Welcome to the Pre-Workshop Webinar!

• Plan for ~ 90 minutes
• This will be recorded

Notes:
• There will be some homework to complete before we meet in person!

Workshop:
• June 3-5, starting at 9am
Outline

1. Climate change impacts
2. Adaptation concepts
3. Guiding principles and Tribal Adaptation Menu
4. How to prepare for the workshop
Who we are -

Core Tribal Adaptation Menu team:

- GLIFWC (Melonee Montano, Hannah Panci, Rob Croll, Kim Stone)
- 1854 Treaty Authority (Tansey Moore)
- Lac du Flambeau (Patricia Moran)
- Michigan Tech (Jerry Jondreau)
- College of Menominee Nation (Chris Caldwell, Greg Gauthier)
- Red Cliff Band (Ziigwanikwe (Katy) Bresette)
- Northeast Climate Adaptation Science Center (Sara Smith)
- Inter-Tribal Council of Michigan (Robin Clark)
- NIACS (Stephen Handler, Kristen Schmitt, Chris Swanston)
Who’s on the phone?

Share your name, location, favorite May activity
Climate Change Impacts
Climate Trends and Projections:

Fourth National Climate Assessment
nca2018.globalchange.gov/

- National Climate Assessment - Climate Science Special Report
  science2017.globalchange.gov

NOAA Climate at a Glance tool (data)
www.ncdc.noaa.gov/cag/
**Impacts on ecosystems**

**Forests (NIACS)**
[forestadaptation.org/vulnerability-assessment](https://forestadaptation.org/vulnerability-assessment)

**Wetlands/natural communities (WICCI)**

**Culturally Important Species (GLIFWC)**
[data.glifwc.org/archive.bio/GLIFWC_Climatic_CHANGE_Vulnerability_Assessment_Version1_April2018.pdf](http://data.glifwc.org/archive.bio/GLIFWC_Climatic_CHANGE_Vulnerability_Assessment_Version1_April2018.pdf)

**Culturally Important Species (ITCMI)**
[www.itcmi.org/departments/environmental-services/](http://www.itcmi.org/departments/environmental-services/)
Climate impacts
Adaptation concepts
Tribal adaptation menu
Preparing for the workshop

There are still a range of possible futures!
Eight Key Impacts ...

• Longer growing season
• Less cold / more heat
• Less snow
• More rain in winter/spring
• More extreme rainfall
• More drought stress
• Shifting species
• Cumulative stressors
Longer Growing Seasons

Opportunity:
Longer period for plant growth

Challenge:
Potential risks from altered seasonality
  • Early bud break/loss of cold hardening
  • Frost damage during spring freezing
  • May advantage some invasive plants

The frost-free season lengthened by **16 days** in the Great Lakes region from 1951-2017

http://glisa.umich.edu/resources/summary
Longer Growing Seasons

Opportunity:
Longer period for plant growth

Challenge:
Potential risks from altered seasonality
- Early bud break/loss of cold hardening
- Frost damage during spring freezing
- May advantage some invasive plants

May increase up to **50-70 days** by 2100 (high emissions)

Projected Change in Frost-Free Season Length
Period: 2070-2099 | Higher Emissions: A2

Data Source:
NOAA NCDC/CICS-NC

Change In Number of Days Per Year
0 10 20 30 40 50 60 70

http://glisa.umich.edu/resources/great-lakes-regional-climate-change-maps
Less Extreme Cold

Decrease in **4 - 28 days** below 0°F by 2100 (high emissions)

MRI model

IPSL model

http://nelson.wisc.edu/ccc/resources/LCC/index.php
More extreme heat

Increase in **10 - 60 days** above 90°F by 2070 (high emissions)

http://glisa.umich.edu/resources/great-lakes-regional-climate-change-maps
Warmer Winters = Less Snow
Also decreases in snow cover duration & depth

Climate impacts
Adaptation concepts
Tribal adaptation menu
Preparing for the workshop

MRI Model
IPSL Model

Warmer Winters = Less Snow
Also decreases in snow cover duration & depth

Challenge:

Decreased snowpack

- Increased soil frost and root damage in cold temps
- Warmer soil temperatures and altered processes
- Changing wildlife dynamics (e.g. deer)
Warmer Winters = Less Snow
Decreases in snow as well as ice cover

Climate impacts
Adaptation concepts
Tribal adaptation menu
Preparing for the workshop

Decreased Ice Cover

- First ice cover on inland lakes is already 6-11 days later than it used to be, along with the ice-out 2-13 days earlier
- The annual ice coverage has decreased drastically by 71% from 1973-2010
**Climate impacts**

Adaptation concepts

Tribal adaptation menu

Preparing for the workshop

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**More rain in winter & spring**

From 1951 2017 total annual precipitation has increased by 14% in the Great Lakes region.

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**Opportunity:**

Potentially more water available for humans and ecosystems

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**Challenge:**

- Earlier spring peak streamflows
- Potential increases in flashiness – erosion & washouts
- Potential declines in summer stream flow

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http://glisa.umich.edu/resources/great-lakes-regional-climate-change-maps

Project Change in Average Precipitation
Period: 2041-2070 | Higher Emissions: A2

[Map showing projected change in average precipitation]
Increased extreme rainfall (and other events)

Challenge:
- Heavy precipitation
- Flooding
- Ice storms
- Heat waves/droughts
- Wind storms

“Events” are very difficult to predict

Photos: Linda Parker/ USFS
Increased extreme rainfall

The amount of precipitation falling in the heaviest 1% of storms increased by 35% in the Great Lakes region from 1951-2017, **30-80% more** extreme precipitation days by 2100.

![Map showing percent change in extreme precipitation between lower and higher emissions scenarios.](image)
Moisture Stress

Warmer temperatures = vapor pressure deficit (VPD)

- More evaporation from soils & open water
- More transpiration from plants

Source: NCA4 – Midwest Regional chapter: https://nca2018.globalchange.gov/chapter/21/
Moisture Stress

Warmer temperatures = vapor pressure deficit (VPD)

 Cooler air can hold less water
 Less moisture demand on plants

 Warmer air can hold more water
 More moisture demand on plants

Challenge:
- “Feels” like a drought, even with more precip

Source: NCA4 – Midwest Regional chapter: https://nca2018.globalchange.gov/chapter/21/
**Opportunity:** Increased habitat for some species

**Challenge:** Decline of northern/boreal species

Species Changes

Plant and animal species will respond to changes in climate.
Species Changes – White oak

Climate impacts
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Preparing for the workshop

Current

Importance
Value
Low
High

2070-2100 Low

2070-2100 High

Modeled Current
• Coldwater fish most likely decline and migrate north due to warming temperatures in lakes and streams.
• Changes in the timing and duration of lake stratification will also impact aquatic species and create dead zones in water bodies.
Interactions make all the difference.

- Chronic stress
- Disturbances
- Invasive species
- Insect pests
- Forest diseases
Impacts on Culturally Important Species
The most frequently mentioned beings are among the most vulnerable
The most frequently mentioned beings are among the most vulnerable
Giizhikaatig (Northern White Cedar)

• Adapted to cool environments
• Susceptible to drought, deer browse
• Requires moist soils
• Dependent on snow
• Suitable habitat projected to decrease

• Used as medicine
• Cedar swamps are drying
• Cedar abundance is decreasing

Confidence level: Moderate

[Graph showing vulnerability score with categories: Less, Moderately, Highly, Extremely]
Waabooz (Snowshoe hare)

- Adapted to cool environments
- Preyed on by coyote, fisher, bobcat
- Low genetic variation
- Mismatch - color change and snowpack
- Documented decline due to climate change
- Modeled future range shows a northward shift

- TEK interviewees all expressed concern about a decline in population over the last 15 years. A decrease in snowfall may be contributing.

Confidence level: High
Manoomin (Wild rice)

- Affected by human land use changes
- Limited dispersal ability
- Adapted to cool environments
- Particular hydrological requirements
- Susceptible to disturbance, competition, pathogens
- Dependent on ice/snow
- Lack of genetic variation

Confidence level: Moderate
“According to the little bit I know about wild rice, you have to have the water, it’s gotta be just right in order for, otherwise you're gonna drown it.”
– Tom Maulson Sr., Lac du Flambeau

“You know what I was worried about this mornin’? That rain knocking my rice over.”
- Fred Ackley, Mole Lake
Michigan Tribal Adaptation Planning

Tribal staff working with tribal members

- Engage Anishinaabe and western scientific ways
- Better understand changes in plants, fish, wildlife, community health, and infrastructure
- Identify ways to support and honor all our relations
Michigan Tribal Adaptation Planning 2015-2016

- 9 Tribes
- 120 plants, fish, and wildlife

<table>
<thead>
<tr>
<th>Region</th>
<th>Plants, Fish, Wildlife</th>
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<tbody>
<tr>
<td>EV</td>
<td>Bog rosemary, Northern wild rice, Southern wild rice, Snowshoe hare, Moose, Lake sturgeon</td>
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<tr>
<td>HV</td>
<td>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, Walleye</td>
</tr>
<tr>
<td>MV</td>
<td>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., American beaver, American marten, Fisher, Common loon, Ruffed grouse, Spruce grouse, Sharp-tailed grouse, Brook trout, Burbot, Lake trout, Lake herring, Whitefish</td>
</tr>
<tr>
<td>LV</td>
<td>Basswood, Bearberry, Bigtooth aspen, Blue cohosh, Boneset, Jack in the pulpit... White water lily, Winterberry, Badger, Black bear, Mink, Bobcat, Coyote, Cottontail rabbit, Elk, Gray wolf, Porcupine, Bald eagle, Loon, Blue heron, Mallard, Sandhill crane, Snapping turtle, etc., Northern pike, Perch, Smelt, Muskellunge, Black crappie, Bluegill, Longnose/White sucker, Large/Smallmouth bass</td>
</tr>
</tbody>
</table>
Inter-Tribal Forest Understory Adaptation 2017-2018

- 4 Tribes
- 5 plants
Inter-Tribal Forest Understory Adaptation

How might Mashkiigobag respond to climate-driven change in Michigan?

VULNERABILITY RATING

**LOW**
No major change in abundance, range extent, or tribal access by the year 2050

**MODERATE**
Abundance, range extent, or tribal access may decrease by the year 2050

**HIGH**
Abundance, range, or tribal access may decrease greatly by the year 2050

**EXTREME**
Abundance, tribal access, or range may decrease or disappear by year 2050

<table>
<thead>
<tr>
<th>Climate-driven changes</th>
<th>Possible impacts on Mashkiigobag</th>
<th>What to watch for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increasing temperatures</strong></td>
<td>Mashkiigobag are at their southern limit in Michigan and grows in cooler areas of the forest, which may become too warm for Mashkiigobag to grow.</td>
<td>Have you noticed changes in how or where Mashkiigobag grows? Are they limited to the coolest areas of the forest?</td>
</tr>
<tr>
<td><strong>Drier soils</strong></td>
<td>Mashkiigobag may be out-competed by other plants as soils warm, dry out, and become more nutrient-rich.</td>
<td>Have there been changes in how wet or dry the places are where Mashkiigobag grows?</td>
</tr>
</tbody>
</table>
Final thoughts

- Many resources of tribal interest are vulnerable to climate change
- TEK and SEK complement each other and strengthen our overall knowledge of climate change vulnerability
- We need to use both knowledge systems to move forward in adapting to climate change
Adaptation Concepts
Responding to climate change

**Mitigation** = actions that reduce the human contribution to the greenhouse gas effect.

**Adaptation** = actions to prepare for and adjust to new conditions.
An Uncertain Future

Don’t wait for the crystal ball...
An Uncertain Future

We don’t need certainty to act
Climate impacts

Adaptation concepts

Tribal adaptation menu

Preparing for the workshop

Plan for a Range

Figure Source: IPCC 2007, 2014
Adaptation Concepts

**Manage for Persistence:**
Ecosystems are still recognizable as being the same system (character)

**Manage for Change:**
Ecosystems have fundamentally changed to something different

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**Reduce impacts / Maintain current conditions**

- **Resistance**
- **Resilience**
- **Transition**

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*Intentionally promote change*

Millar et al. 2007, Stein et al. 2014
There isn’t a single answer

Every community is different

Each decision is unique and will vary based upon:

**Place:** Location & Site Conditions

**Purpose:** Goals & Objectives

**People:** Values, Culture, & Mission

**Practices:** Equipment, Procedures, & Methods
Adaptation Resources + Workbook

• Practical process to intentionally consider climate

• Designed to be flexible – for diverse goals, and values

• Does not make recommendations – users customize actions

Swanson and Janowiak 2016; www.nrs.fs.fed.us/pubs/52760
1. **DEFINE** management objectives.

2. **ASSESS** climate impacts.

3. **EVALUATE** management objectives.

4. **IDENTIFY** adaptation approaches.

5. **MONITOR** and evaluate effectiveness.

**Preview of the workshop process**

Adaptation Menus

A collection of plausible adaptation actions that is:

- Specific to a discipline
- Organized into a tiered hierarchy
- Thorough and comprehensive (including opposing ideas!)
Adaptation Menu Benefits

Address challenges in implementing adaptation:

1. Connecting broad ideas to specific actions
2. Making actions intentional
3. Communicating your ideas
4. Boosting creativity
Adaptation Menus

1. Connecting Broad Ideas to Specific Actions

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Option: Resistance (forestall change)
Adaptation Menus

1. Connecting Broad Ideas to Specific Actions

OPTION

STRATEGIES

APPROACHES

TACTICS

Strategy 4. Sustain fundamental ecological and cultural functions
1. Connecting Broad Ideas to Specific Actions

Approach 4.5. Revitalize and maintain Anishinaabe/cultural use of ishkode (fire) as a stewardship tool.
Adaptation Menus

1. Connecting Broad Ideas to Specific Actions

OPTION

STRATEGIES

APPROACHES

TACTICS

ACTION

Tactic: Use prescribed burns in marsh habitats to encourage young plant communities
2. Making Actions Intentional

My intent is to ....
(Options and Strategies)

So I will ....
(Approaches and Tactics)
Adaptation Menus

3. Communicating your Ideas

Photo: Robin Clark, Baawaating
Adaptation Menus

4. Boosting Creativity

Photos and beadwork by Josh Hudson, Gnoozhekaaning
The need for indigenous perspectives

- Adaptation menus have been reflective of western science and a resource-centric perspective
- Needed to create a menu reflective of Indigenous knowledge and kin-centric perspectives
Tribal Adaptation
Menu & Guiding Principles
Tribal Adaptation

Indigenous peoples have adapted to environmental change for millenia

We have a responsibility to understand and support our relatives

• Change in access-relations
• Fixed boundaries - reservations, treaty-ceded territories
Origins: Tribal Adaptation Menu

In the Spring of 2017, NIACS held an Adapting Forested Watersheds to Climate Change Workshop in Minocqua, WI

– Case Study Wild Rice Restoration project that was to be used with the NIACS Adaptation Workbook and Adaptation Menu
Purpose: Tribal Adaptation Menu

- Create a new climate adaptation approach menu
- Decision-making and conduct rooted in Indigenous ways
- Engage Indigenous sciences and knowledges
- Trend of Euro-centric science looking to Indigenous knowledge, which has been the foundations of our existence for millennia
Multiple Perspectives

• Indigenous perspectives call for observation, recognizing and learning from our first teachers, and adaptation that addresses responsibility and reciprocity to all our relations

• Western perspectives emphasize control and management of non-sentient resources
Adaptation & Natural World

Abundance of adaptation options from Western perspectives
• Instead of waiting for systems to naturally establish themselves, managers are tasked with selecting and managing for specific future forest/aquatic/natural communities

The Tribal Adaptation Menu offers a different perspective on adaptation
Three R’s: Respect, Reciprocity, and Relationships

- Decisions for use of our relatives were originally communal decisions made with recognition and acknowledgement throughout.
- Today management and decision-making for land and the natural environment is made less as a communal decision and more as an individual or institutionalized.
Tribal Adaptation Menu

No singular native, tribal or indigenous approach for caring of the land

• Suggestions to assist in addressing needs of a particular indigenous community

• Used by non-tribal people or organizations interested in indigenous approaches to adaptation
Guiding Principles for Interacting with Tribes

How to Develop Culturally Appropriate Climate Adaptation Actions

This document is intended to empower tribal governments, federal and state agencies, non-governmental organizations (NGOs), individual landowners and others to incorporate Anishinaabeg perspectives, specifically from the Great Lakes region, into a climate adaptation framework. We recognize the shortcomings of this document in our attempt to incorporate indigenous concepts, language, and cultural practices; a single document written in English can’t fully capture what we intend to express. We hope that the perspectives given here offer users an additional lens with which to view the environment and facilitate a more culturally appropriate approach to working with tribal nations.

While the intent of this document is to give specific examples from one group of people, we encourage other tribes to edit these according to the needs of their individual community by adding language, words, and concepts unique to that community. We should stress that the editing process be undertaken first, before initiating any project, as the intent behind this document is to ground climate change adaptation planning in knowledge that is unique to the perspective of each indigenous community.

Offering asemaalnāeqnemaw (tobacco). (Photo by Charlie Rasmussen, GLIFWC.)
- Designed for use by tribal communities and their non-tribal partner agencies

- Strategy/approach/tactic framework

- The first three strategies address cultural practices, community engagement and recognizing human and non-human reciprocal relationships

- Emphasizes that sometimes not doing something may be appropriate

### Menu of Adaptation Strategies and Approaches

**Strategy 1: Consider cultural practices and seek spiritual guidance.**

Indigenous knowledge and ways can provide the backbone for successful climate adaptation. Seeking guidance from the community on adaptation needs and actions, respecting and building on dynamic relationships, and honoring cultural responsibilities and histories may benefit both short- and long-term adaptation efforts.

1.1. Consult cultural leaders, key community members, and elders.

Cultural leaders, community members, harvesters, elders, and other key individuals have important knowledge and perspectives that can inform climate adaptation activities. Taking time to build relationships and properly consult with the broader community will result in more informed decisions and more support for adaptation actions.

Example tactics:
- Conduct community engagement workshops to learn about past changes using specific examples or important resources as discussion points.
- Interview wild rice gatherers to discuss observed impacts on wild rice from storm events or changing lake levels.
- Work with tribal leaders and members to identify knowledgeable individuals in the community, such as elders, and how to consult with them in a good way.
- Build organizational capacity by funding outreach staff who are trained to discuss climate change with the community.

1.2. Consider mindful practices of reciprocity.

Healthy relationships depend on reciprocal exchanges of gifts, knowledge, and respect, among others. For example, it is appropriate to offer asemaa/nâëqemaw (tobacco) to people when requesting permission to use a gift (resource). This principle applies to land management as well as interpersonal relationships within the community.

Example tactics:
- Offer asemaa/nâëqemaw (tobacco) when requesting permission to use a gift (resource).
- Provide gifts when seeking guidance or knowledge from elders or community members.
- Share data and results of climate change assessments and adaptation projects with the local community.
- Ensure that teachers and contributors are credited in presentations, public documents, and materials.
- Teach harvesting in a good way, such as taking only what you need and leaving enough to sustain a population. For example, harvesters should refrain from harvesting wild rice when it is raining, because it can weaken the root system.

1.3. Understand the human and landscape history of the community.

Every place has a unique context and unique stories to tell. The history of the community and the land can inform land management decisions, and it is worth investing time and attention to cultivate a deeper understanding of a place before deciding on appropriate management actions.

Example tactics:
- Identify and meet with Tribal Historic Preservation Officers and discuss the history of the local community.
Culturally Relevant Adaptation

Forest Adaptation Menu:

**Strategy 9:** Facilitate community adjustments through species transitions.

**Approach 9.7:** Introduce species that are expected to be adapted to future conditions.

Tribal Adaptation Menu:

**Strategy 11:** Encourage community adjustments and transition while maintaining reciprocity and balance.

**Approach 11.4:** Seek out and share traditional and cultural knowledge of potential new beings from tribal communities where these beings are native.
Preparing for the Workshop
Before the Workshop

• Read through the Guiding Principles and Tribal Adaptation Menu

• Complete “Step 1” of the adaptation workbook, for a project of your choice, using the template worksheet.
Before the Workshop

- Read the Guiding Principles
- Read through the Tribal Adaptation Menu

Outline of the Menu’s Strategies and Approaches

**Strategy 1: Consider cultural practices and seek spiritual guidance.**
1. Consult cultural leaders, key community members, and elders.
2. Consider mindful practices of reciprocity.
3. Understand the human and landscape history of the community.
4. Hold respect for all of our relations, both tangible and intangible
5. Maintain dynamic relationships in a changing landscape.

**Strategy 2: Learn through careful and respectful observation (gikinawaabi).**
1. Learn from beings and natural communities as they respond to changing conditions over time.

**Strategy 3: Support tribal engagement in the environment.**
1. Maintain and revitalize traditional relationships and uses.
2. Establish and support language revitalization programs.
3. Establish, maintain, and identify existing inventory and monitoring programs.
4. Establish and maintain cultural, environmental education, and youth programs.
5. Communicate opportunities for use of tribal and public lands.
6. Participate in local- and landscape-level management decisions with partner agencies.

**Strategy 4: Sustain fundamental ecological and cultural functions.**
1. Maintain or restore hydrology and soils.
2. Maintain or restore riparian areas.
3. Maintain or restore nibi (water) quality.
4. Support specific plants or plant communities with essential requirements.
5. Revitalize and maintain Anishinaabe/cultural use of ishkode/fire as a stewardship tool.
6. Maintain and revitalize cultural approaches to harvesting and caretaking.
Step 1: DEFINE area of interest, program goals and objectives, and time frames.

What project should I choose?

- Something you’re working on now!
- Something from your IRMP
- Something you want to spend time discussing.
- You’re encouraged to submit a project as a group – just let us know.
**Step 1:** DEFINE area of interest, program goals and objectives, and time frames.

Bay Mills Project – cedar planting OR leek restoration

Dowagiac River and Peavine Creek – Restoration for Salmonids

St. Marys River – wetlands and manoomin

EUP Natural Hazards Mitigation Plan
**Step 1:** DEFINE area of interest, project or program goals and objectives, and time frames.

*Send to Stephen Handler* ([Stephen.handler@usda.gov](mailto:Stephen.handler@usda.gov)).

<table>
<thead>
<tr>
<th>Project Area:</th>
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<tbody>
<tr>
<td>Location:</td>
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<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>Management Goals</th>
<th>Management Objectives</th>
<th>Time Frames</th>
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</tbody>
</table>
**Step 1:** DEFINE area of interest, program goals and objectives, and time frames.

**Goals:** What are your desired outcomes?

**Objectives:** How do you plan to achieve these outcomes?
**Step 1:** DEFINE area of interest, program goals and objectives, and time frames.

**Example Goal:**
- *Improve wildlife habitat for game species in a tribally owned hunting area.*

**Example Objective:**
- *Implement prescribed burns across 100 acres of property to encourage growth of mast species like northern red oak.*
Step 1: DEFINE area of interest, program goals and objectives, and time frames.

Think about how you’re already considering the community:

• **Strategy 1**: Consider cultural practices and seek spiritual guidance.

• **Strategy 2**: Learn through careful and respectful observation (gikinawaabi).

• **Strategy 3**: Support tribal engagement in the environment.
**Step 1:** DEFINE area of interest, program goals and objectives, and time frames.

Please send your worksheet to Stephen by May 29!

Sooner is better!
For more background ...

Look over some information on ecosystem vulnerabilities:

Forest Assessments: https://forestadaptation.org/vulnerability-assessment

Culturally Important Species, Health, Infrastructure (ITCMI) www.itcmi.org/departments/environmental-services/

Culturally Important Species (GLIFWC) data.glifwc.org/archive.bio/GLIFWC_Climate_Change_Vulnerability_Assessment_V1_April2018.pdf

Your own Vulnerability Assessments!
For more background ...

Talk to your elders, hunters, gatherers, first-language speakers, youth, and other community members
Questions ?