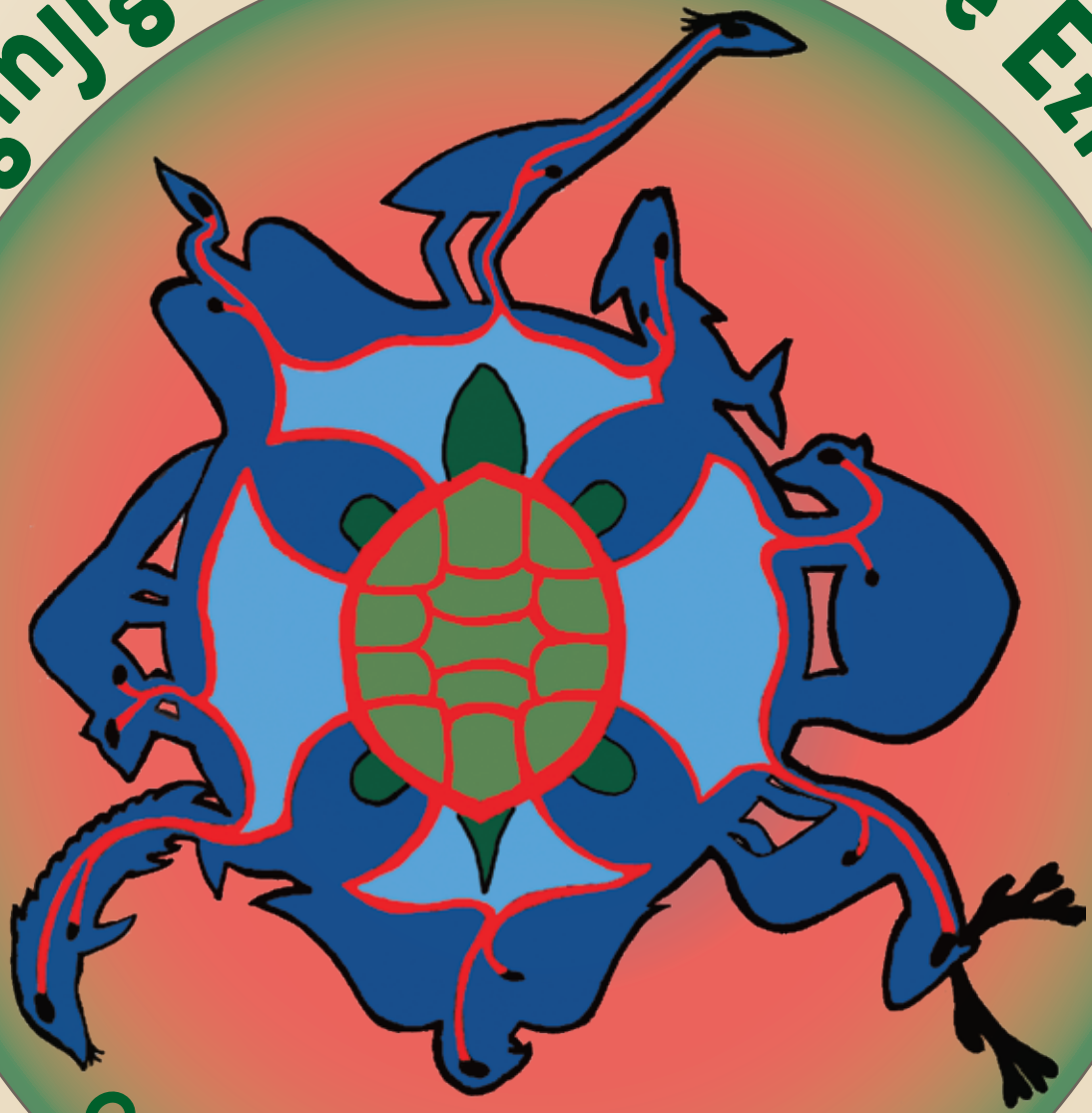


**Dibaginjigaadeg Anishinaabe Ezhitwaad**



**A Tribal Climate Adaptation Menu**

*Caring for those who take care of us*

# Abstract

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. Many climate adaptation planning tools fail to address the unique needs, values and cultures of indigenous communities. This Tribal Climate Adaptation Menu, which was developed by a diverse group of collaborators representing tribal, academic, intertribal and government entities in Minnesota, Wisconsin and Michigan, provides a framework to integrate indigenous and traditional knowledge, culture, language and history into the climate adaptation planning process. Developed as part of the Climate Change Response Framework, the Tribal Climate Adaptation Menu is designed to work with the Northern Institute of Applied Climate Science (NIACS) Adaptation Workbook, and as a stand-alone resource. The Menu is an extensive collection of climate change adaptation actions for natural resource management, organized into tiers of general and more specific ideas. It also includes a companion Guiding Principles document, which describes detailed considerations for working with tribal communities. While this first version of the Menu was created based on Ojibwe and Menominee perspectives, languages, concepts and values, it was intentionally designed to be adaptable to other indigenous communities, allowing for the incorporation of their language, knowledge and culture. Primarily developed for the use of indigenous communities, tribal natural resource agencies and their non-indigenous partners, this Tribal Climate Adaptation Menu may be useful in bridging communication barriers for non-tribal persons or organizations interested in indigenous approaches to climate adaptation and the needs and values of tribal communities.

## Suggested Citation

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## Disclaimer

This document was prepared by a team of individuals from a variety of agencies, tribes and academic institutions. It represents the consensus view of its authors and the guidance of teachers and elders.

## Cover Art

This piece was designed to represent Ojibwe clans and their role in caring about the earth. The turtle in the center is a representation of Turtle Island: our lands, waters and home. The red lines connect the hearts and minds of the beings on earth, through their feet and into the ground. These bloodlines show how we are made up of everything the earth has to provide, how we draw our existence from this place, and also how our thoughts, intentions and actions impact the place we call home. There are four basic colors: the dark blue of the waters, the light blue of the skies, the green of the plant life and the red of our blood and the earth. Artwork by Ziigwanikwe (Katy Bresette), digitized by Bazile Panek.

Layout and design by Great Lakes Indian Fish and Wildlife Commission Public Information Office staff, with a special miigwech to Lynn Plucinski.

**Dibaginjigaadeg Anishinaabe Ezhitwaad**  
**Doing something based on the Anishinaabe way**



# Authors



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Minogiizhigookwe izhinikaazo. Migizi odoodeman. Mashkiziibiing onjibaa. **Emily Minogiizhigookwe Nelis** is a member of the Bad River Band of Lake Superior Ojibwe, and is part of the eagle clan. She began working for GLIFWC in 2018, and enjoys connecting with Ojibwe culture through Ojibwemowin, traditional beadwork, moccasin making, ceremonies, seasonal activities, and more.

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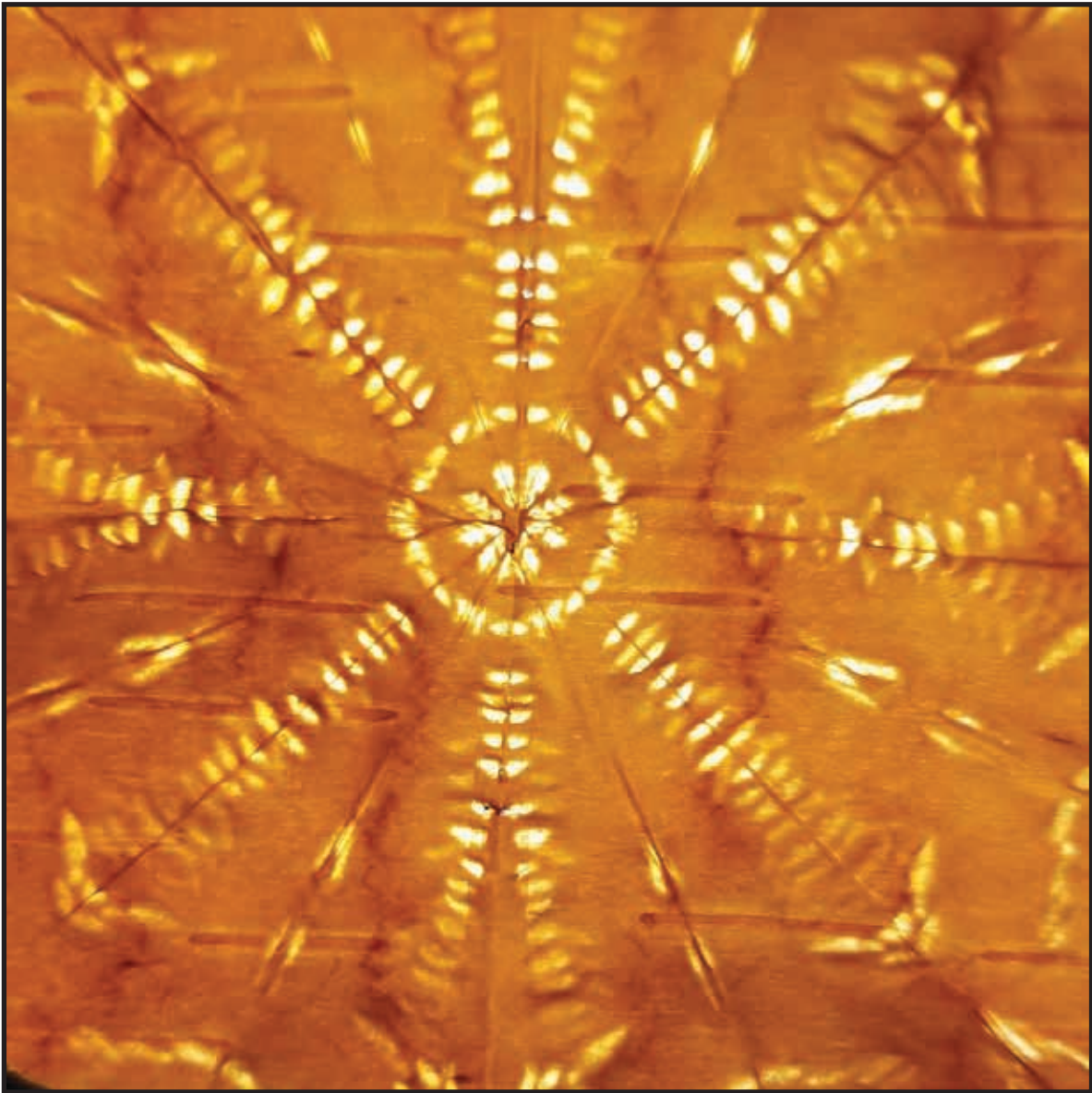
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*Mazinibaganjigan (Ojibwe birch bark biting art). (Photo by Gidagaa bizhiw (Jerry Jondreau).)*

# Guiding Principles for Interacting with Tribes

## How to Develop Culturally Appropriate Climate Adaptation Actions



*Offering asemaal/nāēqnemaw (tobacco). (Photo by Charlie Rasmussen, GLIFWC.)*

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.

### Importance of Human/Non-Human Relationships

Relationships are the interwoven bonds that form the framework of place within which we exist. Western societies value, and therefore emphasize, the importance of human interactions. These exchanges are often categorized into bonds of family, friendship, business, casual, intimate, and intellectual, to name but a few. All of these ties create a roadmap that we utilize to guide our everyday actions. Indigenous cultures around the globe and throughout time have also applied these relational values to recognizing and developing connections with their natural environment. We consider beings in the natural environment to be elders and teachers who can teach us valuable lessons. This has ensured an equitable, long-term, sustainable, and generational existence for many of these human and nonhuman communities. These relationships have developed in a multiplicity of cultures that have passed down a knowledge of place through thousands of years of experience to subsequent generations. They provide the framework of relationships and the roadmap to a truly sustainable way of life, with respect and understanding for all aspects of creation.

*The Menominee awareness of our position in nature was born from careful observation of our ancient garden beds.*

*The corn is recognized as the Elder, the one who guides and cares for the beans and squash and calls together the wild brothers (plants) that line the edges of the planted community.*

*We recognize that we are just one part of this community and not above it.*

*We who receive these benefits are truly honored, for this is a gift of life, given from the heart of our Creator.*

*—as told by Jeff Grignon*





*Fran Van Zile, Vickie Ackley, and Fred Ackley share knowledge and input at GLIFWC's Advisory and Guidance Input Group of Elders (GAAGIGE). Fred has since walked on. (Photo by Paula Maday, GLIFWC.)*

As the original and current stewards of the Great Lakes region, Ojibwe and Menominee tribal members who worked on this project felt it important to bring a language of parity between human and non-human beings. English and scientific terminology used in currently accepted land management practices tends to assume human dominance over non-human beings. This approach deviates from an equitable co-existence with our environment, which is typically a foundational understanding in many indigenous cultures. The terms used throughout this document are an attempt to recognize agency and sovereignty of our non-human relations.

The ability of indigenous communities to survive was developed with their understanding of self within place. From this understanding, humans learned values of respect, humility, honesty, bravery, love, wisdom and truth. These

values are applicable in most interactions of the Anishinaabeg people and can be closely considered when understanding an Anishinaabe perspective on climate change and adaptation. Since its inception this world has been constantly changing. Seasons change, years change and eventually, climates change. From an Ojibwe perspective, one can derive an understanding of these changes through the values that are declared in stories, practices and teachings.

## **Tribal Culture and Adaptation**

The Ojibwe people, like many indigenous populations, are an adaptable people. The Western perspective understood indigenous communities as nomadic or unsettled. In early interactions, the first colonizers described the communities they settled as “savage,” unable to put down roots, and therefore less civilized than their Western counterparts. However, from a different perspective, perhaps these communities were far more “civilized” than we are even today. Through the values of respect and understanding, Anishinaabeg communities can be seen as adaptive, flexible, and able to respond to any given situation. Instead of trying to change the environment to suit their needs, they patiently observed and learned from their surroundings over hundreds of thousands of years to see how they should change. Where should they move? When should they go? How should they build, eat, live? These questions were regularly debated and counseled so that the best decisions for the survival of the people could be made.

Many of the ecological crises humanity is facing are due to the pervasiveness of the Western perspective in decision-making around the globe. Anishinaabeg perspectives call for observation, deliberation, recognition, and adaptation. Western perspectives more closely reflect exploration, domination, exploitation, and extraction. Though Western societies have built themselves upon the wealth they have gained from this way of life, there is an air of stagnation that refuses to allow for the flexibility to adapt to new challenges. When Anishinaabeg communities were faced with impending changes in their surrounding environment decisions were made based on where the communities should be in order to survive. Western traditions still dictate actions that reflect the worldview of altering the environment to maintain a specific way of life. Many solutions to climate change also reflect a dominant perspective that tries to change what is happening around us. Instead of removing people from potential at-risk areas and finding better environments to suit their needs, people want to control their environment and force it to change. Instead of waiting for systems to naturally establish themselves, people assume authority and choose who they believe should be there. These are all rooted in a Western perspective of control and dominance over the natural world.

Colonialism has been extremely detrimental to the continuation of tried and true indigenous lifeways. The transfer of ancient understandings has been disrupted by extermination, assimilation, and other government policies, leaving an enormous void within tribal communities. In tribal communities, decisions for use of available natural resources were originally communal decisions made with recognition and acknowledgement

through principles of respect, reciprocity, and relationships. 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 activity, based on economics. This can lead to disagreements over decision-making within indigenous/tribal communities, and often results in decisions that reflect dominant culture and their values. We must revitalize our culture, language, and relationship with our environment in order to reverse the trends we see today.

The plants, animals, and other manidoog (spirits) are our relatives and original teachers. We have always been the younger siblings and students. Our teachers are still teaching but we no longer acknowledge their wisdom. When their wisdom is not valued our teachers and relatives quickly become “resources” stripped of their true identities and sold on the open market to the highest bidder. This is surely not a lesson taught by our original instructors. While extractive economies have become a mainstay of Western society, we must also remember the entirety of value from all beings, human and non-human. Returning to our elders for guidance and actively participating in the revitalization of our traditions, language and ceremony will begin the path to healing. In order to return to this path, we propose that communities remember the important framework of relationships with our relatives, both human and non-human. These relationships will present the path to healing and to a sustainable future.

## Important Cultural Paradigms to Consider

This section provides an overview of ways for engaging indigenous perspectives in stewardship. We understand that not all of these suggestions will apply to each individual case or tribe; however, we believe it will initiate discussions among current generations of stewards, and inspire and guide younger stewards as they begin to examine how to incorporate their belief systems and perspectives into their work. Our co-authors felt it important to emphasize key points to consider before beginning a project.

Respect is an integral value in indigenous communities. What is considered respectful behavior will vary in each community, and it is important to find out what is expected from the community before beginning a project. In many Ojibwe communities, for example, respect is first demonstrated through the offering of asemaa/nāēqnemaw (tobacco), as discussed below.



*Ojibwe elder Sue Lemieux instructs interns how to braid sweetgrass at the GLIFWC garden. (Photo by Charlie Rasmussen, GLIFWC.)*

The personhood of all beings should be considered when approaching communities and projects tied to the land. Western notions restrict the value of respect to human interactions. In many indigenous communities, respect goes beyond human-to-human relationships and includes all beings involved in an endeavor. It is important to understand that the respect you pay “people” should be the same level of respect you afford all beings involved in the process. Establishing a relationship with these beings requires a deep understanding of their sense of place, which is better understood from those in the community who know and cherish it best. It will be important for any outsider to be sure the space and time is available for the community and its members to initiate this level of respect. Do not assume you are the authority. Take guidance from the community, understand your place in this effort, and allow for the true relational values to flourish.

In addition to the value of beings, reciprocity is very important in many indigenous communities in communicating respect. The English definition of reciprocity is “the practice of exchanging things with others for mutual benefit.” This English concept is the closest understanding available to values that are built into the daily existence of many indigenous communities. A common example of reciprocity in Ojibwe culture is the giving of asemaa/nāēqnemaw and gifts as a way to ask for culturally significant knowledge, such as a name, a story, or advice. It is important to understand that built into indigenous cultures are perspectives of reciprocity that go beyond a Western understanding of the word. True reciprocity goes beyond a pinch of asemaa/nāēqnemaw. In Ojibwe communities for example, it is understood that the effort you dedicate to a

*So Nenabush was the one that created the animals. So he invited all that he made to come here. So this is how people gathered to smoke their pipes. As they sat in a circle, he spoke to each one individually. “The reason why I ask you to come here is, I am going to ask you all this. People will soon arrive; the Anishinaabe will soon arrive here. I am going to ask you ahead of time, how are you going to help the Anishinaabe when they get here. You are called animals, and you each have a different name. This is how the Anishinaabe will survive, by you the animals. This is how they will get their food to survive.”*

*So the moose was the first to start talking. “This is what I would like to give the Anishinaabe, they will eat my meat. If you look at (study) the things I eat. This is medicine that I go about eating all over. I eat grass, twigs and roots from the water. I eat all these things wherever I go; that is how I eat. So Anishinaabe eats my meat. This is how they will cure themselves. This is how he will lead a good healthy life. If they show respect to my meat. If they show respect of my gift. When they offer tobacco, that is what I like when they show me respect with tobacco. The trimmings (from the meat) and also the bones. My wish is that they put these in the woods. Not to throw them over there in the garbage is my wish. When the bones are returned to the woods, another one of me will arise from there. These four-legged little runners and also the large birds and little birds. They too will eat from this. When you put things back in the woods. And when one picks the meat from the bones, that is what I appreciate. They too will eat these animals. That is how I will help the Anishinaabe. And also my jacket, my skin, this is what they will use to lace up their snowshoe, the hide. I will not be far away when I know that the one that is looking for me has done the proper protocols. I will be here waiting, because I care, and I will care, for the Anishinaabe that is going to arrive. That is what I will do.”*

*—as told by Ogimaagwanebiik [Nancy Jones]*

process will dictate what you will see in return. The approach of respect and reciprocity will open the doors to local perspectives and stories in ways that discussion questions, which tend to be direct and focused, will not.

Gifts are tangible illustrations of reciprocity. The history of these gifts and their original intentions will serve to inform our current understandings and what intent should underlie gifting. Asemaa/nāēqnemaw, blankets, and food were exchanged as they served utilitarian purposes. Often food, lodging and resources were exchanged in return for the assistance rendered following a request.

Although an offering of asemaa/nāēqnemaw when asking for something is customary now, the intent behind those exchanges have been lost. When surveying your intentions, ask yourself these questions: How do you show your gratitude? What are gifts you should bring? Who should be gifted?

People who are not from a given community may not understand that there are even places that should be gifted. Gifts and gifting come in many different forms and may vary from tribe to tribe, and even within each community. Some examples of gifting from an Ojibwe perspective include opening and closing ceremonies or feasts with gift bundles gathered from the community. If you are gifting an individual, you may be offering food, lodging and/or a stipend to compensate for that person’s time. The local manidoog should be taken into consideration, as some communities or individuals have specific helpers who are caretakers for that place. Again, guidance in this effort must be initiated by the community. As a guest, it is most important to be open to the fact that the traditions and customs of a place are always purposeful. The intentionality of life is to be valued and cherished for the knowledge and connections that are intrinsic to place.

One concept that is often overlooked in Western societies is the importance of dedicating time. Climate change often promotes a sense of urgency. Many agencies and institutions that are brought into indigenous communities to tackle climate change issues have a sense of time based on Western values. Projects that aim to tackle an issue like climate change need a dedication of time for the entirety of the process. Relationships with all beings also require time in order to get more complete access to the desired information. For example, working with knowledge holders involves initiating, building and maintaining relationships. This is a long process that involves spending time outside of what is considered typical “work” settings and timeframes.

In order to truly understand the land you are looking at, time must be spent there, through the seasons and changes. Taking time to connect with the local landscape will allow you to understand the major and subtle cues for the history of that place and what that place could be.

## Community Engagement

A large component of the Tribal Climate Adaptation Menu involves community engagement. In many tribal communities, outside entities—including research institutions and government agencies—have conducted research and developed plans on behalf of communities with little input from community members. Additionally, many of the results and plans have been inaccessible to the community members they impact.

The following suggestions for engaging with the community are based on the GLIFWC Guidelines for Conducting Traditional Ecological Knowledge Interviews. Please make note, these customary practices are specific to the eleven Anishinaabe/Ojibwe member tribes of the GLIFWC intertribal agency. We acknowledge that these practices may not be common to all tribal communities.

## The cultural importance of asemaa/nāēqnemaw

Asemaa/nāēqnemaw is one of the four most common nookwezigan, or sacred herbs, characterized by their fragrant smoke and slow-burning properties, along with bashkodejiibik (sage), wiingashk (sweetgrass) and giizhikaandagoons (cedar leaves). These herbs are used for smudging, healing, cleansing, and other ceremonial purposes. Asemaa/nāēqnemaw in particular is used when offering prayers and asking for help or favors because it acts as a spiritual signifier that an exchange is occurring. Since knowledge is intangible, that person is sharing a part of his or her spiritual energy and, through the act of explaining his or her experiences, he or she is providing years' worth of data that someone else would have to experience to gain the same level of knowledge. A knowledge holder sharing their knowledge is a gift, as are the gifts and assistance we receive from plants, animals, places, and manidoog.



*Traditional Anishinaabe asemaa consists of a mixture of plants indigenous to tribal homelands. Native tobacco, known as apaakozigan, may include a wide variety of blends, appearing different in color and composition. (Photo by Charlie Rasmussen, GLIFWC.)*

*Tobacco was put here on earth for the Indian to use. Tobacco was used when an Indian person gave thanks. In the morning too, they used tobacco. Also, tobacco was offered to the one asked to tell legends, only done in the winter. An Indian always offered tobacco to the thunderbirds when they came around. That is why it was known that an Indian was present.*

*In everything an Indian did, he offered tobacco. If he went far, if he was by the water, and if animals were killed, they made an offering. When they saw something unusual, they made a tobacco offering—at waterfalls, huge rocks, mountains—they considered them sacred.*

*When somebody picks his medicine, he certainly makes an offering, putting down his tobacco. And if somebody is picking rice, he certainly makes an offering and puts down tobacco in the water. And if somebody is going to boil sap, he certainly makes an offering. Tobacco is given to somebody who is a gifted speaker when he prays with tobacco. Not everyone knows how. That is why attempts are being made for children to speak Ojibwe to understand the Indian way of life.*

*—as told by Jessie Clark*

Offering asemaa/nāēqnemaw demonstrates humility and reciprocity as values of engagement by acknowledging one's ignorance and need for help and honoring the wisdom and knowledge that will be shared. The proper use of asemaa/nāēqnemaw indicates to both the knowledge holder, and to the spirits that may be associated with the topics that will be discussed, that the knowledge will be respected by those seeking it. Asemaa/nāēqnemaw is the minimum requirement for such a request of information and these steps should be applied when seeking knowledge and assistance from all beings.

## Approaching knowledge holders

These procedures describe human-to-human relationships as referenced in the GLIFWC TEK document. Through these initial relationships you may gain knowledge and perspectives that can guide interactions with non-human beings.

Asemaa/nāēqnemaw needs to be offered to a knowledge holder when asking whether a discussion can be initiated, and again before the discussion is conducted. It is very effective to offer asemaa/nāēqnemaw first in the manner of asking a knowledge holder for the favor of just listening to a basic overview of the project. Each community and individual knowledge holder may have different preferences for the proper manner of offering asemaa/nāēqnemaw. When offering asemaa, one should be open to taking guidance or being corrected on someone's preferences, however the most widely accepted method of asking an Anishinaabe to help you is to offer asemaa/nāēqnemaw with one's left hand. It is useful to carry a small piece of cloth and string in case a knowledge holder does not plan on using the asemaa/nāēqnemaw right away to prevent it from staining hands or being lost during transport.

Once she or he agrees to assist, explain the details: what entities are involved, what type of information will be documented, why that information is useful, the manner in which the information will be used, how the information will be stored, and whether or not the information is intended to be used at a later time. At this point, the knowledge holder is able to agree to participate or can politely decline if uncomfortable with sharing that type of information. If the discussion will occur at a later time, one should offer asemaa/nāēqnemaw again before beginning, this time signifying respect for the knowledge that is going to be shared. If the discussion occurs shortly after the asemaa/nāēqnemaw is given the first time, such as later that same day, then an additional asemaa/nāēqnemaw offering for participating is usually not necessary unless the knowledge holder requests it.

## What knowledge seekers need to consider before a discussion

A knowledge holder should be made aware of the scope of the project, what information or input the project requires, and the manner in which the information obtained will be used for the project as well as any future projects. Before the project begins, it should be decided who will "own" the information shared. The suggestion of the authors of this document is to emphasize that any information shared for a project is owned by the knowledge holder, not the individual(s) conducting the discussion. The information should only be used as authorized by the one the knowledge is obtained from. The transparent nature of how the information will be used and emphasizing ownership and control of the information provided will foster good will towards the project. This is especially useful when helping to create community buy-in for greater participation and reception. Compensation for the discussion, if any, needs to be explained before recording necessary information for payment. Any additional questions or concerns that a knowledge holder has should be addressed before the discussion begins.



*Manidoons Leonard Moose of Mille Lacs and Mary Moose of Canada. Manidoons has since walked on but gifted many with a large amount of knowledge before his passing. (Photo by Melonee Montano, GLIFWC.)*

As a reminder, once work with a knowledge holder is finished, ask if there is anything she or he would like to add. When conversations are over, explain again how the information gathered will be used, both for the current use and possible future uses. It is often more useful to ask if there are uses the knowledge holder does not want his or her knowledge used for, instead of imagining a long list of potential scenarios. If recording, explain storage, who will have access to it, and what will happen to the recording once your tasks are completed. Asking if the knowledge holder would like a copy of the recording, or if the recording may be retained after the project is completed, also reinforces the fact that she or he is the owner of the knowledge that was shared.

The knowledge holders should have the right to determine what happens with transcripts and recordings, as well as the knowledge shared during the discussion. Ask the knowledge holder for her or his preferred method of transcript review. Although some knowledge holders may decline reviewing recordings or transcripts, each recorded discussion should be transcribed in order to ensure accuracy of the information shared, and as an accessible reference for later use when creating deliverables. Often, when reviewing a transcript, there may be information that needs clarification or the identification of additional information that may be useful. If such information is needed, the knowledge holder can provide it, if she or he deems it appropriate to share. The transcript review also provides another opportunity to ensure that the knowledge holder approves what information was shared and if there is any information that she or he wants deleted, edited, or added to. The transcript review is an opportunity to determine what information is shared and used. Any information edited or removed from the transcript after review must not be used in any way. Finally, if any information from the discussion is intended to be used for another purpose besides its original intent, contact the knowledge holder and ask for her or his permission to do so. Many knowledge holders are also respected elders in their communities. In the event that a knowledge holder has passed away before final approval has been sought, during recognition of contributions, or for any other circumstance in which you would need to work with that knowledge holder again, it is important to empower the surviving family members and seek their guidance about the knowledge that has been shared.

## **Finalizing a project and disseminating information**

In the planning stages, be sure to ask questions that reflect how actions will be finalized once a project is complete. This should include information gathered, the people who participated and the people and locations that will be impacted. It will be important to provide the information for the community through many approaches that will meet the diversity of accessibility in these communities. Online resources are helpful for immediate access, but accessibility to technology is often a struggle in tribal and rural communities. Though there may be tribal libraries that could house information, there are still tribal members who may not have access to, or faith in, education systems that keep these resources. It will be important to survey the community on an individual basis to see what will work for that place. A multi-faceted approach will help reach a broader audience. Take into account intertribal sharing opportunities as well. It will be important to support established intertribal institutions that already exist as a means to disseminate information and promote an indigenous worldview.

Recognition of participants will be very important in many communities. From an Ojibwe perspective, an honoring feast or celebration is often held for important events. An understanding of the cultural practices in an individual community will help guide these actions. As previously mentioned, often outside institutions come into a community, conduct their work and leave with their information in hand. Proper compensation for what has been shared will be necessary, however, proper recognition of that information, and those who have shared it, is just as important. Those who hold knowledge are the reason those who seek knowledge can be successful. During recognition and celebration, there is also an opportunity to disseminate results, proposals and other finalized products that have come from your endeavors. It gives the opportunity for the community to see what has occurred during a project, have input about the project and reflect on the process. While these types of community input events are often implemented during projects to seek guidance, they should also be considered as the projects end.

## Final Thought

Engaging with indigenous knowledge systems to address natural resource concerns requires engaging indigenous community members who hold this knowledge. It also requires recognizing historical violations of trust that have inhibited the balanced exchange of knowledge between research institutions and other agencies and the community, and often have not reflected the community accurately. Community-based projects need the indigenous community to be involved in all stages of the planning process and have community-based mentors to co-develop the outcome. Understanding the underlying values and principles will guide efforts and transform the dominant paradigm to one that is cultural, ethical, effective and sustainable.



*The four sacred herbs: bashkodejiibik (sage, top left), asemaa (tobacco, top right), giizhikaandagoons (cedar leaves, bottom left), and wiingashk (sweetgrass, bottom right) are used for smudging, healing, cleansing, and other ceremonial purposes.*

# Introductory Note

The idea to build this Tribal Climate Adaptation Menu grew from an experience shared by several of the authors at an Adapting Forested Watersheds to Climate Change Workshop in March 2017. The group worked together to develop adaptation actions for a wild rice restoration project using the Adaptation Workbook and an adaptation menu developed by the Northern Institute of Applied Climate Science (NIACS), published in *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers*. As members applied the NIACS menu to a tribally-focused project, it became increasingly clear that the menu wasn't designed to address the unique needs, values, and cultures of tribes and tribal practitioners. Traditional and indigenous knowledge and perspectives weren't being recognized in climate adaptation resources, and this seemed like a gap to fill.

Our goal in creating this Tribal Climate Adaptation Menu is to provide a resource for incorporating tribal and traditional values into the existing NIACS Adaptation Workbook as well as other climate adaptation planning processes. This Menu follows the same framework as the previous NIACS adaptation menus, and it is designed to be used across a diversity of ecosystems, scales, management contexts, and values. Each set of Strategies and Approaches suggests ways to incorporate traditional values and relevant cultural considerations into climate adaptation planning and natural resource management. We hope this Menu will offer land managers a framework to include traditional and cultural knowledge, the input of community members such as tribal elders and harvesters, culturally-based management techniques, cultural and historical sites, indigenous languages, and other appropriate cultural values and priorities in the process of planning for climate change.

This Tribal Climate Adaptation Menu is not intended to prescribe a singular native, tribal, or indigenous approach for caring for the land and resources. Individual tribal communities and projects might vary greatly; this menu provides suggestions to assist in addressing the needs of your community. As with the other NIACS adaptation menus, the menu allows users to insert their own values into the process. For example, seeking traditional knowledge is proposed as a way to understand the unique needs of your project and community. We did attempt to incorporate as broad a spectrum of tribal adaptation approaches as possible, but we are aware this menu is not a comprehensive list of climate adaptation actions.

This Tribal Climate Adaptation Menu might also be used by non-tribal persons or organizations interested in indigenous approaches to climate change planning and the unique needs and values of tribal communities who apply them. We hope it will help bridge communication barriers between tribal and non-tribal partners, as well as between tribal natural resource managers and local communities.

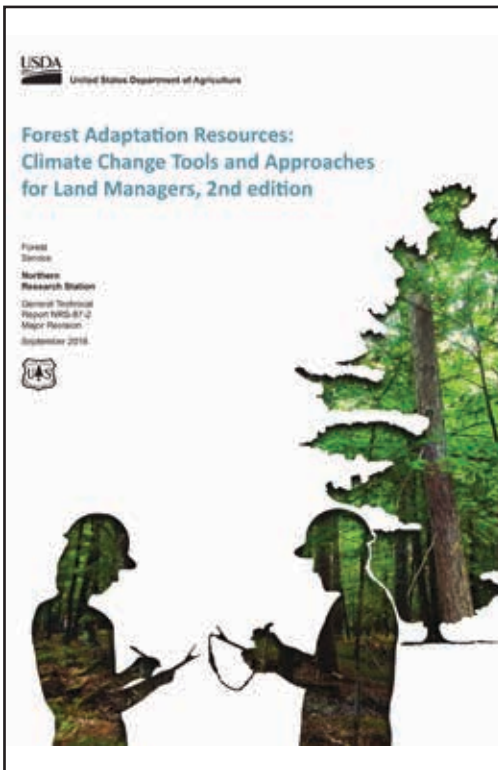
Language is integral to indigenous cultures and can be a critical tool in understanding and planning for a changing landscape. Words in Ojibwe and Menominee, the languages of our working group members, are used in this menu, and their meanings can be found at the end of this document in a glossary of terms. However, most indigenous languages are based on spoken teachings and often contain concepts which do not easily translate into English. Indigenous language has evolved through the creation of language dictionaries and the preservation of language is a focus within indigenous communities. This Tribal Climate Adaptation Menu is a living document and we invite each user to add language, words, concepts, strategies, approaches and tactics to customize this menu to fit their community.

Those involved in writing this edition come from a variety of indigenous communities and other backgrounds. Many guidelines and expectations are the result of templates developed from a Western perspective. Our belief, in creating this particular menu of climate adaptation approaches, is that we must be rooted in indigenous ways of decision-making and conduct. This is especially important while working in a seemingly disconnected world on a subject so vital to the well-being of us all. Our truths are still relevant and it is only recently that Western science has begun to verify knowledge that has been the foundations of our existence for millennia. These roots, these foundations, should guide decision-making in all aspects of our communities and most especially in our principles of conduct in meeting goals, objectives, and tasks tied to the relationships of Anishinaabewakiing, our homelands.

May your planning be carried out in a good way.



# Tribal Climate Adaptation Menu Overview



This Tribal Adaptation Menu is designed to align with the Adaptation Workbook and adaptation menus published in *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers* ([www.nrs.fs.fed.us/pubs/52760](http://www.nrs.fs.fed.us/pubs/52760)). Therefore, we are presenting these adaptation ideas in a tiered structure to organize many concepts. The 14 Strategies, 50+ Approaches, and 100+ example tactics were developed through an assessment of existing adaptation tools, focus group discussions, and workshops with natural resource professionals. Adaptation Strategies are very general and can be applied in many ways across different ecosystems and cultural contexts. Adaptation Approaches are more specific, describing in greater detail how Strategies could be put into practice. These Strategies and Approaches are designed to serve as stepping stones to allow natural resource managers and planners to translate broad concepts into targeted and specific actions (tactics) for putting climate change adaptation into practice to achieve a specific management objective in a specific location. Example tactics are provided in this chapter as illustrations; they are not comprehensive, and represent but a few of the possible tactics that could be used in ecosystem management and climate adaptation projects.

The Strategies and Approaches are presented as a flexible menu rather than

a prescribed list, as land managers can pick and choose adaptation actions which make the most sense for their particular context. This flexibility is needed to accommodate diverse management goals, geographic settings, perspectives on climate change risks, and cultural contexts. The Adaptation Workbook describes a structured process to help people use the menu and develop their own specific adaptation tactics.

Although menu items can be applied in various combinations to achieve desired outcomes, not all items on the menu will work together. Furthermore, actions that work well in one ecosystem type may not work in another; it is up to the land manager and other project partners to select appropriate actions for a specific purpose. Even though this Tribal Climate Adaptation Menu is primarily designed to focus on natural resource management decisions, it includes Strategies that are focused on relationships with other beings, the land, and the community. These concepts are deliberately presented first in the Tribal Climate Adaptation Menu to emphasize the importance of considering these relationships first and foremost.



# Outline of the Menu's Strategies and Approaches

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

- 1.1. Consult cultural leaders, key community members, and elders.
- 1.2. Consider mindful practices of reciprocity.
- 1.3. Understand the human and landscape history of the community.
- 1.4. Hold respect for all of our relations, both tangible and intangible.
- 1.5. Maintain dynamic relationships in a changing landscape.

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

- 2.1. Learn from beings and natural communities as they respond to changing conditions over time.

## **Strategy 3: Support tribal engagement in the environment.**

- 3.1. Maintain and revitalize traditional relationships and uses.
- 3.2. Establish and support language revitalization programs.
- 3.3. Establish, maintain, and identify existing inventory and monitoring programs.
- 3.4. Establish and maintain cultural, environmental education, and youth programs.
- 3.5. Communicate opportunities for use of tribal and public lands.
- 3.6. Participate in local- and landscape-level management decisions with partner agencies.

## **Strategy 4: Sustain fundamental ecological and cultural functions.**

- 4.1. Maintain or restore hydrology and soils.
- 4.2. Maintain or restore riparian areas.
- 4.3. Maintain or restore nibi (water) quality.
- 4.4. Support specific plants or plant communities with essential requirements.
- 4.5. Revitalize and maintain Anishinaabe/cultural use of ishkode (fire) as a stewardship tool.
- 4.6. Maintain and revitalize cultural approaches to harvesting and caretaking.

## **Strategy 5: Reduce the impact of biological and anthropogenic stressors.**

- 5.1. Maintain or improve the ability of communities to balance the effects of manidoonsag (little spirits).
- 5.2. Maintain or improve the ability of communities to balance the effects of bakaan ingoji gaa-ondaadag (non-local beings).
- 5.3. Manage herbivory to promote regeneration of impacted beings.
- 5.4. Reduce negative impacts from anthropogenic disturbances.
- 5.5. Monitor and reduce ambient air pollution.

## **Strategy 6: Reduce the risk and long-term impacts of disturbances.**

- 6.1. Alter community structure or composition to reduce risk or severity of major disturbances.
- 6.2. Promptly revegetate sites after natural disturbance.
- 6.3. Care for cultural sites after a severe disturbance.
- 6.4. Plan harvesting, gathering, and collecting opportunities to reduce the risk and impacts of disturbances.



**Strategy 7: Establish, support, and recognize opportunities for beings or sites of concern to the community to withstand climate change.**

- 7.1. Identify, prioritize, and maintain cultural sites and/or culturally sensitive areas.
- 7.2. Identify, prioritize, and maintain at-risk and/or culturally important beings or communities.
- 7.3. Establish places for at-risk or displaced beings outside of their normal environments (biological nests/refugia).
- 7.4. Seek out or share traditional and/or cultural knowledge to inform management of sensitive or at-risk beings or communities.
- 7.5. Create and/or maintain access routes to traditional gathering and harvesting sites.
- 7.6. Work across treaty or tribal areas with partners and other tribes to manage at-risk beings.

**Strategy 8: Maintain and enhance community and structural diversity.**

- 8.1. Maintain and restore diversity of native beings.
- 8.2. Promote diverse generations (both elder and younger beings).
- 8.3. Retain biological and cultural legacies.
- 8.4. Establish protected areas to maintain ecosystem and cultural diversity.

**Strategy 9: Increase ecosystem redundancy and promote connectivity across the landscape.**

- 9.1. Manage habitats and access opportunities over a range of sites and conditions.
- 9.2. Identify additional lands for acquisition to expand the tribal land base, maintain diversity, and improve connectivity.
- 9.3. Reduce fragmentation to promote continuous natural ecosystems.
- 9.4. Maintain and create habitat corridors through restoration.

**Strategy 10: Maintain and enhance genetic diversity.**

- 10.1. Use seeds and other biological material from relatives of beings from across a greater geographic range.
- 10.2. Favor local beings whose traits are better adapted to future conditions.
- 10.3. Collect and preserve seeds from beings that are at-risk or of concern to the community.

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

- 11.1. Favor or restore native beings that are expected to do well under future conditions and that can help meet future needs.
- 11.2. Establish or encourage new mixes of local beings and/or bakaan ingoji gaa-ondaadag (non-local beings) expected to do well under future conditions to meet future needs.
- 11.3. Guide changes in composition of beings at early stages of development.
- 11.4. Seek out and share traditional and cultural knowledge of potential new beings from tribal communities where these beings are native.

**Strategy 12: Support a new ecosystem balance after a major disturbance.**

- 12.1. Promptly prepare and revegetate sites after disturbance.
- 12.2. Allow for areas of natural regeneration to observe which beings naturally appear on the site.
- 12.3. Adapt significantly disrupted ecosystems to meet expected future conditions and needs.
- 12.4. Relocate ecosystems, beings, or cultural sites.

**Strategy 13: Design and modify infrastructure and access to match future conditions and community needs.**

- 13.1. Reinforce infrastructure to meet expected conditions.
- 13.2. Incorporate natural or low impact development into designs.
- 13.3. Reroute, relocate, or remove infrastructure to increase access efficiency and minimize harmful impacts.

**Strategy 14: Accommodate altered hydrologic processes.**

- 14.1. Plan for decreased streamflow and limited water availability.
- 14.2. Enhance the ability of ecosystems to retain water.
- 14.3. Adjust systems to cope with increased water availability and high water levels.
- 14.4. Respond to or prepare for excessive overland flows (surface runoff).
- 14.5. Adjust the location and size of forested areas to new or changing water levels.



*Youth group walking through the woods in Beartown, Keweenaw Bay Indian Community reservation. (Photo by Gidagaa bizhiw (Jerry Jondreau).)*

# Menu of Adaptation Strategies and Approaches

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

*Indigenous knowledges 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 knowledges 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.



*Pat and Chibinesiban Jim Northrup from Fond du Lac Band of Lake Superior Chippewa. Chibinesiban Jim Northrup has since walked on. (Photo by Melonee Montano, GLIFWC.)*

### 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/nāēqnemaw (tobacco) 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/nāēqnemaw (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.

- \* Create maps to provide a visual story of the history and landscape of the community to inform climate adaptation planning and community meetings.
- \* Seek out and obtain traditional stories (such as creation stories) and teachings from knowledgeable elders to make connections to climate change.

#### **1.4. Hold respect for all of our relations, both tangible and intangible.**

*We exist in a web of relationships, among human and non-human communities. Giving attention and respect to all our relations will help us consider and address needs beyond simple land management objectives.*

Example tactics:

- \* Offer asemaa/nāēqnemaw (tobacco) and communicate with beings to explain intended actions, such as communicating with tree beings before conducting harvest activities or research.
- \* Hold respect for and carry out ceremonies for protecting natural communities and gifts (particularly nibi).
- \* Respect and acknowledge the presence of spirit beings, such as binesiiwag (thunderbeings), as referred to in traditional teachings.

#### **1.5. Maintain dynamic relationships in a changing landscape.**

*The changing climate may support novel combinations of beings living in a given landscape. When considering climate change adaptation actions, it is important to explore relationships between and among new beings as well as maintain relationships with existing beings. Relationships are integral to a holistic approach to adaptation.*

Example tactics:

- \* Seek out or share traditional and/or cultural knowledge regarding beings moving among tribal communities, such as southern tree species that are intentionally planted in new areas north of their current home range.
- \* Be aware of how climate change may affect the timing of cultural indicators in order to ensure the harvest of beings in a good way. For example, the traditional practice in northern Wisconsin has been to wait to harvest deer until after fireflies emerge, but climate change may alter this timing.
- \* Involve the community when considering changes in harvesting decisions, such as managing cold water or warm water fish populations in a lake.
- \* Adjust moose hunting seasons and rules to accommodate changing population patterns, particularly in areas where moose are declining.



*Tannins leaching out of a red maple leaf, Slate River, Baraga County, MI, 1842 Ceded Territory. (Photo by Monique Jondreau.)*



*Black ash stand. Black ash are projected to be decimated by the emerald ash borer. This Strategy suggests observing and learning from the tree beings as they respond to the manidoonsag. (Photo by Travis Bartnick, GLIFWC.)*

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

*Indigenous knowledges and ways recognize plant, animal, and other spirit beings as our original teachers. While conventional land management favors direct intervention, with humans controlling the natural world, indigenous perspectives emphasize the importance of learning from other beings and natural communities. This Strategy involves taking time to observe and learn from the beings in a given area. This idea may become even more important in an era of climate change, as shifting conditions result in cascading ecosystem impacts and unexpected outcomes.*

### **2.1. Learn from beings and natural communities as they respond to changing conditions over time.**

*With careful and patient attention, we can learn about strategic adaptation from the experiences and actions of plant, animal, and other spirit beings and natural communities. This can include monitoring that acknowledges, respects, and learns from beings and natural communities. Learning patiently can be a valuable first step in situations with great uncertainty.*

Example tactics:

- ✿ Observe survivors of pest or disease outbreaks, droughts, and windthrow events to learn how they tolerated change and identify natural resistance to manidoonsag or other stressors.
- ✿ Establish a phenology monitoring program to observe changes in flowering dates, migration patterns, or other seasonal events.
- ✿ Seek out Traditional Ecological Knowledge and Scientific Ecological Knowledge (SEK) on the life history and natural capabilities of beings to tolerate change.
- ✿ Observe shorelines and flood zones throughout lake level fluctuations or extreme weather events to understand new system dynamics.
- ✿ Observe bakaan ingoji gaa-ondaadag (non-local beings), their interactions with other beings, and changes to natural communities.

### Strategy 3: Support tribal engagement in the environment.

*Climate adaptation can both encourage and rely on relationships among tribal communities and the lands, waters, and other beings of an area. Supporting and revitalizing these relationships may improve both human and non-human community health and lead to greater community involvement and ownership over land management processes and decisions.*

#### 3.1. Maintain and revitalize traditional relationships and uses.

*Traditional relationships are a source of strength and are integral to holistic climate adaptation. These relationships may be strained and pressured by climate change, and adaptation may involve strengthening and supporting those relationships. For example, encouraging more people to participate in maple sap harvesting, even if this practice becomes more difficult, supports climate adaptation actions focusing on maintaining healthy and viable sugar maple stands and the traditional relationship between human and tree beings.*



*Early each fall semester, native students from Ashland, Mille Lacs, Lac Courte Oreilles and other schools attend manoomin camp on Ceded Territory wild rice waters. Bringing the classroom outdoors replicates century-old Ojibwe traditions and creates opportunities for youth to acquire essential harvest skills. (Photo by Charlie Rasmussen, GLIFWC.)*

Example tactics:

- \* Hold educational sessions and workshops on the use of traditional food, crafts, medicine, and ceremonies.
- \* Involve youth in traditional harvesting activities, such as holding wild rice harvesting camps to teach youth traditional teachings, stories, and practices.
- \* Utilize traditional fire practices to encourage blueberry growth.
- \* Preserve threatened resources to ensure that traditional crafts, medicines, and relationships can continue in a changing environment. For example, store black ash logs from Emerald ash borer killed trees in water to preserve the wood for future use in craft-making.

#### 3.2. Establish and support language revitalization programs.

*Language embodies cultural knowledges and ways of life, which can guide adaptation efforts. Loss of native languages can create a disconnect between community members and the environment and create a barrier to effective community involvement in climate adaptation. Programs that revitalize native languages can re-establish important connections and revive cultural traditions.*

Example tactics:

- \* Hold language camps and create school programs that incorporate climate change as a theme.
- \* Develop a climate change-related vocabulary in native languages.
- \* Incorporate native language in adaptation planning documents and other similar documents such as forest management plans.





### 3.3. Establish, maintain, and identify existing inventory and monitoring programs.

*Inventory and monitoring programs can help assess changes as they occur, which can be crucial when making decisions about climate adaptation. Inventory and monitoring programs are also a way to involve community members, school groups, and professional staff to the shared process of observing and caring for the local environment.*

Example tactics:

- \* Create a list of existing inventory and monitoring programs.
- \* Involve the community in using citizen science tools such as Nature’s Notebook and iNaturalist.
- \* Participate in networks with other communities involved in climate change research, such as the Indigenous Phenology Network or the Alaska Local and Environmental Observer Network.
- \* Implement a continuous forest inventory on tribally managed forests to record changes over time.
- \* Conduct a bioblitz to catalog different beings and provide inventory data.



*Madison Bear and Katie Carlson assisting with GLIFWC’s plant phenology study. (Photo by Hannah Panci, GLIFWC.)*

### 3.4. Establish and maintain cultural, environmental education, and youth programs.

*Cultural and environmental education engages young people with the natural world through their culture and language, reinforcing their place in the world and respect for the relationships that sustain them. By encouraging elders and harvesters to pass along traditional knowledges to younger generations, the culture continues even as conditions are changing.*



*Tribal Engagement Nett Lake School Sugar Camp, Bois Forte Reservation. (1854 Treaty Authority photo.)*

Example tactics:

- \* Involve youth in traditional harvesting activities by holding a wild rice harvesting camp, or a trapping class that incorporates native language.
- \* Hold a culture camp to teach youth traditional teachings, stories, and practices.
- \* Hold community presentations focusing on climate change, cultural beings and/or the environment.
- \* Develop or utilize climate change-related curriculum for schools, such as materials from the G-WOW program.

### 3.5. Communicate opportunities for use of tribal and public lands.

*Increasing awareness of opportunities for tribal members to use tribal and public lands for harvesting, culture, and recreation will increase knowledge of and relationships with an area, which may lead to greater engagement with adaptation actions and their potential success. Intertribal organizations and public management agencies can assist with this objective.*

Example tactics:

- \* Clarify existing regulations for harvesting, camping, logging, and prescribed fire on USFS or other public lands. For example, distribute clear maps and fact sheets with permits as they are issued.
- \* Encourage tribal hunting on public lands through hunter safety and youth programs.

- \* Create a mapping tool for public use that identifies land ownership, cover type, permitted activities, and other information.
- \* Help to distribute the gathering of declining resources by using newsletters to highlight multiple harvesting areas for tribal use.

### 3.6. Participate in local- and landscape-level management decisions with partner agencies.

*Tribal input and involvement can influence local- to landscape-scale management decisions when tribes effectively partner with county, state, and federal land management agencies in climate adaptation planning. All potential partners must work to address cultural and administrative barriers that may impede effective collaboration. Intertribal organizations and other “boundary-spanning” organizations can support these relationships and other co-management efforts.*

Example tactics:

- \* Coordinate with multiple tribal contacts and involve them early on—this could include the tribal council, tribal environmental and natural resources staff, Tribal Historic Preservation Office, and others.
- \* Establish and maintain an effective protocol for communicating between tribes and partner agencies, which would include ideas about timing, appropriate contacts, and communication methods.
- \* Request or utilize a tribal liaison to increase communication with partner agencies on climate change planning.
- \* Coordinate management of declining resources with other agencies to reduce impacts of overharvesting. For example, tribal, state, and federal agencies have recently coordinated a management response to intensive harvest of paper birch poles in Wisconsin.
- \* Serve on a landscape-level management committee such as a zoning, land use, or landscape conservation board.



*At the 25th anniversary celebration of the Tribal–USDA Forest Service Memorandum of Understanding (MOU), leadership from GLIFWC and the Forest Service exchange gifts to commemorate many years of a healthy working relationship. (Photo by Dylan Jennings, GLIFWC.)*

## Strategy 4: Sustain fundamental ecological and cultural functions.

*Climate adaptation actions will need to focus on maintaining the integrity of ecosystems and supporting cultural relationships in a changing climate. The following Approaches describe different ways to sustain native cultural and ecological systems.*

### 4.1. Maintain or restore hydrology and soils.

*Climate change is expected to alter hydrology and soils in many ways, including changes in streamflow, snowpack, soil moisture, flooding, and drought. Maintaining soil quality and nutrient cycling is fundamental to sustainable land management and can help ecosystems persist under new conditions. Adaptation actions may focus on ensuring that ecosystems have the right amount of water at the right time. It may be necessary to redesign infrastructure to maintain or restore hydrology, such as road-stream crossings and culverts. Keep in mind that modifications to maintain hydrology and soil quality at one site may have negative impacts on hydrology and soil quality at another site. Existing guidelines and best management practices describe actions to reduce impacts to soil and water, which are also likely to be beneficial for climate adaptation.*



*Downed coarse woody debris in a northern hardwood forest. (Photo by Joshua Cohen, Michigan Natural Features Inventory.)*

Example tactics:

- \* Protect and enhance infiltration and water storage capacity of soils by timing timber harvest activities to reduce potential impacts to soils, especially in areas that require frozen soil or dry conditions.
- \* Assess existing culverts and restore and/or replace where necessary, utilizing designs and management practices which also facilitate the passage of fish and other aquatic beings.



*Little Carp River, Keweenaw Bay Indian Community, Baraga County Michigan. (Photo by Gidigaa bizhiw (Jerry Jondreau).)*

#### **4.2. Maintain or restore riparian areas.**

*Forests in riparian areas decrease soil erosion, filter water, cool stream temperatures, and provide habitat corridors for wildlife and plant beings. These important functions and benefits may be degraded if riparian forests suffer from climatic shifts and extreme events. Protective guidelines, such as best management practices and riparian management zones, can help avoid damage or additional stress to riparian areas during management activities. It may also be necessary to help prepare riparian areas for more extreme high flow events due to heavy rain, as well as low-flow periods due to late-season droughts.*

Example tactics:

- \* Design drainage structures and road-stream crossings to accommodate projected high and low flows and permit beings to pass between upstream and downstream water sources.
- \* Reconnect wetlands, meadows, and riparian areas to floodplains.
- \* Remove obstructions to stream flow that alter channel shape (check dams, undersized culverts) and redesign culverts and bridges to accommodate dynamic stream channel shape.



*Stockton Island, Apostle Islands National Lakeshore, Ashland County, Wisconsin. (Photo by Gidigaa bizhiw (Jerry Jondreau).)*

#### **4.3. Maintain or restore nibi (water) quality.**

*Clean water is one of the most important gifts we receive from the natural world. Climate change may reduce water quality in a variety of ways, such as through changes in nutrient levels and increased sediment loading. Adaptation actions can help preserve habitat for beings that depend on clean water.*

Example tactics:

- \* Divert nutrient loaded waters from infrastructure or agriculture to vegetated areas likely to absorb and settle out nutrients.
- \* Collaborate with neighboring landowners around important water bodies to reduce sources of land-based pollutants.
- \* Plant conifers in riparian areas to increase stream shading and maintain cool water habitat.

- \* Delay timber harvests following heavy rains and avoid timber harvesting activities prior to expected rain events to reduce soil erosion and sedimentation in streams.
- \* Hold respect for and carry out ceremonies for protecting nibi.

**Indigenous and tribal peoples care for an estimated 22% of the Earth's surface, and protect nearly 80% of the remaining biodiversity on the planet, while representing only 5% of the world's population.**

—*International Labour Organization, 2017*

#### 4.4. Support specific plants or plant communities with essential requirements.

*Adaptation actions often target certain beings and ensure that they can grow to their fullest potential. Providing desired or at-risk beings with essential requirements such as light, nutrients, and moisture can help them persist and increase the ability of an ecosystem to cope with effects of climate change. Providing essential requirements may also mean reducing competition, being mindful of the interconnectedness of all beings.*

Example tactics:

- \* Provide suitable regeneration environments for culturally important beings, such as exposing mineral soil and providing adequate sunlight for paper birch regeneration.
- \* Release the canopy of particular trees to increase health of sugar maple stands for maple sugaring.
- \* Use water control structures to maintain proper water levels during different life stages to maintain wild rice.



*A prescribed burn on Stockton Island in the Apostle Islands National Lakeshore to reintroduce the cultural practice of burning. The burn was a joint effort between members of various tribes, agencies, and the National Park Service. (Photo by Melonee Montano, GLIFWC.)*

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

*Native people often have cultural traditions of using fire on the landscape as a management tool, and natural ecosystems and communities have evolved together within this relationship. Restoring cultural fire regimes in fire-adapted systems can benefit fire-dependent and fire-tolerant beings. These actions can also create more complex ecosystem structure and reduce the risk of severe wildfire on the landscape. The wildfire season is expected to lengthen in much of the Midwest and Northeast, and wildfires may occur more frequently. Helping fire-adapted ecosystems tolerate these changes may be the focus of adaptation actions.*

Example tactics:

- \* Restore ishkode (fire) and miinagaawanzh (blueberry) relations with prescribed burns.
- \* Allow naturally occurring wildfires to burn in fire-adapted ecosystems such as jack pine and in areas without human development or infrastructure.
- \* Use prescribed burns in marsh habitats to encourage young plant communities.
- \* Identify people (tribes, elders, community members) who have knowledge and stories about fire practices.
- \* Conduct understory burns to clear shooting lanes for hunting.
- \* Use ishkode as a natural disturbance to clean out unhealthy trees and reset the community.

#### 4.6. Maintain and revitalize cultural approaches to harvesting and caretaking.

*Using traditional harvesting and caretaking methods can be an important way to sustain ecological functions in a given area, as these methods are often holistic and respectful in a way that standard land management practices are not. Revitalizing the use of these methods can serve as a climate adaptation tool and help provide balance in an ecosystem and strengthen relationships with its native beings. For example, traditional caretaking might provide guidance on how to harvest certain plants in a good and respectful way, to not overharvest, and to allow for healthy regeneration.*

Example tactics:

- \* Promote sustainable harvest techniques for sensitive beings, such as proper methods of birch bark harvest or tapping sugar maple trees.
- \* Remove weak or sick trees during forest management activities to leave the stronger, healthier individuals behind.
- \* Use honorable harvest practices when gathering non-timber forest products to give back from what is taken, for example to gather and re-plant wild ginseng berries for the next harvest.
- \* 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 will weaken the root system.



*Waabinigigoonsikwe (Charlotte Jondreau) harvesting birch bark on the Ottawa National Forest, 1842 Ceded Territory. (Photo by Gidagaa bizhiw (Jerry Jondreau).)*

#### Strategy 5: Reduce the impact of biological and anthropogenic stressors.

*Climate change will cause stress and changes within native ecosystems. These climate-driven stressors can interact with other stressors that may already be occurring on the landscape. Reducing the effects of biological stressors such as bakaan ingoji gaa-ondaadag (non-local beings) and human-caused stressors like water pollution and soil disturbance can be an important part of a climate adaptation plan. The Approaches that follow describe different ways of maintaining clean air, clean water, and clean land.*



*One of the manidoonsag—a bumblebee on a dandelion, Dynamite Hill Farms, Keweenaw Bay Indian Community, L'Anse, Michigan. (Photo by Gidagaa bizhiw (Jerry Jondreau).)*

#### 5.1. Maintain or improve the ability of communities to balance the effects of manidoonsag (little spirits).

*In the context of land management, the term “manidoonsag”—little spirits in Ojibwe—can be used to collectively describe insects and pathogens. Keeping a community healthy and in balance with manidoonsag in the area is a common purpose of land management. As the changing climate continues to create conditions for manidoonsag to have more severe impacts, taking action to maintain balance and health will be particularly important.*

Example tactics:

- \* Maintain an alert system to distribute educational materials and manidoonsag updates to natural resources staff and community members in regards to quarantines or other protective management actions.
- \* Communicate with beings (including manidoonsag) in the area to listen and to explain intended actions.
- \* Create monitoring programs and networks to understand impact of stressors.
- \* Encourage beneficial manidoonsag, such as bees or other pollinators.

## 5.2. Maintain or improve the ability of communities to balance the effects of bakaan ingoji gaa-ondaadag (non-local beings).

*Bakaan ingoji gaa-ondaadag is an Ojibwe term that describes non-local or invasive beings. When natural ecosystems are healthy and in balance, bakaan ingoji gaa-ondaadag may not have a large or noticeable effect. As climate change continues to add stress and disturbance, there may be more opportunities for non-local beings to disrupt the normal function and health of an ecosystem. Climate adaptation may require respectful actions to minimize or prevent the establishment of non-local beings, particularly if they pose a threat to the health of the local environment.*

Example tactics:

- \* Wash equipment before using in management activities to prevent the spread of bakaan ingoji gaa-ondaadag.
- \* Remove existing bakaan ingoji gaa-ondaadag after communicating with beings in the local area to explain intended actions.
- \* Consider alternative uses of bakaan ingoji gaa-ondaadag, such as harvesting non-local cattail roots.
- \* Reduce large openings in the forest canopy and vehicle usage to minimize establishment of bakaan ingoji gaa-ondaadag.
- \* Seek out traditional and/or cultural knowledge regarding bakaan ingoji gaa-ondaadag from tribal communities where these beings are native by identifying and interviewing harvesters.
- \* Use a biological control method for bakaan ingoji gaa-ondaadag that appear at a site, for example, using lupine to counteract growth of spotted knapweed.



*Mashkisibi Boys and Girls Club hand pulling garlic mustard along the Bad River upstream of Bad River reservation with GLIFWC staff. (Photo by Dara Unglaube, GLIFWC.)*

## 5.3. Manage herbivory to promote regeneration of impacted beings.



*Hunting both on and off reservation, tribal members maintain a significant relationship with waaawaashkeshi (deer). (Photo by Dylan Jennings, GLIFWC.)*

*Because deer and other herbivores preferentially browse particular beings, it may be increasingly important to assist with the regeneration of desired beings. Managing herbivory alone may not promote desired beings, particularly since many deer and other herbivores are expected to increase as the climate warms. Thus, this Approach may be combined with other Approaches that encourage regeneration.*

Example tactics:

- \* Where possible, favor moose or elk in ungulate management rather than promoting a larger deer herd
- \* Encourage tribal hunting to maintain appropriate deer populations.
- \* Adjust regulations to promote additional harvest by increasing number of tags issued in areas of heavy deer impacts on forest beings.
- \* Install deer exclosures or other physical barriers to prevent herbivory in particular areas.
- \* Encourage native predator populations, such as wolves, in a given area to control deer populations.



#### 5.4. Reduce negative impacts from anthropogenic disturbances.

*Respectful and purposeful human interactions in ecosystems can leave minimal effects or even benefit an environment. However, some human-caused disturbances from recreation, infrastructure, development, or pollution can cause negative impacts. Reducing these negative impacts can form part of a climate adaptation plan.*

Example tactics:

- \* Reduce nutrient loading and other pollutants to water bodies.
- \* Increase protected setbacks and encourage riparian buffers around water bodies to limit development and control erosion and other land-disturbing activities.
- \* Manage uncontrolled all-terrain vehicle (ATV) and off-highway vehicle (OHV) use in a given area to reduce erosion and introduction of bakaan ingoji gaa-ondaadag.
- \* Educate community members about anthropogenic impacts.
- \* Create protective boundaries around sensitive habitats, such as no-wake zones around current or potential wild rice habitats.

#### 5.5. Monitor and reduce ambient air pollution.

*Although air pollution is a global problem, local efforts to improve air quality and to alert community members of air quality issues are important. Monitoring the air quality in your region will allow you to reduce ambient air pollution and negative effects when possible and communicate these issues with the local population.*

Example tactics:

- \* Work with the Environmental Protection Agency (EPA) to obtain an ambient air monitoring station.
- \* Work with the EPA to establish an ambient air program.
- \* Obtain EPA Class 1 Air Status.
- \* Limit outdoor fires, prescribed burns and recreational fires when air quality is poor, while allowing ceremonial fires.
- \* Restrict or ban the use of burn barrels for garbage.

### Strategy 6: Reduce the risk and long-term impacts of disturbances.

*Climate change is projected to increase the potential for severe disturbance events, such as wildfire, extreme wind, and ice storms. These disturbances have the potential to alter natural ecosystems over large landscapes. Disturbances can interact with other stressors to increase the risk of pest outbreaks or wildfire. Even as trends continue to emerge, management will need to adjust to the changes in natural disturbance dynamics.*

#### 6.1. Alter community structure or composition to reduce risk or severity of major disturbances.

*Major disturbances such as wildfires, floods, pest outbreaks, ice storms, and wind events can often affect different beings in different ways, and they may also affect older and younger individuals in different ways. When managers can anticipate which kinds of disturbances are most important for a particular area, they may intentionally alter composition of beings or ecosystem structure to reduce susceptibility to these threats.*

Example tactics:

- \* Establish fuel breaks to slow the spread of catastrophic ishkode (fire).



*A prescribed burn to promote fire-adapted beings on Stockton Island in the Apostle Islands National Lakeshore. The burn was a joint effort between tribal members of various tribes, agencies, and the National Park Service. Vern Northrup of the Fond du Lac Tribe in Minnesota (shown here holding the drip torch) was asked to start the fire. (Photo by Melonee Montano, GLIFWC.)*

- \* Use prescribed fire treatments or other means to reduce fuel loading.
- \* Use defensible space in planning around high priority areas to reduce risk of loss or damage from wildfire.
- \* Alter forest community structure to reduce severity or extent of wind and ice damage. For example, create “soft” edges between stands and be mindful of creating boundaries perpendicular to the prevailing wind direction.
- \* Include buffer zones around wild rice beds or other sensitive communities to prevent effects of disturbance (logging, lakeshore development, wind, etc.)
- \* Promote fire-adapted beings in areas with a higher risk of wildfire.

## 6.2. Promptly revegetate sites after natural disturbance.

*Potential increases in the frequency, intensity, and extent of severe disturbances may disrupt regeneration and result in reduced forest cover or health. Prompt revegetation of sites following disturbance helps reduce soil loss and erosion, maintain water quality, and discourage bakaan ingoji gaa-ondaadag (non-local beings) in the newly exposed areas. These efforts can also provide an opportunity to promote natural regeneration or foster beings that may be better adapted to future conditions.*

Example tactics:

- \* Create suitable regeneration environments for target beings, such as exposing mineral soil to promote natural paper birch regeneration.
- \* Plant larger individuals (saplings versus seedlings, or containerized versus bare-root stock) to help increase survival in sites where dry conditions are expected.
- \* In flood-impacted areas, use mixtures of native plants to reseed and stabilize riverbanks and lakeshores.
- \* Provide habitat and food sources to draw birds to a site, so that they can help attract new beings.



*Jeff Grignon of Menominee Tribal Enterprises planting seedlings in an opening treated for oak wilt disease. (Photo by Kristen Schmitt, NIACS.)*

## 6.3. Care for cultural sites after a severe disturbance.

*Cultural sites such as cemeteries are an important part of a culture, its history, and its identity. When a severe disturbance occurs, there is a risk that response efforts may occur without recognition of cultural sites and special places. Appropriately caring for and protecting cultural sites and uses after a disturbance is important for maintaining relationships with a particular area.*



*Old Odanah cemetery in the floodplain of a local creek on the Bad River Reservation will be vulnerable to future high water events. (Photo by Charlie Rasmussen, GLIFWC.)*

Example tactics:

- \* Remove hazardous trees and debris from cultural sites after storms or high wind events.
- \* Evaluate and restore eroded or damaged areas after a flood.
- \* Survey cultural site locations ahead of time so when a disturbance occurs it is easier to act, but be mindful about how this information is stored and shared.





*Waabinigigoonsikwe (Charlotte Jondreau) drinking sap at Dynamite Hill Farms, Keweenaw Bay Indian Community L'Anse, Michigan. (Photo by Gidagaa bizhiw (Jerry Jondreau).)*

#### **6.4. Plan harvesting, gathering and collecting opportunities to reduce the risk and impacts of disturbances.**

*Strategically planning gathering opportunities to minimize the potential impact of disturbances may provide many benefits to the ecosystem. An increase in opportunities for gathering could create a more resilient ecosystem.*

Example tactics:

- \* Spread out gathering opportunities among several accessible sites to reduce the risk of a single disturbance (for example, tap several sugar maple stands in different locations instead of concentrating gathering on one stand).
- \* Initiate salvage harvesting after a disturbance when feasible.
- \* Plan for future conditions to reduce negative impacts to harvesting opportunities; for example, design culverts to allow for fish movement upstream and prepare for larger storm events.

### **Strategy 7: Establish, support, and recognize opportunities for beings or sites of concern to the community to withstand climate change.**

*Some beings or sites may be better able to resist ecological changes occurring elsewhere. These places are often formed by topography (e.g., north sides of slopes, or sheltered ravines), proximity to large water bodies, or connection to groundwater. The Approaches that follow describe different ways to identify and maintain special beings or places that: (1) are on sites that may be better buffered against climate change and short-term disturbances, and (2) contain special features or beings that are at risk across the larger landscape.*

#### **7.1. Identify, prioritize, and maintain cultural sites and/or culturally sensitive areas.**

*Some spaces (beings and places) may become priorities due to cultural and historic significance. Under future climate scenarios, these spaces provide opportunity to maintain, support, and protect culturally important sites and relationships. It might be necessary to commit additional resources to ensure that sites are protected and remain healthy.*

Example tactics:

- \* Meet with the Tribal Historic Preservation Officer and other key individuals to identify cultural site locations, but be mindful about how this information is stored and shared.
- \* Utilize Ground Penetrating Radar to identify unmarked burial sites.
- \* Establish a natural barrier such as a forested wetland buffer to protect a low-lying cemetery from flooding damage and erosion.
- \* Use historical and cultural preservation designation and zoning, or other ordinances and policies, to protect cultural sites within reservation boundaries.
- \* Educate the community about appropriate uses within cultural sites.



## 7.2. Identify, prioritize, and maintain at-risk and/or culturally important beings or communities.

*Some beings and communities are projected to decline as a result of climate change. For example, northern and boreal beings are widespread in portions of the Midwest and Northeast, but are expected to lose habitat because they are already at the southern extent of their range. Other beings may be more vulnerable if they depend on a narrow range of site conditions. Identifying and maintaining at-risk beings and communities may help them persist on the landscape for as long as possible.*

Example tactics:

- \* Collect and preserve seeds from at-risk or culturally important beings for use in restoration and planting programs.
- \* Identify natural habitats that are likely to provide suitable habitat in the future and prioritize protection of those places, such as identifying cisco lakes as cold-water refuges in Minnesota.
- \* Use GIS analysis to identify areas with suitable microclimate and intentionally propagate paper birch.



*Miinan (blueberries) in the Baraga Plains, 1842 Ceded Territory, Baraga County, Michigan. (Photo by Gidigaa bizhiw (Jerry Jondreau).)*

## 7.3. Establish places for at-risk or displaced beings outside of their normal environments (biological nests/refugia).

*Some beings are at-risk and/or being displaced from their native habitats; climate change will increase the stresses on them and cause them to become endangered or no longer present in the area. By establishing and designating areas on the landscape as “biological nests” that have specific conditions for survival as well as certain protections, beings at-risk or displaced may have a chance at regeneration in the area.*



*Food sovereignty is a priority in Indian Country. Youth from Bad River plant and harvest from community gardens and high tunnels, meant to extend the growing season. (Photo by Dylan Jennings, GLIFWC.)*

Example tactics:

- \* Promote at-risk beings in gardens for community members.
- \* Create medicine and food gardens using culturally important beings such as wiingashk (sweetgrass) to maintain relationships and traditional uses.
- \* Use fish hatcheries to maintain populations of threatened or sensitive fish beings, such as sturgeon or walleye in the Great Lakes region.



#### 7.4. Seek out or share traditional and/or cultural knowledge to inform management of sensitive or at-risk beings or communities.

*Traditional Ecological Knowledge can provide a holistic and long-term perspective on management of sensitive and at-risk natural and cultural resources, particularly when combined with Scientific Ecological Knowledge. This knowledge is often sensitive, but when shared and sought respectfully, can provide a much more comprehensive set of adaptation actions and give beings the best opportunity to withstand climate change.*

Example tactics:

- \* Seek guidance from wild rice chiefs to determine a harvesting plan/schedule for wild rice lakes.
- \* Seek guidance from tribal commercial fishermen, traditional leaders, and others regarding how, when, and where to manage for particular fish beings such as walleye or coaster brook trout.
- \* Involve tribal cultural committees when making management decisions that influence culturally important beings.

#### 7.5. Create and/or maintain access routes to traditional gathering and harvesting sites.

*Using and harvesting some beings is important to ensure spiritual, biological, and cultural sustainability. Continued sustainable use of these beings helps ensure resilient populations for future generations. Maintaining and creating new access routes to harvesting sites is critical to facilitating this sustainable harvest.*

Example tactics:

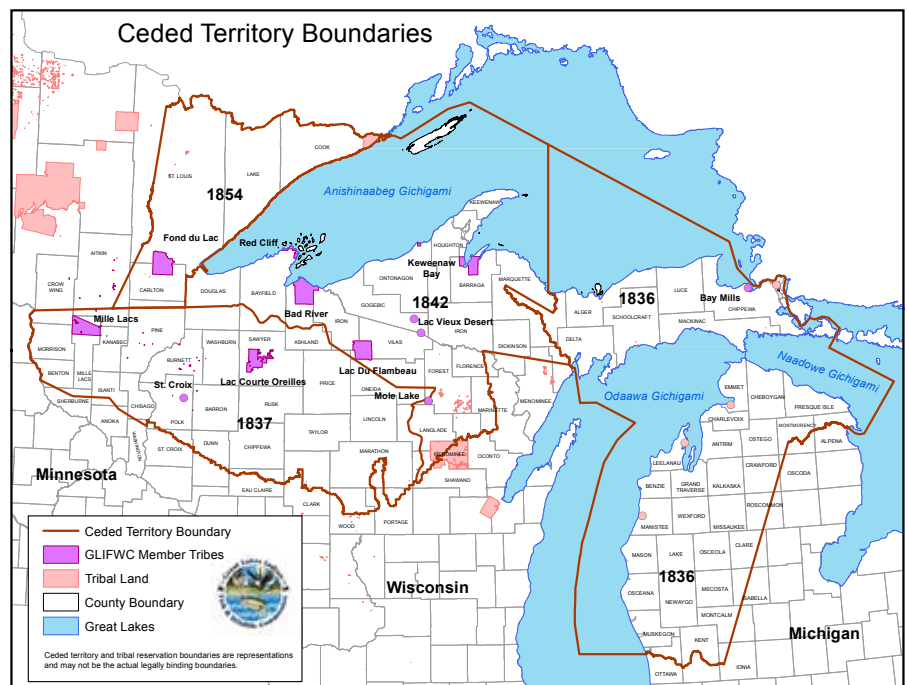
- \* Carry out maintenance of trails by clearing brush or debris after a storm.
- \* Carry out waterway (or streambank) stabilization in order to keep water access open, and establish alternative access points in case of severe disturbance.
- \* Mow roads for wildlife and traditional harvesting access.

#### 7.6. Work across treaty or tribal areas with partners and other tribes to manage at-risk beings.

*Tribes in different parts of a region may be able to facilitate protection and migration of sensitive beings, and tribal access, by working together and with other partners. A single treaty area may span large environmental and climatic gradients, so it may be possible to move at-risk beings from place to place within a treaty area in order to find suitable long-term locations.*

Example tactics:

- \* Partner across tribal areas to collect and share seeds of culturally important or at-risk beings.
- \* Work with another tribe to create favorable conditions for a being outside of its current area.
- \* Establish Memoranda of Understanding (MOUs) that allow for tribal members to harvest within different administrative areas or land ownerships.
- \* Work with public agencies to use prescribed ishkode (fire) across the landscape to maintain suitable habitat for certain beings; for example, the Forest Service and Red Cliff Tribe work together on sharp-tailed grouse habitat in northern Wisconsin.



## Strategy 8: Maintain and enhance community and structural diversity.

*Land managers are already used to making decisions that affect the diversity of beings within natural ecosystems, as well as the balance of elder and younger generations (structural diversity). As a climate adaptation strategy, this general idea receives added effort and focus. Increased structural and overall diversity of beings may buffer the community against climate change. In other words, individual beings or age classes may be stressed by climate change, but the overall risk to the community is reduced if there are many different beings operating together.*

### 8.1. Maintain and restore diversity of native beings.

*Diverse communities may be less vulnerable to climate change because they distribute risk among multiple beings. This reduces the likelihood that the entire ecosystem will decline even if one or more beings are harmed by changing conditions. Even small increases in diversity may increase resilience without greatly altering the overall identity of the ecosystem.*

Example tactics:

- ✿ Plant desired native beings within an area that is otherwise expected to regenerate naturally in order to add diversity (enrichment planting).
- ✿ Utilize agroforestry practices to diversify beings on the landscape and to diversify production of non-timber forest products, such as establishing nut tree orchards or propagating other food-producing beings.
- ✿ Establish a tribal native plant nursery to cultivate desired native plants.
- ✿ Move plantations toward a more natural state by retaining a diverse mix of beings during thinning operations.



*Planting a cedar seedling. (Photo by Kailey Marcinkowski, NIACS.)*

### 8.2. Promote diverse generations (both elder and younger beings).

*Beings are vulnerable to different stressors at different stages in their life cycle. Communities with a single age generation are often more vulnerable to manidoonsag, because a single stressor can affect the whole community at once. In communities with many generations occurring together, a smaller proportion of the population may be exposed to a particular threat at any one time, so the community can tolerate a wider range of disturbances. Maintaining a mix of ages, sizes, or canopy positions will help buffer vulnerability to stressors of any single age class. This principle applies within a single stand as well as across a broader landscape.*

*The Menomoni came into possession of wild rice at the very inception of their tribal organization. Mi'nibush . . . created the bear [and] determined to make an Indian of the bear. . . He called the Indian "Shekatचेke'nau." . . Then taking the Indian to the river he showed it to him and gave it into his hands, with all its fish, its great beds of wild rice, and many sugar trees along its banks. He said, "I give these things to you, and you shall always have them—the river, the fish, the wild rice, and the sugar trees." When Weskineu the Thunderer came from Lake Winnebago to the Menominee River, the Bear clan turned everything, including the river and the wild rice, over to the Thunderer. But the Thunderer always brought rain and storms, so the rice harvest was ruined. Weskineu then returned the rice to Sekatsokemau. So after that when rice harvest came Shekatचेke'nau called all his people together, and they made a feast, and smoked, and asked the Great Spirit to give them fair weather during the harvest. Since then there has always been a fine, stormless harvest season.*

—as told by Chris Caldwell and Marie Schaefer

Example tactics:

- \* Discourage converting natural stands to plantations.
- \* Move plantations toward a more natural state by opening gaps to allow for natural regeneration and favoring young trees during thinning operations.
- \* Maintain a diverse mix of forest age classes across the landscape, such as managing a mix of young and older aspen stands.



*A diverse conifer forest with an old legacy tree. (Photo by Joshua Cohen, Michigan Natural Features Inventory.)*

### **8.3. Retain biological and cultural legacies.**

*Biological legacies are organisms, structures, or patterns inherited from a previous ecosystem and often include mature trees, snags, and downed logs remaining after natural disturbance or harvesting. Biological legacies can enhance species and structural diversity, serve as a seed source, or provide nurse logs for seed germination. Mature trees can often survive through periods of unfavorable climate, even while conditions become unsuitable for seedling establishment. In a changing climate, biological legacies may play a critical role in a being's persistence or colonization of new habitat.*

Example tactics:

- \* Retain elder trees during forest management operations.
- \* Retain and observe survivors of pest or disease outbreaks, droughts, and wind events.

### **8.4. Establish protected areas to maintain ecosystem and cultural diversity.**

*Some areas support a large diversity of different beings. These areas may be protected by reducing harvest activity, development, or other disturbances. Protected areas may still allow ecosystem management, cultural uses such as gathering and harvesting, or fire and other natural disturbances. Protected areas may also be used as a control for monitoring more intensive adaptation actions implemented in other stands.*

Example tactics:

- \* Establish a tribal national park in an area of important ecosystem diversity.
- \* Create a protected area to gather important foods and medicines, and align the management of the area to promote those beings.
- \* Restore communal ownership of land by developing a land purchasing and consolidation program.
- \* Incorporate established land use plan and zoning ordinances.
- \* Preserve and set aside areas only for tribal use.



*Frog Bay Tribal National Park, Red Cliff Reservation. (Photo courtesy of Red Cliff Band of Lake Superior Chippewa.)*

## Strategy 9: Increase ecosystem redundancy and promote connectivity across the landscape.

*Some losses from climate change are inevitable, whether due to catastrophic events or unforeseen impacts. The Approaches that follow describe ways to increase ecosystem redundancy and reduce the overall risk of losing a particular being or community. This can be accomplished by increasing the extent, frequency, and diversity of regeneration stages across the landscape. This Strategy may benefit greatly from developing partnerships with other land management organizations and coordinating landscape-scale conservation practices.*

### 9.1. Manage habitats and access opportunities over a range of sites and conditions.

*The suitable site conditions for a community or being may shift on the landscape as climate changes. In some situations it might make sense to encourage a community or being to exist across a range of site conditions, especially if there is uncertainty about the direction of future change. Beings currently covering a large geographic extent may provide many options for retaining redundancy across the landscape.*

Example tactics:

- \* Attempt wild rice restoration and seeding in a variety of different habitats to provide potential future access opportunities in many locations.
- \* Manage cold or cool-water fish beings and fishing access in a variety of different lake habitats.
- \* Identify areas across the landscape that are suitable for gathering sensitive resources, such as paper birch.



*GLIFWC staff attach an archival tag for a project aimed at assessing depth and temperature preferences of namegos (lake trout). (Photo by GLIFWC Great Lakes section staff.)*

### 9.2. Identify additional lands for acquisition to expand the tribal land base, maintain diversity, and improve connectivity.

*The acquisition of additional lands may help increase or maintain the diversity and health of beings by providing more suitable habitat and connectivity across ecosystems. Expanding tribal lands can also aid in current and future management practices as well as expand spaces for cultural traditions, as well as hunting, fishing, and gathering opportunities.*

Example tactics:

- \* Strategically acquire lands to connect key habitats and protected areas, such as connecting tribal forest land and other publicly-owned land.
- \* Build capacity for and establish a land acquisition program.

### 9.3. Reduce fragmentation to promote continuous natural ecosystems.

*The fragmentation of contiguous natural habitats is a primary contributor to biodiversity loss and reduced health. Protecting large areas from fragmentation will require a concerted effort to create partnerships, agreements, and other mechanisms for land protection and management across property boundaries. Strategic acquisition of high-priority conservation areas, conservation easements, certification programs, restoration projects, and other efforts to increase the size and connectivity of natural ecosystems will foster a landscape-level response to counter the widespread effects of climate change.*

Example tactics:

- \* Focus development of urban infrastructure and housing in already fragmented landscapes.
- \* Restore native vegetation in degraded areas within the forested matrix.
- \* Create road crossing structures and land bridges for wildlife to cross highways.

#### 9.4. Maintain and create habitat corridors through restoration.

The presence of both small and large corridors on the landscape may help beings migrate more freely. Corridors oriented in any direction may be useful to facilitate genetic mixing, but corridors arranged along climatic or elevational gradients may be more useful if the goal is to allow movements along the gradient. Reforestation or restoration of riparian areas may help retain beings on the landscape longer while providing a habitat corridor.

Example tactics:

- \* Establish a network of landowners and land managers to manage for common objectives, such as creating a wildlife corridor along a river.
- \* Rehabilitate previously fragmented areas by reseeding historic wild rice beds or reforesting cropland.
- \* Restore marsh wetland complexes to support bird species along their migration corridors.



*Manoomin (wild rice) is a main staple for many Ojibwe communities. Youth at the Sokaogon Mole Lake community show some of their freshly harvested manoomin. (Photo by Dylan Jennings, GLIFWC.)*

#### Strategy 10: Maintain and enhance genetic diversity.

Greater genetic diversity may help a population of beings adjust to new conditions or sites by increasing the likelihood that some individuals will be able to withstand climate-related stressors. Current guidelines for management of tree genetics generally promote the conservation of local gene pools and define small seed zones to maximize local suitability. A changing climate may require new guidelines that accommodate shifting seed zones and promote more options for increasing genetic diversity. Actions to enhance genetic diversity could be timed to occur after large-scale disturbances to take advantage of regeneration and establishment phases. Approaches under this Strategy are best implemented with caution.



*Ash seed collection. (Photo by Kim Stone, GLIFWC.)*

#### 10.1. Use seeds and other biological material from relatives of beings from across a greater geographic range.

Planted seedlings are typically grown from local seed sources, but local seed sources may no longer produce the best adapted seedlings for future climate conditions. Using seed zones based on regional analyses of climate change data may provide better seed sources than static seed zones. This may require importing seeds from new locations in order to introduce plants that are expected to be better adapted to current or future conditions. It is important to note that although many environmental factors may match seedlings to geographic areas, limitations such as cold tolerance may remain. It is also important to carefully consider these decisions to avoid introducing bakaan ingoji gaa-ondaadag (non-local beings).

Example tactics:

- \* Bring in paper birch seeds from the southern end of its range for planting in northern areas, such as northern Minnesota.
- \* Collect sugar maple seeds from across its range and plant in a project area to observe which beings grow best.
- \* Work with commercial and tribal nurseries to identify and use seed sources from a wider geographic range.

## 10.2. Favor local beings whose traits are better adapted to future conditions.

*New selective pressures on populations from climate change may favor some individuals with particular traits or characteristics. Some beings may be better adapted to future conditions or changing conditions because of pest resistance, drought tolerance, short regeneration times, or other characteristics. Identifying and managing for individuals with these beneficial traits during various life stages may allow a population to persist where it may otherwise fail.*

Example tactics:

- \* Look for, protect, and collect seeds from individuals that maintain vigor during droughts or other stressful conditions.
- \* Collect seeds from ash that survive emerald ash borer infestation.
- \* Avoid planting beings highly susceptible to bronze birch borer or other manidoonsag.

## 10.3. Collect and preserve seeds from beings that are at-risk or of concern to the community.

*Some culturally important beings may be highly vulnerable to climate change or other stressors. In situations where maintaining a being in its natural environment seems very challenging, it may be appropriate to store seeds and other material from these plants in seed banks or other storage facilities. These highly controlled environments may be used to preserve options until the beings can be moved to new suitable habitat.*

Example tactics:

- \* Collect and store seeds in a tribally-owned seed bank, from beings such as paper birch or black ash, for potential use in future restoration projects.
- \* Create agreements to collect and store seeds in established seed banks such as in Colorado or Iceland (specify ownership and uses related to genetic testing).
- \* Establish tribal nurseries with seeds collected from the area to maintain diversity.
- \* Create a seed saver network with other tribes or agencies and collaborate on seed collection efforts.
- \* Attend food sovereignty summits to exchange seeds and knowledge with other tribes.



*Melonee Montano, GLIFWC's TEK Outreach Specialist, using an arborist's slingshot to shake miinikaanan (birch seeds) out of a tree. (Photo by Hannah Panci, GLIFWC.)*

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

*Natural communities are expected to change as plant and animal beings adapt to a new climate and transition into new communities. The following Approaches describe ways to maintain overall ecosystem balance and health by gradually assisting with these transitions, which may alter or fundamentally change the makeup of beings in the community. This Strategy includes methods to actively promote ecosystem change, including assisted migration, in which the establishment of beings suited to future climate conditions are encouraged and assisted in their movement—an issue of some disagreement. Managers should thoroughly investigate potential consequences and knowledge from other sources before introducing new beings to the native ecosystem.*

### 11.1. Favor or restore native beings that are expected to do well under future conditions and that can help meet future needs.

*Some native beings may already be well suited to the future range of climate and site conditions, particularly those which can tolerate a wide range of temperature and moisture conditions. Using management techniques to favor these future-adapted beings can encourage a gradual shift in the makeup of the community or forest type and may create opportunities to meet future needs by replacing beings which are likely to decline with drastic change.*



Example tactics:

- \* Create gaps to favor sun-loving beings such as black cherry, basswood, and yellow birch in northern hardwoods forests.
- \* Convert sugar maple forests to oak, particularly in areas historically controlled by fire.
- \* Favor red maple in areas where sugar maple may not grow well in order to maintain the cultural tradition of tapping trees.

### 11.2. Establish or encourage new mixes of local beings and/or bakaan ingoji gaa-ondaadag (non-local beings) expected to do well under future conditions to meet future needs.

*Novel climate and site conditions are expected to continue to affect individual beings and ecosystems in different ways. Although some beings may not occur in a forest or community type as currently defined, they may have lived together previously. Managers might decide to create new mixes of native beings, even though this may eventually create new or redefined forest or community types.*

Example tactics:

- \* Experiment with planting bakaan ingoji gaa-ondaadag for cultural uses, like Manchurian ash to replace black ash for use in crafts.
- \* Use forest gaps to plant a combination of local beings and bakaan ingoji gaa-ondaadag, such as using oak wilt treatment sites to plant native and southern oak species in central Wisconsin.
- \* Experiment with planting super-sweet sugar maple cultivars in sugarbush areas.

### 11.3. Guide changes in composition of beings at early stages of development.

*Active management of understory regeneration may help transition communities to new and better-adapted compositions more quickly than allowing changes to occur on their own. Managers can speed up transitions by managing regeneration to promote desired beings and reduce competition from undesirable, poorly adapted, or bakaan ingoji gaa-ondaadag. Natural disturbances or appropriate management can promote regeneration. When communities are dominated by one or a few beings, this Approach may lead to conversion to a different community type.*

Example tactics:

- \* Use exclosures to protect seedlings, saplings, or younger beings expected to do well in future conditions.
- \* When regenerating paper birch, select and release seedlings that are growing well to shape the future of the stand.
- \* Select seedlings of specific beings that may be future-adapted to shape the composition of the stand.
- \* In a planting project, foster positive relationships between elder and younger beings, such as planting beings that grow well together in forest gaps.



*Regeneration of native conifer seedling.  
(Photo by Maria Janowiak, NIACS.)*



#### 11.4. Seek out and share traditional and cultural knowledge of potential new beings from tribal communities where these beings are native.

Many beings may shift their ranges to new areas as suitable conditions change. It is important that relationships and traditional knowledge associated with those beings are maintained wherever they occur, and for tribal gatherers and elders to share traditional and cultural knowledge about the beings with other communities in which those beings are novel. Sharing information will inform adaptation actions and give beings the best opportunity to withstand climate change.

Example tactics:

- \* Interview harvesters about new beings, such as white oak in northern Wisconsin, and how it is utilized from tribal communities where white oak is native.
- \* Establish an intertribal network to exchange knowledge about beings moving between communities.
- \* Establish a food summit to exchange knowledge about traditional foods moving between regions.



Great Lakes Intertribal Food Summit poster.

### Strategy 12: Support a new ecosystem balance after a major disturbance.

Ecosystems may face significant impacts as a result of climate change-related disturbances, including fire, drought, bakaan ingoji gaa-ondaadag (non-local beings), and severe weather events. Although it is often not possible to predict a disturbance event, it is possible to prepare for large and severe disturbances by planning a potential response. In many cases, it may be best to respond immediately after the disturbance event, so having a range of preplanned options in place may help a community implement an earlier and more flexible response. In cases where a disturbance is severe enough, it might be impossible to return the ecosystem to its previous condition. In these cases, it may be necessary to support a new ecosystem that will be better in balance with new climate and environmental conditions. The Approaches that follow describe a full range of responses to severe ecosystem disturbance.

#### 12.1. Promptly prepare and revegetate sites after disturbance.

Severe disturbances may prevent natural regeneration of desired beings. Prompt revegetation of sites following disturbance helps reduce soil loss and erosion, maintain water quality, and discourage bakaan ingoji gaa-ondaadag in the newly exposed areas. These efforts can also provide an opportunity to promote beings and systems that may be better adapted to future conditions.



Blowdown at the Birch Grove campsite. (Photo by Linda Parker, USFS.)

Example tactics:

- \* Plant a variety of elder and younger beings from southern zones to revegetate oak wilt areas and promote diverse regeneration.
- \* Use fire to prepare a seedbed for fire-adapted beings.
- \* Provide suitable regeneration environments for culturally important beings, such as exposing mineral soil and providing adequate sunlight for paper birch regeneration.
- \* Coordinate with communities to utilize downed wood for fuel, enabling better access to the site for replanting.

## 12.2. Allow for areas of natural regeneration to observe which beings naturally appear on the site.

*Although many areas may be replanted after severe disturbances, some areas can be set aside to allow for natural regeneration. This can help identify the well-adapted beings. It will be important to monitor the results of these actions and compare to intentionally planted areas.*

Example tactics:

- \* Use modeling or remote sensing to identify areas at low risk for erosion, flooding, or other threats to natural regeneration.
- \* Monitor naturally revegetated areas for changes in composition of beings, productivity, and other factors.
- \* Monitor beings that naturally appear on a site after disturbance and explore using them as “nurse ecosystems” to shelter a future ecosystem.

## 12.3. Adapt significantly disrupted ecosystems to meet expected future conditions and needs.

*Some ecosystems may experience such significant disruption that restoring them to pre-disturbance conditions may no longer be feasible. These systems may be designed with a new suite of beings in mind. Developing clear plans that describe when it is appropriate to “realign” or redesign disrupted ecosystems will allow for more thoughtful discussion and better coordination with other adaptation responses.*

Example tactics:

- \* Plant future-adapted beings in a stand that is already declining or expected to decline, such as planting swamp white oak or hackberry in former black ash stands to maintain forested wetlands on the landscape.
- \* Use a significantly disrupted site, such as a mine reclamation site or agricultural site, to introduce beings expected to do well in future conditions.
- \* Use low-lying disturbed lands (such as agricultural areas) as an area to restore or encourage wetland habitat.
- \* Seek community input on how to replant or otherwise manage significantly disrupted ecosystems.

## 12.4. Relocate ecosystems, beings, or cultural sites.

*A major disturbance has the potential to affect certain ecosystems, beings, or cultural sites in a way that disrupts the potential of the beings or sites to be used in a traditional way. In these cases, it may be necessary to take action for the sake of cultural uses. This may mean relocating beings from a recently disturbed site to a site that would provide better habitat, or transitioning the area used for a particular cultural use to a new area. Having a plan for carrying out cultural uses in case of a severe disturbance can ensure continuity in harvesting and gathering despite disturbances that may become more frequent with climate change.*

Example tactics:

- \* Develop a plan for relocating ecosystems, beings, or cultural sites in case of a severe disturbance. For example, identify areas to use for sugarbush in place of sugar maple stands that have flooded.
- \* Relocate wild rice beds in the case of lakes with high sulfide/sulfate levels, or lakes with altered water levels that may no longer be suitable for rice.
- \* Use new locations for, or relocate, burial sites in the case of erosion, high water levels, or flooding.



*A flood warning sign for a low-lying bridge on the Monongahela National Forest. (Photo by Kristen Schmitt, NIACS.)*

## Strategy 13: Design and modify infrastructure and access to match future conditions and community needs.

Infrastructure in natural ecosystems (roads, bridges, trails, water control structures, etc.) is typically designed for static conditions of the past. Climate change may create new situations and stress that current structures cannot tolerate (e.g. extreme heat and high water levels), increasing the risk of damage or failure. Proactive planning and design will be necessary to reduce risks associated with older and undersized structures in vulnerable locations in order to cope with additional stressors from climate-related impacts. It will also be necessary to effectively gather input from the community to be clear about community needs in a local area. The following Approaches describe different ways to adapt infrastructure in natural ecosystems.



Bad River staff replacing a culvert on a tributary to Sucker Creek, which was regularly overtopped by water during spring floods. Funds were obtained through an EPA Great Lakes Restoration Initiative (GLRI) grant. (Photo by Eric Andrews, Bad River.)

### 13.1. Reinforce infrastructure to meet expected conditions.

In some places, it is unacceptable to have damaged or failing infrastructure—busy travel corridors, critical routes for emergency evacuation, vital flood control structures, etc. In these situations, adapting to climate change will require reducing risks of damages or failure. This may require reinforcing or upgrading existing infrastructure or replacing existing infrastructure with more robust versions.

Example tactics:

- \* Replace undersized culverts with large bottomless culverts to allow sediment, debris, and aquatic beings to move freely during high-water events.
- \* Elevate bridges, roads, trails and important facilities that could be washed out.
- \* Reseal roadways more frequently to avoid rutting from precipitation or freeze-thaw cycles.

### 13.2. Incorporate natural or low impact development into designs.

Natural and low impact development (LID) techniques help to decentralize runoff by helping the site absorb or store water from rain or snowmelt. With deliberate planning, LID and green infrastructure techniques can reduce stormwater runoff and improve water quality by diffusing flows, capturing and filtering pollutants, and enhancing groundwater recharge. This Approach may be of particular importance in areas with high levels of impervious land cover and sensitive ecosystems.

Example tactics:

- \* Set wider buffers for development and forest management around riparian areas and waterways.
- \* On lightly used roads or trails, use low-water crossings like a ford or low-water bridge, designed to be occasionally overtopped by water or by debris or ice during floods.
- \* Use permeable surfaces such as block pavers, porous asphalt and concrete when designing roads, parking lots, and other infrastructure.
- \* Create water retention basins with native beings to capture runoff from developed areas.
- \* Utilize natural materials for bank stabilization and other project designs instead of concrete and steel (e.g. natural wood posts, wood building materials).
- \* Seek out and share traditional and cultural knowledge from indigenous communities on natural infrastructure materials and techniques (e.g. natural fences).

### 13.3. Reroute, relocate, or remove infrastructure to increase access efficiency and minimize harmful impacts.

*Evaluating existing infrastructure and community access needs may lead to a variety of potential adaptation adjustments. Removing or decommissioning infrastructure may make sense when risks and potential costs outweigh the benefits of continued access to a particular location. This may also allow for restoring hydrology or improving habitat. Infrastructure located in areas prone to high soil-moisture and flooding may require more regular maintenance and other investments to ensure access can be maintained, particularly for heavily trafficked systems (roads, bridges, trails, campsites, etc.). Where facilities, roads, or trails are necessary to maintain, the physical relocation of infrastructure away from high-risk areas may reduce long-term impacts. Using flexible temporary infrastructure when feasible can also minimize risks associated with long-lived permanent structures.*

Example tactics:

- \* When a site is identified for an infrastructure change, make plans public, post signs and descriptions at the site, and allow extra time to ask for input.
- \* Carry out a feasibility assessment before a project begins to address community concerns.
- \* Reroute a road out of a floodplain to an area with lower flood risk.
- \* Decommission and revegetate roads or trails with high risk and low access, and replace with well-designed roads or trails that meet community needs.
- \* Abandon campsites in higher risk locations but add sites in other locations, conserving the total number of sites.
- \* Remove levees or dams as part of a project to restore riparian areas and reconnect the channel and floodplain.



*Coastal erosion at Bay Mills Indian Community near a campsite on the reservation. (Photo by Sara Smith, College of Menominee Nation Sustainable Development Institute.)*

### Strategy 14: Accommodate altered hydrologic processes.

*Climate change will affect how water moves through ecosystems in many ways, including more frequent heavy precipitation, a more variable snowpack, and changes in the timing of spring melt and runoff. These changes will have cascading effects on water quality and water availability. The Approaches that follow describe ways to proactively address changing hydrology to minimize risks and offer opportunities.*

#### 14.1. Plan for decreased streamflow and limited water availability.

*Anticipating dry and drought conditions in watershed planning efforts may help ecosystems to persist under a range of future conditions. Drier conditions can change the structure and function of upland and riparian ecosystems, and some beings are particularly sensitive to changes in water availability. Drier conditions may require managers to reconsider whether ecosystems will be fundamentally changed, and also how to prioritize limited water resources in order to maintain ecosystem and community values.*

Example tactics:

- \* In a stream restoration project, favor beings that consume less water, including beings that may tolerate drought.
- \* Coordinate with partners to release water from reservoirs at critical times of low water to provide habitat and boost water levels.
- \* Increase tree canopy shading around rivers and streams to keep water cool as long as possible.
- \* Use water control structures to regulate water levels to maintain necessary water levels and flow patterns for wild rice life stages.

## 14.2. Enhance the ability of ecosystems to retain water.

*Slowing the transport of water through the landscape increases water retention, providing opportunities for the water to be used and stored. Water retained in natural ecosystems is typically slow released as clean, cold water throughout the year. Ecosystems that*

*retain water can also help to buffer against periods of high rainfall and flooding. Land managers can choose to strategically improve water retention by protecting leaf litter and porous soils, headwaters forests, riparian areas, and bottomlands.*



*Beaver pond in the Penokees, northern Wisconsin. (Photo by Travis Bartnick, GLIFWC.)*

Example tactics:

- \* Thin forests around forested wetlands to reduce interception and transpiration, and to maintain water levels in the wetland.
- \* Restore previously drained wetlands and mimic beaver dams to increase water storage on the landscape and slow flood flows.
- \* Restore and maintain beaver populations in areas to increase water storage.

## 14.3. Adjust systems to cope with increased water availability and high water levels.

*Proactive planning can help ecosystems and communities to cope with increased water availability, higher water levels, and flooding. Stabilizing stormflows, slowing overland flows, and increasing exchange to groundwater stores can help ecosystems retain moisture without degrading infrastructure, water quality, and habitats.*

Example tactics:

- \* Promote a mix of beings in riparian areas, including beings that can tolerate floods and saturated conditions.
- \* Increase protected setbacks from water bodies to prevent flood damage.
- \* Expand riparian areas and natural floodplains, wetlands, and off-channel basins to enhance water storage during high-water events.
- \* Design culverts and road crossings to accommodate increased water levels.
- \* Develop a flood mitigation plan.



*July 2016 flood on the Bad River Reservation in northern Wisconsin. High water events of this type are predicted to become more frequent and could affect tribal homelands situated on rivers and waterways. (Photo by Charlie Rasmussen, GLIFWC.)*

#### 14.4. Respond to or prepare for excessive overland flows (surface runoff).

*Overland flows occur when soils cannot absorb water, such as when rain or meltwater flows over saturated soils, or as a result of rain that is too intense for soils to absorb. Overland flows can lead to erosion, degrading local water quality and aquatic habitat. Forested land cover and green infrastructure can help the land absorb rain and meltwater. Proactive planning can identify sites likely to experience overland flows in all seasons, such as areas adjacent to infrastructure and open areas prone to early snowmelt over frozen soils. Addressing these high-priority areas to reduce overland flows will lead to multiple benefits throughout the watershed.*

Example tactics:

- \* Set wide buffers with natural vegetation along streams, rivers, and wetlands.
- \* Strategically place large woody debris to deflect and slow water flow during snowmelt or heavy rains.
- \* Use wattles and water bars to slow water and reroute water away from infrastructure.

#### 14.5. Adjust the location and size of forested areas to new or changing water levels.

*Some ecosystems are particularly sensitive to shifts in the timing, duration, depth, and frequency of water availability. As the hydrologic cycle changes, some systems may need to migrate in order to survive. Managers can take advantage of shifting water levels by adjusting the size and location of vegetated areas based on new or changing water levels.*

Example tactics:

- \* Expand riparian and floodplain areas to anticipate more extreme floods.
- \* Encourage native shoreline vegetation in new areas to increase water retention, dissipate wave energy, and reduce erosion.



*Frequent flooding events and high water can create challenges to maintaining healthy ecosystems. (Photo by Sara Smith, College of Menominee Nation Sustainable Development Institute.)*

*From the lands of the Lake Superior Ojibwe and Menominee Nations, we hope this document provides constructive guidance and insight as we all work to find our place and purpose in supporting a more ecologically sound, just, and equitable future for all aspects of creation. Miigwech—Waewaenen—Thank you*

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# Glossary

**Agroforestry** A land use management system in which trees or shrubs are grown around or among crops or pastureland. This system combines shrubs and trees in agricultural and forestry technologies to create more diverse, productive, profitable, healthy, ecologically sound, and sustainable land-use systems.

**Anishinaabe** A group of culturally related Indigenous peoples in Canada and the United States that include the Odawa, Ojibwe (including Mississaugas), Potawatomi, Oji-Cree, and Algonquin peoples.

**Anishinaabewakiing** Ojibwe word for original land/place.

**Anthropogenic** Relating to, or resulting from the influence of human beings on nature.

**Asemaa** Ojibwe word for tobacco, which is used as a gift or offering when requesting permission from another being.

**Bakaan ingoji gaa-ondaadag** Ojibwe word for non-local beings, also called invasive species. Its meaning translates roughly to “that which comes from somewhere else and now resides here.”

**Bashkodejiibik** Ojibwe word for sage.

**Being** An organism, creature, and/or spirit. Beings include those which are both animate (such as fish) and inanimate from the western perspective (such as rocks), and implies an equal importance to all.

**Binesiiwag** Ojibwe word for thunderbeings—spirits that reside in the sky and are believed to be responsible for thunder and lightning.

**Bioblitz** An intense period of biological surveying in an attempt to record all the living beings within a designated area. Groups of scientists, naturalists and volunteers conduct an intensive field study over a continuous time period (e.g., usually 24 hours). There is a public component to many bioblitzes, with the goal of getting the public interested in biodiversity.

**Biological nest** Also known as refugia, biological nests are places on the landscape that have specific conditions for particular beings’ survival as well as certain protections.

**Citizen science** Citizen science is scientific research conducted, in whole or in part, by amateur (or nonprofessional) scientists.

**Cultural** In this menu, “cultural” is used to describe tribal habits, beliefs, and traditions. It is often used interchangeably with “traditional.”

**Dominant** Most important, powerful, or influential.

**G-WOW** stands for Gikinoo’wizhiwe Onji Waaban (Guiding for Tomorrow). G-WOW is a service learning curriculum that integrates place-based evidence of climate change with science and promotes action. More information can be found at <http://www.g-wow.org/en-us/default.aspx>.

**Gikinawaabi** An Ojibwe word for “he/she learns by observation.” This concept is important in the adaptation context because it represents taking time to learn from the beings on the landscape, instead of simply taking action.

**Giizhikaandagoons** Ojibwe word for cedar leaves.

**Indigenous** In this menu, “indigenous” is used to describe the original inhabitants of a region, prior to colonization by another culture. Also used interchangeably with “native” or “native peoples.”

**Ishkode** Ojibwe word for fire.

**Manidoonsag** Ojibwe word for “little spirits.” In our menu, this concept replaces the concept of pests and pathogens. Ojibwe do not view pests or pathogens as negative, and view manidoonsag as being in existence for a reason.

**Memorandum of Understanding (MOU)** An agreement between two or more parties. It expresses a convergence of will between the parties, indicating an intended common line of action. It is often used in cases where parties either do not imply a legal commitment or in situations where the parties cannot create a legally enforceable agreement.

**Miinagaawanzh** Ojibwe word for a blueberry plant.

**Nāēqnemaw** Menominee word for tobacco, which is used as a gift or offering when requesting permission from another being.

**Native** In this menu, “native” is used to describe the original inhabitants of a region, prior to colonization by another culture. Also used interchangeably with “indigenous.”

**Nibi** Ojibwe word for water.

**Nookwezigan** Ojibwe sacred herbs.

**Ojibwe** An Anishinaabe group of Indigenous peoples that originated from the northern United States and Canada; also an Indigenous language.

**Reciprocity** The practice of exchanging things with others for mutual benefit, especially privileges granted by one country or organization to another.

**Salvage Cut/Harvest** The harvesting of dead or damaged trees or of trees in danger of being killed by insects, disease, flooding, or other factors. This practice can be used for economic, social and ecological opportunity. (i.e.: firewood, reduce hazard potential, nurse logs) ([www.maced.org/foi/generalforestryglossary.htm](http://www.maced.org/foi/generalforestryglossary.htm))

**Scientific Ecological Knowledge (SEK)** An alternative to the phrase ‘western science;’ describes an objective and quantitative system of knowledge which relies on certain laws that have been established through the application of the scientific method. SEK often views humans as separate from the natural world.

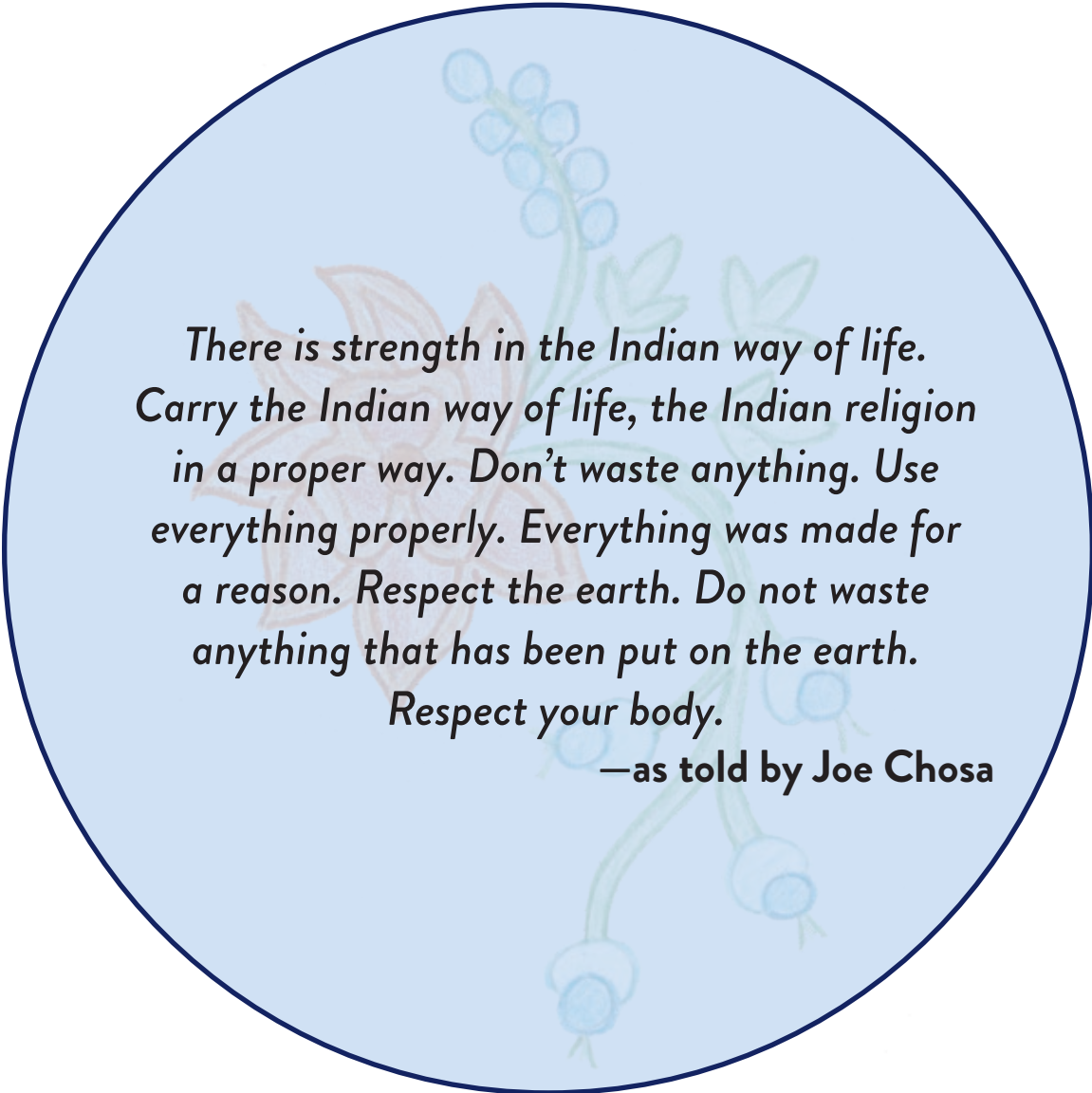
**Traditional** In this menu, “traditional” is used to describe tribal habits, beliefs, and traditions. It is often used interchangeably with “cultural.”

**Traditional Ecological Knowledge (TEK)** There are many definitions of TEK, but one way to view it is a knowledge system that reflects an intergenerational world view of interrelationships with the environment. Also known as traditional knowledge or Indigenous knowledge, TEK is expressed orally, through languages, stories, songs, and laws.

**Treaty area** A region in which hunting, fishing, and gathering rights were retained by tribes when they ceded their lands to the United States government.

**Tribe** A political group existing before the development of states. The northern Midwest region includes Ojibwe (also known as Chippewa), Menominee, Ho-chunk, Potawatomi, Ottawa, and Dakota tribes, among others.

**Wiingashk** Ojibwe word for sweetgrass.



*There is strength in the Indian way of life.  
Carry the Indian way of life, the Indian religion  
in a proper way. Don't waste anything. Use  
everything properly. Everything was made for  
a reason. Respect the earth. Do not waste  
anything that has been put on the earth.*

*Respect your body.*

**—as told by Joe Chosa**

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