

Chapter 9

Conservation of Freshwater Turtles in The Anthropocene: Indigenous-Engaged Approaches to Tackle a Timeless Problem

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Abstract – Critically important to the long-term success in management and conservation of freshwater turtle populations is the engagement of all stakeholders and rightsholders from the beginning of the project, particularly when the target species use habitat on public, private, and Indigenous lands. Blanding’s turtle (*Emydoidea blandingii*) populations endangered in Canada and along the eastern and northern shores of Mnidoo Gamii (Georgian Bay, Lake Huron, Canada) are assessed as threatened provincially. We present 2 ongoing conservation projects focused on the recovery and protection of the Blanding’s turtle, one within Whitefish River First Nation located at the northern shore of Mnidoo Gamii, and the other in Moose Deer Point First Nation located along the eastern shore of Mnidoo Gamii, located in Ontario. We adopted principles of the two-eyed seeing approach by considering the needs of the community and research priorities equally, and by weaving Indigenous Knowledge (IK) and Western Science (WS) in planning field activities. In both case studies, we used ArcGIS Online surveys to collect data, collaborate on field work, attend community meetings, and conduct informal interviews/discussions with community members to optimize knowledge weaving. We highlight opportunities, methods, and successes in our collaborations to provide an elevated understanding of how IK holders and WS researchers can design effective long-term conservation of species at-risk to combat ongoing biodiversity loss.

Introduction

Encroaching anthropogenic activities are a great cause for concern for turtles worldwide, as more than 50% of turtle species are at risk of extinction (Rhodin *et al.* 2018). This alarming trend persists in Ontario, Canada, as all 8 freshwater turtle species are designated as at risk of extirpation by the federal government (COSEWIC 2016; Government of Canada 2002). To ensure the long-term recovery of these species, the development of robust conservation programs becomes imperative. However, this endeavor is no small feat, as achieving recovery objectives demands extensive collaboration among governments and the active engagement of a myriad of individuals, researchers, groups, and communities (Ontario Ministry of The Environment, Conservation and Parks 2020).

Indigenous-engaged research and weaving of knowledge systems

High-level calls for involvement

Calls for the involvement of Indigenous communities in species-at-risk (SAR) recovery has been recommended and stated in laws and policies at both federal and provincial levels in Canada (Olive 2012; Terbasket and von der Porten 2019). For example, while the Species at Risk Act and Endangered Species Act use western scientific information to identify species at risk, they also consider information obtained from Indigenous Knowledge (Government of Canada 2002; Government of Ontario 2007). However, disparities exist between this official recognition on the importance of involving Indigenous Peoples in SAR recovery and actual Indigenous community involvement (Hill *et al.* 2019). Interdisciplinary practices involving the weaving of multiple knowledge systems including Indigenous Knowledge (IK) and Western Science (WS) should be prioritized to uplift the important values and insights that IK can bring to conservation efforts (Henri *et al.* 2020, 2021). This can range from the duty to consult (Warnock 2021), community-based participatory research (Alexander *et al.* 2019), community capacity building (Latulippe and Klenk 2020), and a genuine respectful representation of Indigenous Peoples. This can further uplift Indigenous self-determination and evolve into direct co-management to integrate local level and shared decision-making (Berkes *et al.* 1991; Carlsson and Berkes 2005).

Indigenous community engagement

When conducting community-engaged research, ongoing efforts must be made to develop open communication based on mutual trust and respect (Adams *et al.* 2014). Involving communities in conservation efforts should also focus on maximizing outreach and relationship building that best fits the individual community's needs and interests. Community engagement can take many forms but generally involves active and meaningful participation of individuals and groups to address relevant issues and shape overall research outcome. In the context of wildlife conservation, we define community engagement as working collaboratively alongside local communities to identify and address conservation issues through the sharing of knowledge, values, research, and efforts. It is critical that research and conservation efforts prioritize community engagement, as it helps to guide efforts and create long-lasting, sustainable, and meaningful impacts.

Engagement should be guided by several principles. First, it is important to establish trust and respect between researchers and community members. This builds a foundation to allow for the establishment of long-term working relationships. Next, it is critical to conduct outreach and relationship building activities to ensure active participation and provide opportunities for training and capacity building. Lastly, it is crucial to make a genuine effort to understand community goals and concerns, and to ensure that community members are directly involved in a shared effort (McGregor 2004; Bartlett *et al.* 2012; Wong *et al.* 2020; Menzies *et al.* 2021). By embracing these ever-evolving principles, conservation efforts can benefit from the unique perspectives and insights of local communities and help to create a sustainable and equitable approach to conservation.

Further importance of community-engaged research

Effective SAR conservation requires the participation of all stakeholders and rightsholders across multiple jurisdictional boundaries, including Indigenous Peoples. This can be particularly effective for the conservation of SAR that occupy large geographic ranges or have a propensity for migration/travels. These species often occur across multiple jurisdictional boundaries ranging from municipalities, private land, Indigenous-managed lands, provincial and national parks, and more. To effectively conserve these species, it is therefore critical to account for the values and knowledge that all stakeholders and rightsholder hold across the species range.

Indigenous community engagement and consultation brings in unique perspectives and knowledge of the land that can enhance conservation efforts. Indigenous Peoples often have a deep connection to their surrounding land, waters, and ecosystems, and possess vast knowledge towards the ecology, behaviour, and habitat of a species. This understanding often occurs at a finer spatial and temporal scale through daily

observation and interaction with the land in comparison to strictly Western Science monitoring and surveying methods (Ban *et al.* 2017; Henri *et al.* 2020; Reid *et al.* 2022). Building relationships with Indigenous communities not only increases the likelihood of long-term success in conservation efforts, but also contributes to reconciliation efforts and highlights the power of holistic approaches in ecological sciences. Engagement with Indigenous Peoples allows for conservation and management actions to be taken across multiple jurisdictional boundaries. Intuitively, this should allow for more comprehensive and coordinated efforts to protect SAR. By embracing the values and knowledge of all stakeholders and rightsholders and recognizing Indigenous Peoples as traditional stewards of the land, we can ensure that conservation efforts are inclusive and effective, and persists into the future.

Through collaborative management efforts, one can strengthen partnerships by building trust and respect between Indigenous communities, Western Science researchers, and other stakeholders. These efforts jointly promote Indigenous communities to exercise rights to self-determination, as is recognized by the United Nations Declaration on the Rights of Indigenous Peoples (United Nations [General Assembly] 2007).

Community-engaged research and successes in a Canadian context

Community-engaged research in Indigenous communities is increasingly documented across Canada and is effectively implemented for the conservation of many SAR (Hill *et al.* 2019; Artelle *et al.* 2021; Buschman and Sudlovenick 2022; Lamb *et al.* 2022). Partnerships between Indigenous rightsholders and Western Science researchers are beginning to come together to investigate conservation trends and propose management options through the weaving of multiple knowledge systems. Henri *et al.* (2020) conducted research on an Arctic tern (*Sterna paradisaea*; takatakiaq in Inuttitit) population in southeastern Hudson Bay and revealed declining population trends by conducting IK interviews and validation workshops. This knowledge sharing platform further provided best management advice, demonstrating the complementarity between WS and IK systems. A similar example on the management of Dungeness crabs (*Cancer magister*) in coastal British Columbia investigated population trends by conducting IK interviews in combination with computer simulation of successful catch under current abundance levels. This demonstrated widespread, local-scale depletion of Dungeness crab populations significant to Indigenous fisheries that was previously undetected by managers monitoring populations at the regional scale (Ban *et al.* 2017).

Management and conservation initiatives are increasingly showcasing co-management efforts involving Indigenous and non-Indigenous partners. This creates a shared decision-making space, which can be applied to conservation efforts such as those shown in examples of moose (*Alces americanus*) co-management across Canada (Popp *et al.* 2019). As research involving IK and community-engaged methodology across Canada begins to gain recognition, unique opportunities arise to increase the effectiveness of management efforts for SAR with multiple conservation hardships such as Ontario's charismatic freshwater turtles.

Blanding's turtle

Freshwater turtles

Freshwater turtles have significant cultural importance to multiple Indigenous communities in Canada, including the Anishinaabe and Haudenosaunee, who share a long-standing relationship with the turtle and its habitat that is incorporated into traditional teachings, ceremonies, and stories (Bell *et al.* 2010). The turtle is often seen as a teacher across various Indigenous cultures, possessing a great wealth of knowledge and represents wisdom, longevity, and endurance. The turtle also plays a critical role in various Creation Stories including that of the Great Flood from Anishinaabe culture and Sky Woman from Haudenosaunee culture, in which 2 different stories describe how North America was created on the back of a turtle (Bell *et al.* 2010). Turtles are further used as medicine and for ceremonial purposes where turtle shells are often used as a rattle (Pearce 2005).

The Blanding's turtle (*Emydoidea blandingii*, Blanding's Mishiikeh/Mishiikenhug) is a freshwater turtle that is easily distinguishable by its bright yellow throat (Figure 1). They are often referred to as the turtle with the sun under its chin in Anishinaabe storytelling, in which long ago, the sun was taken by Nanabozho, leading to panic by all the animal and plants of the land as they no longer had a source of food and sunshine. After many failed attempts by various animals including Eagle and Bear, the Blanding's Mishiikeh snuck into Nanabozho's home, took the sun, and returned it to the sky. In doing so, it held the sun within its mouth, giving its chin a bright yellow colour (Toronto Zoo story shared by Anishinaabe elder from central Ontario 2022).



Figure 1. An adult female Blanding's turtle (*Emydoidea blandingii*) with a bright yellow chin.

This semi-aquatic freshwater turtle is known to have extensive habitat requirements, as they make use of a variety of aquatic and upland habitats during the active and nesting seasons (Ernst and Lovich 2009; Edge *et al.* 2010). They exhibit extended longevity, delayed sexual maturity, low annual fecundity, and females have a propensity for long, overland travels to access nesting habitats (Congdon *et al.* 1993). This co-evolved array of life history traits causes them to be particularly sensitive to human disturbance, as road mortality, habitat loss, and habitat fragmentation challenge the survival of Blanding's turtle populations across their range (Marchand and Litvaitis 2004; Steen and Gibbs 2004; Dowling *et al.* 2010). This has led to the population residing in the St. Lawrence Great Lakes region to be considered provincially threatened in Ontario, and federally endangered in Canada (COSEWIC 2016; COSSARO 2017).

Ecological significance

Blanding's turtles also play an important role in freshwater ecosystems throughout their range. They act as both prey and predators within ecosystems, providing both population control on smaller prey, while eggs, hatchlings and juveniles are food sources for mesopredators (Rowe 1992). Freshwater turtles in general can also act as keystone species in an ecosystem (Buhlmann *et al.* 2002) by partaking in seed dispersal, mineral cycling, and carbon storage (Falcón *et al.* 2020; Stanford *et al.* 2020). They have also been used as an indicator species of healthy wetland ecosystems because of their sensitivity to human disturbance and habitat degradation (DeCatanrazo and Chow-Fraser 2010).

The conservation of Blanding's turtle requires the protection and management of multiple biologically relevant habitats that overlap with those of various flora and fauna such as reptiles, amphibians, submerged aquatic vegetation, and marsh birds. They are therefore considered an effective umbrella species (Reid *et al.* 2016), a concept in which the targeted conservation of a specific species can simultaneously protect multiple species that share similar habitat and biological needs. Thus, protecting Blanding's turtles could

maximize conservation outcomes for other species during an age of ongoing biodiversity loss (Roberge and Angelstam 2004).

Regional management practices

Regionalized conservation efforts and tailored recovery plans can be a beacon of hope for declining at-risk populations, as they can be specifically catered to landscape characteristics and associated communities to maximize conservation success (Willson and Bignall 2009). This is particularly applicable for species such as Blanding’s turtles with vastly different habitat use and anthropogenic stresses that are dependent upon region. Regional surveys and community-specific research projects can provide rare opportunities to gather valuable site-specific information on elusive reptiles such as the Blanding’s turtle. These collective efforts can further form long-term, multi-partner initiatives focused on long-term species survival and targeted conservation outcomes.

Overall objectives

In Canada, Indigenous community engagement is increasingly recognized for its effectiveness and long-term effects. To recognize the importance of holistic approaches to SAR freshwater turtle research, our objective is to emphasize the importance, progress, and successes we have had through engaging Indigenous communities in freshwater turtle conservation efforts and research. In this study, we showcase Blanding’s turtle research and conservation efforts within 2 Anishinabek Nation First Nations along the shoreline of Mnidoo Gamii (Figure 2) – Moose Deer Point First Nation (MDPFN) and Whitefish River First Nation (WRFN).

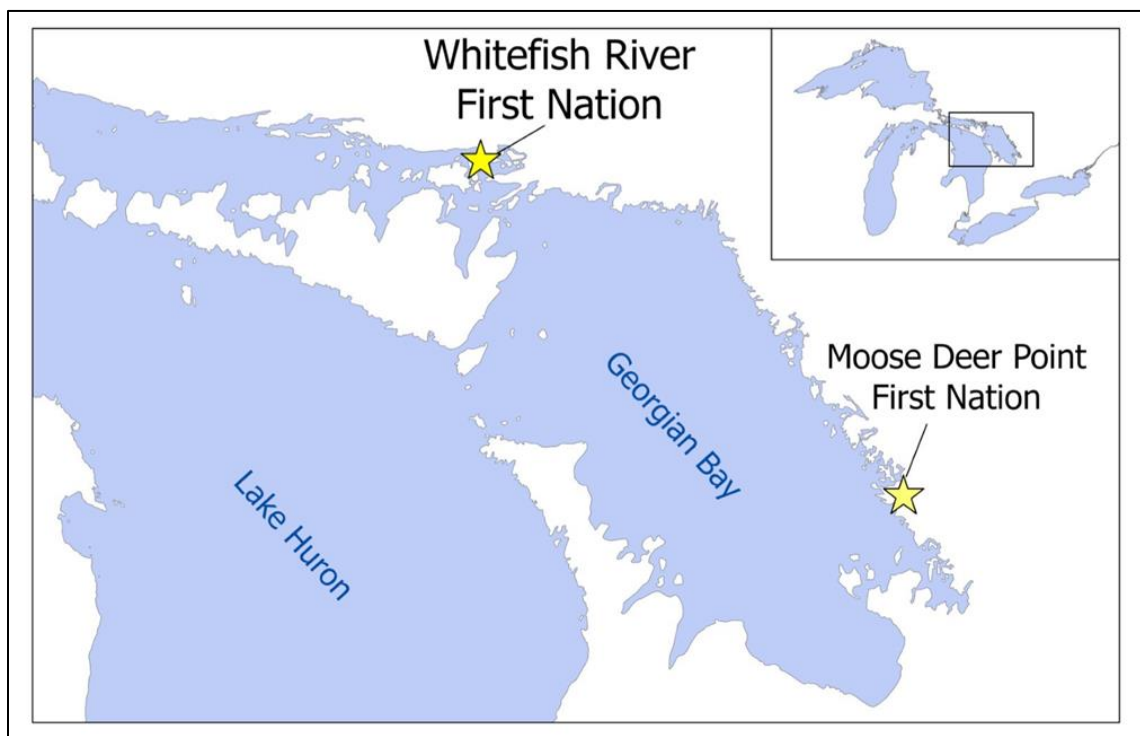


Figure 2. Location of Whitefish River First Nation and Moose Deer Point First Nation relative to Georgian Bay, Ontario. Both nations contain a high biodiversity with various species of freshwater turtles.

Collaboration in each Nation

Moose Deer Point First Nation

Moose Deer Point First Nation is a small Pottawatomi community of 483 ha on the shores of eastern Georgian Bay at the mouth of Twelve Mile Bay. There are approximately 80 homes in 2 residential areas on the north and south side of O'Donnell Point, adjacent to the Provincial Nature Reserve. There are 2 large marinas serving the cottaging public, and a range of government services. Recent efforts to become a self-governing First Nation have led to significant advances in opportunities for the community to engage in research and environmental stewardship efforts. Their relatively new Lands Department has undertaken projects regarding invasive species, bats, ecological land classification, and most recently, freshwater turtles.

This is a highly biodiverse area, with hundreds of relatively undisturbed wetlands and wetland complexes within their current and traditional lands that provide ideal habitat for an abundance of at-risk reptiles, including 6 species of freshwater turtles. Unfortunately, parts of these expansive and interconnected complexes have been fragmented by roads, and community members have voiced their concerns of a decline in local reptile populations due to road mortality. In 2022, McMaster University approached MDPFN to initiate a radio-tracking program for Blanding's turtles on their Land and to work together to begin identifying habitat use and site-specific threats to this population. Through this partnership, there was a mutual sharing of knowledge that aided in a deepened understanding of threats and history, as well as habitat requirements of Blanding's turtles in this region. Community members from MDPFN were hired to learn and partake in turtle conservation research fieldwork by surveying and radio-tracking turtles. Knowledge on past and recent species at-risk observations were shared from knowledge holders to McMaster personnel. Together, we engaged with concerned community members and encouraged the awareness and documentation of road usage by freshwater turtles within the reserve. This partnership created a dramatic and positive shift in awareness towards SAR conservation from members of the community, with field personnel in Moose Deer Point receiving frequent calls and messages from community members on turtle sightings and nests alongside roads throughout the summer. This allowed us to locate multiple turtle nests along the major road within the community, where nest protectors were installed to decrease predation risks. We protected the nest of 1 radio-tagged, gravid, female Blanding's turtle locating her nest where community members confirmed hatchling success ($n = 2$) in early September (Figure 3).



Figure 3. Blanding's turtle hatchlings observed by community members emerging from road-side nests in Moose Deer Point First Nation.

Although the community possessed knowledge about the presence of various species, there was a distinct lack of comprehensive data regarding the distribution and potential road-related threats faced by at-risk reptiles in MDPFN and their traditional Lands. Recognizing this need for data collection and conservation efforts, in 2023, we initiated an innovative community-engaged initiative known as the "Shell Seekers Sweepstakes."

This month-long contest, open to all community members, was designed to incentivize the systematic documentation and recording of sightings of species at-risk reptiles, including snakes and turtles, as well as their nests. Spanning from June to July, the contest strategically aligned with the peak nesting season, encouraging community members to report sightings near wetlands and roadways within the reserve and their traditional lands to field personnel. We collected information on past and recent species at-risk sightings, including nesting locations, road crossings, roadkill, areas of concern, and habitats where they were found. We recorded this knowledge into a web-based turtle sighting survey form using ArcGIS Online Survey 123 (ESRI 2023; Redlands, California), which was accessible through mobile phone and computer. This was used to translate current and historical knowledge into a spatial dataset that could be accessed through a geographic information system (GIS).

To further engage and motivate participants, each sighting, accompanied by a photograph and precise location data, earned participants an entry into a raffle draw for a grand prize. A dedicated scoring system was employed, considering factors such as the species encountered, their rarity (at-risk status), and whether nesting was observed. These elements contributed to the accumulation of raffle points for each community member, which were meticulously recorded in a spreadsheet. At the culmination of the contest, prizes were awarded to individuals with the highest number of sightings, the rarest sightings, the most raffle points, and the grand prize winner won a weekend away at a resort.

At the end of the contest, a total of 247 at-risk reptile sightings were collected from 43 families (roughly half of the community), spanning 11 different species of snake and turtle. This contest not only supplied the MDPFN Lands department with valuable spatial information regarding SAR to be used in protection and recovery efforts, but it also provided a wholistic approach to engage families in community-wide stewardship initiative that educated them on the importance of SAR reptiles, and how we can reduce roadkill.

This partnership also provided us with the unique opportunity to review knowledge shared by community members and reflect on how to incorporate this information into our fieldwork. During the nesting season (early June – late July) of 2022, 16 female turtles (including 3 radio-tracked, gravid Blanding's turtles) of 4 different species were observed on nesting migrations or attempting to nest within 150 m of a single building. The highest density of recorded turtle nests and sightings occurred in this area and were exposed to road mortality because of 2 intersecting roads were used frequently by cottagers during the summer. We learned from community members that female Blanding's turtles have been nesting alongside the roads near this building in recent years, and that 20 yrs earlier, there had been a sand pit in the location where the building currently sits that may have been used for nesting by turtles. Based on this history and the strong nest site fidelity of female Blanding's turtle (Standing *et al.* 1999), we hypothesized that the females had been using the grounds and roadside around the building for nesting for the past 2 decades even though the sand pit no longer existed. We now have an opportunity to provide safe artificial nesting sites near the building to attract females and discourage them from nesting on roads. This is an example of how information sharing and consultation have led to development of an important mitigation measure for the conservation of Blanding's turtle in MDPFN.

Whitefish River First Nation

Whitefish River First Nation is the place of visions and dreams. It is a self-governed First Nation and has an on-reserve population of approximately 500 people and a total membership of approximately 1500. This First Nation is part of the Anishinabek Nation (Ojibway) and are signatories of 2 treaties: The Bond Head Treaty of 1836 and the Robinson Huron Treaty of 1850. Located 30 km south of Espanola, Ontario, and

15 km north of Little Current, Ontario, WRFN is the gateway to Manitoulin Island and home to numerous species of plants and animals.

In response to local community sightings of the threatened Blanding’s turtle within an adjacent archipelago, researchers from McMaster University began a formal mapping of critical turtle habitat in this region in 2021 using high-resolution orthophotos. Interest in this investigation and community sightings of various freshwater turtle species on the WRFN reserve led to a partnership between researchers and Lands department staff to expand the existing archipelago study to include a comprehensive habitat use study on reserve. We have worked together for the past 3 yrs to better understand Blanding’s turtle habitat use and threats in the archipelago, and expanded this project to directly investigate freshwater turtle populations on the WRFN reserve in the summer of 2023.

To better understand the status of Blanding’s turtle within WRFN, the goals of researchers from McMaster University and the WRFN Lands Department are to work together to: 1) assess Blanding’s turtle critical habitat, threats, and overall population status, and 2) establish an iterative design process (Figure 4) in which community input is prioritized at every step. Our mandate is to build mutual trust and respect, and involve stakeholders at all research stages. Thus far, we have worked on capacity building within the community to collaboratively provide training on the use of radio-telemetry for Indigenous youth and staff to collect data within the archipelago. Together, we also learned the comprehensive biology of Blanding’s turtles, including general habitat use, sexual dimorphism, behaviour, and diet. This foundational knowledge helps increase awareness towards the ecological importance of freshwater turtles within the community.



Figure 4. An iterative design process used in the collaborative project between McMaster University and Whitefish River First Nation to place trust, care, and respect to follow the principles of *doing work in a good way*.

Through this partnership, we have also engaged Indigenous youth in interactive workshops, hired community members to participate in radio-tracking, and hosted community meetings to share what we have found about Blanding's turtles. We hosted a community workshop in the summer of 2022 to share conservation progress on projects within the Lands Department and the Blanding's turtle project. This included a presentation on what we have found so far regarding Blanding's turtle habitat use, home range size, movement patterns, and habitat selection. More importantly, we shared our vision in the expansion of the project with the community to better understand research interests, concerns, and to involve rightsholders at the initiation of this project to begin our iterative research plan. A group of 15 community members attended and provided feedback on how we can best carry out this project. This meeting included a mapping exercise, in which we printed a large map of the traditional lands of the Whitefish River First Nation and asked each participant to point out where they have seen freshwater turtles, species name, status (dead/alive), and when they saw it. We used stickers to mark each observation on the map and this will be used to determine potential mortality hotspots, critical habitat locations, and nesting areas. We received 30 sightings of freshwater turtle past/current sightings and community concerns relating to highway development, decommissioned train tracks, and the working relationship between the community and surrounding agencies. An 80 km/h highway runs through WRFN, where speeding and reckless driving is common and have serious implications for the safety of both wildlife and humans. Many community members have witnessed live and deceased turtles near the highway. This is a potential mortality hotspot (Crawford *et al.* 2014). A decommissioned train track also exists in the community and is currently used as an ATV trail for hunting and fishing access, alongside access to community members' houses. Many WRFN members have witnessed turtles nesting along this trail, but surveying shows signs of predation and nest failure, including egg fragments and petrified hatchlings. The community is also working on establishing a working relationship with the governmental agencies regarding highway developments.

To further our outreach efforts, we shared knowledge on freshwater turtles with youths in the community during a summer camp workshop. Twenty-five youths aged 5 to 12 participated in an hour-long workshop, which included a presentation to share the Lands department and McMaster University's work on freshwater turtle species that can be found in the area, and interactive exercises that allowed participants to practice radio-telemetry. The exercise involved 1 participant hiding a VHF (Very High Frequency) tag on themselves, and another holding a radio-receiver to identify which participant was the "turtle." We received positive feedback for this workshop, where participants requested to be the "turtle" or the "tracker" multiple times. In the summer of 2022, researchers from McMaster University were also invited to host a booth at the community Powwow to further exchange knowledge on freshwater turtles within and surrounding the community.

We have worked together to conduct IK interviews in summer of 2023 to better understand community concerns on threats to freshwater turtles in the area, including road mortality, human disturbance, predation, and nest failure. We have also begun to identify habitat use by Blanding's turtle in the region, including critical habitat, individual movements, and population home range. We are achieving this by integrating community-based knowledge and information on population trends of turtles (i.e., do people remember seeing more, fewer, or the same number of turtles compared to previous years), and conventional western science surveying methods (i.e., radio-telemetry, visual surveys, remote sensing). Given the known stressors on freshwater turtles in the area, we are working to identify mortality hotspots using road surveys, conduct walking surveys and trail camera deployment to uncover possible reasons for nest failures, and mapping critical habitats (nesting and overwintering habitats) within WRFN lands with remote sensing and GIS tools. Data collected in 2023 are currently being analyzed for further interpretation.

Our next steps are to synthesize western science data with IK to help identify best management practices for effective conservation. All shared knowledge will be disseminated to the community during validation workshops to ensure accurate representation of information and intent, and identification of discrepancies between the community and research goals. Our goal is to develop a recovery plan that identifies threats and propose appropriate mitigation to increase nesting success of freshwater turtles throughout the region.

Our plan will be presented to the WRFN band and council, local cottage association, and the Township so that rightsholders and other stakeholders can participate in regional planning and protection.

Mutual respect, inclusivity, and collaboration for long-term change

With ongoing declines in freshwater turtle populations across Canada, managing SAR populations by weaving WS and IK while conserving the strengths from both knowledge systems creates a holistic and effective approach. Central to this approach is the emphasis that we must maintain the integrity and appreciation towards all knowledge systems while encouraging reciprocal exchange of knowledge for mutual learning and respect. We have learned firsthand the importance of establishing community-specific collaboration frameworks that incorporate the needs, values, and knowledge held by Indigenous Peoples. It is important that all rightsholders and stakeholders work together respectfully towards shared goals. The partnerships should be equal and inclusive, free of systemic barriers and distrust, and allow efforts to decolonize ecological sciences. This can allow for the weaving of knowledge systems to fill existing knowledge gaps, create long-term best management practices, and uplift Indigenous connections to the land. It is also important to understand that community-engaged projects and efforts should be directly tailored to each Nation in discussion with communities, as each Nation and community is unique with distinct values, priorities, and connection to the land.

It is also critical that information acquired through research be disseminated to all interested community members, when possible, to ensure community knowledge is appropriately represented. This promotes openness and transparency, allowing for engagement opportunities, community suggestions, and/or concerns on research methodology, goals/objectives, and approaches to guide project outcomes. It should also be noted that while identifying threats and solutions may be the common goal in collaborative conservation efforts, research partnerships should focus on overall long-term relationship building. Research relationships need to demonstrate a genuine respect for the perspectives, values, and knowledge that community members hold. By doing so, conservation plans that include multiple knowledge systems will have the best outcomes in achieving long-term successful recovery of freshwater at-risk turtles.

Challenges in community-engaged research on SAR conservation can also exist and vary across partnerships and Nations. In communities with high biodiversity where many species are common, conservation efforts for SAR may not seem especially relevant or high priority for community members (Moose Deer Point First Nation, personal communication). Resource and power imbalances may also be present in research relationships between Indigenous and non-Indigenous partners, which must be addressed in a responsible manner to ensure Indigenous autonomy over lands and resources (Popp *et al.* 2019). Collaboration and co-management agreements should also be carefully drafted and kept up to date to avoid conflict and outline partner responsibilities where applicable. Respectful partnerships can be achieved through active community engagement, ongoing consultation, reflections on project intents, and a commitment towards investing time, resources, and social capital in each collaborative effort (Castro and Nielson 2001).

When approached from a respectful and responsible manner, community engagement, knowledge weaving and co-management of SAR conservation brings renewed hope, excitement, and mutual benefits to all involved partners and species. This project provides some insight into preliminary collaborative efforts on freshwater turtle conservation within Mnidoo Gamii across 2 Nations. Future work should continue to follow the principles of doing work in a good way and honour all knowledge systems in a holistic manner to work together to combat biodiversity loss.

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understand the Potawatomi and Ojibwe philosophies in guiding our research. The connection to the land and care for all beings within each Nation creates paths and opportunities for weaving knowledge systems in combination with western science expertise brought on by settler authors Reta Lingrui Meng, Jonah Lehman, and Dr. Patricia Chow-Fraser. Together, we wish to bring awareness to the reader of the importance of community-engaged research in the natural sciences, specifically for species at-risk conservation. We use this space to share mainstream and Indigenous Knowledge on freshwater turtle conservation, and to show how we can uphold our responsibilities to protect the land and all beings for future generations. Central to our work is the responsibility of doing work in a good way.

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