per year with very heavy precipitation by mid-century.

Glossary

Precipitation Intensity - rainfall rate measuring amount of rainfall over a given time period

Very Heavy Precipitation - defined as the heaviest 1% of all daily events

Extreme Precipitation Scenarios

Scenario 1: Extreme Rain Event During Dry Period in Summer

Event Description	Possible Impacts
<p>Very dry summertime conditions are present when an extreme rain event occurs. The rain event may be an intense 1-day event or multi-day rain event with extremely high rain totals.</p>	<ul style="list-style-type: none"> • Interruption of pollination and food/medicine gathering, destroy gardens & wild gathered foods (depending on timing) • Stress on cold water fisheries • Sedimentation & nutrient loading in surface waters, decrease water quality, cascading impacts on aquatic communities • Blockage or washout of main roads, inability to access healthcare (extreme case with dialysis), groceries, childcare/work • Erosion - major issue with coastal communities & developed areas, water quality, aquatic fish/plants/mussels • Seiche on Great Lakes degrade shorelines, docks, buildings, parking lots, roads, gathering areas/beaches

Scenario 2: Extreme Rain or Snow Event During Dry Period in Spring

Event Description	Possible Impacts
<p>The previous winter experienced less than normal precipitation and the ground is dry going into early spring when the extreme rain or snow</p>	<p>In addition to Scenario 1 Impacts...</p> <ul style="list-style-type: none"> • Damage to budding vegetation, interruption of food/medicine gathering, interruption of pollination, reduced production wild/gathered foods, interruption in wildlife cycles, poor breeding outcomes among wildlife • Risk of mold in homes

Scenario 3: Extreme Rain Event Over Bare, Frozen Ground

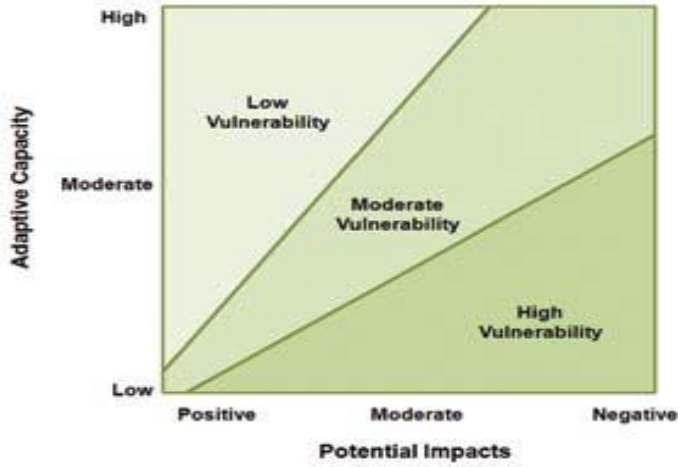
Event Description	Possible Impacts
<p>Winter conditions leave the ground frozen but without snowpack at the time of an extreme rain</p>	<ul style="list-style-type: none"> • Increased flooding & associated risks with infrastructure • Damage to vegetation and roots above-ground • Pollutant loading in runoff to surface waters

Scenario 4: Extreme Rain Event Over Deep Snowpack

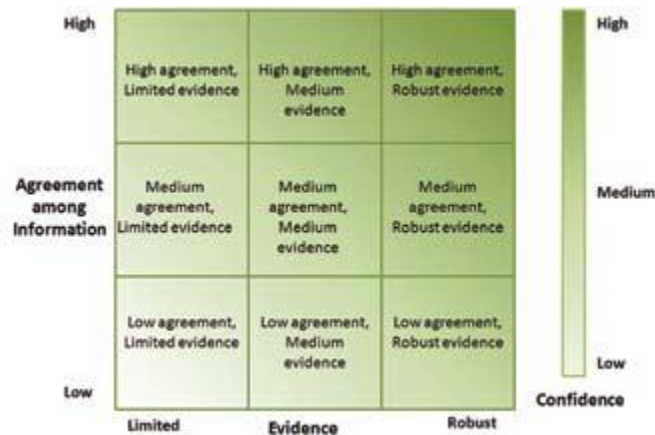
Event Description	Possible Impacts
<p>The ground is covered in moderate to deep snow at the time of an extreme rain event.</p>	<ul style="list-style-type: none"> • Increased flooding & associated risks with infrastructure, damage to vegetation • Pollutant loading in runoff to surface waters • Risk of mold in homes

Qualitative Vulnerability Assessment Tools

The Northern Institute for Applied Climate Science developed the following graphic tools for qualitative vulnerability assessments.



Vulnerability Assessment Tool. Image Source: Northern Institute for Applied Climate Science



Vulnerability Assessment Confidence Tool. Image Source: Northern Institute for Applied Climate Science