

“We Hardly Have Any Moose Around Here Anymore”: Climate Change and the Barriers to Food Security in the Dehcho Region, Northwest Territories

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ABSTRACT. Rural Indigenous communities across northern Canada are experiencing high rates of food insecurity as a result of complex constraints to accessing quality market foods and engaging in local food procurement. Climate change is impacting the ability of northern Indigenous communities to acquire, access, and utilize food that is culturally relevant and sustainable. This research examines the interconnected sociocultural, political, economic, and environmental challenges related to food security in the community of Fort Providence situated in the Dehcho Region of the Northwest Territories. The objective of this research was to consult with community members to understand the impacts of climate change on local food procurement and to explore the myriad challenges related to food security. We utilized Indigenous methodologies to guide all aspects of the research. Evidence was collected using semi-structured interviews with Dene and Métis Elders, knowledgeable land-users, and other community members. Our research demonstrates that changing hydrological systems and ecosystems, unpredictable weather patterns, the presence of non-local harvesters, the loss of traditional knowledge, and the high costs of living in a rural northern community impact local food security. The results of this research can inform policies that reflect the needs of residents, address the distinct barriers to procuring local food, and provide a basis for understanding the complexities of food security in the Dehcho and other subarctic regions.

Key words: food security; climate change; Indigenous peoples; rural communities; subarctic; food procurement

RÉSUMÉ. Les collectivités autochtones rurales du Nord canadien connaissent des taux d’insécurité alimentaire élevés en raison de contraintes complexes en matière d’accès à des aliments du marché de qualité et d’engagement à s’approvisionner en nourriture locale. Le changement climatique a des incidences sur la capacité des collectivités autochtones du Nord à acquérir et utiliser des aliments culturellement pertinents et durables ou à y avoir accès. Cette recherche se penche sur les défis interreliés sur les plans socioculturel, politique, économique et environnemental liés à la sécurité alimentaire de la collectivité de Fort Providence située dans la région du Dehcho, dans les Territoires du Nord-Ouest. L’objectif de cette recherche consistait à consulter des membres de la collectivité dans le but de comprendre les effets du changement climatique sur l’approvisionnement alimentaire local et à explorer les nombreux défis qui se posent en matière de sécurité alimentaire. Nous avons employé des méthodologies autochtones pour guider tous les aspects de notre recherche. Des renseignements ont été recueillis dans le cadre d’entrevues semi-structurées avec des aînés dénés et métis, des utilisateurs des terres bien informés et d’autres membres de la collectivité. Notre recherche a permis de démontrer que les écosystèmes et les systèmes hydrologiques en pleine évolution, les régimes climatiques imprévisibles, la présence de récolteurs ne venant pas de la région, la perte des connaissances traditionnelles et le coût de la vie élevé dans une collectivité rurale nordique ont des conséquences sur la sécurité alimentaire à l’échelle locale. Les résultats de cette recherche peuvent éclairer des politiques tenant compte des besoins des résidents, aborder les obstacles distincts à l’approvisionnement alimentaire local et aider à comprendre les complexités de la sécurité alimentaire dans la région du Dehcho et dans d’autres régions subarctiques.

Mots clés : sécurité alimentaire; changement climatique; peuples autochtones; collectivités rurales; subarctique; approvisionnement alimentaire

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INTRODUCTION

Mitigating the impacts of climate change on food security will be one of the major hurdles of the 21st century (Campbell et al., 2016). Food security exists when all people at all times have physical, sociocultural, and economic access to sufficient and nutritious food to meet dietary needs (FAO et al., 2017). Across Canada, but particularly in northern regions, food insecurity has become a serious public health issue, due in part to limited access and availability of nutritious foods (Randazzo and Robidoux, 2019; Schnitter and Berry, 2019). Food insecurity across northern Canada disproportionately affects Indigenous communities and is connected to sociocultural, economic, political, and environmental challenges (ICC-Canada, 2012; CCA, 2014). The widespread potential risks associated with climate change will further exacerbate ongoing social vulnerabilities related to food security (Adger et al., 2003; IPCC, 2014). In the Northwest Territories (NT), 24% of households are food insecure, compared to the national average of 12% (Tarasuk et al., 2016).

From the viewpoint of Dene and Métis Elders, knowledgeable land-users, and community members of Fort Providence, NT, our research identifies the multiple barriers to engaging in local food procurement and recognizes how they are related to current food insecurity challenges. We investigate the following questions: What are the barriers to engaging in local food procurement practices at localized levels, and what are the interconnected sociocultural, economic, political, and climatic conditions that impact food security in the region? Answering these critical questions is key to any attempt to address food security challenges in Fort Providence and the broader Dehcho Region.

Our study is timely because of recent federal and territorial funding opportunities and localized support for food procurement activities such as the Growing Forward programs and the Northern Farm Training Institute in Hay River, NT (GNWT, 2017, 2018; NFTI, 2020). These programs and targeted investments aim to rebuild local food systems to provide sustainable access to fresh, nutritious, and affordable foods (Chen and Natcher, 2019). For our research, we collaborated with community members in Fort Providence to document local perspectives that can contribute to robust policy outcomes to support localized needs. Our study also contributes to a growing body of research focused on food security in the NT and adds context to policy development by emphasizing the importance of local voices in decision-making processes.

Defining Food Security and Local Food Procurement

The Food and Agricultural Organization (FAO) of the United Nations identifies four food security pillars: availability, access, utilization, and stability (FAO et al., 2017). In this context, food availability relates to supply levels of food (FAO et al., 2017), such as the abundance of

certain fish species that community members rely upon. Access refers to the physical and economic ability to obtain healthy and nutritious food that meets dietary and cultural needs. Food utilization is the metabolism of food; in Fort Providence, this means preparing, processing, cooking, and consuming culturally appropriate and healthy foods. Food stability is the capacity of an individual to attain food over time. A fundamental pillar lacking in the FAO's understanding of food security is food quality. Food quality in terms of the health and condition of locally procured foods and the nutritional quality of market foods is a crucial pillar to attain overall food security (Beaumier and Ford, 2010; Nunavut Food Security Coalition, 2014). For food security to be realized, all pillars, including food quality, must be met simultaneously. The FAO definition of food security does not seamlessly align with an Indigenous perspective on food security and fails to consider the duality of food systems in a northern context. The conceptualization of food security for northern Indigenous people is incomplete without rich qualitative research to understand unique perspectives and connections between food, culture, and society (Power, 2008). For example, harvesting and food preparation activities that bring communities together help to maintain social relationships, facilitate knowledge transfer, and sustain spiritual connections with the land (Schuster et al., 2011).

Locally procured food is defined as foods harvested, hunted, fished, trapped, or foraged regionally from the land. For Fort Providence residents, this includes many diverse species of fish; small game, such as rabbits, geese, ducks, and beavers; big game such as moose, woodland caribou, and wood bison; and numerous plants and herbs (Wesche et al., 2016). A somewhat less substantial part of the conceptualization of local food procurement is the idea of growing foods locally in community gardens and greenhouses. In the NT there are 32 community gardens and 25 community greenhouses; every region has at least one commercial agricultural operation (GNWT, 2018). For example, Norman Wells is home to the largest potato-growing operation in the Territory, Inuvik has transformed an old community arena into a greenhouse, and Polar Eggs, located in Hay River, is the primary commercial egg operation in the territory (GNWT, 2018). Our main focus in this paper is on foods harvested regionally from the land and water. Nevertheless, it is essential to understand the impact that northern agriculture and small-scale food production have on the food system. Community gardening is emerging in many northern communities as a viable solution to the limited availability of nutritious market foods (Thompson et al., 2018; Chen and Natcher, 2019).

The Impacts of Climate Change on Northern Food Systems

With parts of the NT warming up four or five times faster than global averages (GNWT, 2008a), environmental impacts are being felt more readily across the North and must be addressed. Climate change has varying effects on

the natural environment, locally procured food sources, and therefore, food security (Andrachuk and Smit, 2012; Gerlach and Loring, 2013). Most literature on food security in the NT concentrates on remote fly-in communities (Rosol et al., 2016) with less research framed around subarctic communities with all-season road access (Spring, et al., 2018). A case study in Fort Providence provides an excellent opportunity to add to the literature on northern communities with all-season road access that experience food security challenges. Also, to ensure the long-term sustainability of northern food systems, the creation of baseline qualitative data is needed to understand, observe, and document changes that may develop in future years (Kok, 2020). Indigenous communities across northern Canada rely on a combination of locally procured foods and market foods. Although this combination occurred at different times throughout the 20th century, communities have become increasingly reliant on market foods because of new colonial economies, improved transportation networks, and the introduction of permanent stores (Skinner et al., 2013; Randazzo and Robidoux, 2019). An increased reliance on market foods resulted from colonial policies that restricted subsistence and cultural practices and attempted to fundamentally change local Indigenous peoples' relationships to their traditional territories (Robidoux and Mason, 2017). The importance of locally procured foods to the overall health and cultural well-being of northern Indigenous peoples is widely recognized, as the harvesting, sharing, and consuming of foods play an integral part in local cultures (Gerlach and Loring, 2013; Rosol et al., 2016; Spring et al., 2018). Locally procured foods are important for northern Indigenous communities, not only nutritionally, but also for physical and mental health, and spiritual well-being (Van Oostdam, et al., 2005; Lambden, et al., 2007; Kok, 2020).

The conditions currently threatening food security in northern Canada are a result of multiple sociocultural, political, and economic factors. Also, climate change continues to be a significant driving force impacting food security (Power, 2008; Wheeler and Von Braun, 2013; CCA, 2014). Climate change and seasonal variability in weather patterns are significant stressors to food systems across northern Canada, particularly in Indigenous communities that rely heavily on their local environment. Varying weather intensifies the dangers associated with travelling to procure food. For example, unseasonable ice conditions create hazards for harvesters, while an early summer heat wave can ruin berries (C. Bonnetrouge, pers. comm. 2018). According to the Government of the Northwest Territories *Climate Change Impacts and Adaptation Report* (2008), the plants, animals, and people that live in the North have adapted to the cold climate and depend on cold, stable conditions to be successful. The findings in this report are mirrored in numerous international documents outlining the detrimental consequences of rapid environmental changes, which impact a wide range of species, ecosystems, and the people who depend on them (Godfray et al., 2010;

Wesche and Armitage, 2014; GNWT, 2016; WWF Canada, 2017; IPCC, 2014). Stressors to northern Indigenous food security will continue to intensify alongside environmental changes, causing additional pressure on already fragile and volatile ecosystems, locally procured food sources, and the global food system as a whole.

Contextualizing Sociocultural, Economic, and Political Barriers

For northern Indigenous communities, traditional knowledge of the local environment, combined with the related skill sets for harvesting, travelling on the land and water, and food processing, is understood as an array of cultural practices necessary to achieve food security (CCA, 2014). These culturally relevant practices are threatened by interconnected social, political, and economic challenges. Previous scholarly research shows that climate change and the unique circumstances of living in the North, such as long supply chains, gaps in traditional ecological knowledge, and the economic costs associated with food procurement, play a significant role in food security and serve to exacerbate more fundamental drivers (Pal et al., 2013; Skinner, et al., 2013; Loring and Gerlach, 2015; Robidoux and Mason, 2017; Spring et al., 2018). These drivers include the cost of living in northern Canada, the composition of communities in terms of household incomes, employment demographics, top-down governance structures, food-related policies and programs, economic development agendas that marginalize the rights and needs of Indigenous peoples, and compounding historical ramifications (Lysenko and Schott, 2019). Throughout the colonization of the NT, local Indigenous lifestyles were disrupted as traditional lands and resources were appropriated through Treaties 8 and 11 (Sandlos, 2007; Tesar, 2016). These challenges reflect the sweeping sociocultural changes that took place in the second half of the twentieth century, as former seminomadic hunting groups were resettled into centralized communities and incorporated into a colonial relationship with Canada (Ford et al., 2010). These changes eventually resulted in a shift from a former reliance on nutrient-rich locally procured foods towards higher consumption of market foods purchased from a store.

Other impacts include rapidly increasing fuel prices, reductions in global agricultural yields, and growing demand for food by emerging economies and growing populations, which cumulatively influence the cost, quality, and access of market foods transported north (Godfray et al., 2010; ICC-Canada, 2012). Despite substantial governmental subsidies and local efforts, the price of nutritious foods in northern Canada continues to be a formidable constraint, while the quality of perishable food is often compromised due to lengthy transportation distances, frequent delays, and small purchasing powers in remote Indigenous communities (Galloway, 2017; Chen and Natcher, 2019). Most research conducted on this topic focuses on isolated northern communities that rely on

air-freight shipments and ice roads for perishable food supplies (Skinner et al., 2013; Barbeau et al., 2015; Kenny et al., 2018). While northern communities with all-season road access certainly fair better, in Fort Providence, which has all-season road access, food prices remain approximately 35% higher than in Yellowknife, the capital of the NT (NT Bureau of Statistics, 2016). As Indigenous communities across the NT rely on both traditional and market foods, interconnected sociocultural, political, and economic impacts are significant factors in food security challenges in Fort Providence, affecting access, availability, utilization, stability, and quality of foods consumed. There is a distinct lack of food security research in the North that employs a community-driven approach and prioritizes regional issues from local Indigenous perspectives (Loring and Gerlach, 2015). Another important gap our research addresses is the lack of female representation in local food procurement research. Most studies conducted on this topic focus primarily on male harvesters (Gaudet, 2017). Our research attempts to include voices from an array of demographics to formulate more holistic understandings of the interconnected food security challenges experienced in Fort Providence.

COMMUNITY PROFILE: FORT PROVIDENCE, NORTHWEST TERRITORIES

Fort Providence (61.35°N, 117.66°W), with approximately 800 residents, is a small Dene-Métis community located in the Dehcho Region of the NT (NT Bureau of Statistics, 2016). It is situated downstream from Great Slave Lake and along the northern bank of the Mackenzie River (Fig. 1).

With the 2012 opening of the Dehcho Bridge across the Mackenzie River, Fort Providence has year-round road access (GNWT, 2019). In addition to the Mackenzie River, there are a number of water bodies around the community, such as Mills Lake, formed where the Horn River drains into the Mackenzie River from the Horn Plateau. This region has been a spiritual home for the Dene people and a vital harvesting location for millennia. These lands and waters form part of the Edézhzié Protected Area, the first Indigenous Protected and Conserved Area (IPCA) of its kind in Canada (Mason, 2018; GC, 2019). The Edézhzié Protected Area holds meaningful ecological, cultural, and spiritual significance and is home to diverse habitats, while protecting the headwaters of the Dehcho Region watersheds (GC, 2019). The IPCA helps protect critical harvesting grounds and can support local food procurement activities and cultural continuities. Besides abundant aquatic and semi-aquatic species, this region is a major staging area for waterfowl during spring and fall migration, a refuge for molting diving ducks in the summer, a grazing area for wood bison in the winter, and vital moose habitat year round (ESTR Secretariat, 2013; SARA, 2018; GC, 2019). The abundance of species allows residents of Fort Providence to maintain many of their traditional practices,

and community members continue to be supported by land-based foods harvested from the surrounding areas. Despite this abundance of natural resources and wildlife, Fort Providence residents must still rely on income support or employment opportunities to supplement land-based livelihoods. Just over half of Fort Providences' adult population access paid income for full-year and full-time employment (NT Bureau of Statistics, 2016).

METHODS AND METHODOLOGY

From the conception of the initial research questions to establishing relationships between researchers and Dehcho residents, this study benefited from the direction and guidance of Indigenous methodologies (IM) (Kovach, 2010a; Tuhiwai Smith, 2012). Steered by the core research paradigms of trust, respect, reciprocity, and inclusion (Kenny, 2004), our research approach fostered collaborative relationships with community members and supported integrating community members' priorities into the research project. Indigenous perspectives and ways of knowing were central in the overall research process, while the use of IM strengthened the active participation and collaboration between researchers and residents. IM frames a holistic understanding of the complexities of sociocultural, economic, political, and environmental changes related to food security.

Our study is part of an ongoing collaboration with community members in Fort Providence that began in 2010 when C.W. Mason collaborated on a local health initiative. This collaboration has since evolved to include several research projects in which community champions have been co-investigators and which incorporate community-based research assistants and coordinators. Community champions have played active roles in shaping subjects of inquiry, interview guides, recruitment, data collection, and the communication of research results, including scholarly articles and community-based reports.

This research is centered primarily on two separate six-week field seasons in the spring and fall of 2018. We include data from a wide range of community members, including Dene and Métis Elders, local government representatives, and knowledgeable land-users. Researchers also participated in community food procurement trips, volunteered at local events, and collaborated with community members on various projects, particularly those that involved local youth. These experiences contributed to building respectful relationships between researchers and community members. While IM provides general guidelines for research in Indigenous communities, our research respected local values, expectations of reciprocity, and community protocols in Fort Providence. This process was guided by local champions and Elders to ensure that sensitive cultural information from our research was appropriately protected (Battiste and Youngblood Henderson, 2000).



FIG. 1. Location of Fort Providence, Northwest Territories, Canada.

Participants were recruited by non-probability snowball sampling, while local leadership and community champions also recommended knowledgeable land-users and Elders (see Appendix S1). Our research utilized semi-structured interviews and consisted of 15 open-ended questions; interviews lasted between 25 and 90 min (see Appendix S2). This interview method provided participants with a degree of control to share their perspectives in a culturally appropriate manner. Indigenous knowledge comprises a specific way of knowing based upon oral traditions of sharing (Kovach, 2010b), which aligns with semi-structured interviews as a method. All 20 interviewees (nine female [seven of whom contributed to the themes in this paper], and 11 male) are NT residents and represent some of the diversity of motivations, values, perspectives, and opinions within the hamlet of Fort Providence, the

Dehcho Region, and the NT. We created a diverse sample by including interviewees of various ages, including youth perspectives (18+), middle-aged land-users, and Elders. All interviews were collected between September and December 2018. The interview guide was built in consultation with local leaders and community champions, and the overall objective of the interviews was to identify local approaches to, and perspectives of, food procurement and food security. In addition to being guided by IM, this project adhered to OCAP (ownership, control, access, and possession) principles, and followed Tri-Council policies on ethical research with Indigenous communities.

All the interviews were audio-recorded and transcribed verbatim. Raw transcriptions were sent to each participant for review. Collected data were verified with individual participants to ensure reliability and accuracy before

the data were analyzed. Verification is also a key process of IM, which puts into place a measure of protection for any sensitive cultural information. Participants were offered anonymity, but unanimously chose to have their names associated with their words and contributions. All interviews were analyzed and grouped into key themes: 1) past, present, and future food procurement initiatives; 2) the sociocultural, economic, political, and environmental barriers hindering engagement in local food procurement; and 3) local food security issues or perspectives. Guided by content analysis (Elo and Kyngäs, 2008), we analyzed the data to denote commonalities and divergent patterns. The authors both read through each transcript several times using open coding. The authors then jointly discussed the categories and coding to identify relevant themes. The trustworthiness of the data was established by the collaborative nature of the co-authors data analysis through content validation. According to Elo and Kyngäs (2008), direct quotations are critical to displaying trustworthiness. Direct quotations from interviewees appear throughout the following sections to ensure participants' voices are heard and to demonstrate their perspectives as clearly as possible.

CLIMATE CHANGE IMPACTS ON LOCAL FOOD PROCUREMENT: RESULTS AND DISCUSSION

Environmental changes have developed as the main barrier to food procurement practices and are related to food insecurity. Our data analysis revealed two broad climate change themes: changing ecosystems and unpredictable weather patterns, and shifting hydrologic systems.

Changing Ecosystems and Unpredictable Weather Patterns

Changing ecosystems were a key concern noted throughout the data collection process. Some interviewees cited observing new species over the last decade and included personal observations and secondary accounts of deer, cougars, hummingbirds, unidentified fish species, magpies, pine beetles, ticks, and an array of insects. Dene youth, Brandon Thom described:

There's more diversity in the ecosystem. I can see it already. I'm not sure what kind of effects will happen... When I was growing up, there was a lot of bugs and a lot of critters and what not, but now there's a lot more diversity in the bugs... a lot more colour.

Michael McLeod, Member of Parliament for the NT, revealed that it is not just insects that are making their way north: "I've heard of people seeing cougars, but I've never seen one myself ... as the deer population grows then we are going to see the cougar population grow too." Many interviewees remain concerned about new species making their way into the local ecosystem and the potential ramifications of these new plants and animals.

This concern is reflected in a comment by local Dene woman, Charlene Bonnetrouge: "with all the predators coming up, like the cougars... will they eat more of our animals?" A few participants noted a lack of access to information about invasive species, which is problematic considering the significance of incorporating traditional knowledge into ecological management practices. As Charlene Bonnetrouge explained, some species are already impacting locally procured foods:

With climate change, we're seeing all kinds of stuff... I know that there's a lot of ticks coming up to our region. I've seen at least two moose recently with ticks... you could see them all over. I don't know if the moose survived ... because there were so many of them ... It created a sore on the moose ... on its back, by its butt area.

Winter ticks (*Dermacentor albipictus*), an important parasite of moose and other ungulate species, are common in southern Canada (Kashivakua, 2013). Traditional knowledge in the NT suggests that winter ticks were not observed in previous decades (Samuel, 1989), and recent sightings of affected animals have led biologists to document local observations. Large numbers of winter ticks can parasitize moose, causing serious health effects and impacting the quality of meat. Changing environmental conditions could further extend the ticks' range (Samuel, 1989; Bradley et al., 2005).

Ecological changes are not limited to the introduction of new species:

Not only are we seeing invasive species, but also diseases... I had never heard about anthrax in the north until the bison were introduced. I've never heard about brucellosis either or the other new diseases being introduced. I've never heard our Elders talk about these diseases before that just killed the animals, just like that.
(M. McLeod, pers. comm. 2018)

According to the Species at Risk status report for the NT, three infectious bacterial diseases are a great threat to bison: anthrax (*Bacillus anthracis*), bovine tuberculosis (*Mycobacterium bovis*), and bovine brucellosis (*Brucella abortus*) (GNWT, 2016). McLeod explained that when the last anthrax outbreak hit the wood bison population in 2012, over 300 bison carcasses were discovered and burned in the Fort Providence area. Dead moose and black bears affected by the diseases were also discovered. Changing ecosystems have potentially devastating consequences, which can ravage the natural environment and cause socioeconomic issues for Indigenous harvesters (Bradley et al., 2005; Struzik, 2018). Because land-users' success depends on the stability and predictability of environmental conditions, wildlife, and ecosystems, land-users have an intimate knowledge of their environment and remain vital knowledge holders. This is not unique to the community of Fort Providence. One study in a rural northern Ontario

community found that traditional knowledge of the local environment has the potential to increase our understanding of many kinds of ecological phenomena, which in turn can help support effective policy development and risk management techniques for land-users (Khalafzai et al., 2019). Climate-related impacts on ecosystems have a particularly significant effect on subsistence and food security because northern Indigenous communities rely on locally procured resources (Thompson et al., 2018). For example, the availability and quality of local foods are influenced by ecological conditions that shape the health, abundance, distribution, and migration of wildlife populations (Kenny et al., 2018). As Charlene Bonnetrouge described:

The animals have their routines, you know, of how the weather works for them. This time of the year [fall], the bears are waiting for one more Indian summer, then they go off. It's a sign for the bears, saying: it's time to make your way to hibernate. So... I don't know exactly how climate change is affecting the animals... but if there's no last Indian summer then what? Last year the bears were still out in the winter.

While large game, such as caribou, bison, or moose typically dominate the dialogue around local food procurement (Wesche et al., 2016), small fur-bearing mammals and aquatic species, such as fish, remain a vital part of subsistence in Fort Providence. The aquatic species that make the Mackenzie River their home have been an integral part of historical social structures and cultural transmissions of the local Dene and Métis people. Traditionally, the Fort Providence area was used as an important seasonal fishing site, as every fall whitefish spawn near the community. Member of the Legislative Assembly of the NT for the Dehcho Region, Michael Nadli affectionately described, "everyone loves those [white] fish. Big, fat, juicy whitefish! You know, people were raised on that." The dependable whitefish run each fall is a key cultural, social, and subsistence tradition. Land-users set nets in the fall looking to stockpile food supplies of whitefish throughout the winter. However, with the impacts of climate change on the local ecosystem, access to this reliable food source is beginning to change. Elder and skilled land-user Joachim Bonnetrouge described:

Even the various fish around here, for me, are different now... especially in our area. We primarily look forward to harvesting a lot of whitefish, the various different species of whitefish. I made a point this year to set nets in different places... but the whitefish are just not coming like they used to... I've noticed more coney [innconu], and they kind of dominate the fish nets now. Two weeks ago we had to pull our nets because all we were catching, in those usually good whitefish spots, were jackfish... big ones too. So, that's something I've really noticed.

Dene woman and elementary teacher Theresa Bonnetrouge added:

Right now [early September], the jumbo fish are not supposed to be running... not until October and people are now catching jumbo fish in September... Usually they do not spawn until the month of October, towards the end September and the beginning of October. Now they're running too early.

Changes in migratory patterns due to environmental influences on waterways will continue to add challenges to local food procurement, as inconsistent whitefish migratory patterns make it hard to predict the best harvesting times, thus reducing the availability of subsistence resources.

A changing environment brings new diseases, creates stress on vulnerable ecosystems, impacts migratory routes, disrupts wildlife, influences health of food sources, and impacts land-based subsistence, food security, and cultural resilience. Changes in temperature and climate conditions will also likely result in shifts in the movements and breeding success rates of terrestrial animals. Changes in temperature and weather patterns create concerns around the degradation of habitat and feeding conditions that could cause dramatic declines in many wildlife populations (Andrachuk and Smit, 2012). Given that local food procurement relies on species survival rates and the ability to predict their movements, these changing ecological conditions will have devastating implications for Indigenous communities. This finding resonates across many communities in the Canadian Subarctic and Arctic, which are experiencing changes to the natural environment that ultimately impact local food procurement practices (Galappaththi et al., 2019; Khalafzai et al., 2019). Joachim Bonnetrouge explained a localized change:

The Elders have been telling us, for years, that they are having a hard time getting a read on the seasons, especially in the fall.

Autumn is a critical hunting season that includes, for example, the running and spawning of the whitefish and the moose hunt. Autumn also signifies the importance of stockpiling local foods for winter. However, as Charlene Bonnetrouge explained, there are safety risks:

If somebody was going hunting for geese and it was -16° or -10°C , which is good weather for hunting geese... in the spring like the middle of April. All of a sudden the weather changes, it rains, the temperature goes up, and the snow melts. That affects the hunters, and it's actually happened twice. The harvesters are on the land with their skidoos and there's hardly any snow for them to come back, because it's been raining and the temperature went up. It does affect the people who are using the land.

Unpredictable weather patterns can result in hunters getting trapped on the land when weather suddenly shifts. If land-users are unable to predict weather patterns accurately, safety issues result. These concerns could potentially discourage local food procurement and disrupt traditional ways of life (Rosol et al., 2016). Successful procurement excursions are critical to maintaining food security levels. Besides the discussion around safety, it is worth mentioning that unpredictable weather conditions also make it challenging to access local foods. For example, unusually hot summers could dry out the landscape, creating an unproductive environment for native species to flourish (Charlene Bonnetrouge, pers. comm. 2018). This unpredictability adds to the complexity of establishing programs that support local food procurement, as predicting and planning for the future remains ambiguous because of the erratic and volatile consequences of climate change. Food procurement activities are currently threatened by several interrelated environmental factors, as emphasized by participants. As environmental change impacts increase, vulnerable northern communities will need to adapt procurement activities to support food security. Subtle environmental changes are often only witnessed by land-users, as northern Canada remains a vast, remote, and sparsely inhabited territory. Thus, local knowledge holders will be required to guide decision-makers toward effective, robust, and resilient policies.

Shifting Hydrological Systems

Fort Providence's northern location and the long duration of cold temperatures cause the Mackenzie River and surrounding bodies of water to remain covered in ice for approximately 6–7 months a year. The stability and predictability of ice coverage provide harvesters with a stable environment to fish, harvest, and trap to procure food, and provide a major transportation route to access winter hunting grounds. The few ice-free months throughout the summer also play a key role in food procurement via fishing and harvesting ducks and other semi-aquatic species. Interviewees' observations and experiences include low ice depth, changing breakup patterns, permafrost degradation, low water levels, warmer water temperatures, and a drying water table. These hydrologic-based changes are having substantial impacts and creating multifaceted barriers to food procurement. Nimisha Bastedo, a local science teacher, pointed out:

This Elder told me a story that when he was a kid, his family would go check the fish nets in the middle of winter and the ice would be 10 feet thick. Now it's less than a meter when we go out with the kids and measure it. It's really not that thick anymore.

Local Dene land-user, harvester and Elder Albert Nadli commented:

You know, the ice is more thin now. Because some places, the ice will freeze then it will snow right away and the ice stays thin. It gets dangerous for people going out on the ice.

When snow weighs on newly formed ice, the ice does not freeze properly and water seeps into the layer of snow, which then becomes saturated and produces slush (Prowse and Beltaos, 2002; Bengtsson et al., 2012). This slush is commonly known as overflow, and it creates serious safety concerns for land-users who depend on stable ice conditions to travel to and from harvesting sites. Albert Nadli added:

Towards the Horn River, that's where we do our fishing... historically and today too. We set nets under the ice... some places, when you go more up river, there's lots of slush. You always run into that slush and overflow now. You know, when I was growing up you would never see overflow like that.

Thin ice and overflow create safety problems for land-users. Grand Chief of the Dehcho, Gladys Norwegian, explained:

You know at times in mid-winter, you have to be safe to be skidooring on the ice. People are now encouraging each other not to go out by themselves, you know so now you need to find a different way of going out to the land because of the unpredictable weather.

This passage demonstrates the risks associated with local food procurement and provides insight into potential adaptive measures already underway in the community. Northern Indigenous communities will need robust safety strategies to help cope with the impacts of climate change (Rosol et al., 2016). Many communities across the Canadian North are implementing innovative solutions to cope with the consequences of climate change on food procurement activities. Across northern coastal communities, adaptive harvesting practices are used to cope with the rapid biophysical changes being experienced, such as ocean warming and acidification (Kenny, 2019); while in a subarctic community, land-users are adapting their food procurement activities to include agroforestry (Tsuji et al., 2019). Joachim Bonnetrouge highlighted the dangers created by environmental changes in Fort Providence:

The Elders are saying be really careful by the creeks and the ponds, because winter freezing and fall freezing is just not the same as it was before. It's more dangerous. They're telling the people to be careful when they are out on the land. So... it's been challenging to harvest.

These impacts will only intensify as environmental change adds further stress to local ecosystems, disrupts critical habitats, and alters the hydrologic system (Emmert et al., 2007).

Interviewees also noted that breakup patterns are changing. Vice-Principal of Deh Gáh Elementary and Secondary School and Dene male Mike Leishman pointed out:

Years ago at breakup, the ice would just smash and grind up. It was loud...there were ice chunks everywhere. Now it's quiet and the ice almost melts. It was much louder before.

Gladys Norwegian supported this statement:

In my day, breakup used to be quite a powerful experience...with the ice crashing against each other. It sounded like a freight train coming down...but now, it's just not the same. It's not as spectacular...on land you just don't feel the force like you used to. The ice is now melting and rotting.

Other community members reiterated that Mackenzie River breakup conditions were not quite the same and trigger a negative effect on the hunting season. This development ultimately affects the overall access to local foods and influences the presence and availability of certain species, substantially impacting two pillars of food security. As Christina Bonnetrouge, a local Dene university student, explained:

In the spring the snow melts fast, because that is usually when my family goes out geese hunting. Now we're seeing only a week or two for hunting geese before the snow goes. The ice is breaking up really quick too. Usually they'd go out for about a month... so that time is now getting cut in half. At least in recent years, I've been noticing that.

Climate changes are impacting key harvesting periods and, because local food procurement requires seasonal activities, these changes incite some level of food insecurity. Across Canada, Indigenous communities are reacting and adapting to these seasonal changes. For example, one Indigenous community on British Columbia's northern coast that has been actively engaged in climate-related research and its impacts on seasonal harvesting is connecting traditional knowledge, policy decisions, and climate science (Marushka et al., 2019). By making these critical links to inform robust policy initiatives, Indigenous peoples can adapt food procurement activities to ensure all pillars of food security are met; for example, by adjusting harvesting times to coincide with available local foods or to alter food sources to improve the quality and quantity of foods procured (Tsuji et al., 2019).

Another barrier to local food procurement is permafrost degradation and the drying landscape. A number of interviewees mentioned the importance of stable permafrost for successful harvesting activities. Permafrost

is an important physical component of the northern landscape and plays an important role in local hydrology and ecology (Burn and Kokelj, 2009). Permafrost underlies the majority of northern communities, with Fort Providence resting on the edge of discontinuous and sporadic discontinuous zones of permafrost (Burn and Kokelj, 2009). The occurrence of permafrost degradation and a drying landscape are consistent with other studies conducted in the Dehcho Region. In Jean Marie River, NT, a study found that landscape changes induced by permafrost thawing impacted food security and traditional procurement activities such as access to camps and harvesting areas and the availability of wildlife species (Calmels et al., 2015). Two local hunters expanded this point:

As far as I remember, it must be the permafrost or whatever it is that holds the water [in the ground]. The water table I guess. I noticed the last 15-20 years, that it is no more. Those things don't exist anymore... That for me, is really significant. There was rain or snow in the spring and there is nothing around to hold the water anymore. So, that's one thing... our land is drying up.

(J. Bonnetrouge, pers. comm. 2018)

With the permafrost going away, it's really affecting the water sources. There's nothing to hold the water above ground anymore, as opposed to it sinking into the ground. Springtime, you used to have water in the ditches right up until almost June. Now as soon as the snow is gone, the water is gone too. In the springtime, there's not as much water as we would normally have back in the day. It means, less places for the birds to land, so we don't get to see them as long as we used to.

(B. Sanguéz, pers. comm. 2018)

The second quote highlights the importance of water sources for birds, particularly migratory birds. The community tends to hold culturally meaningful traditions during the periods that migratory birds routinely arrive (Andrachuk and Smit, 2012). For example, in Fort Providence, extended families hunt during the spring for geese and swans. Local food procurement relies on specific species to be present in certain areas at precise times but with changing environmental conditions impacting the hydrologic system, land-users observe changes in the abundance and distribution of wildlife. A number of interviewees also mentioned low water levels as a barrier to accessing traditional harvesting areas, which impacts food procurement. Retired Deh Gáh Elementary and Secondary School Principal, Lois Philipp simply said, "the water levels are definitely lower." Albert Nadli added:

The water levels are low...very low. In some places, where traditional harvesting areas are, it becomes hard to access especially when the water is low and the water is also more...it's warmer. Yeah, it's getting warmer.

Not only are the Mackenzie River water levels causing environmental stressors, but the warming water could have a number of effects on local fish populations. According to a few interviewees, the warming water could impact the quality of meat and consequently the level of food security in the community. Charlene Bonnetrouge explained:

At times when I go fishing, usually there's certain months, it's not that great to go fishing because the fish meat gets really mushy. That's usually at the middle of July or the end of July, because the water is warm. But, in recent years I've also noticed that the water has been very warm throughout the course of the summer.

Although the warmer water has not yet become a significant problem, warmer water temperatures could have severe consequences on food quality, access, utilization, and availability, which, in turn, create pressures on food systems, as many community members rely on foods procured locally to sustain a part of their diet. Interview data based on the experiences and observations of land-users and knowledgeable community members revealed that the hydrologic-based changes that are occurring disrupt food procurement activities. These findings are consistent with other northern Canadian communities (Galappaththi et al., 2019; Kenny, 2019; Khalafzi et al., 2019; Marushka et al., 2019).

SOCIOCULTURAL, POLITICAL, AND ECONOMIC BARRIERS TO REGIONAL FOOD SECURITY

Cultural practices, like harvesting skills, safely travelling on the land and water, food processing, and traditional knowledge of the local environment are necessary to achieve food security (CCA, 2014). Interviews elicited broad responses relating to sociocultural and economic challenges, but the following three themes were identified as fundamental barriers to local food procurement and food security in Fort Providence: non-local harvesters, changing lifestyles, and the high costs of living.

Non-local Harvesters

Many community members are averse to the increasing numbers of non-local harvesters in the area, as they add pressure on already fragile ecosystems. Lois Philipp explained, "you see a lot more people coming into the area for moose and that all affects it... the number of moose and big game out there." In addition to this new threat from non-local harvesters, many interviewees cited concerns regarding the overall number of moose in the area. As caribou populations continue to dwindle, one study found increased harvester pressure on moose populations due to limited access to caribou (Davison and Callaghan, 2019). Other areas of the NT are also experiencing low numbers of moose, and in 2017 the Inuvik Hunters and Trappers

Committee expressed the need for updated information on moose populations in order to make harvesting decisions (Davison and Callaghan, 2019). Many Fort Providence interviewees expressed similar concerns:

I noticed we haven't had any moose because of the fires. We never had moose for quite a while, after the big forest fires about... how many years ago? We've hardly had any moose around here. No moose. Nothing.

(T. Bonnetrouge, pers. comm. 2018)

Albert Nadli added, "I've noticed less animals, especially moose...for about four or five years they were hardly around." The local ecosystem is being impacted by environmental changes disrupting habitat ranges and creating drastic consequences for species survival rates. Adding to this environmental challenge, local wildlife populations have to cope with increased hunting activities. Boris Sanguet expressed his concerns:

Back in the day we would never see everyone coming up from Yellowknife, Alberta or anywhere like that. Now that's all you see, trailers, new vehicles and tons of boats. We were on the Yellowknife highway the last couple of days and counted about 20 boats passing by, trailers with quads, and side-by-sides. It never used to be that way.

Because of the direct importance of available local food sources to food security levels, it will be critical to include traditional knowledge in the decision-making process that effectively manages this increase in non-local hunters. There are several possible strategies suggested by interviewees, such as increased funding for wildlife impact monitoring on abundance and distribution, or funding for wildlife and fisheries officers, or prompting local employment opportunities for efficient management of non-local harvesters while gaining economic revenue through a tourism-based operation. Regardless of approaches taken in the future, it will be critical to gain a better understanding of the issues, while allowing local opinions, experiences, and perspectives to guide the discussions and decision-making processes.

Changing Lifestyles

Across the North, communities are witnessing high market food consumption rates, which directly impact traditional and culturally orientated lifestyles. For example, although some of the younger community members indicated they enjoyed harvesting and hunting, food procurement may be more of a hobby and less of a viable and sufficiently lucrative food source (Canada's Public Policy Forum, 2015). This does not mean that local food procurement discourages food security initiatives; on the contrary, the importance of food procurement practices for community-wide resilience and adaptive capacity to climate

change cannot be overstated. In many rural communities across northern Canada, adaptation to the environmental impacts of climate change are especially important, given that communities share many of the same socioeconomic vulnerabilities. These vulnerabilities include little or no waged economy; a remote location, often with dependence on air or water transportation; unreliable and expensive power generation; and a lack of infrastructural capacities (Berner et al., 2016). These vulnerabilities impact access, availability, utilization, stability, and quality of market foods and make local food sources a welcomed and resilient substitute.

Engaging in food procurement activities helps support aspects of food security by encouraging the transmission of cultural and ecological knowledge, which ensures the stability pillar of food security. Regardless of the quantity, local food procurement addresses short-term manifestations of food insecurity, such as hunger and a lack of nutrients. Many studies highlight the benefits of eating locally procured foods as nutritionally dense and a healthy source of micronutrients including vitamins, trace elements, and minerals (Rosol et al., 2016; Robidoux and Mason, 2017; Daigle et al., 2019; Herrmann et al., 2020). One study found that because of the restricted access to caribou in northern Canada, due to many interconnected causes, the nutritional health and well-being of rural Indigenous communities are being impacted (Kenny et al., 2019). By consuming a higher rate of locally procured foods, community members can reduce their purchase of market foods and experience potential physical health, spiritual wellness, and other socioeconomic benefits. As Boris Sanguéz indicated, “there is some stuff that you do need from the store... but, I still prefer my wild game over store-bought food any day.” Joachim Bonnetrouge agreed and explained:

I grew up eating squirrel, muskrat, lynx, and of course fish all the time. One of my uncles was a really good hunter too, so we always had moose meat. But now, our daily diets are not quite the same.

Boris Sanguéz added, “if I can’t get a moose, then I guess it’s basically... I’m going to eat a lot more store-bought foods. You know, it is a little bit pricier and not as healthy.” It is important to note that locally procured foods cannot sustain an entire diet, therefore community members must, at least partially, rely on expensive market foods. Local food procurement has considerable economic costs associated with, for instance, hunting and fishing (Randazzo and Robidoux, 2019). Also, based on human energy requirements alone, communities would need to regularly procure sizeable amounts of local foods to satisfy minimal nutritional requirements (Pal et al., 2013; Randazzo and Robidoux, 2019). However, this does not detract from the significance of locally procured foods in northern Indigenous diets, nor does it diminish the fact that community members are fiercely proud of their local food consumption. The importance of locally procured foods

to diet and community pride is linked to their support for cultural and linguistic continuities, as these practices are associated with the transmission of cultural knowledge. Christina Bonnetrouge noted the importance of locally procured foods in her diet:

It is very important for me to keep eating wild foods. I would actually prefer, if I had it my way, I would prefer to eat wild meat over store-bought.

Overall, the taste preferences of community members tend to favor locally procured foods. Christina Bonnetrouge is a younger member of the community, yet she still prefers local foods. Ensuring traditional food procurement knowledge and harvesting continues into future generations may combat food insecurity and address pressing environmental issues. This finding is mirrored by other studies that highlight the cultural importance of locally procured food and the significance of connecting generations of youth and Elders within Indigenous communities to sustain cultural practices and to ensure cultural continuities (Daigle et al., 2019).

As in other northern contexts, Indigenous communities are involved in fewer local food procurement activities in part due to the generational impacts of colonial policies of repression. These policies directly targeted Indigenous subsistence practices and Indigenous relationships with local ecosystems (Mason, 2014) and have eroded the health and integrity of the Indigenous cultures, ecosystems, and social structures that are integral to maintaining land and food systems. Regardless of these changes, locally procured foods remain socially and culturally important, even amongst the younger generation, a fact reflected unanimously by the three university students who participated in this study. Although they indicated their preference for locally harvested foods, they revealed it is not always available, nor do they possess the necessary skills to procure it themselves. Dene youth and fourth-year university student Bradley Thom explained that during the fall hunting seasons, he is away at university and unable to participate. In general, for northern students attending post-secondary school outside their home community, it can be challenging to access locally procured foods or participate in harvesting activities. This challenge creates a disconnect with traditionally important foods that help shape and sustain cultural practices.

I don’t get out [on the land] as much as I’d like to. I guess just with coming to school for the last few years... I’ve really missed it. September is usually when it’s moose hunting season, so I’ve been missing out on that. But I’m always there for the spring, when we fish and the graylings come out – they’re the best! But in the winter time... I haven’t done as much trapping as I would like... .

(B. Thom, pers. comm. 2018)

This passage highlights the contemporary complexities for northern Indigenous youth. Michael McLeod added:

Many of the different tribes of the Northwest Territories are saying that our youth have a huge responsibility now... because not only are they expected to live in the world of their Indigenous ancestors, where they know the language and all the practices...and they've got to know that, because they are going to be the stewards of the land. But now...they are expected also to survive in the modern society. They have to get an education... and the Elders are saying that an education is our way forward. But you've got to know both. The Tlicho say, you got to be strong like two people. What that means is, we need to have more opportunities for people to be out on the land, knowing where their traditional sites are... knowing where the portages are...you know all that stuff.

Michael McLeod explained the many difficulties present for Indigenous youth across the North and described the importance of encouraging youth to simultaneously pursue educational opportunities and cultural practices to support their language, identity, and traditional ways of life. This will be a key step forward to address food insecurity in the future, as cultural continuities are supported by the stability pillar of food security. This finding is reflected in other studies on Indigenous youth across northern Canada (Daigle et al., 2019; Settee and Shukla, 2020). Michael McLeod explained:

If you are not out there on the land, touching, holding and feeling it, you're not going to know what it's like then you're not going to be able to communicate it well. So... on-the-land programs and language programs, all these things are needed. It's going to be up to our young people, they will have the skills required from post-secondary, universities or colleges to help do it. We got to make people proud of who they are, proud of their language, proud of their culture.

The skills and knowledge transferred through local food procurement remain a critical aspect to support food security initiatives and community-wide resilience to eroding cultural skills, languages, and environmental changes.

Through the voices of local community members, it is clear there is a deep spiritual and traditional connection to local food. Furthermore, many community members recognize that food is more than the substance that nourishes and sustains life—it is a traditional and spiritual connection to the land that goes deeper than simply the notion of food. As Bradley Thom noted:

It's about reconnecting with the spirituality of giving back to the land... life is all about reciprocal relationships. It's all about give and take. If we take from the land, we must give back.

This interpretation provides insight into the interconnected nature of food security within a northern Indigenous context, suggesting that local food procurement helps to address pressing food security issues by supporting culturally relevant food-related activities. Many interviewees expressed their deep connection to the land and the cultural associations with local foods. Community member M. Nadli described:

It's the spirit of the land. You know, people are much healthier when they eat freshly harvested moose meat, it has a lot of protein and iron in it. You become what you eat, and basically, you become the spirit of the land. When you eat fresh fish and fresh ducks, your spirit becomes strong... so that's what it's all about.

This explanation speaks to the complex relationship surrounding local food procurement and food security, as it becomes less about the food itself and more about what food represents in regard to cultural resilience and cultural continuity. In a northern Indigenous framework, the dimensions of a natural environment and of a culture over time define the food system and contribute to individual and community health. This contribution is not only in the sense of physical health, but also emotional, mental, and spiritual aspects of health, healing, and protection from disease (Kuhnlein, et al., 2009). Although the interviewees did highlight a number of local food procurement challenges and opportunities, their discussions demonstrate the resilience of the community through the continued consumption and preference of harvested food sources.

The High Cost of Living

It cannot be overlooked that a key factor in determining overall food security is income (Skinner et al., 2013; Chen and Natcher, 2019). Food insecurity typically results from a household's inability to access food for financial reasons, so it is not surprising that income is the strongest predictor of food insecurity in Canada (Willows et al., 2009; Tarasuk et al., 2016; Bhawra, et al., 2017). This fact proves accurate for northern Indigenous households in a number of ways, as food security is highly dependent upon socioeconomic factors, such as being able to purchase market foods or equipment for harvesting. In Fort Providence, the rising price of gasoline remains a crucial economic challenge. Most residents in northern communities rely on motorized transportation for food procurement, and studies highlight the disruption that rising fuel prices have on subsistence lifestyles (Brinkman et al., 2014). Elder Laura Sabourin explained this local reality:

I would say that the number one thing would be money, like to buy boats, kickers, skidoos, gas, snare or guns... you need money to buy all these things. But most of the guys are pretty good, if they know somebody wants to go hunting they will ask that person to go with them.

They're good that way, you know. Nobody ever says, no just stay home because you don't have nothing. My brothers do that all the time... they get these young guys to go out with them and they teach them.

The community is already employing adaptation strategies to ensure cultural resilience and the transmission of traditional knowledge. The informal strategy employed by community members includes sharing resources to support harvesters. Despite this, livelihoods and the economic capacity of local individuals are greatly influenced by the high cost of living and the variability of employment opportunities within the community, which ultimately impact food security. The prevalence of sociodemographic risk factors for household levels of food insecurity is higher for Indigenous households, which are more likely to have three or more children, be a single parent household, not have homeownership, and be in the lowest income category in comparison to non-Indigenous households in Canada (Willows et al., 2009). These risk factors influence a family's ability to access locally procured foods. Charlene Bonnetrouge explained a specific sociodemographic risk, as it relates to Fort Providence's level of food security:

Some people don't have boats, some people don't have quads or can't afford gas. Especially affording gas, for as many times that you have to get out and check your nets and traps. I think that might be a reason why people don't go out as much as they used to. You know, or it's just maybe the next generation, because I don't see much of our younger people going out to do stuff traditionally.

It is simply easier and potentially economically cheaper to purchase market foods. The need for financial income is necessary in the Canadian economy; however, participation in employment, education, and training allows less time and flexibility for harvesting (Andrachuk and Smit, 2012). This reality may suggest a linear relationship between unemployment rates in small communities across northern Canada and food procurement activities. If unemployment rates decline, so would food procurement, which may correlate to higher food insecurity rates. The increasing costs of hunting, fishing, and gathering, combined with low-income levels, limit many Indigenous harvesters' land-based activities. At the same time, those engaged in the wage economy may have the resources but lack the time required for food procurement practices.

Locally procured food may provide community members with some returns, such as selling food resources or trapping fur-bearing mammals, such as martens, muskrats, and beavers (Wesche et al., 2016). Trappers must spend days on the land checking traps and processing pelts, which requires a particular skill set and traditional knowledge of bountiful harvesting areas. However, as Albert Nadli stated, "one of the challenges is dropping fur prices." With

fewer economic incentives now than in previous decades, communities are participating in less trapping activities, which may correlate to higher rates of food insecurity. Across the NT, trapping remains mainly a part-time hobby, however, it plays a minor role in income supplementation activity for about 650 active trappers (GNWT, 2008b; Wohlberg, 2015). While trapping plays a marginal role in overall local food procurement initiatives, it still has many sociocultural and economic benefits.

Years ago, I used to trap for lynx. Back then one pelt would be \$1200 or something like that. I would eat the lynx meat too, eh. Lynx meat is good, because it eats mostly just rabbits, so it's good meat. It just eats rabbits so there's no harm in eating lynx. I still do some trapping in the winter. Now I usually go for martins.

(A. Nadli, pers. comm. 2018)

The prices used to be pretty good, you know back in those days. But today, for a lynx... you used to be able to land about \$1000 bucks, it was awesome, but like way back in those days. I'm not sure what today's prices are, you know. You could get about \$160 or close to it for a martin, I think back then. I saw the prices posted recently, and it's about \$80 bucks now. That's half of what it used to be.

(B. Sanguet, pers. comm. 2018)

The reduction in economic incentive to trap certain furbearing mammals, which also provide subsistence, creates a number of challenges. Theresa Bonnetrouge explained that her husband does trap less, and now it is more about food procurement and personal enjoyment:

My husband goes trapping every year, every winter. He goes across to our camp. He's been out there trapping for a while, he's set some rabbit snares and if he does catch a rabbit, he'd bring it home and we'd eat the rabbit. Or chickens, he goes for wild chickens.

Despite the drop in market demand for mammal furs, many trapped species provide economic value and a source of food, creating a two-fold reason to maintain trapping as a vital traditional food security measure to address both sociocultural and economic barriers. For many Indigenous communities across northern Canada, ongoing socioeconomic challenges influence land and resource use patterns and impact the ability of communities to adapt to environmental change (Wesche and Armitage, 2014).

Typically, salary employment involves a 9 a.m. to 5 p.m., Monday to Friday work week. In Fort Providence, community members who work salary employment can find it difficult to access the land. M. Nadli explained further:

I try to [get out on the land]. I really try to, but its work and lifestyle. This weekend I was back in [Fort]

Providence. I went for a ride to Bouvier Creek on the highway. That's the only time I have. I'm kind of an urban hunter, hoping a moose will just cross the highway and I can get a chance to shoot it. But it didn't happen. You know, I sold my boat. I had a quad and skidoo, but I sold all of that. I hardly do that anymore.

This explanation illustrates the complexities of employment and traditional activities and suggests that food procurement is changing. Individuals engaged in salary employment may have the economic resources to address food insecurity levels via market foods, but lack the time required to efficiently and adequately procure foods, which ultimately results in loss of traditional knowledge. Full-time employment limits the ability of community members to access the land and can have other unintended impacts on local ecosystems.

[Employment] makes it hard to check the trap lines. Then people start to harvest closer to town because they can't get out for as long ... which means the areas closer to town are being overharvested.

(N. Bastedo, pers. comm. 2018)

The inability of the community's youth to find opportunities to get on the land could result in gaps in the harvesting knowledge required to be successful in these practices. Livelihoods in Fort Providence are characterized as a mixed economy and incorporate land-based income and salaried income. Like many Indigenous communities throughout rural Canada, many northern communities face pressures due to the dwindling participation in traditional harvesting and lack of consistent full-time employment opportunities (Andrachuk and Smit, 2012).

CONCLUSION

By identifying the opportunities, barriers, and gaps in realizing food security, this paper examines the complexities of local food procurement in Fort Providence. Our objective was to identify the shifting environmental, sociocultural, economic, and political challenges to regional food security. By documenting the perspectives, experiences, and knowledge of community members, this research can help tailor food procurement activities to meet localized needs. Many interviewees highlighted the importance of traditional foods and associated activities, which aligns with studies demonstrating the significance of locally procured foods to the overall health and cultural well-being of northern Indigenous peoples (Pal et al., 2013; Robidoux and Mason, 2017; Kenny et al., 2018; Thompson et al., 2018). The procurement, sharing, and consuming of local foods play an integral part in Indigenous cultures and identities.

Indigenous peoples in Fort Providence depend upon the local environment for subsistence, and changing

ecosystems, unpredictable weather patterns, and rising costs of living, leave the community susceptible to the negative impacts of climate change. Moreover, the many sociocultural and economic complications presented in this paper add another dimension to the climate change discussion and provide a deeper understanding of the interconnected impediments to food security. In this paper, we demonstrate the influence of environmental changes on Fort Providence residents' consumption and overall procurement practices, as land-users are forced to adopt novel practices to respond to the changing availability of land-based foods. As environmental changes intensify, local food procurement activities must adjust or cope with the consequences of climate change. Despite the complexities discussed in this paper, northern Indigenous communities will need to adapt to environmental changes dynamically. This adaptation must be guided by local perspectives, opinions, and experiences that should lead the discussions and efforts to improve food security across northern Canada.

Robust and effective policy outcomes must be driven from local perspectives and incorporate traditional knowledge; therefore, this study's results should be considered in future food-related policy development in the Dehcho Region. The importance of lived northern experiences and traditional knowledge in defining and addressing issues surrounding food security is a crucial gap in the literature (CCA, 2014). Land-users are crucial knowledge holders and play a critical role in the understanding of shifting climatic conditions. Elders also remain central to the support of cultural continuities and the transmission of traditional knowledge. This valuable knowledge reinforces the significance of these key voices in decision-making processes. Elders' intimate familiarity with the land is based upon long-term empirical observations suited to local conditions, which enable Indigenous peoples to identify and respond to environmental changes (Mazzocchi, 2006).

The findings from this research address gaps in previous research by using local perspectives to direct the research project and highlight the issues deemed most critical by participants. The situation in Fort Providence is not dissimilar to other Subarctic and Arctic communities in northern Canada, as highlighted throughout this paper. Consequently, our research adds to the body of knowledge that helps encourage innovative solutions, unique program opportunities, and robust policy outcomes to create meaningful change that will be experienced across the North. In the short-term, there must be a focus on sharing traditional and scientific knowledge in decision-making processes on the management of the health and status of wildlife populations that communities depend upon for subsistence. In the long-term, there should be an emphasis placed on local and decentralized policy development to increase the adaptive capacity of communities. Environmental changes around the Mackenzie River have significant impacts on food security, health, and well-being

of both humans and ecosystems, as well as links to cultural identities (Wesche and Armitage, 2014). Our research provides insight into the current state of food security in Fort Providence, while emphasizing the opinions and needs of knowledgeable community members and land-users.

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