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GLFC - First Nations Engagement: First Steps Towards Building A Meaningful Forest Ecosystem Science Relationship

First Nations Internship Project Report



Canadian Forest Service
Great Lakes Forestry Centre

Information Report
GLC-X-27

Canada

The Great Lakes Forestry Centre

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GLFC - First Nations Engagement: First steps towards building a meaningful forest ecosystem science relationship - First Nations internship project report

Lesage-Corbiere, Juliana; Young, David; Jones, Aaron; Young, Megan; Hazlett, Paul.

Cataloguing information for this publication is available from Library and Archives Canada.

GLFC – First Nations Engagement: First steps towards building a meaningful forest ecosystem science relationship - First Nations internship project report (Information Report, GLC-X-27).

Issued also in French under the title: “Centre de foresterie des Grands Lacs – Mobilisation des Premières Nations : premières étapes vers l’établissement d’une relation scientifique significative sur les écosystèmes forestiers - Rapport sur le projet de stages des Premières Nations”.

Lesage-Corbiere, Juliana; Young, David; Jones, Aaron; Young, Megan; Hazlett, Paul.

Issued also in Ojibway under the title: “GLFC - Ntam Anishinaabeg waawinjiganan: Aw wii-ntami-tkokiwiinan wii-naawgsejiged weweni wii-naabidak memtigwaaki Ezhi-naagok bmaadog kendaaswin wijkiiwendiwini - Ntam Anishinaabeg e-kinoomaagozijig zhichigewinan wiindimaagewinan”. Lesage-Corbiere, Juliana; Young, David; Jones, Aaron; Young, Megan; Hazlett, Paul.

Electronic monograph in PDF format.

Includes bibliographical references.

ISBN 978-0-660-38582-2 ISSN 2562-0738

Cat. no.: Fo123-2/27-2021E-PDF

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Acknowledgements

Financial support for this work was provided by the ADM Innovation Fund of Natural Resources Canada through the project “Building environmental monitoring capacity in First Nation Communities”.

This report would not have been possible without the generous contributions of the following people (in alphabetical order): Effah Antwi (Natural Resources Canada); Isabelle Aubin (Natural Resources Canada); Kim Chapman (Natural Resources Canada); Sue Chiblow (Garden River First Nation); Amanda Cress (Garden River First Nation); Erik Emilson (Natural Resources Canada); Rob Fleming (Natural Resources Canada); Travis Jones (Natural Resources Canada); Jason Leach (Natural Resources Canada); Dave Morris (Ontario Ministry of Natural Resources and Forestry); Richard Perrault (Garden River First Nation); Dan Sayers (Batchewana First Nation); Joe Sewell (Batchewana First Nation); Joanne Thiessen (Garden River First Nation); Claudette Trudeau (Natural Resources Canada); Alexis Vanderheyden (Garden River First Nation); Lisa Venier (Natural Resources Canada); and Kara Webster (Natural Resources Canada).

Abstract

The Great Lakes Forestry Centre (GLFC) hired four First Nations interns from the neighbouring communities, Garden River First Nation and Batchewana First Nation, for a four-month internship from December, 2019 to March, 2020. Interns rotated between laboratories in the Forest Ecosystem Research and Assessment Team (FERAT) and gained practical lab experience. In addition, they were responsible for working on a group project with the end goal of engaging with Garden River and Batchewana First Nations, outlining some of the First Nations' environmental concerns, identifying key issues where partnerships with GLFC could be developed, and creating a resource available to staff from GLFC and the respective communities for a path forward. This document is that resource and outlines some environmental concerns of the communities, key projects identified by the interns that would be a good fit for GLFC and potential funding opportunities. Much of the information compiled here is based on the background experience of each intern and engagement activities with Garden River First Nation, and represents a mix of information gathered from traditional ecological knowledge and western science publications. We hope that this resource will be used to foster goodwill, sincere relationships, and mutually beneficial relationships between GLFC, Garden River First Nation and Batchewana First Nation.

1. Introduction

The Forest Ecosystem Research and Assessment Team (FERAT) at the Great Lakes Forestry Centre (GLFC) in Sault Ste. Marie, Ontario secured funds from the 2019 CFS Assistant Deputy Minister Innovation Fund to create four First Nations internship opportunities. One objective of the internships was strengthening Indigenous engagement in CFS science programs. The internships were developed with Garden River First Nation (GRFN) and Batchewana First Nation (BFN) and the Ontario Ministry of Natural Resources and Forestry (OMNRF) to build First Nation capacity by providing interns training in environmental sampling and analysis techniques. To be eligible for the internship, applicants must have graduated within the last five years from an accredited college or university in an environmental science (or related) post-secondary degree or diploma program. All First Nations, Metis and Inuit graduates were encouraged to apply, with priority given to members of GRFN and BFN. From this process, Aaron Jones, David Young, Megan Young (GRFN) and Juliana Lesage-Corbiere (BFN) were chosen as interns for this program. Commencing their placement at various points in December 2019, each intern was able to gain experience in laboratories related to metagenomics and molecular ecology, wood decomposition and nutrient cycling, soil chemistry and community species composition, soil processing and subsampling, herbicide alternative initiatives, and aquatic ecology. Furthermore, the interns were tasked with engaging with the two local First Nations (GRFN and BFN) and strengthening the relationship between the respective First Nations and GLFC. The goal was to use this engagement as a foundation for collaboration on future projects between GLFC and its First Nation neighbours, taking into account both western science and traditional ecological knowledge (TEK) and ways of knowing.

Over its 75-year history, researchers at GLFC have worked cooperatively with First Nations communities on projects of common interest. In most cases the approach, while planned, has been quite ad hoc, based on the interest and expertise of specific researchers. Indigenous students and graduates have also been employed at GLFC across a wide range of forest research studies. In recent years, with a federal government focus on reconciliation, a more intentional method of Indigenous engagement has been emerging. Prior to the commencement of the First Nation internships, GLFC held an initial community engagement event with GRFN (September 2019) to begin some conversations, and strengthen and develop the relationship, laying the foundation for future collaborations on common environmental issues or concerns. This initial meeting (henceforth referred to as “Day on the Land”) took place in Garden River, at culturally significant sites (Pow-wow grounds by the St. Mary’s River, Trap Rock, and Ojibway Park, also known as “Bachine”) to identify broad environmental concerns while being on the land. This event set the stage for “Listening to Indigenous Voices: Continuing the Conversation with Garden River First Nation”. This occurred at the GRFN community centre in January 2020 and provided a chance for GLFC research staff to interact with knowledge keepers and discuss environmental issues or concerns within their traditional territory. At this event, after a round table discussion and a shared meal, individuals split into three groups to identify and discuss environmental changes, issues, and challenges within Garden River, with the groups having general themes: threats to culture and language, water related issues, and forestry issues. The

interns took part in this day and guided discussions between researchers and elders and knowledge keepers from the community, and took notes on common themes, issues, and potentially actionable items. Both meetings were immensely beneficial in establishing intent to build meaningful and authentic relationships and provide a foundation for future collaborations.



GRFN knowledge keeper Sue Chiblow leads water ceremony, September 19, 2019.

To help gain insight into more specific information involving environmental issues and concerns, the interns met with the staff of the GRFN Lands and Resources Department on January 10, 2020, including Richard Perrault, Environmental Coordinator, Alexis Vanderheyden, Lands and Resources Manager and Amanda Cress, Administrative Assistant. This provided direct access to the representatives of GRFN, who manage (monitor, assess, research) Garden River's natural resources. Prior to this meeting, the interns had some preliminary ideas (all have family ties to GRFN) about potential projects that could benefit from collaboration between GRFN and GLFC. In this meeting, some common themes/issues came up, which aligned with initial ideas internally discussed amongst the interns. The interns also cross-referenced these concerns with those expressed by community members at the "Day on the Land" and the "Listening to Indigenous Voices: Continuing the Conversation with Garden River First Nation" events.

Although the initial intention of the internships was to engage with both local communities, BFN Natural Resources Department representatives were unavailable to meet for discussions due to a heavy workload during the internship period. In addition, the Batchewana Day on the Land events scheduled to take place in March, 2020 were delayed due to COVID-19 concerns. Therefore, the interns focused on the ideas and concerns identified by GRFN and subsequently identified their relevance even more broadly to other First Nations communities. This course of action leads to the goals stated by GLFC, to better engage with Indigenous communities locally

and nationally and foster productive and mutually beneficial relationships between Indigenous knowledge and western science.

This report includes a synopsis of the environmental themes, including those discussed internally by the interns, and those raised during the meetings with the GRFN community and GRFN Lands and Resources Department. The report also outlines some key projects identified by the interns that could form the basis for future collaboration between GLFC researchers and the GRFN communities, and a current FERAT project that provides a framework for further engagement. A summary of potential funding sources available to First Nation communities for environmental projects and initiatives, and contact information for environmental staff at GRFN and BFN, and GLFC-FERAT researchers is also included in the report.

2. Themes for Collaboration

The themes that resulted from the internship activities fall into two categories: ideas that the interns had as community members and themes generated through discussion with the GRFN community and Lands and Resources Department. Two of the themes were identified as most feasible with regard to partnership between the FERAT and GRFN and are explored in more detail.

Intern Ideas as Community Members

As community members, the interns had some initial ideas about community environmental issues and potential collaborative projects between GLFC researchers and the local First Nation communities. The interns felt it was important for these to be listed in addition to the themes developed from the engagement with the Lands and Resources Department and key community members. Many of these ideas are similar to, or incorporate aspects of the themes expressed by the Lands and Resources Department or by community members. They also align well with western science expertise that is present at GLFC. The similarities in interests, as showcased by the overlap of these themes, provide grounds to believe that the goals of First Nation communities and research at GLFC align well. Most of these themes are general or encompass broader topics that could be incorporated into future collaborations.

White pine seed collection

The discussion for this idea began at the first site visited by GLFC scientists on “Day on the Land”: Garden River’s traditional pow-wow grounds. Both the site and the species have personal significance to each of the Garden River members that were present. This provided the opportunity for GLFC and OMNRF research staff that participated to discuss a project that would involve youth, elders, GLFC and OMNRF scientists, and the GRFN Lands and Resources Department. GRFN has interest in restoring white pine presence to the Garden River forests, with a goal of restoring the ecosystem to a mature forest, like the pow-wow grounds. GRFN elders have identified white pine as a culturally significant species to the Anishinaabe people of Bawaating, who historically have used it medicinally and as a food source. Both the seeds and the cambium, which has a sweet taste, were eaten, while other tree parts were used medicinally. The young needles were used as a source of vitamin C and to help respiratory illnesses and the resin was used as an ointment for skin conditions, cuts, and scars. Furthermore, the Anishinaabe people used the tree in canoe building, to waterproof their

canoes and fishing equipment, in wayfinding, and as a trade item, especially with settlers for masts on ships. Furthermore, it has ecological benefits, as white pine trees provide refuge and habitat for culturally significant animals like bears, woodpeckers, and seed-eating birds. It also has economical benefits as it can be used to create forest products. The economical, ecological, and cultural significance makes white pine a significant and prominent tree species for planting. The interns felt that establishing a nursery from the seeds of healthy and mature Garden River white pine would be an interesting and manageable project that could include multiple aspects of community engagement and involvement.

Impacts of human activities on water, soil, and forest health

First Nations in general are concerned about the impacts of human activities on water and soil quality (AFN 2019). Dominant high-level issues include herbicides, lampricides, industrial activity, improper landfill management, uncontrolled forestry and road creation, land-use change in upland areas, and point source contamination in stream headwaters due to uncontrolled access or unenforced by-laws (dumping, spilling, leakage, garbage). The latter is of particular concern to GRFN, as they consider the Garden River to be a healthy watershed system. Community members have also observed known species at risk utilizing the river at various locations throughout the year, including lake sturgeon and wood turtles. Furthermore, the Garden River has cultural, ecological and social importance to the people of GRFN, as they rely on it for fish, waterfowl, and other wildlife, use it as a water source, and are caretakers of the water. Landfill management is also a specific concern to the GRFN community, with further details below, as the GRFN landfill site is located upslope from, and near the river.

GRFN Lands and Resources Department and community members are concerned about the overall state of GRFN forests. Key concerns are herbicide use, lack of mature forests due to uncontrolled and unrecorded harvests, and forest post-harvest care and management. Another GRFN concern is a possible change in moose behaviour and habitat use due to wind farm development. The interns felt that a broad topic for discussion and a potential collaborative project would be the impact of forest management on water and soil and relating those impacts to habitat change within the traditional territory of GRFN.

Land use mapping

Land use mapping is a useful tool that can incorporate both TEK and western land management planning techniques (e.g. Recollet and Recollet 2015). It can identify historic and current significant sites related to hunting, fishing, trapping, food gathering, burial, and other culturally/socially significant areas. In addition, mapping can be used to show family usage of First Nation traditional territory; identify potentially important information about species of interest to community members and GLFC researchers; and provide a starting point for First Nation communities to gather information about their natural resources and how they are being used, harvested, or extracted. This information, and how it changes through time, is critically important data used to manage forests, lakes, fish stocks, and other important natural resources.

Furthermore, the development of land use mapping capacity could also incorporate new technologies, examples including drones and geographic information system (GIS). The

incorporation of these technologies would diversify the data, allow easy access and transferability, and would increase the skill sets already present at the GRFN Lands and Resource Department, and also capacity within the community at large. The interns thought this to be an excellent initial project for GRFN with the long-term benefits being more informed and effective management of the land.

Citizen science

Citizen science has been increasingly used in recent years to ease the burden of short-staffed departments and facilitate the monitoring of larger areas (Government of Canada 2020). This method has its drawbacks, mostly relating to concerns about data quality, especially concerning environmental data such as water quality. However, there has been some peer-reviewed writing on the topic (Jollymore et al. 2017; Farnham et al. 2017) and examples of success (e.g., Water Rangers 2015). Citizen science can also be used as an educational tool to get people interested in science fields, to increase their participation in stewardship and conservation activities, to give them a feeling of empowerment, and to make them feel ownership in the data and the results (Government of Canada 2020).

Citizen science can be especially important for Indigenous peoples, as represented by Indigenous guardianship programs, as it can address numerous intersectional issues such as relationship with the land or the water, increased activity on the land, and traditional knowledge transfer, which have been shown to directly relate to cultural practices, mental health, and physical health. It is also a method for the integration of science produced by Indigenous peoples and ways of knowing, as represented by TEK.

Themes Identified through Engagement with the GRFN Community and Lands and Resources Department

As the GRFN Lands and Resources Department would likely be the main partners on any future projects between GRFN and GLFC, their input regarding GRFN community environmental issues was vital to ensure the interns' work would be useful for future collaborations. As noted earlier, gatherings with GRFN elders, knowledge keepers and other community members confirmed many of the same themes raised by Lands and Resources Department staff during their meeting with the interns. Among the various topics discussed, a few main themes arose. The common themes raised by GRFN Lands and Resource Department staff included the need for more staffing, the lack of baseline data related to important components of the natural environment (inventory of GRFN forests, information on lake health, fish and wildlife population assessments), and increasing the incorporation of TEK into their projects. In terms of more staffing, GRFN Lands and Resources staff identified the following areas of need: regulation and enforcement, project completion and writing/preparing grant proposals, all largely due to a lack of in-house personnel (funding and capacity). Lands and Resources personnel also noted the need for baseline data collection including, but not limited to, forest health, forestry practices and harvesting, water systems, water quality, and animal abundance and habitat for culturally significant species. Finally, using TEK alongside western science approaches to inform decision-making was identified as an area of growth by the department. It is important to state that even though some elements of these themes are beyond the scope of the mandate of GLFC

they all need to be considered and incorporated into any future project proposals that result from a collaboration between GRFN and GLFC.

Overall, there were six main themes discussed in different degrees of detail between the interns and GRFN Lands and Resources staff. From their knowledge of their communities and GLFC FERAT expertise, the interns determined that the final two themes were seemingly more actionable by GRFN and GLFC.

Squirrel Island

A GRFN land claim was settled in the 1980's which determined that Squirrel Island (located in the St. Mary's River just upstream of Lake George) belonged to GRFN (INAC 2011a; INAC 2011b). Conditions of successful transfer of Squirrel Island back to GRFN, include the establishment of a remediation plan and the completion of a cleanup process completed. GRFN Lands and Resources staff project the estimated cost of the plan and cleanup to be around \$300,000. GRFN Lands and Resources Department staff noted that this is beyond the capacity of the current GRFN personnel, both in terms of staff numbers and expertise. Although this remediation work is not directly relevant to the FERAT research program, GLFC staff could provide services such as soil and water quality testing, or advice on habitat restoration. The interns researched some potential funding opportunities relevant to this sort of work which are listed in the Funding Opportunities and Related Resources section of this report.

Environmental Hotspots

The members of the GRFN Lands and Resources Department spoke about the presence of numerous environmental 'hotspots' or Areas of Concern (AOC) on GRFN lands. These include sites of illegal dumping, unauthorized land development, and non-adherence to building code standards in craftsmanship or in facilities (waste, sewage, hazardous waste). These sites could be used for monitoring or collection of baseline data.

Fish/Wildlife Management

GRFN is home to extensive natural resources yet the GRFN Lands and Resources Department feels they have very little influence on, or control over, resource management and extraction. In addition to forestry, as discussed specifically below, this lack of influence also applies to fish and wildlife. GRFN community members have observed several species at risk on their reserve, including lake sturgeon and wood turtles, and others within its traditional territory, such as woodland caribou. Furthermore, with such a large reserve and traditional territory, more information on population sizes, ranges, and habitat use would be beneficial for improved management into the future. Some previous work was done by the (then) Ontario Ministry of Natural Resources (the 1960's through 1980's), completing baseline fish and bathymetry surveys in a few of the lakes accessible through the reserve. Since these surveys were completed, there has been very little assessment of what is present on the GRFN reserve and traditional territory and this type of work is seen by the Lands and Resources Department to be an area of expansion.

Forestry Management Plan

Forests play a critical role in the cultural and spiritual ways of life of Anishinaabe people. In Canada, Indigenous people have been largely excluded from forest management activities (McGregor 2002). On-reserve forests have often experienced mismanagement through overcutting, lack of reforestation, no site management, and other issues (Notzke 1994). According to GRFN Lands and Resources staff, forests on reserve land have been logged extensively and often managed improperly, largely due to the underlying issues of lack of personnel, adequate budgets, capacity, legislation and enforcement. GRFN could benefit directly from an updated Sustainable Forestry Management Plan (SFMP). The last plan was developed and written in the 1980's, implemented in 1988, and expired in 2008. GRFN Lands and Resources staff identified this is a critical missing piece that is required to ensure the sustainable management of the land, both for establishing the current status of the GRFN forests and identifying future management, restoration or enhancement options for these forests.

The development of a SFMP for on-reserve forests could also lead to GRFN having a greater impact or influence on SFMPs in their traditional territory. As reported by McGregor (2002), sufficient flexibility allows Indigenous communities to contribute TEK and context to SFMPs. When traditional community-based methods inform SFMPs, Indigenous communities retain control over what information is being shared and how that sharing will take place. Looking at forest management plans within an Indigenous context, allows for considerations beyond the economic and ecological factors that guide current management and enforcement, and includes the physical, mental, and spiritual benefits that forests provide to people. The conceptual framework presented in Section 5 provides an approach to achieving these objectives. Balancing multiple goals related to forest and wildlife health, economic interest, and forest restoration is important in managing forests on- and off-reserve.

3. Actionable Projects

In addition to the four themes listed above, two were identified by the interns as the most likely to be actionable given the interests of GRFN, the resources available through grant funding, and the expertise of GLFC FERAT researchers. These ideas were (1) landfill management and impacts on water quality, and (2) unauthorized logging and road development and impacts on soil erosion, hydrology, and water quality.

Landfill Management and Water Quality

Landfill and solid waste management in First Nations communities across Canada has been a long-standing issue and continues to be a threat to environmental and human health (Bharadwaj et al. 2006). The history of waste management on-reserve can be largely classified as waste mismanagement, largely due to a lack of funding, proper development, legislation, enforcement, monitoring, and remediation of landfill sites, and resource exploitation by industry (Bharadwaj et al. 2006). In comparison, off-reserve landfill and solid-waste sites have legislation at various levels of government (regional, provincial, federal) which has led to a much more effective management of solid waste (Zagozewski et al. 2011).

Many on-reserve 'landfills' sites are open pits, with minimal or entirely non-existent environmental protective measures, and often use open burning to reduce garbage buildup (Bharadwaj et al. 2006). Open burning is often prohibited off-reserve due to increased risk of forest fires, and the release of dangerous by-products, polluting the air, surface and groundwater, and terrestrial environment, and causing health concerns for animals and humans (Zagozewski et al. 2011). In addition to normal, everyday garbage, on-reserve waste management sites often include items such as motorized vehicle parts or entire vehicles; hazardous waste such as motor oil, anti-freeze, items containing mercury; and appliances and electronic waste (Bharadwaj et al. 2006).

GRFN Lands and Resources staff indicated that the GRFN 'dump' is somewhat organized but largely unregulated. Notably of concern, the landfill site is directly adjacent to, and upslope from a small wetland complex and the Garden River near 'The Big Bend'. GRFN Land and Resources staff indicated that the GRFN dump matches the above description, including minimal environmental protection tools or systems, human-induced burning, and numerous garbage types including rubber tires, metal, appliances, motorized vehicles, electronics, everyday garbage and hazardous waste. There are concerns in the GRFN community over physical litter entering the Garden River, but also pollution and bioaccumulation of substances introduced through groundwater leaching or surface runoff. GRFN community members are concerned not only for themselves, as they use the river and downstream wetland and riparian habitats for social and cultural activities including fishing, hunting, and swimming, but also for the wildlife, including animals used as food sources, culturally significant species, or species at risk, that could be exposed (Kelly et al. 2007).

A study on future landfill options was recently completed by a consulting firm under contract with the GRFN, with the results to be reported to the community shortly. Even with the completion of this study, the interns feel there is an actionable project here. An investigation into water quality concerns and potential leachate entering the Garden River and its associated wetland and riparian habitats was a priority issue for the GRFN Lands and Resources Department. Even though infrastructure issues on reserve align much closer to the role of Indigenous Services Canada, there may be some potential role that aligns with the expertise of GLFC FERAT researchers. This could include collecting baseline data and, preferably, could develop into a long-term monitoring project of Garden River water quality. Furthermore, wetlands have been shown to act as water filters (Chilibeck 2018; Haarstad et al. 2012). An assessment of GRFN wetland habitats could provide information on the ecosystem services provided by these wetlands and could inform future wetland or riparian habitat restoration or alteration projects to maximize filtration. This would also necessitate collaboration between GLFC and the GRFN Public Works Department in addition to the Lands and Resources Department, which could further develop the relationship between GLFC and GRFN.

Logging Roads and Water Quality

The GRFN Lands and Resource Department and the community at large are concerned about the building of unregulated access roads for unregulated logging operations. This unregulated road construction, especially near or through rivers, has led to concerns over erosion and sedimentation, and their impacts on water quality and hydrology, including stream drainage, peak flows, debris prevalence, and channel morphology.

Improperly constructed forestry access roads can lead to vegetation removal and soil exposure within the forest ecosystem (Coffin 2007). This can increase the likelihood of sediment transport and potential flooding following storms within a logged watershed. Increased sediment has been shown to alter stream morphology, depositing in slower areas and creating shallower pools (Calder and Aylward 2006; Coffin 2007). When combined with increased turbidity due to sediment transport and less vegetated riparian zones, this effect has also led to an increase in stream temperature (Coffin 2007). Each of these phenomena experienced after logging and associated road development using unsustainable practices impact fauna that use the stream, such as fish, amphibians, waterfowl, and other wildlife (Coffin 2007).

Changes to peak flows or to the channel itself may also cause flooding, which could have minimal impacts or be catastrophic, depending on the intensity (Calder and Aylward 2006; Coffin 2007). Although this is expected to be more influential on smaller streams and rivers, it is also a concern for larger systems during larger storm events, and in the face of climate change (Calder and Aylward 2006; Zbigniew et al. 2014). Within the range of forecasted changes to Canada's climate, we can expect an increased frequency of storms and large rainfall events and therefore, an increase in the number and severity of flooding events (Zbigniew et al. 2014). The proximity of the GRFN reserve and traditional territory to larger systems such as the St. Mary's River, and other smaller rivers, streams, and headwater tributaries, makes these predictions especially concerning to the GRFN community and the Lands and Resources Department. Flood mitigation and management strategies, especially in Indigenous communities, have been insufficient, in part due to limited funding (Shrubsole 2000). Addressing these challenges related to flooding and climate change, using western science and TEK, is very important for Indigenous communities (Khalafzai et al. 2019).

GLFC FERAT researcher expertise and interests are well aligned with GRFN concerns regarding the impacts of forestry access roads on soil erosion and watershed hydrology, including potential flood risks, and the impacts these effects will have on forests, soils, water, wildlife, and humans. Although climate change was not the focus of this engagement, the increasing frequency and severity of rainfall events that have been observed by the community will exacerbate its existing concerns. Therefore, the cumulative effects of climate change could be incorporated into future collaborative projects between GRFN and GLFC.

4. Batchewana First Nation

Drawing from the themes brought forward by the interns and their discussions with GRFN, Juliana Lesage-Corbiere suggested situating them within the context of BFN and the work of their Natural Resources Department. Batchewana's traditional territory runs along the eastern shore of Lake Superior, from Batchewana Bay to Whitefish Island. Batchewana has three different communities and their locations are separated geographically. These communities are Rankin Reserve, Goulais and Batchewana Bay. Through its Natural Resources Department, BFN manages the natural resources across its traditional territory in a sustainable manner that reflects Anishinaabe responsibilities as protectors of the land.

Much like GRFN, BFN has been faced with various environmental issues over the years. Acknowledging that the themes identified in this report were developed after conversations with only GRFN, Juliana is contributing her thoughts and ideas as a BFN community member to this report. Juliana feels that potential projects focused on water quality, fish and wildlife management and climate change would align BFN environmental concerns with the interests and expertise of GLFC FERAT researchers. Juliana notes that BFN community members are noticing changes within their lands, waters and wildlife, and that BFN could benefit greatly from meaningful collaboration on various projects and working towards a respectful and meaningful relationship with GLFC.

5. Herbicide Alternatives Research: A Framework and Opportunity for Further Engagement

The interns participated in ongoing herbicide alternatives research led by Rob Fleming and Kim Chapman. There has been a growing collaboration in northeastern Ontario between CFS, Wahkohtowin Development GP Inc., Rayonier Advanced Materials and the OMNRF to address First Nation community concerns about herbicide use in their traditional territories. Specifically, Juliana Lesage-Corbiere developed a conceptual framework (Figure1) for utilization of both TEK and western ecological research in the context of the forestry herbicide issue. The framework presents an overlapping space, a common area where both worldviews are represented, and when combined, creates an ideal that could not be accomplished by either individually. This space presents an opportunity for innovation; a holistic approach to addressing concerns of First Nations communities and herbicide use, leading to a healthy, resilient forest for all peoples that value the land.

In order to move forward with research on herbicide alternatives, it is essential to look beyond what is often immediately apparent, to look at the issue outside of current thinking. Doing so enables better understanding of the complex systems that directly and indirectly inform alternatives to herbicides, which are rooted in both TEK and western scientific worldviews. This framework addresses the impacts on, and interactions among, human, social, ecological and economic systems and weaves together TEK and western ecological research systems. It recognizes the tension between these systems, but also creates an overlapping space within which critical dialogue and meaningful collaboration can take place. Ultimately, the framework

suggests that there is a need for a paradigm shift within forestry to inform socially, ecologically and economically viable alternatives for herbicides.

This conceptual framework is a model that can be applied while reaching out, developing relationships, and working with First Nations communities in the future. This applies to herbicide alternatives research, as well as to the possible projects identified in this report and other future engagement and collaboration opportunities.

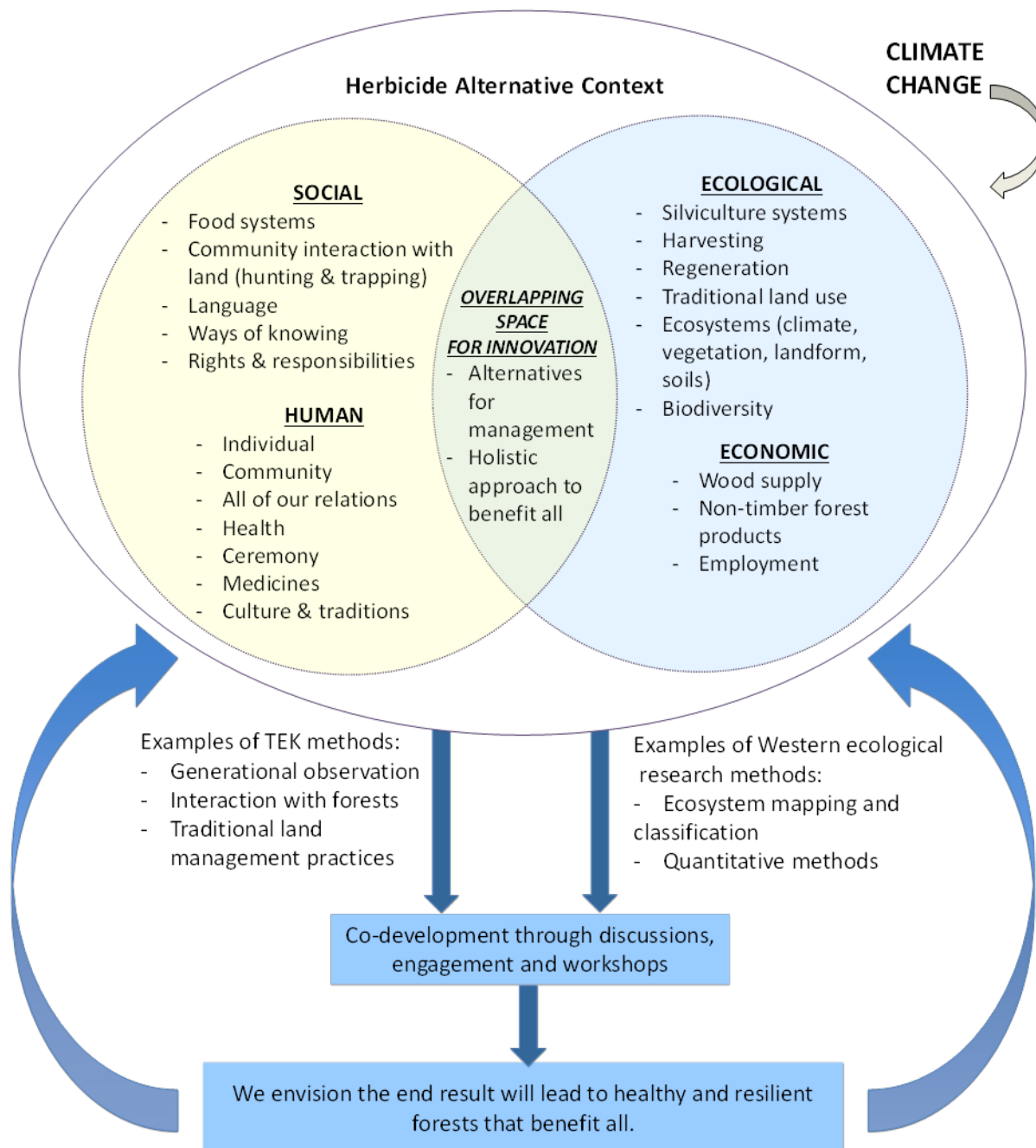


Figure 1. A conceptual framework for exploring herbicide alternatives: two eyed seeing as a path forward.

6. Funding Opportunities and Related Resources

This table provides details of some funding opportunities available to First Nation communities related to support of environmental projects and initiatives. The table includes the grant name, a short description of the goals of the grant, the maximum amount funded, the deadline for 2020, and the website. Please note that these may change over time and that this list is not comprehensive.

List of Grants	Application Deadlines	Short Description	Reference Link
Natural Resources Canada – Indigenous Forestry Initiative	No deadline, ongoing application process	The scope of projects funded by the IFI is broad, with three general categories: Environmental stewardship Forest resource use and management Forest bioeconomy participation (e.g., biomass for heat/energy; pellet manufacturing, etc.)	https://www.nrcan.gc.ca/science-data/funding-partnerships/funding-opportunities/forest-sector-funding-programs/indigenous-forestry-initiative/13125
First Nation Adapt Program	No deadline	Assesses and responds to climate change impacts on community infrastructure and emergency (flood) management. More detail provided for this program in Appendix A.	https://www.aadnc-aandc.gc.ca/eng/1481305681144/1481305709311
Indigenous Community Based Climate Monitoring Program	No deadline, but the earlier in the fiscal year, the better the chances for the application as funds are limited.	Indigenous partners identified 2 key needs: build capacity in Indigenous communities to monitor climate change impacts and foster the co-application of Indigenous knowledge and science. To help address those needs this program provides funding to support design, implementation, or expansion of long-term, community-based climate monitoring projects. These projects: inform efforts to adapt to climate change, fill gaps in climate data, provide employment opportunities, and promote knowledge transfer between Elders and youth.	https://www.aadnc-aandc.gc.ca/eng/1509728370447/1509728402247
Ontario Trillium Foundation	February 26, 2020, and the Grow Grant August 12, 2020	The Seed Investment Stream focuses on four types of projects, which enable us to see positive change in our communities. They are to: convene around an emerging issue, conduct a feasibility study, research a new concept, OR Develop or pilot a new idea. There are also GROW or CAPITAL Grants. More information on website.	https://otf.ca/apply-grant?redirected=1

List of Grants	Application Deadlines	Short Description	Reference Link
Indigenous Great Lakes Protection Initiative	March 17, 2020 (around the same time 2021)	GOC takes action to address the most significant environmental challenges affecting Great Lakes water quality and ecosystem health by delivering on Canada's commitments under the Canada-United States Great Lakes Water Quality Agreement	https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/funding/engaging-indigenous-peoples-addressing-issues.html
Species at Risk Stewardship Fund	Wednesday April 8, 2020 at 3 p.m. DST	The Species at Risk Stewardship Program was created under the <u>Endangered Species Act</u> to encourage people to get involved in protecting and recovering species at risk through stewardship activities.	https://www.ontario.ca/page/grants-protecting-species-risk
Eco-Action Fund	March 3rd, 2020 (expect similar for 2021)	Funding is available for new projects that engage Canadians and clearly demonstrate measurable, positive results related to the key environmental priority: Freshwater. Your project must include one related priority result: 1) Canadians contribute to the improvement of water quality through the diversion and reduction of harmful substances in freshwater OR 2) Canadians contribute to improvement of freshwater management and increase climate resilience through action involving the development and/or restoration of natural infrastructure. <i>Preference will be given to proposals that engage Indigenous Peoples, youth or small businesses.</i>	https://www.canada.ca/en/environment-climate-change/services/environmental-funding/ecoaction-community-program.html
Aboriginal Fund for Species at Risk/Habitat Stewardship Fund	February 28, 2020 for 2020-2021 (will be approximately the same date in 2021)	Provides funding for projects submitted by Canadians that contribute directly to the recovery objectives and population goals of species at risk.	https://www.canada.ca/en/environment-climate-change/services/environmental-funding/programs/habitat-stewardship-species-at-risk.html

List of Grants	Application Deadlines	Short Description	Reference Link
Indigenous Guardians Pilot Program	2020-2021 has closed but 2021-2022 should open in the fall of 2020.	<p>This program will provide Indigenous Peoples with greater opportunity to exercise responsibility in stewardship of their traditional lands, waters, and ice.</p> <p>The Pilot Program supports Indigenous rights and responsibilities in protecting and conserving ecosystems, developing and maintaining sustainable economies, and continuing the profound connections between Canadian landscape and Indigenous culture.</p>	https://www.canada.ca/en/environment-climate-change/services/environmental-funding/indigenous-guardians-pilot-program.html
Science Horizons Youth Internship Program	Not listed	<p>The Science Horizons Youth Internship Program provides wage subsidies to eligible employers to hire university, college and polytechnic graduates in science, technology, engineering, and mathematics (STEM).</p> <p>Up to \$15,000 in funding is available to employers for internships in the environmental and clean technology sectors.</p> <p>Internship opportunities lasting 6 to 12 months provide youth hands-on experience working on environmental projects.</p>	<p>https://www.canada.ca/en/environment-climate-change/services/science-technology/managing/horizons-youth-internship-program.html</p> <p>Contact: ec.sciencehorizons.ec@canada.ca</p>
First Nations and Inuit Youth Employment Strategy	Not listed	Indigenous Services Canada (ISC)'s First Nations and Inuit Youth Employment Strategy (FNIYES) supports initiatives to provide First Nations and Inuit youth with work experience information about career options and opportunities to develop skills to help gain employment and develop careers.	https://www.sac-isc.gc.ca/eng/1100100033607/1533125081187

List of Grants	Application Deadlines	Short Description	Reference Link
Zero Waste Plastic Initiative	Starts: January 2, 2020 Ends: March 2, 2020 (expect a similar time period for 2021)	Projects must improve the understanding, mitigation or remediation of plastic waste and pollution in Canada. They must clearly demonstrate activities that are measurable and will contribute to the implementation of Canada's zero plastic waste vision.	https://www.canada.ca/en/environment-climate-change/services/environmental-funding/programs/zero-plastic-waste-initiative.html
First Nation Infrastructure Fund	In the fall of each year there is a deadline to submit your financial plan although there is no deadline to receive funding.	Funding for First Nation communities to improve community infrastructure and includes eight categories of eligible infrastructure projects: <ol style="list-style-type: none"> 1. planning and skills development 2. solid waste management 3. roads and bridges 4. energy systems 5. connectivity 6. structural mitigation (previously disaster mitigation) 7. fire protection 8. cultural and recreational facilities 	https://www.sac-isc.gc.ca/eng/1100100010656/1533645154710
Reserve Lands and Environment Management	No definitive deadline date for application, communication will be done with each project individually.	Land support for: initiatives that support the development of land and resources under community control as well as access to opportunities from lands and resources not under community control; initiatives that support compliance with the statutory provisions of the Indian Act and the processing of land management instruments under the Indian Act. Environmental management support for: initiatives that enhance environmental awareness and support efforts towards pollution prevention; initiatives that support environmental management best practices with land and community assets; and initiatives to improve environmental regulatory compliance.	https://www.sac-isc.gc.ca/eng/1399400428303/1611930557393

List of Grants	Application Deadlines	Short Description	Reference Link
TD Friends of the Environment Foundation Grant	January and July 15 th , winter and summer deadlines	Eligible projects include schoolyard greening, park revitalization, community gardens, park programming and citizen science initiatives.	https://www.td.com/ca/en/about-td/ready-commitment/funding/fe-grant/
Funding for Indigenous Economic Development	Currently closed	How Indigenous peoples can get support for business, employment and training opportunities.	https://www.ontario.ca/page/funding-indigenous-economic-development

Centre for Indigenous Environmental Research

Additionally, the interns found the Centre for Indigenous Environmental Research (CIER) to be helpful during the process of identifying resources for future collaborative projects between GRFN and GLFC. CIER was established as a national First Nation-directed environmental non-profit charitable organization in 1994. CIER's mission is to work in partnership with First Nations to support and build sustainable Indigenous communities and protect lands and waters. This organization seems to be focused on working for the First Nation on concerns directed by the First Nation. It could be a very valuable resource for future projects, whether in collaboration with GLFC or work being done by Indigenous communities on their own. They focus on issues or questions related to water, Indigenous knowledge, biodiversity, youth, sustainable waste management, and renewable energy and climate change. They may be able to provide support with project planning and development, fieldwork, grant applications, and interpreting results. They can be contacted at: (204)-956-0660 (phone), earth@yourcier.org (email), and more information can be found at their website: <http://www.yourcier.org/>.

7. Partner Directories

Garden River First Nation

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Great Lakes Forestry Centre-Forest Ecosystem Research and Assessment Team

Effah Antwi - Research Scientist, Ecosystems Ecology

Topics of Interest: Cumulative effects, risk assessment, environmental impacts. Research focuses on the impacts of industrial development on social, economic and ecological indicators and community development and well-being.

Phone Number: (705) 541-5672

Email: effah.antwi@nrcan.gc.ca

Isabelle Aubin - Research Scientist, Forest Vegetation Ecology

Topics of Interest: Disturbance, forest management, habitat restoration. Research focuses on forest ecosystem responses to human-induced changes, multi-trophic assessment of ecosystem response to forest management, impact of climate change on biodiversity, and restoration ecology.

Phone Number: (705) 541-5516

Email: isabelle.aubin@nrcan.gc.ca

Erik Emilson - Research Scientist, Forest Aquatic Ecology

Topics of Interest: Carbon cycling, benthic invertebrates, genomics. Research focuses on forest reclamation, carbon cycling in lakes and streams and aquatic system biological monitoring to determine effects of forest disturbance.

Phone Number: (705) 541-5646

Email: erik.emilson@nrcan.gc.ca

Rob Fleming - Research Scientist, Biophysical Processes

Topics of Interest: Herbicide alternatives, forest microclimate, forest productivity. Research focuses on the impacts of forest harvesting intensity on the bio-physical controls and affects on seedling establishment and forest growth.

Phone Number: (705) 541-5632

Email: rob.fleming@nrcan.gc.ca

Paul Hazlett - Forest Soils Scientist (retired)

Topics of Interest: Soil, soil change, nutrient cycling. Research focuses on terrestrial/aquatic linkages in forests and the impacts of global change and forest management practices on soil and forest sustainability and water quality.

Jason Leach - Research Scientist, Forest Ecohydrology

Topics of Interest: Physical hydrology, forest harvesting, hydrologic modelling. Research focuses on forested watershed sensitivity to environmental change.

Phone Number: (705) 541-5622

Email: jason.leach@nrcan.gc.ca

Lisa Venier - Research Scientist, Forest Biodiversity

Topics of Interest: Bioindicators, genomics, forest disturbance. Research focuses on the assessment of a range of taxa (birds, arthropods, bacteria, fungi) in natural and disturbed forest ecosystems.

Phone Number: (705) 541-5605

Email: lisa.venier@nrcan.gc.ca

Kara Webster - Research Scientist, Forest Soil Ecology

Topics of Interest: Soil, water sustainability, digital soil mapping. Research focuses on the fate of forest soil carbon across spatial scales and how that fate is linked to other nutrient cycles and hydrologic fluxes.

Phone Number: (705) 541-5520

Email: kara.webster@nrcan.gc.ca

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Appendix: First Nation Adapt Program

The First Nation Adapt Program appears to hold promise as a potential funding source for the project “Logging Roads and Water Quality” described in Section 3. This fund could be used to identify both the impact of road construction on flood risks and the impact of flooding on land access (i.e. road and bridge washouts) and how this would change over time due to climate change. Another aspect that could be considered is the flooding of the GRFN pow-wow grounds. If GLFC were included on the project proposal, research staff there could provide support such as sample testing (laboratory work), assistance with project planning, and assistance with data analysis and interpretation.

The information below was taken from the First Nation Adapt Program website (<https://www.aadnc-aandc.gc.ca/eng/1481305681144/1481305709311>) to provide a guide to the program objectives and application process.

“This program provides funding to First Nation communities located below the 60th parallel to assess and respond to climate change impacts on community infrastructure and emergency management.”

There is no deadline for submission. The average yearly funding per project is \$160 000, which could fund a year-long position, training, and project expenses.

The program provides support for communities to address one or more of the following types of projects:

- risk assessments of climate change impacts on community infrastructure or emergency management
- development and assessment of adaptation options
- cost benefit analysis of adaptation options

Mapping is part of this program.

The floodplain mapping portion of the program provides support for communities to:

- participate in regional watershed management processes
- collect and share regional watershed data
- develop floodplain maps on a smaller scale in order to identify flood risks to local infrastructure
- develop best practices, tools and adaptation options for flood management
- develop climate change adaptation process

First Nation Adapt supports many different types of activities or studies depending on specific community needs. Generally, the first step is to improve understanding of how climate change may be impacting community infrastructure or emergency management by conducting a risk assessment. This assessment is the most common type of study and involves identifying and quantifying community risk to climate change related impacts. Subsequent to addressing community risk, adaptation planning can be undertaken to prioritize options and to develop adaptation recommendations in order to reduce current or potential climate impacts. What can follow is a cost-benefit analysis of the various adaptation options under consideration. Each

community has unique needs. Support is available for those communities that are just beginning to explore the impacts of climate change as well as those communities looking at adaptation options to respond to a well understood need.

Project examples:

These are some examples of activities that can be incorporated into a project. This is not a complete list, and communities are encouraged to identify project activities that respond to their needs.

- community risk assessment based on community site visits and engagement sessions with community participants, including the gathering of Indigenous knowledge
- collection of baseline information on local river or coastline characteristics and integration of climate change projections
- assessment of community drainage (e.g., culverts) systems for current and future projected extreme precipitation events
- capacity building in the community through fire prevention using a FireSmart assessment
- integrating climate change risk into community planning documents such as: emergency management plans, land use plans, infrastructure plans
- winter road realignment studies
- using Engineer's Canada's Public Infrastructure Engineering Vulnerability Committee (PIEVC) protocol to assess infrastructure
- hazard mapping to identify suitable areas for development using historical and future climate information
- identification of adaptation measures to reduce climate change impacts including natural infrastructure options
- collection of Indigenous knowledge regarding community-based local knowledge of past climate events and trends, climate change impacts on people or the environment, and ideas for adapting to climate change impacts
- floodplain mapping to assess current and future projected flood risk to community infrastructure
- participation in regional watershed management discussions with various stakeholders, i.e. provincial governments, other First Nations and NGOs, on potential collaborative projects to address gaps in floodplain mapping and related data needs.

How to apply:

1. Review the program funding guidelines 2018-2019 and the budget spreadsheet
2. Contact the program to discuss a potential project idea
3. Seek and confirm community support for your project with a band council resolution or other proof of community support
4. Complete a 3 to 5 page project proposal as described in the guidelines, as well as the budget spreadsheet (MS Excel)
5. Submit the project proposal, budget spreadsheet, and band council resolution to: aadnc.adaptation.aandc@canada.ca

Want to discuss a project idea?

If you have a project idea but are not sure where to begin, the program staff would be pleased to discuss the eligibility of your group and project, to answer your questions about the application process or to provide general guidance. Please contact us by email at: aadnc.adaptation.aandc@canada.ca.

Examples of Ontario programs that were funded in 2019:

Contact	Community	Project	Funding
Mohawks of the Bay of Quinte	Mohawks of the Bay of Quinte	Community Climate Change Study Funding to conduct a risk assessment, adaption planning, and cost-benefit analysis to address flooding in the community.	\$ 77,631
Mocreebec Eeyoud	Mocreebec Eeyoud	Moose River Vulnerability Assessment, Floodplain Mapping, and Adaptation Planning Funding for a multi-stage project comprising risk assessment, floodplain mapping, and adaptation planning to look at community infrastructure vulnerabilities and needs.	\$ 512,500
Eagle Lake First Nation	Eagle Lake First Nation	Collecting our Knowledge about Climate Change Funding to conduct: <ul style="list-style-type: none">• A vulnerability assessment using knowledge sharing circles• Interviews with key elders• Other youth engagement initiatives to gather and interpret the community's knowledge on climate change	\$ 39,596
Grand Council Treaty #3 Representative Services Ltd.	28 First Nations in North Eastern Ontario	Watershed Management Planning Funding to: <ul style="list-style-type: none">• Acquire climate change data to bring regional watershed management organizations• Coordinate regional forums to develop watershed management plans• Develop an interactive watershed map	\$54,150

Project description guidelines

Please ensure your project description (3-5 pages) contains the following content areas.

1. Title page:

Include project title, community(s) involved in the project with contact information (name, email address, telephone number).

2. Description of community concerns:

Tell the story of your community's climate change concerns and issues. In your description, be sure to include how your community's public buildings, services, facilities, and roads appear to be at risk to climate impacts, e.g., flooding, wildfires, etc. and how this affects the community. It is most important to specifically indicate what your project will accomplish in terms of improving community resilience to climate impacts.

3. Proponent eligibility:

Describe how you are eligible for funding (First Nation community, band or tribal council, Indigenous organization, etc.).

4. Adaptation project type:

Outline what type of adaptation project is being undertaken. Valid project types include risk assessment, floodplain mapping, adaptation planning, and cost-benefit analysis. Projects need not include all project types.

5. Climate impact priority area:

Clearly state how your project will address impacts to community infrastructure or emergency management from one or more of the following climate impact areas: inland flooding, drought, wildfires, sea level rise and coastal erosion, winter road failures, or impacts on fisheries.

6. Proposed methodology and outcome of the project:

The methodology demonstrates how the proponent will address the goals of the project by outlining clear steps in achieving the project results. This is the most important section of the project proposal, be sure to include a detailed description of all the activities that you are planning to undertake. This section should identify how the community will be involved in the project and who will be working on it. Many projects include the hiring of a climate change coordinator to lead the work. The First Nation Adapt team can aid on the development of a methodology if needed. Please contact us to discuss tools, best practices, and potential partners.

7. Community agreement:

Community support for the project must be demonstrated, through a signed Band Council Resolution or other proof of community support.

8. Budget and work plan:

First Nation Adapt will aid by supplying the required budget template.



For more forestry-related publications, visit the Canadian Forest Service Publications website at:

cfs.nrcan.gc.ca/publications