



PRELIMINARY REPORT FROM THE ANISHNABE MOOSE STUDIES

Anishnabe Knowledge and Governance for the Protection of Moose Populations in and around La Verendrye Park, Quebec

BY THE ANISHNABE MOOSE RESEARCH COMMITTEE
COORDINATED BY WABA MOKO (SHANNON CHIEF)

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Executive Summary

The moose are suffering due to colonialism. When we were young, we would see moose all the time, in lakes, crossing back roads, moving through the park. In winters, we would sometimes see them in packs of 14 or more. But over the last 15 years, Elders and Land users have noticed fewer moose on the territory and advised that something needs to be done. Our previous moose protection efforts led to a temporary moratorium on sport hunting in La Verendrye Wildlife Reserve (also referred to as La Verendrye park).

The Anishnabe Moose Committee (AMC) is a grassroots committee made up of people from several different Anishnabe (Algonquin) communities in and around La Verendrye. We engage directly with our communities to protect the moose, our lands, and our culture. Our traditional governance framework requires that we work directly with our people to connect with our traditions and protect the moose and our lands. We do this by bringing communities together into discussions that generate grassroots, bottom-up solutions to important problems like the declining moose population. Through these gatherings, community-led research, and community-building rooted in our traditions, we are building awareness and capacity to develop a Moose Management Plan and, ultimately, reclaim our lands and empower our culture. Traditional governance is the way forward to better steward the land and the Moose. This report is the first phase of our work.

Our research project began in December 2021. Through the summer of 2022 we held community workshops with all nine of the Anishnabe (Algonquin) communities in and around the park. Through these workshops we gathered knowledge and observations about the moose from Elders, hunters and other land users and Knowledge Keepers. Throughout the project, we have been collaborating with **Research for the Front Lines**, who have coordinated teams of volunteers to work on other research tasks related to understanding the causes of decline in the territory.

Our research has found that the Moose are threatened by poor management of sport hunting and they are being over-hunted by sport hunters in La Verendrye and in the surrounding areas on Anishnabe territory. Over-hunting is produced through a combination of factors: too many sport hunters; improper hunting regulations that allow for the unbalanced killing of females, males, and calves; waste and poaching; and unfair technological advantages over the moose. The underlying cause of these factors is the government's interest in generating revenue and its lack of holistic moose management. The consequences of these factors have produced a smaller and imbalanced population that cannot recover under current conditions. Additionally, enforcement by the provincial game wardens is discriminatory towards Indigenous people. Game wardens and other enforcement are not responsive to reports from Anishnabe people, which frequently go unanswered.

The findings of this research phase have clearly demonstrated that multiple, compounding factors continue to exacerbate the moose herd health and population numbers. Analysis of the results of this study show two main drivers of change: deforestation and sport hunting. Logging and the associated forestry operations are responsible for immense moose habitat loss. Deforestation, heat accumulation, snow packing and winter tick resilience all negatively impact the winter survival rate and number of viable moose calves. In addition, deforestation decimates the biodiversity index at every level, which causes ecosystem repercussions for all species, including the moose.

Climate change, disease, forestry operations and sport hunting all continue to drastically drive the moose population down. In doing so they are leading to detrimental impacts on the food security and sovereignty of the Anishinabe people, in their own territory. This is also unacceptable. Continuation of current practices constitutes violations of territory, species health and Anishinabe rights supported by UNDRIP.

If a moose population management plan is to see any success, and respect for the Anishinabe inhabitants of the territory is to be upheld - all forestry operations must cease immediately, the moratorium on the sport hunting of moose must continue to be enforced and a comprehensive, multi-method study that is co-developed, co-implemented and informed by the knowledge of the Anishinabe people, must be a prerequisite.

We demand that the Quebec Government respect our rights as grassroots Anishnabe people to protect the moose; the moose that since time immemorial have provided for us.



Acknowledgements

The Anishnabe Moose Research Committee is made up of members of different communities within the Anishnabe-Algonquin Nation, including:

- Shannon Chief, Barriere Lake First Nation
- Anida Decoursey, Barriere Lake First Nation
- Mike Diabo, Kitigan Zibi
- David Kistabish, Pikogan First Nation
- Trycia Bazinet, settler
- Sean McLaren, Timiskaming First Nation
- Jerry Polson, Long Point First Nation
- Claudette Poucachiche, Long Point First Nation
- Joey-Lynn Wabie, Wolf Lake
- Harry Paul, Kebaweok First Nation
- Amber Hein, Pikwakingan First Nation
- Dale Benoit-Zohr, Pikwakinagan First Nation

The Anishnabe Moose Research Committee would like to express deep gratitude to the traditional Elders, knowledge keepers, hunters and youth of the territory who attended the community workshops and shared your knowledge and observations of our moose relatives. We look forward to continuing this community-led work together, bringing our People together to protect the Moose who take care of us.

Many other people contributed to this research. Thank you Bobbie Rose O'Donnell for helping out at community workshops, taking notes and helping us make the gatherings successful.

We are thankful for the support of Maamwizing Indigenous Research Institute, at Laurentian University. This institute works hard to promote collaboration among researchers and community partners and to better align Indigenous research initiatives with the needs of communities. They have provided financial support, helped organize events, and recruited Indigenous students to help out on our project.

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We would also like to thank the Moose for all that you have provided for us since time immemorial. You have kept us alive, gave us food and shelter, gave us clothes, mukluks, baby clothes, moccasins, drums. You give us ceremony, education, stories, economy, a way to live. You have protected and provided for us.



Photo from Community Workshop, Sept 24-25 2022.

1. Introduction

1.1 Historical context

As our people are in the process of negotiating with the Quebec government about the extension of the moratorium on sports hunting in our territories, we need to acknowledge that this is all happening amidst a long history of colonialism, land theft and extractive development. Our communities have consistently faced settler government control, broken promises and unwanted industrial projects.

The Elders have shared with us stories of historical agreements with colonial governments. Again and again, the agreements which we made with them were violated.

Anishnabe Wampum Governance & Treaty

Elders explained that through the times of the fur trade, the times of the wars between the English and French, to who we were allied, our People began to observe resources becoming depleted, as they began to dig for gold and cut various trees. It became abundantly clear that inherent to the colonial presence was the extraction of our resources and destruction to our lands, waters and communities. In order to address this, an agreement was made and ratified through a wampum belt (see image). Through this treaty, it was agreed that they would not harvest more than one kind of tree and could not dig more than 3 feet deep in the ground - as long as the sun shines, the rivers flow, the leaves fall, and the wind blows. That is what the agreement said. We knew such limits would be necessary. But they violated that treaty, generation after generation, time and time again. Government and industry have been voraciously extracting resources from our territories, taking from our communities and lands and harming the moose, and offering very little in return.



Photo provided by Waba Moko (Shannon Chief).

The Hudson Bay wampum belt. This treaty included environmental clauses that stated that settlers would not harvest more than one kind of tree or dig more than three feet deep.

If the colonists had honored that agreement, we would not be having the profound ecological and climate crises we're facing now. We would not be having trouble finding birch bark, accessing medicines, and feeding our People. That Wampum has been misinterpreted and misused in order to justify extraction on the territory.

This kind of betrayal of agreements has happened again in the La Verendrye park, which is now the largest Wildlife Reserve in Quebec, with over 4,000 lakes and rivers and two huge hydro reservoirs. From the 1950s until the 1970s, La Verendrye park was a protected area. In 1964, the Quebec government began a pilot project. It was agreed with the community of Barriere Lake that this would be a five-year pilot project where they would open up the park for the hunting of moose. They said this would be for only five years. At the time of agreement, they agreed that non-Indigenous hunters would need to have an Anishnabe guide during their hunt. After five years, when the pilot project was supposed to end, Quebec changed its position.

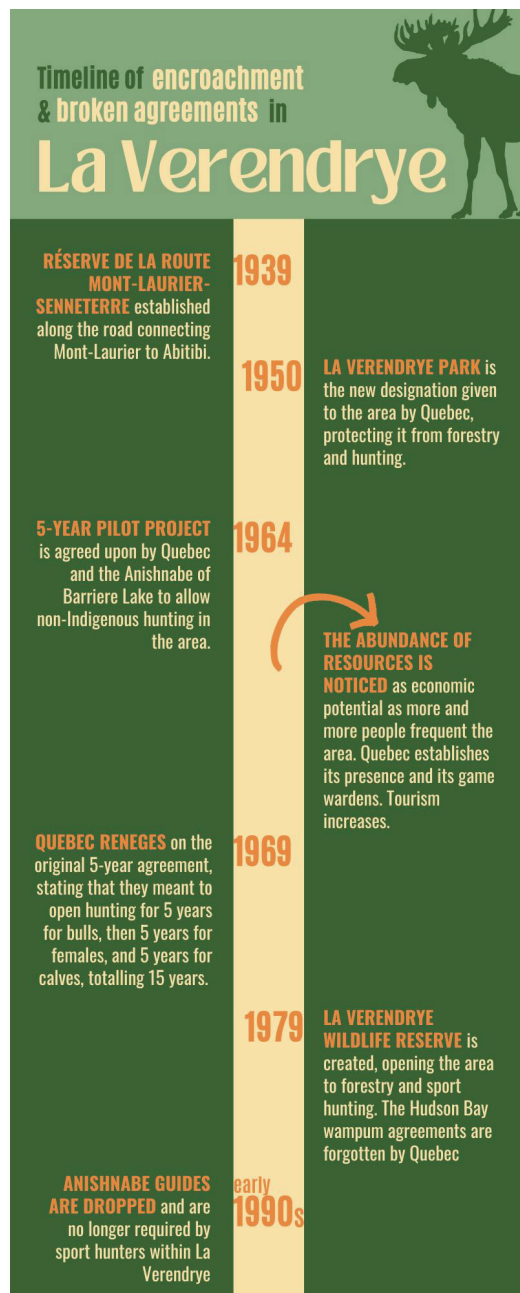
They now said that they meant five years of hunting bulls, followed by five years of hunting females and five years of hunting calves, thereby extending this “pilot project” to a total of 15 years, which was not the agreement the community of Barriere Lake had agreed to in 1964. At this point, Quebec also started to increase tourism, bringing in wealthy Americans to hunt and fish on the territory. They established a presence in La Verendrye. They established game wardens. During this time, they observed all the pine species, white birch, spruce, and poplar, and saw all the wealth within the park, including moose, foxes, rabbits, bears, partridges, beavers, wolves, walleye, northern pike, lake trout, bass, and sturgeon. By 1979, La Verendrye became a Reserve Faunique (“Wildlife Reserve”), which removes protections from forestry and hunting. In the early 1980s, Anishnabe guides were used as fishing and hunting guides but were dropped in the early 1990s. The original five-year pilot project agreement was violated. Clearly, Quebec had no intention of honoring that agreement and continuously encroached on La Verendrye in the following decades without the consent of the Anishnabe people.

Again and again, when agreements are made, the colonial powers disregard them and do what they want. This profoundly unjust relationship needs to end now.



Four wampum belts and one wampum string, the original Anishnabe governance. Wampum belts are a record of events and agreements made.

Photo provided by Waba Moko (Shannon Chief). Unknown photographer.



1.2 Grassroots Momentum

The moose are suffering due to colonialism. When we were young, we would see moose all the time, in lakes, crossing back roads, moving through the park. In winters, we would sometimes see them in packs of 14 or more. But over the last 15 years, Elders and Land users have noticed less moose to be seen and advised that something needs to be done. Our previous moose protection efforts led to a temporary moratorium on sport hunting in the park.

The Anishnabe Moose Committee (AMC) is a grassroots committee made up of people from several different Anishnabe communities near the La Verendrye Wildlife Reserve (also referred to as La Verendrye park). We engage directly with our communities to protect the moose, our lands, and our culture. Our traditional governance framework requires that we work directly with our people to connect with our traditions and protect the moose and our lands. We do this by bringing communities together into discussions that generate grassroots, bottom-up solutions to important problems like the declining moose population.

For us, the “grassroots” includes all people in our Nation as they live on the land and engage in community life. In our communities, sometimes the word grassroots refers to the many people living in their traditional territories who are not represented by the Tribal Councils (band councils) or whose lands are not included in the reserve system. These families steward lands that have been passed down since time immemorial—hereditary territories where people live, hunt, fish, trap, and take care of the land and the animals. These lands and the moose are under constant threat and are being taken up by colonial settlement, agriculture, logging, mining, and sport hunting. We engage with our people in these communities to protect the land and stand up for our rights and culture.

The grassroots also includes people living on the reserves that were set up under the Indian Act, which are managed by the Tribal Councils. People living on reserve often rely on the Tribal Councils and related businesses for work, although many people from these communities are frequent land users too, and many people in these communities are starting to reawaken to the grassroots movements. Both on and off the reserves, there is widespread interest in reclaiming our rights, lands, traditional knowledge and land practices. Elders and youth from all over the territory are showing up to help figure out how to protect the moose and restore our governance.

1.3 Grassroots-led Moose Management Plan

The AMC's work is to reunite our people using the Spider Governance system. As opposed to the Tribal Councils' way of operating, Spider Governance requires that all our people gather regularly to share knowledge about the land, the moose, the other animals, and our relationships and obligations to them. Through these gatherings, community-led research, and community-building rooted in our traditions, we are building awareness and capacity to develop a Moose Management Plan and, ultimately, reclaim our lands and empower our culture.

This report is the first phase of our work. Next, we will complete our next phase of developing an Anishnabe-led Moose Management Plan as this needs much more open discussions with provincial wildlife representatives in order to achieve a respectful agreement on a Moose Management Plan. This process will also be grounded in our own governance and will involve more gatherings, traditional meals, and ceremonies. Rather than us visiting all the communities, this phase will involve one big gathering during which all communities come together. We will hold land gatherings to engage with our communities and develop our own Moose Management Plan, which will essentially be a treaty relationship with the moose, a way to relearn and remake treaty relationships between our Nation, other Nations, and the Animal Nations. We need to relearn the purpose of wampum and of treaty within our Nation and with other Nations, and the moose is allowing us to begin this work.

After extensive community meetings and the development of a Moose Management Plan, our work will involve implementing the plan and continuing with the community meetings as a long-term way of stewarding our lands and navigating the challenges we face in the future. Ultimately, our path forward depends on the will of the community. Spider Governance means consulting with the people, collectively, and developing a consensus about how to move forward. This work is never-ending. Our job is to listen to the people, seek consensus, and implement the solutions the people want. Already, important paths toward the development of a management plan are taking shape from the workshops.



The Ottawa River Watershed is the traditional territory of the Anishnabe (Algonquin) people.

Photo provided by Waba Moko (Shannon Chief)

1.4 An overview of the research

Since December 2021, the Anishnabe Moose Research Committee has led this research project on the moose populations in and around La Verendrye park. At the heart of our work has been gathering observations about the moose from Elders, hunters and other land users and Knowledge Keepers in all the Anishnabe (Algonquin) communities. Our research findings presented in this report are grounded in local knowledge and the expertise of our People. We have taken on this work because we are deeply concerned about the moose decline and the various stressors impacting the moose's health and wellbeing.

Throughout the project, we have been collaborating with Research for the Front Lines, a network of researchers donating their time and labor in allyship and solidarity with communities and movements on the frontlines of the fight for environmental and climate justice in so-called Canada. We have been collaborating with the Small Change Fund to raise money to cover the research expenses.

The following have been our goals that have guided the research:

- To gather information about the current state of moose populations in and around La Verendrye park, including the possible causes of decline.
- To ground this work in Indigenous Knowledge and Indigenous research methods, bringing in Western science methods when useful.
- The information we gather will be used to:
 - Inform decision-making about the extension of the Moratorium on sport hunting of the moose
 - Support the creation of an Anishnabe-led moose management plan
- Overall, we seek to protect the moose and our food sovereignty and to bring our communities together.

The research has involved the following threads:

Literature Review. To begin the project, over the winter of 2021-22, we conducted a thorough literature review to learn about what is already known about the state of moose populations across Canada and to better understand what western and Indigenous Knowledge has already discovered about the causes of moose declines. You can find the full literature review report here and in Appendix 1.

Gathering community knowledge. Through the summer of 2022, we have led Community Workshops across the territories to learn from Elders, Hunters and Knowledge Keepers and Youth about their observations of the state of moose populations and health. The workshops included participatory survey activities, knowledge sharing circles with mapping components. In each workshop, we also shared meals of traditional foods.

Modeling forestry impacts on moose. We worked with forestry plans and existing knowledge about logging impacts on moose to explore the relationship between logging and moose and to try to determine what will happen to moose if logging continues as planned in the park.

Critical analysis of government methods for assessing moose populations and health. Concerned that the Quebec governments' own data about moose numbers in the park appeared to be underestimating the moose decline and misinterpretations of the causes of decline, we conducted an analysis to understand potential biases in their methods for gathering and analyzing data.

Gathering affirmations of Anishnabe rights to manage the moose. To help make clear our rights to make decisions about hunting on our traditional territories, we conducted summaries of legal cases relevant to Anishnabe self-determination regarding moose management and resource use.

Literature review on economically viable alternatives to industrial logging. We suspected our research would confirm the negative impacts of industrial logging and other forms of extractivism on our territories. Given that many of our community members are dependent on jobs in these industries, we wanted to offer alternative paths forward for livelihoods and industries that are good for our people, for the moose and for our food sovereignty.

In the pages that follow, we share what we've learned through this first phase of the research.

Photo by Marie-Raphaëlle Lebond



During the workshop, Spider web governance was used to discuss moose management. The Spider web governance is a model used to teach community-based decision making that involves the Nation. This model was envisioned by Tina Nottaway (pictured above). Tina is from the Wolf clan, member of Barriere Lake Community and lives on the territory. May 2022.

2. Legal Considerations

At its most basic, settler colonialism involves the denial of Indigenous self-determination and the dispossession of their land. This denial means that settler colonial democracies, like Canada, refuse to share power. Denying Indigenous self-determination prevents Indigenous peoples from relating to and managing their land bases as they see fit. As many Indigenous peoples note, relating to and managing their land bases also involves a struggle to be responsible to all their relations, human and animal nations alongside the land and water.

In Canada and elsewhere, a key mechanism for the denial of self-determination has been the law. In the 1888 *St. Catherine's Milling* decision, the Privy Council grounded Canadian sovereignty and underlying title through the racist legal principle of the Doctrine of Discovery. Essentially, the decision interpreted treaties as a gift of recognition by the empire rather than an acknowledgment of Indigenous self-determination and a framework to share power into the future (Starblanket 2019). As many observers note, this alternative understanding of the treaty is the only legitimate basis for settlement.

Of course, Canadian claims to sovereignty in the courts did not stop Indigenous peoples from practicing and fighting for their inherent rights to self-determination. The long-standing tradition of resistance, coupled with the delegitimization of racist ideologies in the aftermath of the Holocaust and imperialism by decolonization movements worldwide, created an ideological crisis. The denial of Indigenous self-determination and the dispossession of their lands on the basis of presumed inferiority was delegitimized, creating legal, political, and economic uncertainty.

During the repatriation of the Canadian constitution, Indigenous peoples fought to have their right to self-determination and their lands recognized. The meaning of those rights was to be determined in a series of constitutional conferences following repatriation. When no agreement could be reached on the meaning of these rights – no doubt due to federal and provincial resistance to such rights – the courts became a key player in the politics of reconciliation through their role in interpreting the meaning of said rights.

Although there was hope that Section 35 would end this denial and dispossession, the Supreme Court's understanding of reconciliation continues to rely on the Crown's assertion of sovereignty. For Bruce McIvor (2021) and Joshua Nichols (2019), this means that the Court has not rejected the racist doctrine of discovery. For reconciliation to be meaningful and substantive, denial and dispossession must cease, and the exercise of power shared with Indigenous peoples.

While the law has been a tool for colonization, glimpses of its potential in facilitating the sharing of power can be observed as well. In *Haida Nation*, the Supreme Court continued with the assertion of Crown sovereignty but now marking this assertion as *de facto* – meaning that it has exercised control and jurisdiction over territories (paragraph 32). According to Kent McNeil, with this qualification opens a gap between *de facto* and *de jure* sovereignty – meaning that while it has exercised control and jurisdiction in practice, this says nothing about its legality. While the act of state doctrine prevents the Courts from ruling on the legality of Canadian sovereignty, this distinction suggests that “Crown sovereignty would not be legitimate until it is reconciled with pre-existing Indigenous sovereignty through honorable negotiations leading to treaties” (2019: 12).

As negotiations proceed, the Supreme Court also argued that the Crown has a duty to consult and accommodate Indigenous peoples on matters that would adversely impact their rights and title (Paragraph 35). Importantly, this duty is triggered upon knowledge of a claim (Paragraph 37) and so it arises *before* proof of claim (Paragraph 34). The reason for this is so that when claims are settled the claimant does not find “their lands and resources changed and denuded” (Paragraph 33). This duty arises out of an acknowledgment that litigation and injunctions are time-consuming, expensive, and ineffective (Paragraph 14). What’s more, the duty to consult encourages give and take on all sides, encouraging negotiations, which the Court understands to be the spirit of reconciliation (*ibid.*). The strength of the claim and the seriousness of impact increases the required consultation (Paragraph 43-5).

In *Rio Tinto Alcan Inc. v. Carrier Sekani Tribal Council*, the Supreme Court offered further clarification on the duty to consult, particularly for determining adverse impact. According to the Court in this case, the duty is triggered not only by immediate impacts but also by the potential adverse impacts of “strategic, higher level decisions” of a government decision on lands and resources – such as the transfer of tree licenses which permit the cutting of old-growth (*Haida Nation v. British Columbia*) and the approval of a multi-year forest management plan (*Klahoose First Nation v. Sunshine Coast Forest District*) (Paragraph 44 and 47). This was reaffirmed in *Ross River Dena Council v. Government of Yukon*: “The duty to consult exists to ensure that the Crown does not manage its resources in a manner that ignores Aboriginal claims. It is a mechanism by which the claims of First Nations can be reconciled with the Crown’s right to manage resources. Statutory regimes that do not allow for consultation and fail to provide any other equally effective means to acknowledge and accommodate Aboriginal claims are defective and cannot be allowed to subsist” (Paragraph 37; and accepted in *Mitchikanibikok Inik First Nation (Algonquins of Barriere Lake) c. Procureur général du Québec*. When a new potential adverse impact on Aboriginal rights and title arises from prior and continuing breaches of the duty to consult, this will also trigger the duty to consult (*Rio Tinto*, Paragraph 49; see also *West Moberly* and *Adams Lake*).

Who holds the duty to consult? As argued by the Ontario Superior Court in *Kelly v. Canada (Attorney General)*, the holder of Aboriginal rights is not necessarily the Indian Band (Paragraph 58). Rather, **the rights holder must be determined “primarily from the viewpoint of the Aboriginal group itself in accordance with its customs and habit”** (Paragraph 59). Although the applicants failed to convince the court of their claims to representation, **this principle and its application to the duty to consult was reaffirmed in 2014 by the Quebec Superior Court in *Manatch c. Louisiana-Pacific Canada Ltd*** (paragraph 72).

As the minimum international standard for Indigenous rights, the Courts could also look to the United Nations Declaration on the Rights of Indigenous Peoples for guidance. UNDRIP recognizes Indigenous peoples’ right to self-determination (Articles 3, 4), that this is not limited to state-imposed forms of governance (Articles 5, 18, 33(2), and 34), and provides further support for a vision of decolonization as the sharing of power (Article 18) (see also McNeil 2021: 14-5).

In 2007, after blocking forestry trucks from entering their territory for two weeks, an Anishnabe family (Chief/Thomas) was arrested by about 60 police officers. The family had never been consulted about forestry operations on their land, and they did not consent to it happening. The court postponed the associated case over multiple years, but the family never gave up (*Wally c. R.*, file number 565-01-000352-070). Meanwhile, there was another ongoing court case at the Superior Court in Montreal, which was eventually lost, but provided valuable insight on future legal strategy necessary for defending traditional territory: written explanations of traditional governance system were deemed essential to support the proper consultation and consent needed to extract resources on family territories (*Manatch c. Louisiana-Pacific Canada Ltd.*). With that in mind, the traditional governance of the area was written down. With that support, the family was acquitted in 2015 for the road blockages in 2007, along with other cases (related to *Wally c. R.*, *Manatch c. Louisiana-Pacific Canada Ltd.* and *PF Résolu Canada inc. c. Wawatie*).

The Anishnabe struggle to enforce a moratorium on moose hunting is an expression of Indigenous self-determination – including responsibility to human and non-human relations – *against* Quebec’s refusal to share power. Such a refusal represents the continuation of Quebec as a settler colonial society. And yet, the Anishnabe continue to offer Quebec the opportunity to change this by ending their denial and embarking on a path to meaningfully share power. This requires **recognizing Anishnabe self-determination and legal orders in the management of territory**. In so doing, Quebec would be following the Supreme Court’s rulings on Duty to Consult. As Kent McNeil has noted (2021), **the Courts do not need to wait for treaties to be signed or for legislation to be implemented in order to recognize Indigenous law. It exists already. They may however need some assistance in ‘seeing’ it.**



Photo by Marie-Raphaëlle Lebond

Photo from Community
Workshop in Pikogan, May 2022

3. Threats to the Moose

3.1 Grassroots approach

During the summer of 2022, all nine communities in and around La Verendrye were visited to gather knowledge of Elders, hunters and other Knowledge Keepers about the state of the moose and the causes of decline. Each workshop took place over several days and included ceremony and shared meals of traditional foods.

These workshops were much more than just data gathering; we have been bringing our minds and our communities together based on our love and gratitude for the moose. We are enacting our responsibilities to the land and to our animal relatives. We are bringing back our traditional governance, which centered all voices and all community members. Drawing on the Anishnabe Spider Governance and the Pike Constitution, we are leading this work in a way that is grounded in and strengthens our own ways of learning, communicating, and making decisions.

3.2 Results from grassroots workshops and discussions about the moose in Anishnabe territory

In the summer of 2022, workshops were led by the Anishnabe Moose Committee with Elders, Knowledge Keepers, Hunters, and Youth in Anishnabe communities in and around La Verendrye (Figure 1). In addition to these discussions, a total of 64 surveys were filled out (49 paper surveys and 15 online surveys).

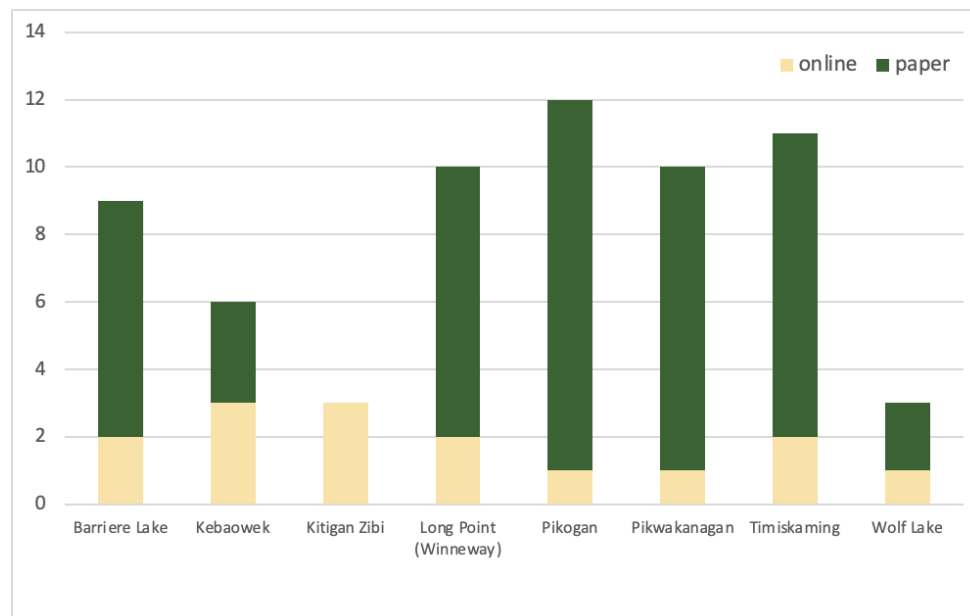


Figure 1. Survey respondents. A total of 64 surveys, including 15 online surveys and 49 paper surveys, were filled out. Respondents are mostly Elders and land users. Some workshop participants did not participate in the surveys, so a greater number of people contributed to the ideas in this report.

While the moose moratorium must continue in La Verendrye, the issues and threats that the moose populations are facing extend beyond the boundaries of La Verendrye. For this reason, it is important to consider the entirety of Anishnabe territory regarding decisions regarding the moose population.

Sport hunting has been systematically identified across all communities as being the principal threat to the moose. Concurrently, provincial moose management and regulations, forestry, and mining throughout the territory contribute to the degradation of a once-healthy moose population. These threats are further aggravated by the increasing threat of climate change, diseases, and human encroachment. A return to the rightful traditional management systems that have taken care of these places since time immemorial is required for the moose and the forest to thrive once again.

A synthesis of the issues with the current provincial moose management policies that were determined from the community workshops and surveys is described in the following section.

3.3 Issues with over-hunting under provincial moose management

Over-hunting is a problem that has been discussed across all communities (Figure 2). The consensus is that the most direct threat to moose is the excessive number of sport hunters allowed yearly, compounded by the provincial government's inappropriate moose management policies.

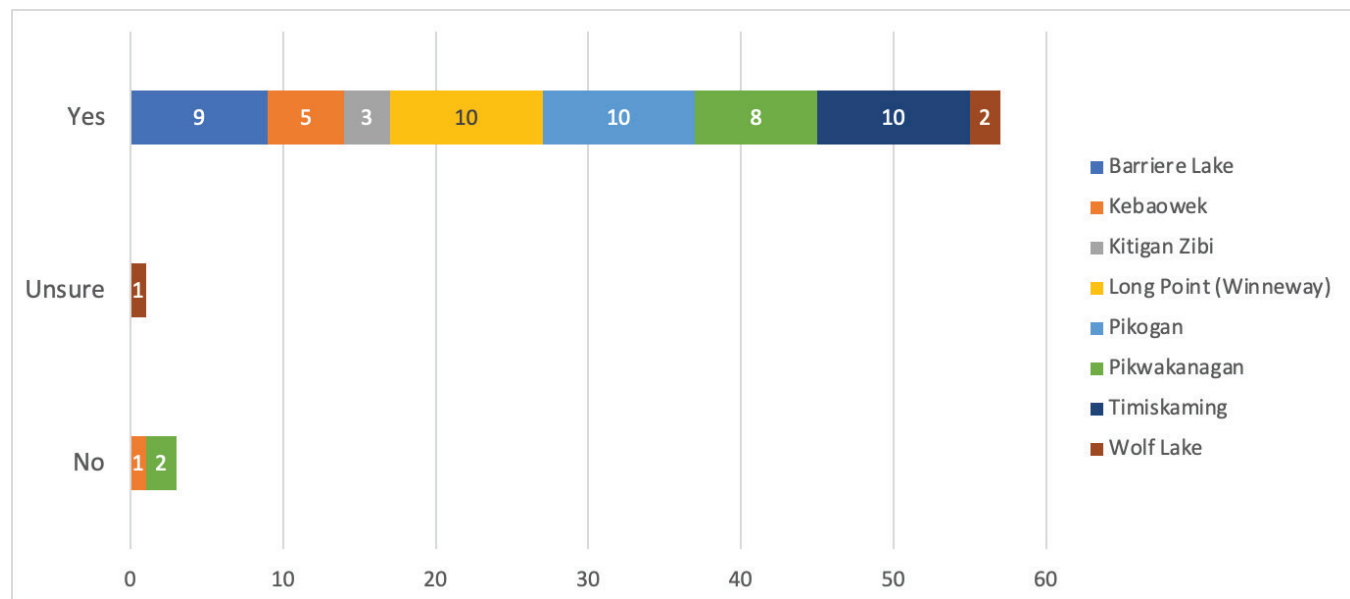


Figure 2. Over-hunting. In response to the question “Do you feel there is an over-hunting problem in your area?” most respondents (57/61) responded “yes.” The total number of responses (61) differs from the total number of surveys (64) because not all respondents answered every survey question.

Too many permits sold

To Anishnabe knowledge keepers and hunters, it is clear that too many moose are killed by sport hunters. Provincial regulations allow for too many tags to be sold and, thus, too many moose to be killed. The increase in the number of hunters is not only seen within La Verendrye; it is a widespread problem across Anishnabe territory, in both Quebec and Ontario.

In Algonquin Park in Ontario, the evolving political and legal situations add to the complexity of the over-hunting problem, whereby an exponential increase in hunters claiming Indigenous harvesting rights through the Algonquins of Ontario land claim and in Metis harvesters claiming harvesting rights to the area contribute to a drastic increase in hunting pressure in the past decades.

Tourism and the focus on revenue

In Quebec, governmental and business priorities focused on increasing revenue were found to contribute to the over-hunting problem and create additional stress for the moose. This includes attracting out-of-province hunters and advertising to international hunters from the United States and Europe to hunt (moose and other game such as partridge and bear) and fish in Anishnabe territory. To create a “favorable offer” for sport hunters, Quebec’s moose management strategy allows wildlife areas (outfitters, ZECs and SEPAQ Wildlife Reserves) to apply permissive management strategies that allow for a certain number of females to be killed based on a lottery system, even in hunting zones with restrictive (male-only) hunting years. Additionally, increasing the hunting season duration also contributes to the overhunting problem by increasing the chance of sport hunting success. This economic framework of “offer-and-demand” (where the offer is moose hunting opportunities and the demand is sport hunters’ interests) takes precedence over understanding the needs and rights of the moose and Anishnabeg.

Waste and poaching

Furthermore, there was found to be a lack of sufficient enforcement for poaching, and, relatedly, community members have expressed their deep concern about the staggering amount of waste that is seen on the territory. It was mentioned that some had observed sport hunters leaving a female or smaller male carcass to rot if they found the opportunity later on to kill a prized bull. Trophy hunting has also been cited as a major waste of moose meat and other valuable parts that could be useful to the community such as hides and organ meat. This waste is not just observed in the moose but for other harvested animals like bears.

Wasting animals is disrespectful and against Anishnabe ways. Relatedly, other acts of disrespect have also been reported by the communities as being problematic, such as bow-hunters who allow a moose to roam with arrows stuck if they do not land a kill-shot and sport hunters hunting under the influence of drugs and alcohol.



Photo of bear wasted by non-Indigenous hunters found among trash.

Photo by Elder Lucie Decoursay

Hunting technology

Additionally, an increase in the use of hunting technology such as drones and cameras increases the chance of a successful hunt. The author notes here that the effort needed to kill a moose, measured as “hunt days per moose killed” by the MFFP, does not currently take into account the added efficiency of these new technologies in facilitating a kill, which could have an incidence on the general interpretation of the moose population situation. Elders and knowledge keepers have also expressed concerns about hunting moose with tower blinds, which gives the sport hunters an unfair advantage over the moose.

Moose population changes

Across the territory, communities have mainly observed a decline in moose populations (Figure 3).

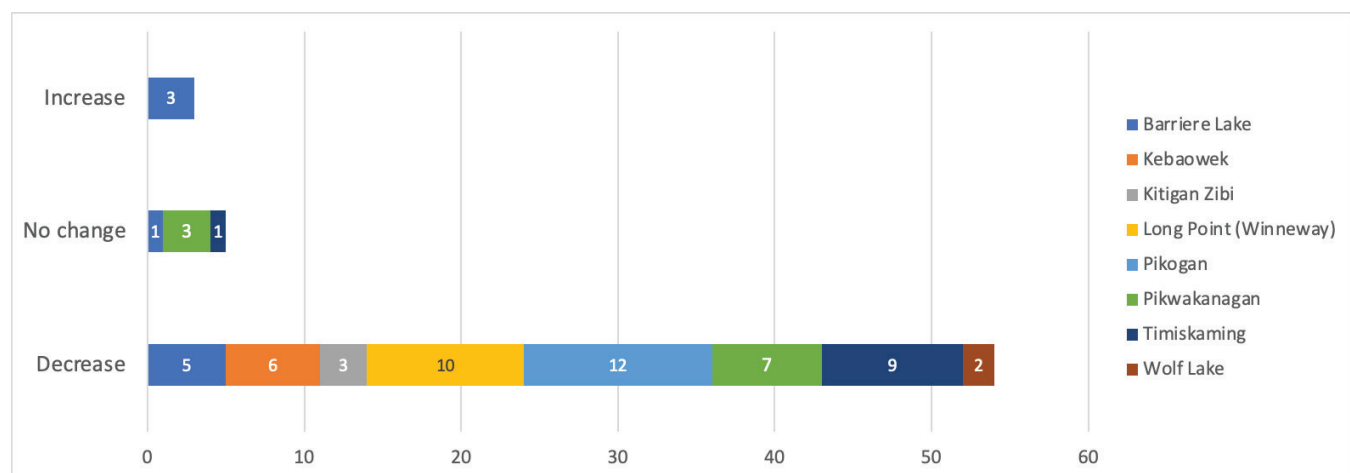


Figure 3. Moose population changes. In response to the survey question “Have you noticed an increase or decrease in moose populations in this area in the last few years?” most respondents (54/62) stated they saw a decrease in moose populations. Notably, the only increases observed here were stated to be within the past two years, since the sport hunting moratorium has been put in place in La Verendrye. The total number of responses (62) differs from the total number of surveys (64) because not all respondents answered every survey question.

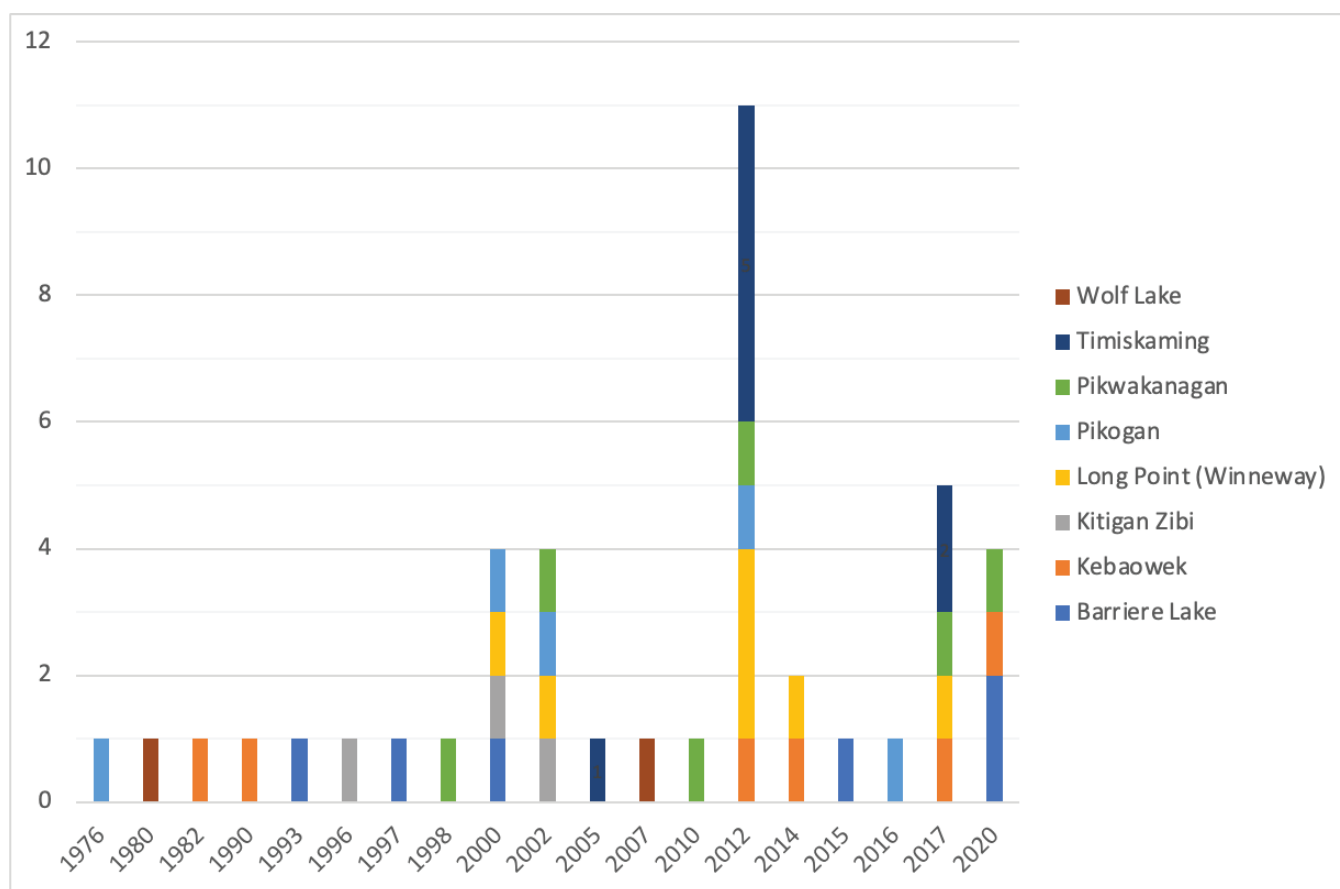


Figure 4. Moose population changes through time. In response to the survey question “*When did this [population change] occur?*” most stated that the population changes have been observed within the last ten years, although there is a wide spread of responses. The total number of responses (43) differs from the total number of surveys (64) because not all respondents answered every survey question.

Additionally, communities have observed a shift in population ratios across the territory. A common observation is that bulls are fewer, smaller and younger. The number of bulls is so low that it is considered to be limiting a sufficient reproduction rate to maintain a healthy moose population. Furthermore, herds are smaller and fewer calves and twins are observed than before.

Community findings in relation to Western science literature

Over-hunting has been described here as a combination of factors: too many sport hunters; improper hunting regulations that allow for the unbalanced killing of females, males, and calves; waste and poaching; and unfair technological advantages over the moose. The underlying cause of these factors is the government’s interest in generating revenue and its lack of holistic moose management. The consequences of these factors have produced a smaller and imbalanced population that cannot recover under current conditions.

The risks of selective hunting (meaning a focus on trophies or large males) are described in Western literature. Indeed, it is documented that a drastic reduction in males can have a negative effect on the population’s persistence. For more information on the state of the population in La Verendrye, see the “Population” and “Population, Sex, Age, and Hunting Data” sections of the literature review in Appendix 1 of this report. For more information on the effects of hunting on moose population decline, see the “Hunting” section in the literature review in Appendix 1 of this report.

Racism, discrimination and harassment

Different forms of discrimination against Indigenous people are felt throughout the territory Figure (5), especially so during hunting season.

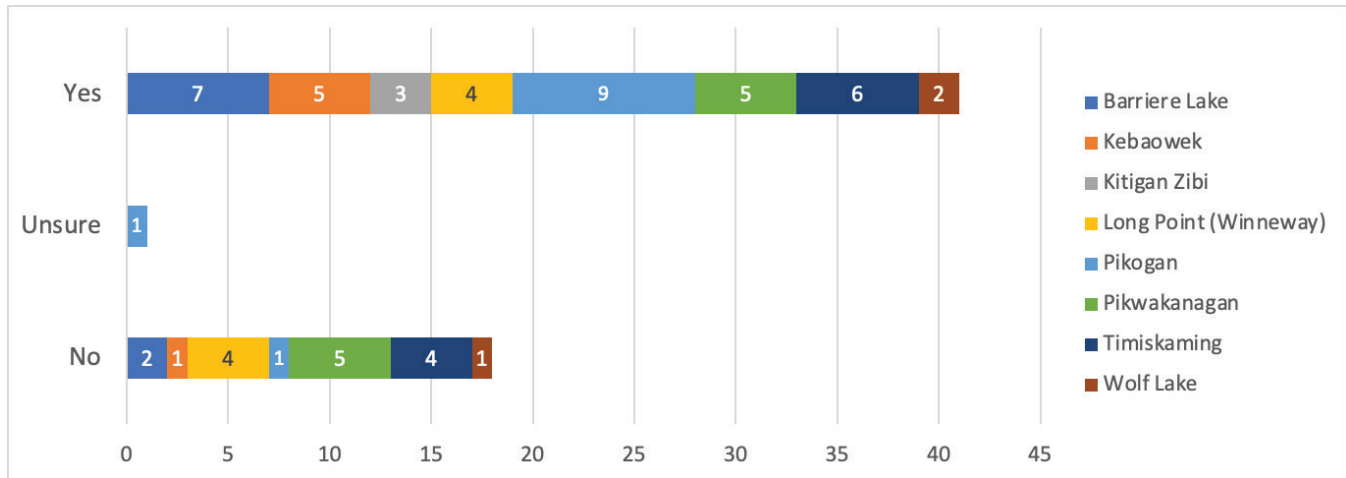


Figure 5. Experiences of harassment. In response to the survey question “Have you experienced harassment by game wardens or non-Anishnabe hunters?” most respondents (41/60) stated “yes.” The total number of responses (60) differs from the total number of surveys (64) because not all respondents answered every survey question.

Indigenous people, even non-hunters, are subject to racism online and in town. This impacts all generations, including young Anishnabe children in school. Racist actions are especially prevalent during the hunting season.



Photo of anti-Indigenous graffiti found near La Verendrye park.

Photo by Waba Moko (Shannon Chief), October 2022

Anishnabe are also frequently questioned about their Indian status and the legitimacy of their rights to hunt and to be on the territory, both by sport hunters and game wardens. First Nations people are often accused of being the cause of the over-hunting (and over-fishing) problem. It is reported that sport hunters will purposefully create noise at night by loudly driving ATVs to scare off the animals and to disturb Anishnabe harvesters.

Sport hunters will put up signs to keep others out of “their” hunting area, will intimidate Anishnabe with threats of physical violence, sometimes with guns, and some will tell Anishnabe to leave their territory during the hunting season. Indigenous cabins have been vandalized, such as broken windows and stolen property. These acts restrict and interrupt the free and safe movement of Anishnabe people on their territory during the hunting season.

Enforcement by the provincial government employees is discriminatory towards Indigenous people. Game wardens and other enforcement are not responsive to reports from Anishnabe people, which frequently go unanswered. Survey respondents have also stated that game wardens have harassed Anishnabe to buy game meat. This is the continuation of the legacy of oppression and discrimination that provincial agents have upheld since the 1930s when RCMP officers would demand that moose meat from Indigenous harvesters be handed over to them.

The contempt held toward Indigenous people impacts the safety of Anishnabe people on the territory and beyond, and the ability to adequately care for the land. By extension, Anishnabe rights and the moose population are also impacted.



Photo from mapping session at Community Workshop in Timiskaming First Nation in June 2022.

4. Forestry Issues

4.1 A note on alternative livelihoods

The AMC knows that many people depend on forestry and other extractive industries in the region for employment. This is why other possibilities must be envisioned to move away from dependence on destructive practices. The full analysis of alternative livelihoods can be found in Appendix 2 of this report. A summary is presented here.

For example, “community forestry” or “Aboriginal forestry” refers to partnerships between Indigenous-led entities and non-Indigenous partners to create ecosystem-based forest plans that ensure the ecosystem’s health is prioritized over short-term benefits. Even if it is a slow-moving process to be fully implemented, Aboriginal is set to become the standard for forestry management on Indigenous territories.

Indigenous-led renewable energy projects are another alternative to explore to generate jobs and income, such as wind- and hydro-power, which can reduce the emission of greenhouse gases compared to other energy sources. If these projects are anti-colonial, community-owned and based on local priorities, they can positively impact the environment and Anishnabeg.

Finally, community-owned agricultural businesses can also be considered as a potential for revitalizing economic development in the areas surrounding the forests. For example, hemp is re-emerging as a leading organic product useful for many industries such as food products, clothing, and construction materials. A community-based enterprise similar to the Anishnabe Agricultural Institute in Minnesota could build and diversify local economies.

The dependence on forestry as it is currently practiced is not a viable future for healthy forests and moose populations. Looking towards a better future will require creative and holistic solutions, including rebuilding the local economies more sustainably.

4.2 Forestry impacts on moose and moose habitat

Logging has been ongoing in La Verendrye and the surrounding area for decades. Massive forestry operations are widespread across the territory (Figure 6). In more recent decades, heavy forestry machinery has increased the cutting intensity and has led to changes in the overall health of the forest and aquatic ecosystems on which the moose depend and of which they are part. The forestry issues were discussed during the community workshops and addressed through community surveys. The main findings are described in this section.

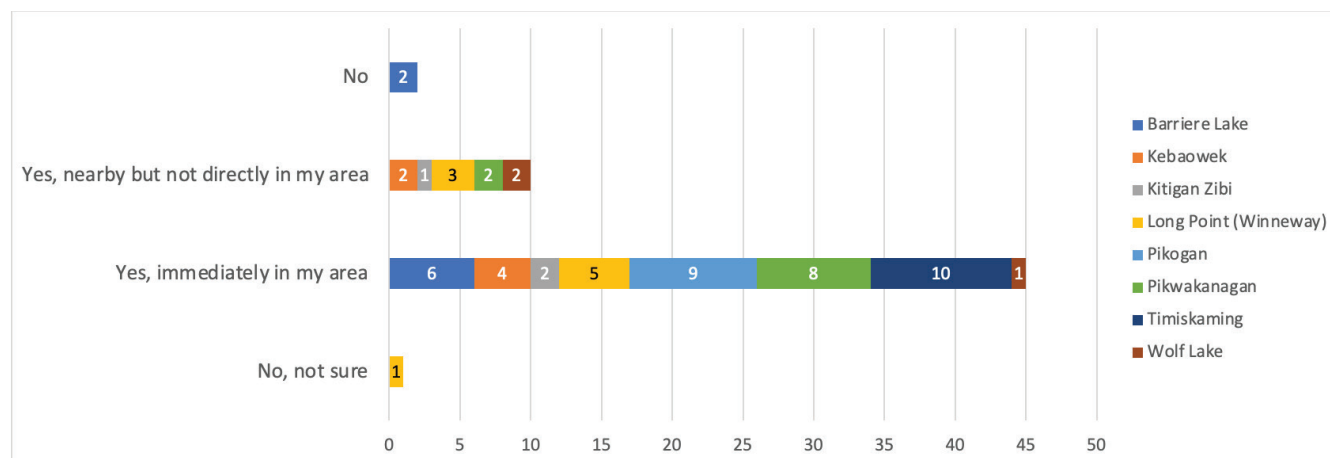


Figure 6. Presence of logging. In response to the survey question “*Is there a presence of logging in your area?*” most respondents (45/58) answered in the affirmative. The total number of responses (58) differs from the total number of surveys (64) because not all respondents answered every survey question.

Food quantity and quality

Moose do indeed use previous cut blocks to feed on the new undergrowth. Nevertheless, forestry does in fact negatively impact food quality and availability. Participants in community discussions and survey respondents noted that the forestry industry replants the wrong species for moose after a cut, like spruce; moose do not eat spruce. Also, there is a concern about the chemicals left behind after a cut. These pollutants contaminate the land and water and can make their way into the twigs and water consumed by moose. Knowledge keepers from Pikwakanagan are also concerned about herbicide spraying along hydro lines and its effects on moose health.

Changes in movement patterns

Forestry operations cause a direct disturbance and stress on the moose and cause them to flee the area. Disturbances include machinery noise, truck traffic, forestry road construction and dust pollution. Post-cut, the vegetation changes do not allow the moose to use the area in the same way, and they change their movement patterns in response to this disturbance.

Impacts on wetlands and aquatic ecosystems

The riparian buffer zones left are not large enough. Knowledge keepers reported that cutting too close to the water disturbs the water regimes, causing a subsequent decrease in wetland habitats and a reduction in water quality. These are essential food sources for moose and are crucial for providing protection and relief against insects.

Habitat loss

Clear-cutting reduces the amount of shade habitat and protective cover from predators. The effect of habitat loss is felt even more with the warmer summers induced by climate change. Moose are increasingly vulnerable to heat and predators and must seek shelter elsewhere when their natural habitat is so frequently destroyed.

Changes in the food web

The speed at which new forestry machines fell trees is also deemed to impact other wildlife that inhabits the trees and compacts the soil. Smaller animals living in the trees do not have time to escape the fast-working forestry machinery. When there are fewer smaller animals, the repercussions are felt across the food web. Come wintertime, hungry predators are a bigger threat to moose and to the isolated communities.

Finally, knowledge keepers have reported that other animal populations are shifting across the territory. For example, more deer, coyotes and turkeys are observed than before. These overarching changes in the environment and far-reaching threats must be taken into account when looking at the moose population in Anishnabe territory. Some of these far-reaching threats that were noted as being of concern during the community workshops include climate change and human encroachment on moose habitat.

Community findings in relation to Western science literature

The problems with forestry described above are multi-faceted and far-reaching. Disturbances related to logging operations during and post-cuts impact moose food availability and key habitats for shelter both on land and in aquatic environments, across all seasons. Forestry also has a negative impact on the entire food web, including the moose. Climate change can further aggravate these environmental changes (Figure 7).

The impacts of forestry on moose can also be found in Western literature (see Appendix 1). Clearcuts reduce thermal shelter habitat and shelter habitat from predators. The transformation of mixed-stand forests to coniferous forests introduces habitat fragmentation and increases vulnerability to hunters and predators. Moose avoid very recent clearcuts. The increase of edge habitats created by forestry introduces more complexity to the matter because it represents an increase in food sources for many different species, like moose and deer. However, in the longer term, forestry seems to have a negative effect on moose populations because of the changes in the vegetation. For more information on the documented impacts of logging, see the “Logging” section of the literature review in Appendix 1 of this report. For more information on the projected impacts of climate change, see the “Habitat Effects of Climate Change” section of the literature in Appendix 1 of this report.



Photo by Marie-Raphaëlle Lebond

Photo from Community
Workshop in Pikogan, May 2022

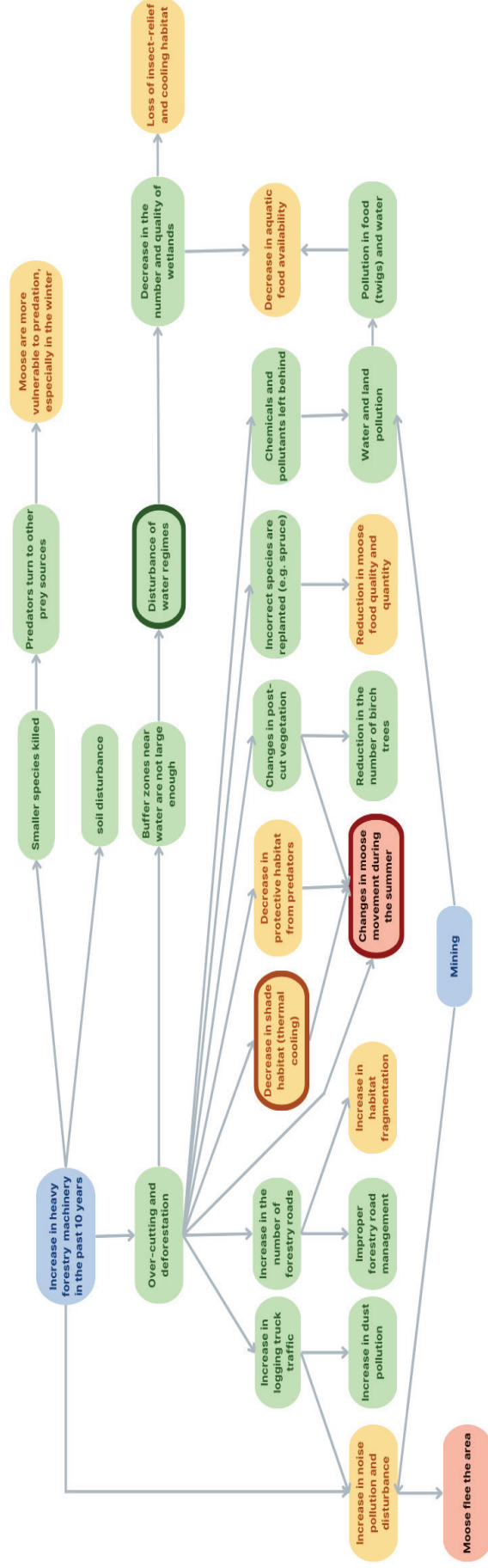


Figure 7. Mind map representing the findings in the community workshops and surveys concerning forestry and mining impacts on moose habitat. The extractive industries are represented in the blue bubbles; green bubbles represent direct impacts on the environment; yellow bubbles are direct consequences for the moose; red bubbles are the behaviors that have been observed and explained in the community workshops and surveys. Bubbles with a thick border are anticipated to be further impacted by climate change (see the literature review in Appendix 1 of this report). Behavioral responses are further explored in the next section.

5. Changes in Moose Health and Behavior

5.1 Moose Health

Community surveys highlight an array of health and behavioral changes observed in moose in several communities in Quebec. Among the surveyed communities, the most reported health changes were lower twinning rate and increased presence of ticks on moose (Figure 8). Ticks are associated with a variety of health conditions and increases in mortality in moose, including lower twinning rates, altered behavior, and greater risk of parasitic infection (see Appendix 1). Tick infestations are predicted to increase with climate change (see Appendix 1). Other adverse health effects, including increased mortality, smaller body size and lower body weight were also frequently reported. Smaller body size and lower twinning rates can result from tick infestations and logging (see Appendix 1). Some individuals also noted older reproduction age among cows and increased heart rates. Increased heart rate can also be a result of climate warming (see Appendix 1). Other, less frequently reported but concerning observations of moose health include lower body fat and increase in disease in moose carcasses. Participants noted an increase in deer mite (brain worm), as well as parasites or other abnormalities in moose lungs, liver, and kidneys. The community surveys also recorded increased observation of atypical racks among bulls. While changes in moose health were reportedly observed as early as the 1960s, the majority were observed in the last decade (Figure 9).

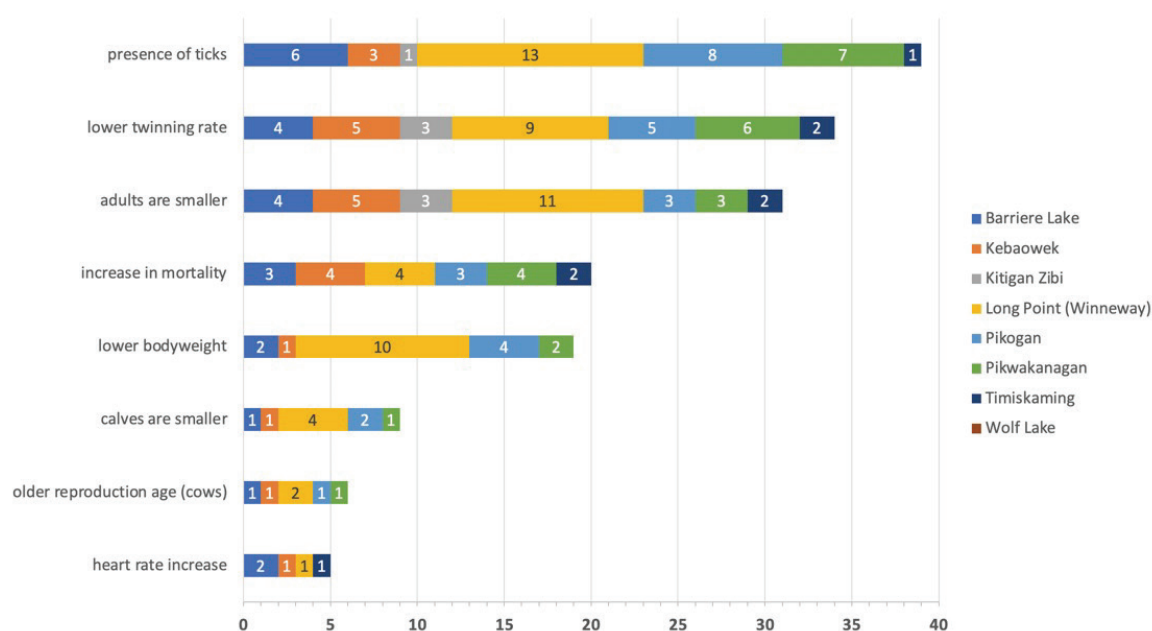


Figure 8. Health changes in moose. Observed health changes in moose reported in community surveys and workshops. The total number of responses differs from the total number of surveys (64) because respondents could select multiple responses, and not all respondents answered every survey question.

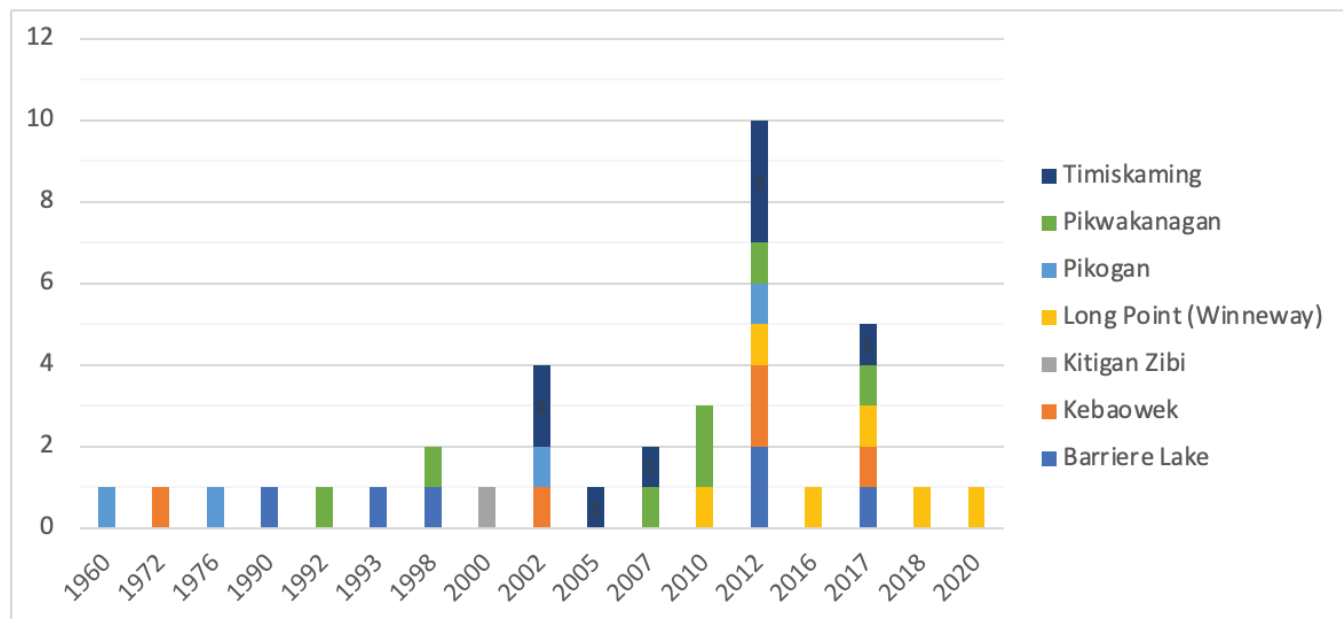


Figure 9. Health changes through time. Approximate start date of observed health changes as reported in community surveys. The total number of responses differs from the total number of surveys (64) because not all respondents answered every survey question.

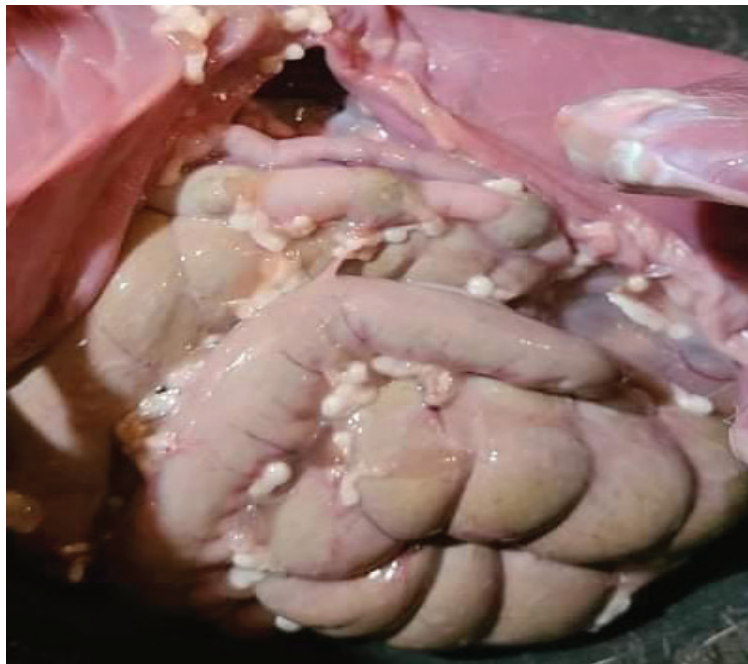


Photo of diseased rabbit organs found on the territory. The same symptoms have been seen on moose as well.

Photo credit by Elder Lucie Decoursay

5.2 Moose Behavior

Significant changes have been observed in moose behavior. Many respondents reported less movement of moose (either in summer or winter), as well as less browsing or reduced food intake (Figure 10). Further, many community members noted alterations in the use of various habitats by the moose, i.e. a change in their frequency of using different types of forest stands, wetlands, or open water. While the reported habitat use by moose varies, it is evident that changes have occurred in their behavior.

Overall, community members reported disturbances in moose movement and migration patterns, mating areas, feeding movement patterns, and avoidance of certain areas. Moose behavior in relation to human presence has also been altered; some respondents observed moose encroaching on farms or other human settlements, while others reported that moose appear skittish or nervous, possibly due to increased mining or logging activity (see the relevant sections in this report).

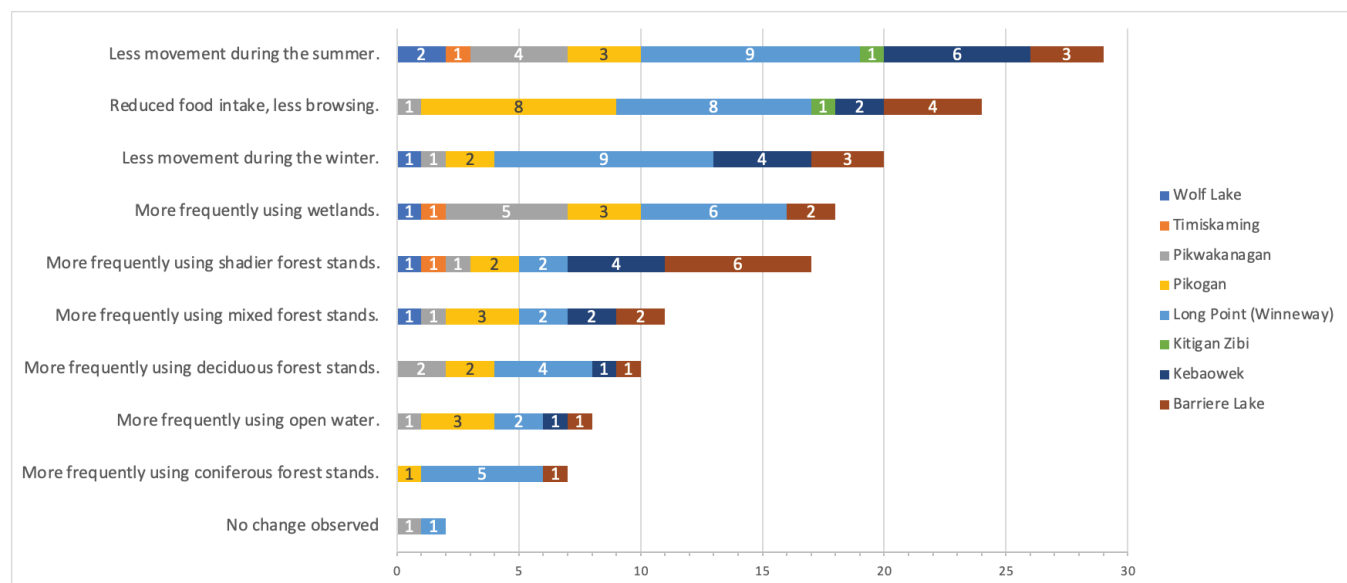


Figure 10. Behavioral changes in moose. Observed behavioral changes in moose reported in community surveys and workshops. The total number of responses differs from the total number of surveys (64) because respondents could select multiple responses, and not all respondents answered every survey question.

Similar to moose health changes, behavioral changes have also been primarily observed in the last decade (however, there is a wide range of responses) (Figure 11).

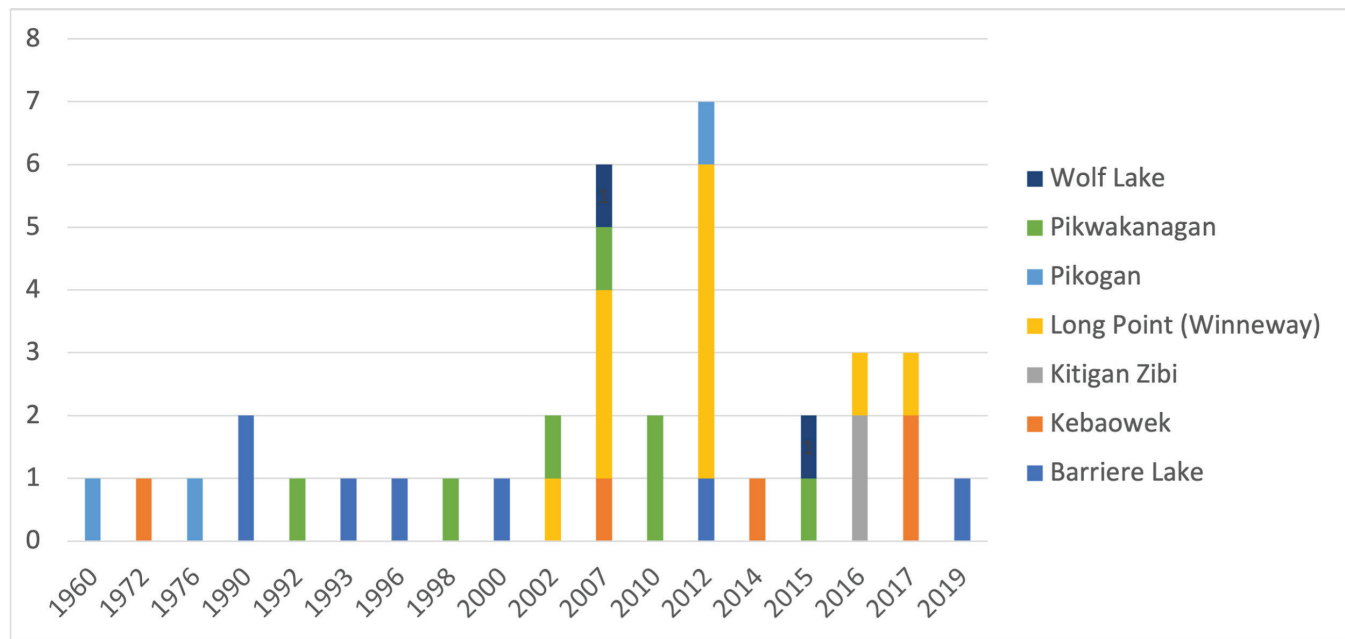


Figure 11. Behavioral changes through time. Approximate start date of observed health changes as reported in community surveys. The total number of responses differs from the total number of surveys (64) because respondents could select multiple responses, and not all respondents answered every survey question.



Photo of Waba Moko, during a discussion in a community research workshop. Waba brought Tina's teachings on the spiderweb governance model to all the community workshops to honor Tina's teachings. May 2022.

6. Impacts of Mining and Extractive Industry Expansion

A majority of respondents reported that there was a nearby mining presence, either directly in or surrounding their hunting area (Figure 12). A mining presence was reported by respondents in all eight surveyed regions. Many respondents expressed concerns regarding the potential health effects of this on moose, including but not limited to water and food pollution, noise pollution, increase in truck traffic, and illegal hunting by personnel. All of these factors could contribute to the habitat and population decline of moose in these areas (Figure 7).

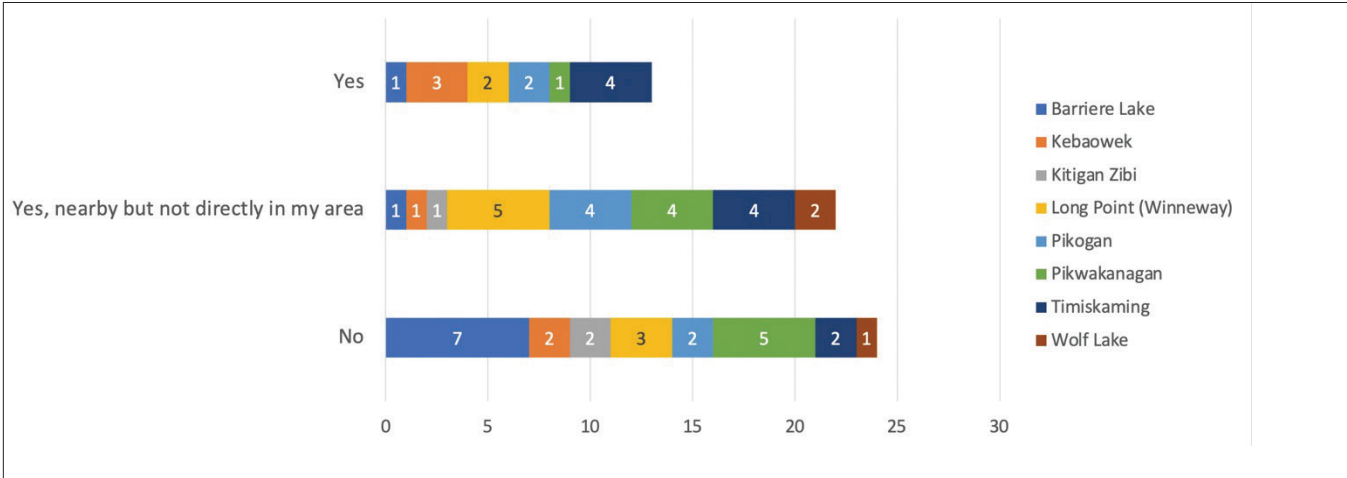


Figure 12. Presence of mining. Community survey responses of mining presence in hunting areas. The total number of responses differs from the total number of surveys (64) because not all respondents answered every survey question.

Extractivist industries on Anishnabe territory contribute to many harmful consequences to not just the moose population but the environment at large. Forestry and mining practices exact many harmful effects on moose in interconnected and compounding ways (Figure 7). While we do not provide a complete analysis of all the downstream harms caused by these extractivist practices, we attempt to demonstrate the primary effects and their interrelatedness.

Forestry practices have caused an increase in heavy and intense machinery use in the past decade, which disturbs the soil and causes changes in the food web (killing of small creatures), which in turn increases predator pressure in the environment.

Increase in the machinery’s efficiency also contributes to increase in cutting (deforestation, over-cutting,

clear-cutting) which has profound downstream effects: buffer zones near water not being large enough and disturbing water regimes decreases the number and quality of wetlands, which decreases aquatic food availability and increases insect-related stress; changes in post-cut vegetation reduce the number of birch trees, and replanting the incorrect species causes a reduction in food quality and quantity; changes in the vegetation, along with the decrease in protective habitat from predators and decreased shade all contribute to changes in moose movements during the summer; more forestry roads contribute to improper forestry road management and decrease moose habitats, and increase in logging transportation increases dust in the area.

The mining industry contributes to many of the same harms as the forestry industry, along with its own unique problems. Mining also causes noise pollution and an increase in transportation, which causes moose to flee the area and increases dust pollution. Water pollution and environmental pollution reduce the food quality and quantity as well as cause changes to moose movements in the summer. In addition, mining contributes to an increase in hunting pressure by personnel (an illegal hunting practice).

Furthermore, hydro damming, another big industry present on Anishnabe territory, has a negative effect on the overall ecosystem, of which the moose are part. Opening of dams in the winter does not allow for a proper freeze-over of the lakes. Unstable and irregular water fluctuations destroy beaver dams and affect other aquatic species like fish and muskrats. Hydro damming destroys the environment, and is not beneficial to Anishnabe people.

Finally, we must not forget the interrelated and compounding impacts of climate change, which can contribute to warmer summers, droughts, habitat loss, reduction in food quantity and quality, increase of exposure to parasites and disease, and many more harmful effects to the moose population.

Photo by Marie-Raphaëlle Lebond



Photo from Community Workshop in Pikogan, May 2022.

7. Critique of Provincial Methods

7.1 Critical Analysis of SEPAQ/MFFP Data

The Quebec government conducted an aerial inventory of the moose population in La Vérendrye Wildlife Reserve in 2019-2020. Although this study showed a significant decline in moose numbers in the park, Anishnabe hunters and knowledge keepers working with the Anishnabe Moose Committee (AMC) assert that the government's study contains methodological flaws and biases in its framing and approach and that moose numbers in the park are likely lower than the government's study shows. The government claims to have consulted with members of the Algonquin Nation for this study, and yet hunters and knowledge keepers associated with the AMC assert that Anishnabe perspectives, experiences, and voices were excluded from the process. They also assert that the study ignored several important factors in its design, framing, and conclusions.

The government's study attempted to measure the "winter population level [of moose], its main demographic parameters and the rate of exploitation by sport hunting" (Dumont & Trudeau, 2020). While the findings report a staggering 35% decline in the moose population since the previous inventory in 2008, the study also implies that hunting is the only potential cause of moose decline (Dumont & Trudeau, 2020). Hunters associated with the AMC point out that it is essential to study other causes, and have conducted their own study to do so.

The government's study states that the moose harvest by sport hunters is not large enough to explain the population decline, and further states that data on the Indigenous moose harvest is required to explain the decline.¹ It is reductive and colonial for the government to imply that Anishnabe hunting is the only other factor that could explain the decline in moose numbers. There are many other factors potentially causing the decline, including logging and climate change, most of which are the result of settler-colonial industry. Furthermore, our analysis of the Quebec government's own data, combined with an analysis of the amount of logging activity that has occurred in the reserve over the past several years and the moose population decline (see next section for this analysis) show that there are arguments and counter-arguments for the idea of logging being beneficial to the moose population. The strongest argument in support of logging being *detrimental* is the fact that in the La Verendrye region the moose population has been declining even during the hunting moratorium. Additionally, the knowledge workshops and surveys show that Anishnabe hunters and knowledge keepers have observed that factors other than hunting have caused population decline, including logging, ticks, thermal stress, and specific sport hunting practices.

¹ The full translation reads: "Currently, the lack of accurate harvest data from Algonquin communities limits the scope of analyses. Knowledge of northern moose populations suggests that subsistence hunting is significant. In fact, the controlled sport hunting that takes place in this territory cannot explain the observed density level alone. Sharing information on the Indigenous harvest would allow us to evaluate the relevance and effectiveness of measures to be put in place to increase the moose population."

In the government's report, the effects of sport hunting are considered inadequately, and other complex causes of moose population decline, such as climate change and logging, are not considered at all. In fact, the government report states that "recent forestry cuts" (done within the past five years) make up only 12% of the surface area of the study's parcels, and therefore do not "appear" to have a significant effect on moose populations. As such, the study effectively ignores forestry as a potential cause. This is problematic in two ways.

First, logging can have important long-term effects, beyond five years. Though moose tend to avoid clear-cut areas in the first few years following a clear-cut, they are attracted to the area for food after eight to ten years (Courtois & Beaumont, 1999). This could inflate moose numbers temporarily. After just 20 years, clear-cut forests already offer poor moose habitat, and moose numbers tend to decline (Lamy & Finnegan, 2016). So while clear-cutting has short-term positive impacts on moose populations due to the habitat conditions offered by logged mixed stands (Potvin, Breton & Courtois, 2005), long-term impacts are detrimental. Studies show that while moose are attracted to recently clear-cut areas, this increases browsing pressures on these areas of the forest, which in turn can "suppress abundance and height of tree regeneration after clear-cutting, preventing sapling recruitment" and ultimately creating the potential for decade-long negative effects with regard to forest regeneration and the overall maintenance of the ecosystem (De Vriendt, Lavoie & Barrette, 2021). In other words, "[h]eavy moose browsing in logged areas can slow forest development and favour coniferous growth in cut stands, resulting in a long-term degeneration of healthy moose habitats" (Jacqmain et al., 2012; Lamy & Finnegan, 2019). To properly assess whether logging activity affects moose, a study should be conducted that accounts for changes in logging activity and moose population over time.

Second, there are many logging-related activities, other than clear-cuts, that have negative effects on moose populations. The methods used in the government's study to assess "forestry cuts" are not explained. However, if the study measured only "cuts," it would be missing the effects of other forestry practices, such as plantations, thinning, and clearing, which can impact moose negatively (Gendreau, 2015; Leblond, Dussault, & St-Laurent, 2015).

Furthermore, factors such as hunting and logging can exacerbate each other. While moose are temporarily attracted to clear-cut areas due to food availability, this also increases their vulnerability to hunters and predators. Likewise, hunting can take an added toll on moose populations when their numbers are already jeopardized by habitat degradation. This calls into question the net impacts of logging. We cannot merely look at the short-term effects, or at clear-cutting alone, to determine whether or not logging-related activity significantly impacts moose.

Anishnabe hunters note other impacts as well. Climate change impacts moose populations negatively by causing thermal stress, habitat change, and increased tick infestations (Borowik, Ratkiewicz, Maślanko, Duda & Kowalczyk, 2020; Hoy, Peterson & Vucetich, 2018; Jensen et al., 2018; Jones et al., 2019; Jones, Pekins, Kantar, O'Neil & Ellingwood, 2017; Lamy & Finnegan, 2019; McCann, Moen & Harris, 2013; Murray et al., 2006; Priadka, Browna, DeWitt & Mallorya, 2022; Teitelbaum et al., 2021). In turn, logging activity can reduce thermal cover and exacerbate tick infestations (Blouin et al., 2021; Lamy & Finnegan, 2019).

Community members also note a lack of attention to poaching by sport hunters and to the sex ratios of sport hunting harvests, both of which can also negatively affect moose populations (Lamoureux, 2021; Milner, Nilsen & Andreassen, 2007; Van Ballenberghe, 1983).

The Quebec government has vested interests in the sport hunting and logging industries, which introduce significant bias in examining these as causes of moose population decline. While the government study reported that the population decline cannot be attributed to sport hunting alone, an in-depth and unbiased study, accounting for Anishnabe concerns, is required to determine other factors harming the moose population, such as climate change, tick populations, habitat loss, logging, and the sex ratios of the sport hunting harvest.

The government's study relies on a single method—the aerial survey—to measure moose populations. While this method is quite useful, it provides a “static” view of moose populations, ignoring changes over time and complex, interconnecting factors (Lamy & Finnegan, 2019). To construct a more accurate picture of the moose populations and their fluctuations around factors such as climate change, weather, logging activities, and hunting, a study should include various methods, such as snow-tracking, camera trapping, browse and forage surveys, biological sampling, hunter and knowledge-keeper surveys and workshops, winter tick surveys, and analyses of the effects of logging activity on the moose (Lamy & Finnegan, 2019).

Although the government's study and other sources stress the importance of conducting aerial surveys in winter to increase the visibility of moose, Anishnabe hunters point out that this may skew the results due to the fact that moose shelter under evergreen forest canopies during the winter and therefore would often remain invisible from above. This on-the-ground knowledge represents another potential flaw in the aerial method and another reason why any assessment of moose populations should use multiple methods.

Furthermore, the government report states that a main objective of the study was to create an inventory “in partnership with the Algonquin Nation” (Dumont & Trudeau, 2020). Although the report names certain Anishnabe individuals as participants in the study, it does not describe the precise nature of the collaboration or participation, other than to say that “the representatives of the Algonquin communities proved to be seasoned and dynamic observers” (Dumont & Trudeau, 2020). Anishnabe hunters and knowledge keepers associated with the AMC assert that their communities were not consulted when the study was designed and that their communities sought to design a much different study. If co-creating the inventory was a vital part of the objective of the government's study, then this seems to have failed. This leaves no doubt that the study should be reconstructed to actually consider Anishnabe concerns and objectives.

La Verendrye Wildlife Reserve is situated on unceded Anishnabe territory, where Anishnabe people have hunted since time immemorial. Anishnabe people should be the ones managing the forests and moose populations, and are under no obligation to disclose their hunting practices to the government. Anishnabe people have the right to hunt unimpeded in their traditional territories and to manage the moose, forests, and other natural systems according to their traditional ways, which have maintained overall healthy ecosystems for thousands of years.

7.2 Analysis of the impact of logging on moose populations

Scientific literature suggests that logging can lead to an increase in the moose population. However, the evidence supporting this argument is indirect. Indeed, it is based on the following observations. First, logging can increase the amount of available forage for moose. Second, in regions where logging takes place, moose are found with a higher probability on or close to zones of recent logging. To the best of our knowledge, there exists no direct evidence that logging can lead to an increase in population. Such evidence could be obtained, for example, through a longitudinal study comparing the moose population in a region before and after logging.

Most of the existing literature focuses on determining logging practices that lead to an increase in forage and minimize other impacts on the moose population. Adequate logging practices are site dependent; thus the results of these studies are difficult to generalize (Collins and Schwartz 1998). While logging can potentially increase forage availability for a period of time, it also can lead to increased predation and decreased thermal cover that negatively affect the moose population. In fact, winter is considered the limiting season in mountainous ecosystems because deep snow restricts their distribution and movements, and forage is the least available (Poole & Stuart-Smith 2006). Thus, an increase in forage in regions with poor cover leads to a higher energy budget to access this forage.

Studies have also shown that moose are more likely to be found on or close to areas that were logged recently, presumably because of the forage available in these areas. The local increase in moose density near the logged areas increases predation, and it likely has negative health effects due to a higher concentration of parasites.

In summary, a critical review of the literature on the effect of logging on the moose population shows that appropriate logging practices can lead to an increase in forage availability and moose tend to be found close to recently logged areas due to this availability. However, access to this forage is costly in winter due to a lack of cover, and the concentration of moose around these areas leads to an increase in predation and health problems. There is no direct evidence that the forest without logging would not be able to support the same moose population.

We conclude that there are arguments and counter-arguments for the idea of logging being beneficial to the moose population. The strongest argument in support of logging being *detrimental* is the fact that in the La Verendrye region the moose population has been declining even during the hunting moratorium.

Analysis of governmental data on moose and forestry in La Verendrye Wildlife Reserve

Moose population data and parcel locations were obtained from the report (Dumont & Trudeau, 2020). From 205 parcels in the park, the moose numbers were gathered and presented for 101 parcels, in 5 categories, 0, 1-10, 11-20, 21-30, and 30-38 moose per parcel. The coordinates of the parcels were obtained by georeferencing the map in the report using the QGIS software. The area of water in each parcel, as well as yearly forestry interventions and forest fires were obtained from the web map service of the Quebec government (Forêt ouverte <https://mffp.gouv.qc.ca/les-forets/inventaire-ecoforestier/foret-ouverte-wms/>). The parcels are not perfectly aligned in latitude and longitude, but the misalignment was considered negligible. The web map data was retrieved and processed automatically using Matlab. The land area of each parcel was computed by subtracting the portion coerced by water. Then the proportion of land area with forestry intervention (or forest fire) was computed for each year. For clarity and noise reduction, the interventions were classified in 6 groups, as 0-7, 8-15, 16-23, 24-31, 32-39 and more than 40 years before December 2019, the starting date of the moose survey.

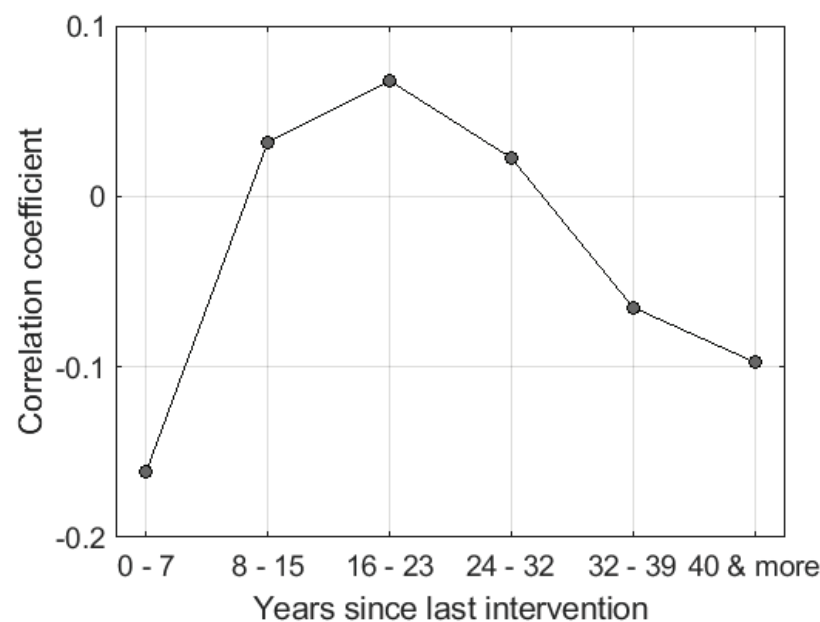


Figure 13. Correlation between number of moose per parcel and percentage of land area with forestry intervention (and forest fires) in different time intervals.

We computed the Spearman correlation between the moose per parcel categories and the percentage of land area last disturbed in each time interval. The results are shown in Figure 13. None of the correlation values were statistically significant at 5% significance level. The highest (negative) correlation was observed for the 0-7 years post-disturbance interval, with Spearman's $\rho = -0.16$, $p=0.11$. The maximum positive correlation was observed for the 16 to 23 years post-disturbance interval, $\rho = 0.07$, $p=0.50$. Even if the correlation values are not statistically significant, the distribution is as reported in the literature (e.g., Collin and Schwartz, 1998), with an initial reduction, followed by an increase in years with increased availability of forage, and a subsequent reduction for older interventions. However, there is no evidence that overall there is a net benefit for the moose population number. In fact, the correlation between the number of moose per parcel and the percentage of land area last disturbed in the preceding 0 to 31 years, which should be high if the increase in forage availability overcomes the disadvantages of the initial years post-disturbance, is negative, albeit very close to null, $\rho = -0.01$, $p=0.9$. Thus, there is no statistical significance in either direction, but it is slightly more likely that the overall effect is detrimental.

We note that attempts were made to use this data to generate a model of moose numbers per parcel based on the percentage of land area disturbed in the mentioned time intervals. Different classification and regression approaches were pursued, but the amount of available data (105 parcels) was insufficient for training purposes. E.g., the multiclass classification error for the 5 groups of moose numbers per parcel was always higher than 50% when assessed through 5-fold validation.

In conclusion, we analyzed the effect of logging on the moose population in La Verendrye, accepting the unsubstantiated hypothesis that the spatial distribution of moose with respect to disturbed forest areas is a good indication of potential moose population numbers. **A simple correlation analysis shows that there is no statistical evidence of logging being either beneficial or detrimental to the moose population, although the latter is slightly more likely.** It seems then irresponsible to continue with logging operations before gathering more data to further investigate this issue. Ignoring the effect of logging in the long term sustainability of the moose population, as in the latest governmental report, would be unforgivable.



Photo by Marie-Raphaëlle Lebond

Photo from Community Workshop in Pikogan, May 2022.

8. Our Recommendations for an Anishnabe Moose Management Plan

During the community workshops, we have lengthy discussions about how to best take care of the moose. We also included a question in the survey about the most effective strategies for protecting the moose.

One thing is clear: a moose management plan must be guided by our own communities, grounded in our own Knowledge and our relationships with our Moose relatives. We can build this plan together through gatherings in the next two years, guided by our traditional governance systems.

In this section of the report, we are not offering a Moose Management Plan, we are sharing the wealth of fantastic ideas that came out in our community workshops, to give readers a sense of what was discussed and to inspire further conversations and next steps in the creation of our own Anishnabe-led Moose Management Plan.

Community Recommendations for Moose Management

Principles and values to guide us

- Our Moose Management Plan must be holistic, taking into account the whole territory, other species, and the many other factors besides hunting that are threatening the moose (climate change, forestry, mining, disease, etc.)
- Anishnabe moose harvest should always be prioritized over other hunting in the area
- Hunt with respect, create no waste
- Hunt with respect, never under the influence
- Respect the moose, even after it is dead
- No selling of meat, only sharing
- Any money made through selling moose hunting licenses to non-Indigenous people should stay within the communities and be used to benefit our communities
- Our work in protecting the moose will bring our communities together, reuniting us and bringing harmony
- Preserve forests and trees that moose rely on

Moose Governance

- Anishnabe laws must lead the management plan
- We need to establish our own rules within our communities
- Hereditary land stewards should be decision-makers about what is happening on their territories
- Begin annual gathering of all communities to share knowledge of hunting and other cultural things and to decide together how many moose can be harvested each year
- Host Elders gathering to guide how we use natural resources
- Secure funding to develop and implement our own community-led plan
- Develop our own 5, 10, 15-year benchmark goals for moose management
- Create Anishnabe Employee Liaison positions at SEPAQ offices

Restrict Hunting

- Continue the moratorium for 2-5 years
- Create no-hunting protection zones/sanctuaries, rotate exclusion zones
- Creating hunting zones and limiting the moose taken from each zone
- Limit the number of hunters (lottery system, limit number of tags sold)
- Implement Lottery tags for settlers (like the Ontario system or the Ontario merit system)
- Reduce the number permits for non-residents
- Reducing the length of hunting season
- Have stricter rules for harvest (e.g. no killing of cows or calves, max of 1 moose every 3 years, no hunting during calving season, during heat waves or rainstorms, one harvest per trapping area, etc.)
- Moose hunt should be allowed only for food needs
- Limit harvest to one moose per family, any additional moose would be offered to Elders Center to teach values to the youth and community
- Each community should have own protected spaces to hunt & camp as a way to neutralise confrontations
- Limit hunting technology: no baiting (salt, carrots, electronic calls)
- Restrict 4 wheelers, no hunting blinds
- Ban towers, they are not fair to moose
- Ban bow and arrow
- Ban trophy hunting; no moose heads on trucks to be a new law

Leadership and Education

- Develop and provide traditional teachings about moose hunting, respect & protocols
- Promote awareness on responsible hunting (e.g. knowing spawning/mating seasons)
- Annual Moose Camps to teach young men, youth & families (including rites of passage ceremonies for boys)
- Teach the youth, host other youth gatherings
- Share traditional knowledge of meat preservation
- Provide classes in tanning hides
- Get our people out on the land and relearning traditional practices
- Hold community discussions about the differences between traditional economy vs. monetary systems
- Hold discussions on the privatizations of land on Anishnabe territory
- Bring back sharing systems
- Educate non-Indigenous people, including SEPAQ employees of our ancestral teachings and relationship with Moose
- Find ways to share traditional community observations with the wider community
- Increase awareness across the whole community about the problems the moose are facing
- Develop ways to make information about the moose population easily accessible to the public
- Make information about moose predators easily accessible

Future Research

- Continue research, develop methods to determine abundance of various species in different areas
- Map out hereditary family territories for better understanding
- Conduct proper population monitoring of the moose yearly, more if possible
- Take part in the aerial surveys
- Develop an ongoing data base of moose data
- Develop new ways to ensure no meat waste, for example, community storage for meat, especially in summer
- Evaluate the impact of existing specific management and tourism strategies such as “4-day” or “8-day” hunting packages

Enforcement

- Each community should patrol their own lands and regulate
- Establish our own community members as 'game wardens'
- Implement our own conservation officers, who are trained both in settler and traditional law and trauma-informed care
- Create our own systems to count kills and takedowns
- Use traplines and family hereditary territories for zoning and controlling number of hunters/tags
- Develop our on internal tag systems
- Moose tag reporting should be mandatory, with repercussions for people if they don't report
- Reinstate Anishnabe guides to take settlers out hunting
- Enact our own justice systems to enforce penalties for over-hunting, based on reparative justice approach
- Develop systems to ensure sport hunters donate to local communities any meat they leave behind



Photo from Community Workshop in Pikogan, May 2022.

9. Conclusion

The Anishinabe people living and occupying their territory, (in which La Verendrye, as well as various outfitters and ZECs are situated) have recognized the steady decline of the moose population. The findings of this research phase have clearly demonstrated that multiple, compounding factors continue to exacerbate the moose herd health and population numbers. Analysis of the results of this study show two main drivers of change: deforestation and sport hunting.

Logging and the associated forestry operations are responsible for immense moose habitat loss. Deforestation, heat accumulation, snow packing and winter tick resilience all negatively impact the winter survival rate and number of viable moose calves. In addition, deforestation decimates the biodiversity index at every level, which causes ecosystem repercussions for all species, including the moose.

Over-commercialization and the commodification of the moose sport hunt drive the herd to further demise. Outdated, arbitrary management plans perpetuated by provincial and local organizations like the MFFP, SEPAQ, ZECs and various outfitters, lack validity and sustainability. The extended hunting periods, overselling tags and inaccurate population data (all “supported” by cursory, flawed studies) cannot and will not support and protect a healthy moose herd.

Forestry operations and sport hunting continue to drastically drive the moose population down but also have severe, detrimental impacts on the food security and sovereignty of the Anishinabe people, in their own territory. This is also unacceptable. Continuation of current practices constitutes violations of territory, species health and Anishinabe rights supported by UNDRIP.

If a moose population management plan is to see any success, and respect for the Anishinabe inhabitants of the territory is to be upheld - all forestry operations must cease immediately, the moratorium on the sport hunting of moose must continue to be enforced and a comprehensive, multi-method study that is co-developed, co-implemented and informed by the knowledge of the Anishinabe people, must be a prerequisite.

“Our own people should be funded to be out on the land, observing the moose and other animals and plants, relearning and then teaching. These people would be paid to live up on the territory, as full time Land Defenders and Knowledge Keepers for the next generation. Through these positions, we could gather the evolving knowledge needed to inform strong self-determined management practices through time”

– Workshop attendee

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Appendix 1: Literature Review

<https://researchforthefrontlines.files.wordpress.com/2022/06/literature-review-moose-populations-health-causes-of-change-and-methods-of-evaluation-research-for-the-front-lines-for-anishnabe-moose-research-committee.pdf>

Appendix 2: Alternative Livelihoods

People depend on forestry for their livelihoods. To offer viable alternatives for sustainable economies that do not compromise the health of the moose populations or Anishnabe food sovereignty, this section offers pathways to move away from the status-quo forestry operations and examines the potential of renewable energy projects and “wood-less” economic activities.

Improving Current Logging Practices

To promote both reconciliation and Anishnabe self-determination on the territory, we propose ways in which forestry could proceed in better ways on the territory. This solution allows for people, including non-Indigenous people, to continue to make a living while ensuring that the moose habitat is not being devastated for short-term benefits.

In Canada, the emerging concept of collaborating with Indigenous communities in the industry is often referred to as “community forestry” or “Aboriginal forestry” (Palaschuk & Bullock, 2019). Aboriginal forestry is an approach which boasts several advantages for everyone involved. First, forestry fully or partially led by Indigenous peoples who use the forest allows for a more effective long-term planning of the resource since Indigenous peoples, who depend on the forest, have a direct interest in managing it in a way that will be truly sustainable (Lawler & Bullock, 2017). Partnerships often take the form of collaborative assessment of the land in which Indigenous peoples can point out areas of the forest (regenerating, mature, mixedwood) that should be protected for the wellbeing of the entire ecosystem (Bélisle & Asselin, 2020). Aboriginal forestry is likely to manage through the protection and management of the ecosystem (rather than trees only), which is more effective in creating natural-like forests in the long term than selective clear-cutting as practiced by the industry today (Asselin et al., 2015). This “ecosystem based-management of forests” (Lertzman, 2010) namely took place around Kitchisakik, in which the Anishnabe were able to protect areas based on the ecosystems they sustained, which involved less and targeted logging practices (Asselin et al., 2015). In Wet’suwet’en territory (British-Columbia), there is a recent example of the form that the collaboration can take in Aboriginal forestry, whereby the community was namely able to share information about rare species of the area and to launch an initiative to plant species of trees that can help face the climate crisis (Assuah et al., 2016). In sum, Aboriginal forestry is currently best practiced via ecosystems that they identify themselves and which are protected on the same grounds as the industry’s interest. This approach is considered the best meeting ground for Indigenous and scientific forest knowledge (Asselin, 2015), but of course, industry partners need to reconsider the profit-only incentive to leave room for these partnerships and relationships to flourish so that everyone can reap the benefits, including the moose.

Moreover, partnerships between Indigenous communities and non-Indigenous entrepreneurs are more likely to be successful; by establishing respectful agreements before taking from the territory, conflicts are less likely to stop operations (Beaudoin et al., 2015) and create further mistrust in Indigenous communities. This is the case in Temagami, where a license for co-managed forestry with the local First Nations community was granted for up to 20 years (Bay Today, 2022). Based on real examples, the principles to “facilitate meaningful collaboration in the forest sector” have already been laid out by researchers (Robitaille et al., 2017), which include bridging knowledge systems and the building of respectful relationships, and are likely to be relevant on Anishnabe territory as well.

Aboriginal forestry is set to become the minimum standard for the logging industry on Indigenous territories, especially since the circulation of the nation-wide calls for action of the Truth and Reconciliation Commission (TRC, 2015) and the increasing deployment of the United Nations Declaration for the Rights of Indigenous Peoples (UNDRIP) in Canada (Caverley et al., 2020). However, governmental agencies can be behind other actors in implementing respect for Indigenous rights and consent. The movement towards Aboriginal forestry in Quebec is already taking shape in Forest Certification (Forest Stewardship Council - FSC), with the introduction of the obligation to respect First Nations rights, which is a step beyond “consultation” (Wyatt & Teitelbaum, 2020). Overall, the trend shows an increasing number of direct partnerships between the Industry and First Nations (Zurba et al., 2016) and, in general, a change in normative guidelines that are set to improve the relative influence of Indigenous nations in managing their forest (Bulkan, 2017). In the future, it is important to create partnerships in which the knowledges of Indigenous peoples, and the long-term benefits associated with them, can make it into the decision-making step as an equal. This reality is likely to take place when direct and local partnerships between a First Nation and a local company are built in an interdependent manner. As an example of this model, Essipit and the Boisaco company have partnered up in a way which has afforded them more leverage than the mechanism for public participation of the Quebec forestry regime allows. On Anishnaabe territory, we recommend for local logging industries (including investors and each contractor hired) to partner up with either First Nations companies and or collectives and take the time to come to an agreement to ensure a standard for sustainability in which communities and animals can thrive again.

Renewable Energy

Many people in Canada earn their livelihoods from extractive practices like logging. In order to successfully transition away from extractive practices like logging, communities will need to secure alternative livelihoods for those who currently rely on these practices. Renewable energy projects may help fill this need.

Renewable Energy as an Alternative Livelihood

Many communities are already beginning to make the transition away from extractive practices like logging to alternative livelihoods based on renewable energy. Many of the communities leading the way in this regard have been Indigenous communities, who have been able to secure new sources of jobs and funds for their communities through renewable energy projects - all while helping reduce greenhouse gas emissions. This includes:

- **M’Chigeeng First Nation, Ontario:** The M’Chigeeng First Nation is the sole owner of the Mother Earth Renewable Energy Project (MERE), a 4-megawatt wind turbine farm. The M’Chigeeng First Nation has secured a 20-year power generation contract with the Ontario Power Authority, and it is expected that the MERE will generate hundreds of thousands of dollars in surplus funds for the community every year (Kelly, 2013).
- **Bitigtigong Nishnaabeg (Pic River) First Nation, Ontario:** The Bitigtigong Nishnaabeg First Nation has been involved in several hydroelectricity projects. It developed a 5-megawatt generating station on one of its major waterways in partnership with several other stakeholders; the First Nation ultimately went on to become the station’s sole owner. In collaboration with Innergex, the First Nation has also begun developing the 24-megawatt Umbata Falls generating station (Krupa et al., 2015).
- **Haida Nation, British Columbia:** The Haida Nation has collaborated with NaiKun Wind on the construction of a major wind project, partly on the condition that NaiKun provide members of the Haida Nation with employment opportunities. The first phase of this project has involved the construction of 110 offshore wind turbines, with generating capacities of 3-5 megawatts. It has been projected that this project will displace 26,000 tonnes of greenhouse gas emissions emitted by diesel generators on Haida Nation (Krupa et al., 2015).

- **Vuntut Gwitchin First Nation, Yukon:** The Vuntut Gwitchin First Nation has established a large solar panel project to help the community transition away from its reliance on fossil fuels. The electricity produced by the project, which involves over 2,100 solar panels, is currently being sold under a 25-year purchase agreement to ATCO Electric Yukon and has reduced diesel fuel use by approximately 189,000 litres per year (Baker, 2021).

Renewable energy projects like those listed above can be excellent economic opportunities for Indigenous communities (Krupa, 2012), both in the sense that they can create jobs for members of these communities and in the sense that they can generate revenues for First Nations if they own the projects either in whole or in part. But as Schatz and Musilek (2020) emphasize, the economic potential of renewable energy projects is more likely to be fully realized where projects are “anti-colonial, locally owned, and in touch with the community’s needs to see the rich social impact these projects can have.”

Supporting Communities in Transition

Communities’ ability to transition away from extractive practices like logging by developing renewable energy projects depends on factors such as:

- **The availability of project funding.** With government or private funding, communities can take whole or partial ownership of renewable energy projects in their communities. This affords communities some measure of control over project development and implementation, which can ultimately improve project legitimacy (Schatz & Musilek, 2020). While government funding cuts have historically posed a barrier for communities looking to fund renewable energy projects (Krupa, 2012), several new government programs have been introduced to assist Indigenous communities in funding such projects, including the federal Strategic Partnerships Initiative (Government of Canada, 2022a) and the Québec Green Initiative (Government of Canada, 2022b).
- **Community members’ levels of training and education.** Communities can more fully reap the benefits of renewable energy projects when community members are directly employed by these projects. But as Krupa (2012) notes, this can be difficult where few community members have project management experience or where few community members are familiar with renewable energy technology. Providing training and education opportunities geared towards the demands of the renewable energy sector will need to be a key part of helping communities transition away from extractive practices.
- **Perceived project legitimacy.** Where communities seek to transition away from extractive processes by developing new renewable energy projects, it is essential that community members perceive these projects as legitimate (Krupa, 2012). Project legitimacy can be improved by involving community leaders throughout in the development and implementation of renewable energy projects, rather than simply holding one-off community consultations (Krupa et al., 2015). Project legitimacy can also be improved by familiarizing community members with the technology used in renewable energy projects and by communicating with them regularly about project developments (Mercer et al., 2020). Most importantly, project legitimacy can be improved by ensuring that communities are able to directly benefit from renewable energy projects (Schatz et al., 2020).

The potential for a hemp production economy

Hemp production in Canada

While hemp is the same plant as cannabis (*Cannabis sativa*), it is a variety that contains very little to no THC. Since 1998, industrial hemp has been legalized and authorized in Canada as it was distinguished as a different cultivar than cannabis. Industrial hemp has been regulated under the federal *Industrial Hemp Regulations* since 2018 and is currently run through the Industrial Hemp Regulation Program policy that delivers annual licenses for activities under their purview (Health Canada, 2020).

Globally, hemp uses are varied and span multiple industries, such as construction materials, textiles, food, and CBD oils. In the construction industry, hemp fibre is used to produce insulation materials like “hempcrete” that are energy-efficient (Bedlivá & Isaacs, 2014). As a textile, hemp is generally viewed as more environmentally-friendly than cotton because it requires less water, pesticides, and energy to produce a durable garment (Duque Schumacher et al., 2020).

In Canada, food is the principal driver of hemp production (Alberta Agriculture and Forestry, 2020). Similarly, in Quebec, hemp is mainly grown for its seeds, whereas other industries, such as construction materials and isolation fibres and textiles, are emerging (Lalonde et al., 2018). “Generally, the demand for hemp products is expected to benefit from a growing demand for products that are environmentally and economically sustainable” (Alberta Agriculture and Forestry, 2020).

Growing hemp in Anishnabe territory

It must be recognized that the conversion of forested or natural areas to any agricultural crop represents a change in the landscape that could affect biodiversity, with unquantifiable impacts on moose. However, it could also represent an alternative livelihood in Anishnabe territories in areas *already devoted to agriculture*. In Canada, hemp crops are best-suited to grow in rotation with other crop types and grow best in well-drained, slightly acidic (pH 6.5) soil in a field ideally cleared of weeds (Lalonde et al., 2018).

It is difficult to quantify the environmental impacts of industrial hemp production compared to those of forestry operations. Hemp is believed to sequester enormous amounts of carbon, about 10 tonnes of Co2 per hectare - which is more than the average forest - but rigorous data is missing to confirm this metric and for hemp to be included in carbon markets (New Frontier Data, 2022). Further studies are underway to evaluate the potential for hemp to improve soil health and erosion control (Alberta Agriculture and Forestry, 2020). Compared to other commercial crops, hemp generally requires fewer chemical inputs, water and energy to process, which increases its potential to be marketed as an organic product (Alberta Agriculture and Forestry, 2020). However, agricultural fields do require more intensive inputs in fertilizer than forestry operations (Boreal Forest Facts, 2022). The impacts on biodiversity would also vary and depend on the type of agriculture (organic or not), the surrounding landscape (forested or not), and the size of the fields (Martin et al., 2020). There are no documented cases of invasive hemp cultivars.

Economic potential

An Indigenous-led hemp project has the potential to diversify local economies and can support multiple adjacent nation-building projects. For example, the Anishnabe Agricultural Institute based in northern Minnesota is a centre guided by the principle of transitioning to a post-carbon, sustainable, and respectful economy by focusing on food sovereignty, culture, and health for tribal nations. They grow hemp, research hemp production and products, and support tribes in their own hemp-based economic endeavors by providing hemp seeds and training to five tribes in the USA and Canada (thus far) (Anishnabe Hemp Institute, 2022).

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