# EXAMINING LOCAL FOOD PROCUREMENT, ADAPTIVE CAPACITY AND RESILIENCE TO ENVIRONMENTAL CHANGE IN FORT PROVIDENCE, NORTHWEST TERRITORIES

by

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## ABSTRACT

Rural Indigenous communities across northern Canada are experiencing high rates of food insecurity as a result of interconnected socio-cultural, economic and environmental challenges. The loss of traditional ecological knowledge, high costs of market foods and lack of infrastructural capacity are creating multifaceted barriers for isolated, northern communities. Climate change is impacting the ability of northern Indigenous communities to acquire, access and utilize food that is culturally relevant and sustainable. This research explores local food procurement activities in the community of Fort Providence, Northwest Territories. The objective of this research was to consult with key community members to understand the detrimental effects of climate change on land-based food procurement, but also to understand the complex socio-cultural, economic and environmental challenges related to food security. This study utilizes Indigenous Methodologies to guide all aspects of the research. Evidence was collected using semi-structured interviews with Elders, land-users, and knowledgeable community members. The benefits and difficulties of engaging in land-based and alternative food procurement were key topics explored. Strategies to manage food insecurity, to promote local food procurement and to create a clear picture of community perspectives in addressing constraints to adaptation, were also considered. The results inform policies that reflect the needs of local residents, address the distinct socio-cultural and economic barriers to procure local food and support overall community resilience and adaptive capacities to environmental changes.

**Keywords: food security, climate change, Indigenous, rural communities, sub-arctic**

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## DEDICATION

*This thesis is dedicated to my mother, Ursula Ross. I truly appreciate and treasure all you do and all you continue to do for me. Thank you for inspiring my endless passion for food, the north and the outdoors. I would not be here without your unconditional love, encouragement and support.*

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# CHAPTER 1: INTRODUCTION

Food security challenges resulting from climate change 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, socio-cultural and economic access to sufficient and nutritious food to meet dietary needs (FAO, 2017). The widespread potential risks associated with climate change will further exacerbate ongoing social vulnerabilities related to food security. The need to adapt to these environmental changes remains inevitable (Adger, Nuq, Brown, Conway & Hulme, 2003). Countless stakeholders across the world have studied the compounding impacts of global food security, understanding that the majority of food insecure individuals live in low-income and rural regions of the Global South (FAO, 2017; IPCC, 2014; Sarkar, 2016). However, even as a wealthy nation, Canada still faces significant food security challenges that are disproportionately affecting northern Indigenous[1] communities (Council of Canadian Academics, 2014; Inuit Circumpolar Council, 2012). The Northwest Territories (NT) has the second highest rate of food insecurity of in Canada (Tarasuk, Mitchell & Dachner, 2016).

Food security issues across northern Canada are complex, and there are many contributing socio-economic and environmental factors, such as climate change which is placing stress on food insecure northern Indigenous communities. This is impacting local ecosystems, traditional lifestyles and land-based subsistence (GNWT, 2008). Climate change is also burdening the global food system, and for northern Indigenous communities, costs are rising while the quality of store-bought foods are declining. Shifting environmental conditions

[1] Currently in Canada, "Indigenous" has become the more useful term to collectively refer to First Nations, Métis and Inuit peoples. Attention to commonly used terminology of self-appellations is also critical to recognize the diversity of Indigenous languages, peoples and cultural groups in Canada (Mason, 2014).

could create potential agrarian opportunities as growing seasons and climates could become more favorable to alternative food procurement and agriculture. On the other hand, climate change is expected to bring erratic weather patterns and extreme climatic events, which will likely become problematic for agricultural opportunities in the north (Walsh et al., 2014). Regardless, this emphasizes the need for continued research to reduce the effects of climate change on food security, while promoting locally procured foods.

Scholarly research of the impacts of climate change on food security often revolves around Arctic communities, with less work conducted in the sub-arctic (Andrachuk & Smit, 2012; Council of Canadian Academics, 2014; Powers, 2008; Ford & Smit, 2004). This study addresses this gap in academic literature by highlighting the community of Fort Providence, located in the southern part of the NT. There is insufficient research that examines the extensive challenges that climate change is placing on local food systems in the NT. Also, there is a lack of research on the socio-cultural, economic and environmental barriers facing rural communities, in regards to adapting food systems to meet the unpredictable demands of climate change. This study adds to the body of academic literature by providing an overview of local food procurement in the community of Fort Providence by examining community adaptive capacities to environmental changes.

In terms of governmental support for food security in the NT, there has recently been significant federal and territorial resources allocated for agrarian opportunities. With programs like Growing Forward or funding opportunities for existing organizations like the Northern Farming Training Institute in Hay River, government backing for localized food procurement is building. For example, the Canadian Agricultural Partnership, is a joint policy framework between the Government of Canada and the Government of the Northwest Territories (GNWT), which provides the NT a multitude of agricultural training programs and resources

(Canada Agricultural Partnership, 2018). In May 2018, the GNWT announced a 5.6-million-dollar investment in agricultural opportunities in the NT (Maher, 2018). While this funding is significant, it is equally important to tailor these funded programs to meet localized needs. This means that academic research must strive to collaborate with communities directly to document local perspectives for robust policy-outcomes that effectively support community needs. This study adds to the growing body of scholars who support food security research in the NT, and adds context to policy development by emphasizing the importance of local voices in decision-making processes. While these resources are primarily agricultural strategies, traditional food systems remain extremely important to Indigenous communities across the north. Harvesting and food preparation activities bring communities together, which helps to maintain social relationships, facilitate knowledge transfer and sustain spiritual connections with the land (Schuster, Wein, Dickson & Chan, 2010). The GNWT provides funding for traditional food procurement activities and policy strategies like the Sustainable Livelihood Action Plan, which supports an array of traditional activities (GNWT, 2019). This study is timely due to the ongoing federal and territorial funding opportunities as well as the localized support for food procurement activities.

This research utilizes Indigenous Methodologies to guide all aspects of the study. Evidence was collected using semi-structured interviews with Elders, land-users and knowledgeable community members. This research identifies the shortcomings to local food procurement and recognizes the multifaceted challenges of food insecurity. The results will guide policies that reflect the needs of local residents and address the distinct socio-cultural and economic barriers to engage in local food procurement, while supporting overall community resilience and adaptive capacity to environmental changes. In this thesis I argue that local food procurement is a critical aspect to support food security initiatives, community-

wide resilience and adaptive capacities to environmental change in Fort Providence, Northwest Territories. Chapter 2 investigates the fundamental research question: What are the impacts of climate change on local food systems and what are the barriers to, or opportunities available in, current food procurement programs? Chapter 3 addresses the question: Do local food procurement strategies help increase community adaptive capacity and resilience to climate change?

**Community Profile: Fort Providence, Northwest Territories**

For thousands of years, Indigenous people have lived and prospered on the lands we now call the Northwest Territories. Before colonization, the Dene people hunted, gathered and survived off the bounties of their vast lands. The land near what later would become Fort Providence was traditionally used as a lucrative fishing spot, and was in close proximity to good hunting and trapping areas up stream, near the Horn River Delta (see Appendix A). As colonization and fur traders began to makes their way to the NT, everything began to change. In the early 1700s European goods were beginning to be traded far inland, and this had a transformative effect on traditional ways of life for the Dene people, specifically in terms of harvesting resources (Laura Sabourin, personal interview, 2018).

By the 1860s, Roman Catholic Oblates began to settle in Fort Providence, building a mission, and later a boarding school and an orphanage, all of which were maintained and managed by the Grey Nuns (PWNHC, 2019). In 1887, a Hudson Bay fur trading post was established in Fort Providence (Usher, 1971). The community has since acted as a hub for goods and people in the region **(**Wesche, O'Hare-Gordon, Robidoux & Mason, 2016). The Dene name for Fort Providence is Zhahti Koe, which means mission house and this speaks to the significant role that the mission played throughout the history of the community. As

community members noted, the mission, its potato fields, and the social impacts it and the Grey Nuns had on the local residents remains an important history (Alex Arychuk, personal interview, 2019). Throughout the mission's existence, the Grey Nuns cultivated extensive garden plots, growing mainly potatoes, with the assistance of local Dene and Métis students. In some cases, these colonial interventions have contributed to the alienation of Indigenous school children from their culture and traditional ties to the land. Consequently, residential schools and missionary influences impacted rates of food insecurity. Research has demonstrated how the use of food activities as forms of punishment severed the intergenerational transmission of ecological knowledge that could only be learned through observation and practice (Leblanc & Burnett, 2017). For example, residential schools often punished children with intensive labour in gardens for various infractions relating to the expression of their culture.

Fort Providence is a small Dene-Métis community with approximately 800 residents (Northwest Territories Bureau of Statistics, 2016). The municipality (61.35º N, 117.66º W) is situated along the banks of the mighty Mackenzie River and is positioned several kilometers downstream from Great Slave Lake (see appendix A). The community has a local hotel, two small grocery stores, a health care center, a multipurpose sports center which includes an ice pad, fitness facility and swimming pool, a territorial campground, as well as two small family restaurants. One of the newest infrastructure developments in the region is the Mackenzie River bridge which was completed in 2012. It is the only bridge across the Mackenzie River and the longest bridge in northern Canada (GNWT, 2018). Fort Providence is one of the few communities in the NT with all-weather road access linking the community to hubs such as Yellowknife and Hay River.

Located in the southern Deh Cho region of the NT, Fort Providence is situated within the Taiga Plains Ecozone, which is characterized by a semi-arid and cold climate, typically marked by long and cold winter seasons with short and warm summers (Government of Canada, 1986). One of the reasons the community was initially erected at this location was due to its proximity to several bodies of water that provide land-based foods year-round. For example, a freshwater delta is positioned close to the community and forms into Mills Lake, and this is where the Mackenzie River widens at the mouth of the Horn River. This area has important historical and cultural significance and related human presences, but is also a key stopover for birds on all four major continental flyways (ESTR Secretariat, 2013). The Horn River Delta 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). Many Fort Providence residents continue to also rely on the surrounding environment to access wild foods, including semi-aquatic species, freshwater fish, caribou and other small game.

## Literature Review

### *Contextualizing Food Security and Food Procurement*

It is critical to contextualize food security and food procurement to gain a deeper understanding of these two interwoven concepts. In general, the concept of food security is framed around the Global South and is embedded in dominant neoliberal and globalized discourse surrounding agriculture, global hunger and poverty (FAO, 2017; Campbell et al., 2016). The notion of food security is typically paired with discussions surrounding severe hunger, malnutrition, agriculture constraints, climate change, and a number of other socio-economic challenges (FAO, 2017). This leads to the general view that food security is not a

significant issue in a wealthy and westernized country such as Canada. However, many Canadians, in each province and territory, experience elements of food insecurity (Tarasuk et al., 2016). Over the past decade, researchers and countless stakeholders attempt to address the complexities associated with food insecurity. This requires a multidisciplinary approach from an array of actors: locally, regionally, nationally and globally.

Due to the emergence of centralized distributors for market foods, the lack of local food infrastructure, the loss of traditional harvesting and land-based knowledge, and the dominance of corporate food service companies, food is now commonly sourced worldwide (Adger et al., 2009). This global food system is highly unsustainable, one of the biggest polluters, and is riddled with severe inequalities (Smit et al., 2014). The Food and Agricultural Organization (FAO) of the United Nations identifies four food security pillars: availability, access, utilization and stability (2017). Food access, for example, looks different for communities and nations across the globe. In Canada, for instance, the price of food is predicted to increase by up to 3.5% in 2019 (Charlebois et al., 2018). As northern Canada already struggles with a food insecure population, due in part to access, the increase in food prices will only reduce market food availability for low-income families. Food availability relates to supply levels of food (FAO, 2017). For example, the availability and abundance of a certain species of fish that communities rely on. Food utilization is understood as the metabolism of food (FAO, 2017). In the context of Fort Providence, this means preparing, processing and cooking culturally appropriate land-based foods like rabbit, moose or beaver. Traditional knowledge of food processing is eroding with younger generations of Indigenous youth which creates serious concerns for food security levels and cultural continuities (Michael McLeod, personal interview, 2018). Finally, food stability refers to the capacity of an individual or household to attain food overtime (FAO, 2017). As climate change continues to add stress on wildlife

populations, the stability of land-based foods is at risk. A key pillar lacking in the FAO's understanding of food security, is food quality. Concerns regarding the quality and health of land-based foods were raised by participants of this study. The Nunavut Food Security Coalition outlined quality,[2] of both land-based foods and the nutritional quality of market foods, as a key pillar to attaining overall food security (2014). Understanding the links between environmental change and food security in Fort Providence is crucial to strengthen community adaptive capacity and determine effective options in the future (Wesche & Chan, 2010).

The contextualization of food security aligns with the human right to food and forms a part of global grassroots resistance to the effects of international food systems, policies and prices (Jarosz, 2014). Food security in an Indigenous context can encompass the protection of natural resources, including seeds and biodiversity; protection of traditional knowledge; and working for real democratic control of communities, nations and food sources (La Via Campesina, 2014). Additionally, it addresses the underlying issues impacting Indigenous people in Canada and their ability to respond to their own needs for healthy, culturally adapted traditional foods (Indigenous Food System Networks, 2018). Indigenous food related knowledge, values and wisdom has built up over thousands of years and provide a basis to identify the impacts of climate change on local food procurement activities (Indigenous Food System Network, 2018). These food-based activities are accompanied by notions of self-governance, decolonization, food sovereignty and the reclaiming of Indigenous rights, territories and freedoms. Food sovereignty[3] is essentially groups of people making their own decisions about their own food systems, and in an Indigenous context aligns with a longer

[2] For the purposes of this thesis, food security will be conceptualized using the four pillars outlined by FAO.

[3] I use the term "local food procurement" when talking about increasing locally produced food. I chose to use this term as opposed to food sovereignty because locals tend to refer to food procurement when discussing methods of acquiring food.

history of resistance to the colonization of Indigenous space and places (Grey & Patel, 2015). For the purposes of this thesis, food sovereignty will be conceptualized as the right of all peoples to define healthy and culturally appropriate food sources that are produced through sustainable methods. This notion develops a model of small-scale sustainable production, benefiting communities and local environments, and puts the aspirations, needs and livelihoods of those who produce, distribute and consume food at the heart of food systems (La Via Campesina, 2014).

Food security cannot be accomplished without the tool of food procurement. Procurement is defined as the purchase of goods and services (Oxford English Dictionary, 2019), normally obtained at the lowest possible cost in consideration with other qualifiers, such as the quality of the product (FAO, 2017). Consequently, grassroots movements worldwide have emerged to resist the corporate, colonial, globalized food system in exchange for local, sustainable, culturally relevant foods. Food procurement simply means the purchase of, or obtaining of, food. This can happen in a number of ways. In Fort Providence, and for the purposes of this thesis, local food procurement refers to two distinctive categories: land-based foods and alternative foods. Land-based foods include 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, or wood bison; as well as numerous plants and herbs (Wesche et al., 2016). In addition to land-based procurement, sustainable agriculture in the form of community gardens and greenhouses is slowly emerging in many northern communities as an alternative solution to the limited availability of nutritious market foods (Thompson, Mason & Robidoux, 2018). Alternative food procurement includes food grown locally; for example, farming a plot of land or growing vegetables in a greenhouse, community garden, or using hydroponics.

Alternative food procurement also includes techniques such as rooftop growing, vertically-integrated growing, small-scale animal husbandry, or growing food in shipping containers (Tuijl, Hosper & Van Den Berg, 2018). While not all of these models are employed in Fort Providence, it is critical to note that local food procurement remains a micro-piece of the solution for food security. It is vital to understand that alternative food procurement is not the same as industrial farming or large-scale, commercial animal husbandry. Alternative food procurement can include elements of larger-scale agriculture, but is typically conducted on much smaller plots of land and the food grown is usually consumed locally and not sold wholesale. While these models of food procurement are undoubtedly noteworthy, research indicates that the net cost of procuring land-based foods is comparable to market foods (Thompson et al, 2018). The combination of market foods and land-based harvested foods make up the majority of foods consumed by many northern Indigenous communities, as is the case in Fort Providence. The conceptualization of food security in Fort Providence centres around a model of small-scale sustainable procurement, mainly through land-based harvesting, but slowly is beginning to include once again, alternative food procurement practices. This creates a multitude of benefits for the community, such as supporting the aspirations and needs of local food procurers.

*Climate Change Impacts on Northern Food Security*

A considerable amount of research has been conducted on arctic food security that demonstrates the detrimental effects of climate change on food sources (Andrachuk & Smit, 2012; Gerlach & Loring, 2013). Literature on food security in the NT is typically framed around the context of remote fly-in communities (Rosol, Powell-Hellyer & Chan, 2016), with substantially less literature available concerning Indigenous food security in the NT sub-arctic

and Taiga Plains Ecozone (Spring, Cartern & Blay-Palmer, 2018). Indigenous communities across northern Canada rely on a combination of traditional land-based foods and market foods, with diets becoming increasingly reliant on market foods (Skinner, Hanning, Desjardins & Tsuji, 2013). The residents of Fort Providence maintain many traditional practices and continue to be supported by land-based foods.

The importance of traditional land-based foods to the overall health and cultural well-being of northern Indigenous people's is widely recognized, while the procuring, harvesting, sharing and consuming of land-based foods play an integral part in local cultures (Gerlach & Loring, 2013; Rosol et al., 2016; Springer et al., 2018). There appear to be a growing number of barriers related to land-based food procurement for northern Indigenous communities, including gaps in traditional ecological knowledge[4], economic costs associated with procurement, and risks associated with environmental change and land-based harvesting (Robidoux & Mason, 2017; Skinner, et al., 2013; Springer et al., 2018). Climate change remains a significant stressor to local ecosystems and food security across northern Canada, particularly amongst Indigenous communities who rely heavily upon their local environment. According to the Government of the Northwest Territories (2008) Climate Change Impacts and Adaptations Report, plants, animals and people that live in the north have adapted to the cold climate and depend on the cold stable conditions to maintain the circumstances they need to be successful. This report is mirrored by countless international documents that outline the detrimental consequences of rapid environmental changes, which impact a wide range of species, ecosystems and those who depend on them (IPCC, 2014;

[4] Traditional ecological knowledge and traditional knowledge are sometimes used interchangeably throughout the thesis. However, there is a slight difference with the two terms. Traditional ecological knowledge refers to specific environmental and ecological knowledge spheres, whereas traditional knowledge encompasses more general Indigenous knowledge at localized levels.

Wesche & Armitage, 2014; WWF Canada, 2017; GNWT, 2016; Godfray et al., 2010). Stressors to northern Indigenous food security will continue to intensify alongside environmental changes, causing additional pressure on already fragile and volatile ecosystems, traditional land-based food sources and the global food system.

Food insecurity typically affects individuals with high levels of poverty, and in Canada, this correlates to the food insecurity challenges experienced disproportionally by Indigenous communities (Council of Canadian Academics, 2014; Tarasuk et al., 2016). Rapidly increasing fuel prices, reductions in global agricultural yields, and growing demands for food by emerging economies and growing populations will cumulatively influence the cost, quality and access of market foods transported north (Inuit Circumpolar Council, 2012; Godfray et al., 2010). In general, store-bought foods across northern Canada are quite expensive. Most research conducted on this topic focuses on isolated northern communities that rely on air freight shipments and ice roads for perishable food supplies (Barbeau, Oelbermann, Karagatzides & Tsuji, 2015; Skinner et al., 2016; Rudolph & McLachlan, 2013; Kenny, Wesche, Fillion, MacLean & Chan, 2018). Northern communities with all-season road access certainly fair better; however, market foods in the north remain inevitably expensive. Although Fort Providence has all-season road access, food prices are approximately 35% higher than in Yellowknife, the capital of the Northwest Territories, which is located further north (Northwest Territories Bureau of Statistics, 2016). Despite governmental subsidies and local efforts, the price of nutritious foods in northern Canada remain out of reach for many Indigenous households (Council of Canadian Academies, 2014; Galloway, 2017).

It is widely accepted that climate related changes are creating considerable stress on agricultural crop productions around the world, while concurrently adding to anthropogenic climate change (Campbell et al., 2016; Kulak, Graves & Chatterton, 2013; Garnett, 2011;

Rotter, Hohn & Fronzek, 2012). Global populations are expected to grow significantly, which will increase the demands on the global food system. Subsequently, food producers are experiencing greater competition for land, water and energy, causing negative effects on the global environment (Godfray et al., 2010). These complications to the global food system will be felt in remote, northern communities in a number of ways. As Indigenous communities across the NT rely on both traditional and market foods, it can be argued that climate change is a significant driver to food security challenges in Fort Providence. There are many complications associated with transporting store-bought foods to northern Canada, harvesting land-based foods, and locally growing and procuring alternative foods.

*Adaptive Capacity and Food Procurement*

Although projections of climate related changes remain uncertain, they will nonetheless provide widespread challenges. These varied global complications can include water shortages, natural disasters and food insecurity, which will negatively affect human health and well-being (Adger et al., 2003). For northern Canadian communities, this requires proactive development of adaptive capacity to respond to these environmental constraints. Adaptive capacity is the ability of a system to adjust to climate change, to manage potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC, 2018). By using community vulnerabilities as drivers for adaptive capacities, food insecurity in Fort Providence can be addressed by increasing locally produced and harvested foods that support food sovereignty, promote individual and cultural empowerment, and encourage community resilience. Community-based resilience to climate change is generally understood as the capacity to recover or cope with challenges and ramifications of environmental changes. While this understanding of resilience is fairly straightforward, it comes from an westernized

perspective. Tuhiwai Smith conceptualizes resilience as resistance to colonial norms, which often assumes that communities are to be blamed for the position they are in and therefore the need to be resilient (1999, p. 97). Indigenous notions of resilience are conceptualized as resistance to unequal power structures, and opposition to colonial discourse which continues to have negative impacts on Indigenous socio-economic and political lives (Penehira, Green, Tuhiwai Smith & Aspin, 2014). In this conceptualization of resilience, Indigenous communities can continue to use their resistance to respond to environmental changes, as they have done so for millennia.

In moving toward food security for northern Indigenous communities, local food procurement is integral for increasing overall adaptive capacity and community resilience to environmental changes (Berkes & Jolly, 2002). This is only possible with collaboration amongst stakeholders and with local voices guiding decision-making processes. To support community resilience alongside increasing food security, a number of diverse strategies and food procurement programs would need to be coordinated and implemented (Ford, Pearce, Duerden, Furgal & Smit, 2010). Food security is a complex issue and actions must be community-driven to ensure their feasibility in responding to localized needs.

Since reliable, available and affordable food is central to human well-being and the stability of societies, it is paramount to effectively adapt northern food systems to climate related changes (Rotter et al., 2012). There are many experimental food procurement strategies being tested in the NT, some of which include: Fall Harvest Fairs in Yellowknife, courses on traditional food processing in Inuvik, and creating greenhouses in a Seacan in Fort Good Hope (Ecology North, 2018; Hugall, 2018). Fresh foods grown locally and sustainably can have positive effects on health and well-being, while improving community and regional food security with environmentally-friendly benefits. These local alternative food procurement

strategies have the potential to mitigate environmental changes to local food systems, while promoting, supporting and increasing food security in small northern Indigenous communities. Many researchers have studied the significance of locally procured food through community gardens, greenhouses, aquaponics, hydroponics and other innovative ways to produce food locally, sustainably, and efficiently (Barbeau et al., 2015; Rudolph & McLachlan, 2013; Okvat & Zautra, 2011; Benis & Ferrao, 2018). Local alternative food procurement can contribute to both individual and community resilience, by creating a space for communication, information-sharing and co-learning among members. It can also contribute to ecological resilience by decreasing community demands for less sustainable market foods (Okvat & Zautra, 2011). This literature suggests that alternative food procurement could have potential socio-economic and environmental benefits for community members in Fort Providence.

Community adaptation strategies must be diverse in orientation, which could perhaps imply using alternative food procurement initiatives in conjunction with other local food procurement strategies or programs. This could effectively address community vulnerabilities while promoting local food sovereignty. In Fort Providence, the sustained transmission of traditional land-based knowledge is essential for the continuity of land-based food harvesting (Charlene Bonnetrouge, personal interview, 2018). However, there appears to be a growing gap in traditional knowledge, where youth may lack the necessary skills to harvest and prepare wild foods (Wesche et al., 2016). This gap in knowledge is present for a number of reasons due to impacts of colonization, historic disruptions of food systems, residential schools, and the introduction of market foods (Mason, 2014; Robidoux & Mason, 2017; Rudolph & McLachlan, 2013). This has the potential to have serious consequences for cultural stability and land-based food security, as the impacts of colonialism continues to be systematic and multidimensional (Thompson et al. 2018). This research project digs deeper to explore other

strategies that impact food security in Fort Providence. The objective of this research is to contribute to the growing body of literature surrounding sub-arctic food security in Canada, while highlighting Fort Providence and local efforts. According to the Council of Canadian Academia (2014), the lack of a comprehensive review of northern food security, derived from the first-hand experiences and knowledge of northern people, is a major knowledge gap.

**Methodological Approach**

When collaborating with Indigenous communities, it is important to choose research methods and methodologies that will best suit the nature of the research. It is equally important to note that research in general has been used as a tool of colonization of Indigenous people and their territories across the world (Kovach, 2010, p.56; Tuhiwai Smith, 2012, p.134). The way in which research has been fully implicated in colonization remains a powerful history for many Indigenous communities (Porsanger, 2004). In a Eurocentric understanding, research generally is defined by investigations or experiments aimed at the discovery and interpretation of knowledge. This knowledge generally fits neatly into a westernized understanding and works to discredit knowledge outside of the scientific or social-scientific norms (Porsanger, 2004; Tuhiwai Smith, 2012, p.16). Many research techniques used to collect qualitative data within Indigenous frames of reference rely on western paradigms of knowledge; this is where the disconnect arises when conducting research with Indigenous communities. Eurocentric research techniques often view Indigenous communities as passive subjects to be studied rather than important holders and makers of knowledge (Koster, Baccar & Lemelin, 2012).

Choosing a methodological approach, such as Indigenous Methodologies (IM), takes into account the historical and contemporary biases present for Indigenous people across Canada, allows the researcher to establish a thoughtful, respectful and insightful study. From

the conception of research questions to established relationships between the researcher and community, this study benefits from the direction and guidance of IM. All aspects of this research project rely on IM to foster a collaborative approach that reflects the values and priorities of the community of Fort Providence. Guided by IM, I worked in collaboration with mainly Indigenous people and a few non-Indigenous people while acknowledging the importance of participants' perspectives, knowledge and understanding throughout the course of my research. This led to qualitative data that provided a deeper understanding of local perspectives regarding the many complex issues examined. IM helped to frame a holistic understanding of the complexities of socio-cultural, economic and environmental changes related to food security. Many scholars recognize the strength of IM when working with Indigenous communities, as it involves the active participation and collaboration between the researcher and the community (Kovach, 2010, 59; Tuhiwai Smith, 2012, p.37; Battiste & Youngblood Henderson, 2000).

This collaboration helps to ensure that community interests are recognized and acknowledged within the context of the decolonizing research. This research project attempts to reframe the narrative surrounding Indigenous food security, by deconstructing colonial-centric research methods and discourse. This goes beyond simply engaging an Indigenous perspective in a Eurocentric structured research project. One of the critical aspects of conducting research within the scope of IM is understanding the dominate paradigm in a Eurocentric system of structures, and understanding the historic and contemporary implications of academic research within Indigenous communities across the world (Sylvestre, Castleden, Martin & McNally, 2018). Also, there is a need to consider the fact that educational institutions have a history of producing deep-seated trauma, abuse and pain, whilst disconnecting Indigenous people from their lands, cultures and languages. In Canada, the

legacy of the treatment of Indigenous communities brought on by acts of colonization and residential schools stole, damaged and deprived Indigenous peoples from their basic rights and freedoms. Therefore, by operating a research project from within an educational institution demands the use of IM to guide the research, by challenging the researcher to focus on the core paradigm ideas of trust, respect, reciprocity and inclusion (Kenny, 2018; Kovach, 2010).

Trust was established between the researcher and the community after 10 weeks of residing and volunteering in the community of Fort Providence. I was invited to participate in spring fish camps and a summer boat trip to Axe Point. Trust was gained during these trips by integrating and immersing myself in land-based food activities. I also participated within the community by joining in local fitness classes, picking berries with community members and volunteering within the Deh Gáh Elementary and Secondary School. It was also advantageous to have a number of mutual northern connections with community members. As a lifelong resident of the NT, I was able to relate to individuals through mutual family connections and friendships. This commonality helped community members to establish trust and to build relationships.

Respect was given to all participants in this research project, especially in regards to their knowledge and perspectives shared. The results of this research benefits all participants by promoting local food initiatives, guiding decision-makers and contributing to the ongoing dialogue surrounding northern food security. While IM provides guidelines for researchers, it is equally important to tailor a research project to local understandings and values; this includes expectations of reciprocity held by local Elders and leaders (Kovach, 2010; Tuhiwai Smith, 2012). Elders who participated in this study were offered a pouch of tobacco as a gift for sharing their time, knowledge and perspectives. Furthermore, upon completion of this research, the final document will be summarized and provided to participants of this study.

Participants will be offered a summarized version in addition to the completed final version. This research project was open for participation from any local individual who sought to contribute. This allowed for transparency, openness and community inclusion. Additionally, the Deh Gáh Got'ie First Nation[5] reviewed and added specific context to the research proposal, guided the researcher within the community, suggested key knowledge holders to connect with, and upon completion of this research paper, will use the findings and recommendations to support continued local food related activities. The on-going collaboration with participants and the extended time spent within the community allowed community members to shape this project and accurately depict food security challenges in Fort Providence. As a result, there was an increase in both the quality and quantity of data received. These meaningful interactions add to the richness and validity of the findings.

**Research Methods**

IM guided all aspects of this research project, from the context in which research questions were conceptualized and designed, to the research methods selected (Simonds & Christopher, 2013; Tuhiwai Smith, 2012). This research project employed a mixed-method approach using primary data and secondary sources. In order to understand the broad topic of food security and community adaptation, an analysis of scholarly literature was conducted. The purpose of the analysis was to identify current food insecurity literature, but also to gain a comprehensive understanding of the many barriers in place. These secondary sources are used throughout the final research document to support the primary data that was collected. The

[5] The Deh Gáh Got'ie First Nation is the Indigenous public government for the Deh Cho region of the NT and is based on the Dene principals and traditions of its communities. There is a Grand Chief for the region, as well as local community chiefs who help to administer and protect the rights of their people (Deh Cho Government Website, 2019).

primary data collection methods included personal interviews. Ethnographic participant observation was also employed through community based involvement. Before interviews were conducted, each participant was invited to sign a consent form. None of the participants signed, and instead opted for an oral agreement, trusting that their contributions would be used in a respectful and appropriate manner. This is important to note, as too often written agreements between Indigenous peoples and westernized institutions have not been honored, leaving Indigenous communities with misleading information or unfulfilled promises. The signing of the consent forms for this research project was not mandatory and all the information on the form was thus communicated orally to individual participants. This was culturally appropriate as Indigenous communities are oral cultures. Each participant then agreed to the terms of the consent form and to include their name in this research project. Translators were provided upon request; however, none were required. Non-probability snowball sampling was used to recruit participants (Babbie & Benaquisto, 2010).

*Semi-Structured Interviews*

Interviews conducted with community members were semi-structured and conversational in nature. They consisted of 15-20 open-ended questions and prompts (see appendix B). Semi-structured interviews were advantageous in this study, as they provided in-depth and highly personalized accounts which created a rich data set (Barriball, 1994). Additionally, utilizing open-ended, semi-structured questions provided participants with a degree of control to share information they deemed significant. The knowledge foundation of many Indigenous peoples in the NT include oral histories, which are transmitted through stories. This research method was selected due to its compatibility with IM. As Kovach

describes, “the use of story, through conversation, [is] a culturally organic way to gather knowledge within research” (2010: 42).

As a researcher, I spent two field seasons in the community during key harvesting periods in the spring and fall of 2018. During the first field season in May and June of 2018, I was invited to participate in a number of on the land activities, like a spring fish camp and a week-long harvesting trip on the Mackenzie River. These experiences demonstrated the importance of spring harvesting within the community and highlighted the breadth of knowledge possessed by land-users. Throughout the second field season, I was once again invited to participate in a fall hunting trip where a bull moose was successfully harvested. The spring and fall are key harvesting seasons for community members, therefore providing critical insight regarding local food procurement practices, consumption habits and food security. During the second field season in the fall of 2018, a total of 20 in-depth interviews were collected. All interviews were collected between September 2018 and January 2019. The interviews ranged in time from 25 to 90 minutes in length. Of these interviews, nine participants were female and eleven were male. Almost all (17) of the interviewees had Indigenous ancestral ties to the NT. The other three interviewees self-identified as non-Indigenous, but were long-term northerners with vested interest in food security and climate change issues in the NT.

A number of interviewees have secondary residences in other communities due to employment requirements and other personal obligations. While almost all (17) participants are local residents of Fort Providence, and were specifically identified as expert land users and key community knowledge holders, there are a few non-resident interviewees that offered additional perspectives. These interviewees were invited to participate in order to create a broader narrative of food security and northern food distribution systems. All participants are

residents of the Northwest Territories and embody the diversity of motivations, values, perspectives and opinions that exist within the hamlet of Fort Providence, the Deh Cho Region and the NT. This diversity ensures a variety of opinions were included.

| | Interview Date | Name | Position |
|---|---|---|---|
| **1** | Sept 13, 2018 | Lois Philipp | Dene woman, retired school principal |
| **2** | Sept 14, 2018 | Brandon Thom | Dene male (18+), young adult |
| **3** | Sept 16, 2018 | Boris Sanguez | Dene male, harvester |
| **4** | Sept 18, 2018 | Michael Nadli | Dene male, MLA of the Deh Cho |
| **5** | Sept 19, 2018 | Bradley Thom | Dene male (18+), young adult |
| **6** | Sept 19, 2018 | Christina Bonnetrouge | Dene female (18+), young adult |
| **7** | Sept 20, 2018 | Laura Sabourni | Dene female, Elder |
| **8** | Sept 22, 2018 | Theresa Bonnetrouge | Dene female, Elder |
| **9** | Sept 22, 2018 | Nimisha Bastido | Non-Indigenous, local science teacher |
| **10** | Sept 24, 2018 | Xavier Canadien | Dene male, Chief of Fort Providence |
| **11** | Sept 24, 2018 | Jason Collard | Non-Indigenous, aquaponics expert |
| **12** | Sept 24, 2018 | Mike Leishman | Métis male, vice-principal |
| **13** | Sept 25, 2018 | Gladys Norwegian | Dene woman, Grand Chief of the Deh Cho |
| **14** | Sept 26, 2018 | Albert Nadli | Dene male, harvester |
| **15** | Sept 26, 2018 | Charlene Bonnetrouge | Dene woman |
| **16** | Sept 27, 2018 | Michael McLeod | Métis male, MP of the NT |
| **17** | Oct 10, 2018 | Joachim Bonnetrouge | Dene male, Elder |
| **18** | Nov 15, 2018 | Marg Henderson[6] | Non-Indigenous, YK Food Bank volunteer |
| **19** | Jan 16, 2019 | Alex Arychuk | Métis male, retired |
| **20** | Jan 16, 2019 | Pamela Richardson | Dene woman, |

***Table 1****: Overview of Research Participants*

The overall objective from semi-structure interviews was to explore the complex and intersectional barriers relating to local food security. Table 1 outlines participant information, date of their personal interview and a description of their position in the scope of this research project. Participants offered profound insight into local food procurement initiatives, identified

[6] Henderson is a resident of Yellowknife (YK). She is one of the longest serving members of the YK Food Bank. She was interviewed as a way to provide context regarding grassroots food distribution systems in the NT. As the YK Food Bank distributes grocery staples every 2nd and 4th Saturday of the month to individuals and families in need (Facebook, YK Food Bank, 2019).

socio-cultural, economic and environmental problems, and provided an understanding of ecological changes, which have altered the harvesting of land-based foods. Additionally, participants offered potential solutions and innovative suggestions for ways forward, which could support the effectiveness of local food procurement to foster community resilience and adaptive capacity to environmental changes.

All interviews were recorded and transcribed verbatim. Data collected over the field research season were coded and analyzed to look for shared and opposing opinions, and to discover reoccurring themes. Data collected was verified with individual participants to ensure reliability and accuracy before the research was compiled into any final form. Raw transcriptions were sent to each participant for review. This was also designed as a key process of IM which puts into place a measure of protection for any sensitive cultural information. All interviews were analyzed and grouped into key themes, including: past, present and future food procurement initiatives; the socio-cultural, economic and environmental barriers present; and potential adaptation strategies. Direct quotes from interviewees are inserted throughout the following chapters to ensure that local voices are presented as often as possible.

*Participant Observation*

The other primary research method utilized in this research was Ethnographic Participant Observation (PO) which was used as a complementary and supportive method. Although PO did not provide tangible data, it did inform this study in several ways. While I was an observing participant in a number of food related and land-based activities in Fort Providence, none of the information gained from these experiences are included as direct evidence. However, it is challenging to completely separate my personal experiences in Fort Providence from my research, as I developed meaningful relationships with participants, which

allowed certain levels of access into the community. Supported by IM, this allowed my project to elicit rich data through semi-structured interviews. Therefore, my experiences and observations did inform and help to facilitate my research.

PO helps to unravel some of the complexities of northern food security (Dewalt & Dewalt, 2002). For example, to assist in recognizing community dynamics with local institutional power structures or to corroborate information uncovered through semi-structured interviews (Kawulich, 2005). When welcomed, I spent as much time as possible participating in local food related activities, which included volunteering with spring fish camps and accompanying a local hunting party. Data collection for PO was in the form of meticulous field notes detailing my experiences working and living alongside community members. PO was useful to this study as it helped me gain familiarity with local food procurement initiatives and more generally with northern food systems. 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. Lastly, this research project was approved by Thompson Rivers University Research Ethics for Human Subject Board (101869) and NWT Aurora Research Institute (Scientific Research License: 16358).

**Research Positionality**

I was born and raised in a middle-class family in Yellowknife, Northwest Territories. I am in my mid-twenties and I am non-Indigenous. Due to my cultural background, Indigenous Methodologies was critical to guide this research project. As I am from Yellowknife and the NT, it gave me a profound connection to the location of my research and a comprehensive understanding of the challenges facing northern communities. Growing up in the north, I was involved in many activities that allowed me to engage with individuals from various

communities across the north, Canada and the circumpolar world. This offered insight and perspective on the uniquely similar barriers that face many northern communities and families. My background and experiences as a non-Indigenous, lifelong northerner, are important facts to understand, but also to establish my role in conducting research in a northern Indigenous capacity. I had previously, on a few occasions, visited Fort Providence, so I was familiar with the community and was connected to some residents through family relations. Due to my positionality as a northern researcher, I was able to immediately settle and feel comfortable.

For this research project, I first visited Fort Providence in the spring of 2018 to develop deeper relationships with the individuals I already knew, but to also connect with other key community members. I lived in the community in a family friend's home for a few months, volunteering with land-based programs and helping in the community when invited. My extended presence in Fort Providence allowed community members to develop a level of comfort and trust. I returned to the community in the fall of 2018 for a month to conduct interviews with the individuals I had connected with previously during my spring visit. By spending a total of three months in the community, as well as being a northerner, I was given a level of trust not typically afforded to outside southern researchers. Additionally, during my time in Fort Providence, I was fortunate enough to stay with a family friend, and thus had a gatekeeper connection that provided more insight into the daily lives of Fort Providence residents. My personal background allowed me to establish the purpose of my study, and allowed me to gain insightful and rich data.

In the northern parts of Canada, particularly in the NT, many individuals feel resentment towards southern enacted policies, decisions and research. Typically, southern decisions or research outcomes are imposed on northern communities and these decisions do not always take into account the cultural, social and economic milieu of the north. Therefore,

my experiences as a lifelong northerner was crucial to my positionality and to access knowledge within Fort Providence. I believe all these factors allowed me to gain a clear understanding of the complexities of food security in the community. I met individuals who were able to provide in-depth explanations and understandings of key issues and concerns. As I plan to return to the north upon completion of this graduate program, I believe the relations I have made and the research I have produced will be invaluable.

**Thesis Overview**

This thesis is divided into four distinct chapters. Above, *Chapter 1* provided an introduction and overview to the thesis, and included a detailed description of Fort Providence. It contained a literature review that contextualizes the notions of food security and local food procurement, recognized the gaps in academic literature, and outlined the research methodologies and methods. Based on local perspectives, *Chapter 2* establishes a basis of food security challenges and local food procurement activities. The goal of this chapter is to understand how environmental changes are presenting distinct socio-cultural, economic and ecological challenges, and to identify opportunities for developing food procurement initiatives. *Chapter 3* focuses on how local food procurement supports overall community resilience and adaptive capacities to environmental changes. Topics such as the cost of living, the complex nature of northern bureaucracy, and economical, technical and infrastructural capacities are explored to help shape the dialogue around pressing food insecurity constraints. In the final chapter, *Chapter 4*, the multifaceted issue of food security in Fort Providence is examined. The conclusion applies the results to broader environmental contexts for northern based research. This chapter concentrates on the applied significance of food security research into decision-making bodies and policy orientated outcomes.

# CHAPTER 2: EXPLORING THE COMPLEX RELATIONSHIP BETWEEN LOCAL FOOD PROCUREMENT AND FOOD SECURITY

Understanding the complexities of food security within an Indigenous Canadian context is challenging and it is further complicated by the diversity amongst Indigenous peoples and their specific food consumption practices (Power, 2008). This suggests that food insecurity issues in Canada cannot be resolved with one single overarching approach, nor can the solution to food insecurity be framed simplistically. Across Canada, but particularly in northern regions, food insecurity has become a serious public health problem, with individual health and well-being tightly correlating to household levels of food security (Tarasuk et al., 2016). This is certainly the case in the NT, where food insecurity is connected to socio-cultural and economic challenges, and is stimulated by ongoing environmental changes. According to the statistics, 24.1% of households in the NT are food insecure (Tarasuk et al., 2016). This data indicates an upward trend, highlighting the importance of food security research in northern Canada.

Previous studies have investigated food security in the NT, however these studies typically focus on arctic regions (Gerlach & Loring, 2013; Burnett, Skinner, LeBlanc & Chambers, 2017). Whereas, the results of this sub-arctic study emphasize the importance of integrating local residents' opinions, experiences and knowledge in the development of local food procurement initiatives, strategies and programs. Through the use of IM and semi-structured interviews, I demonstrate the need to incorporate local perspectives to generate robust and effective policy recommendations. This is imperative in the NT, as typically, southern practices and policy outcomes are imposed without fully recognising the unique context in which the north operates. Throughout the history of northern Canada, southern solutions have been implemented to solve northern problems. These solutions are ineffective

when dealing with regions that lack the technical, economic and infrastructural capacities of the south. From the viewpoint of local residents, this research identifies the problematic challenges relating to local food procurement and recognizes the multifaceted barriers of current food insecurity in Fort Providence, NT. The results will inform inclusive policies based on local perceptions, promote local food procurement, support cultural resilience, and encourage robust food security initiatives. This chapter argues that local food procurement is integral to identify the environmental, socio-cultural and economic barriers to food security. The following research questions are addressed in this chapter: 1) What are the impacts of climate change on local food systems; 2) What are the barriers to, or opportunities available in, current food procurement programs?; 3) How are socio-cultural and economic barriers related to broader processes of environmental change?

**Food Systems, Consumption and Procurement Practices**

Throughout the colonization of the NT local Indigenous lifestyles and land-based subsistence were disrupted with traditional lands and resources appropriated through Treaty 11 (Tesar, 2018). Moreover, environmental injustices related to intensive resource extraction created lasting implications for northern Indigenous food systems (Rudolph & McLachlan, 2013). These challenges reflect the sweeping socio-cultural changes in the second half of the twentieth century, as former semi-nomadic hunting groups were resettled into centralized communities and incorporated into a colonial relationship with Canada (Ford, Pearce, Duerden, Furgal & Smit, 2010). This eventually resulted in a shift from former reliance on nutrient-rich land-based foods, toward a greater consumption of market foods purchased from the store. Market foods are generally highly processed with lower nutritional quality (Wesche et al., 2016). In Fort Providence, while market foods are now a significant part of residents'

diets, land-based foods continue to form an integral part of consumption habits, dietary preference and culturally meaningful practices. This is validated by the fact that 57% of households in Fort Providence consume land-based food regularly (Northwest Territories Bureau of Statistics, 2016).

Academic investigations have demonstrated that hunting, harvesting and sharing of land-based foods play an integral role in social cohesion and cultural continuity for northern Indigenous communities (Rosol et al., 2016). Market foods do not replace the important socio-cultural roles played by locally harvested land-based foods (Wesche, 2016; Gerlach & Loring, 2013). Additionally, land-based foods are nutrient-dense and contribute to a higher overall dietary quality (Rosol et al., 2016). The procurement of land-based foods contributes to both short and long term impacts of food security. As Dene land-user and expert harvester Boris Sanguez indicates, "there is some stuff that you do need from the store... but, I still prefer my wild game over store-bought food any day" (2018). Dene Elder and skilful land-user Joachim Bonnetrouge agrees, and explains that it was not always this way:

> 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. (2018)

It is important to note that land-based foods cannot sustain an entire diet, therefore community members must, at least partially, rely on expensive market foods. Local Dene woman and university student, Christina Bonnetrouge, acknowledges the importance of land-based foods in her diet and supports the point made by Sanguez:

> 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-bough meat. (2018)

As the above point exemplifies, the taste preferences of these community members tends to favor land-based foods. Christina Bonnetrouge is a younger member of the community, yet she still prefers land-based foods. It will be paramount to ensure traditional food procurement

knowledge and land-based harvesting continues into future generations to combat food insecurity and address pressing environmental issues. It was clear throughout the course of the interviews, that there was a great deal of community pride associated with eating traditional land-based foods (Theresa Bonnetrouge, personal interview, 2018; Laura Sabourin, personal interview, 2018).

As in other northern contexts, Indigenous communities are witnessing a decrease in traditional land-based food activities due to a number of reasons, such as the generational impacts of colonial policies of repression that directly targeted Indigenous subsistence practices and relationships with local ecosystems (Mason, 2014). This is one example of colonial influences that have eroded the health and integrity of Indigenous cultures, ecosystems and social structures that are integral to maintaining land and food systems. Regardless of these changes, land-based foods remain socially and culturally important, even amongst the younger generations. This was reflected unanimously among the three university students who participated in this study. Although they indicated their preference for land-based foods, they revealed it is not always available, or they do not possess the necessary skills to procure it themselves. Local Dene youth and fourth year university student, Bradley Thom explains that during the fall hunting seasons, he is away at university and unable to participate. In general, in the north when individuals are attending post-secondary school outside their home community, it can be challenging to access land-based foods or participate in harvesting activities. This creates a disconnect concerning traditionally important foods that help shape and sustain cultural practices. As Thom explains:

> 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... (2018)

This passage highlights the contemporary complexities for northern Indigenous youth. Another Dene male and university student, Brandon Thom, lightheartedly adds:

> I love eating land-based foods…like moose meat and whatnot... but I also eat subway and wings weekly when I'm at school! [laughs] (2018)

The ramifications of colonization and the historical disruption of land-based food procurement has caused systematic and multigenerational food insecurity challenges (Thompson et al., 2018). This means that northern Indigenous youth will have to navigate the globalized world, while maintaining food practices to support cultural continuities. As local Métis male and Member of Parliament for the Northwest Territories, Michael McLeod describes:

> 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. (2018)

McLeod explains the many difficulties present for Indigenous youth across the north, and describes the importance of encouraging youth to simultaneously pursue educational opportunities and traditional, land-based activities to support their culture, language, identity and traditional ways of life. This will be a key step forward when addressing food insecurity in the future. McLeod adds to his above point:

> 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. (2018)

This demonstrates that the skills and knowledge transferred through land-based food procurement remain a critical aspect to support food security initiatives and community-wide

resilience to eroding cultural skills, languages and environmental changes. The transmission of traditional knowledge is a key measure required to support cultural continuity.

Land-based foods remain among the healthier food choices available and they form an important connection to land and local culture for northern Indigenous residents (Rudolph & McLachlan, 2013). As Sanguez states, "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" (2018). However, as Bradley Thom comments below, there are many ways to connect to the land that also evoke spirituality and well-being. For instance, Elders with mobility issues or single-family households can still access the land and procure local food in a healthy and economically favourable way, such as through gardening or forging. He explains further:

> When it comes to the older population, it's about getting their bodies moving. When they are outside working with the land, for example, gardening…if there was a gardening site closer to the Elders and where they stay, it would help encourage them to get outside and work with the land in a different way. Saying, essentially that you don't have to be out in the middle of the nature to connect with the land and with your spirituality, you can do it right in your backyard, through gardening! Even connecting to the land thought activities like raking leaves or cutting the grass. (2018)

Many researchers have studied the health and well-being benefits that stem from gardening (Barbeau et al., 2015; Okvat & Zautra, 2011; Benis & Ferrao, 2018). Local alternative food procurement initiatives, like gardening, can contribute to both individual and community resilience by creating a space for communication, information-sharing and co-learning among members. Gardening can also contribute to ecological resilience by decreasing community demands for less sustainable market foods (Okvat & Zautra, 2011). Alternative food procurement initiatives are micro-pieces of the solution and offer a positive space for strengthening partnerships and creating a dialogue around the boundless possibilities regarding local food procurement (Thompson et al., 2018). As Bradley Thom alludes to:

> We are to dependent on the south and getting food trucked in... it's bad for the environment. The food system that we have is very fossil fuel dependent and that's

> adding to climate change, because we're burning massive amounts of fossil fuels. There's a lot of resistance to use fossil fuels... but it's still being used... and it's still affecting our environment. You know, like flying food from abroad to North America and then trucking it way up north... it's something that I really don't like. Yet, we are so dependent on it. (2018)

Due to the dependency on the fossil fuel intensive global food system, alternative food procurement initiatives can provide ecologically friendly solutions to both food security and to offset carbon footprints. When considering food procurement in a northern Indigenous context, gardening is not the first thought that comes to mind, mainly due to unlikely feasibility of climatic conditions, such as permafrost and short growing seasons (Skinner et al., 2013). However, as many interviewees point out, gardening and alternative food procurement is an critical food security measure. Throughout the history of Fort Providence, gardening has surprisingly played a significant role. Fort Providence's Chief, Xavier Canadien, explains that potato gardening was an important part of the community's past:

> Originally, the residential school here started gardening because they had lots of mouths to feed, and gardening was one of the ways to feed them. Potatoes… potato soup... there was no fries then, just potato soup! [laughs] (2018)

This is reiterated when speaking with past resident and Métis male, Alex Arychuk, who remembers the vast potato garden when growing up in Fort Providence:

> The mission grew everything... Fort Providence was the hub of feeding the Catholic diocese up and down the Mackenzie River. Between Fort Providence and Fort Simpson they grew absolutely all the food for the Mackenzie River Delta people... Fort Providence was, when I was growing up, it was down to basically a garden that was huge enough to feed the 50 people, potatoes for… you know they probably grew 10 thousand – 20 thousand pounds [of potatoes] a year, still when I was a kid growing up in Fort Providence. (2019)

Gardening has emerged as a key piece in the response to northern food insecurities (Rudolph & McLachlan, 2013). As revealed through interviewees' experiences, gardening has played a part in the community's development and history, and will continue to reduce stressors associated with environmental changes. According to one report, in the late 1880s,

approximately 25 acres of land was developed in Fort Providence for agricultural purposes (Territorial Farmers Association, 1994). A portion of this land encompassed the community potato garden but also included personal family gardens. According to some older residents, family gardens in the community were common in their younger years. As Elder Laura Sabourin describes:

> For as long as I can remember, my mom has been gardening. She gardens for potatoes, carrots and lettuce... she tried tomatoes for a bit and they were hanging from the shed. She's always trying new things, sometimes they work and sometimes they don't. (2018)

Through recalling the family gardens of their youth, McLeod and Arychuk reiterate this:

> Historically, all families even if they were out in their cabins would have little gardens in their yards. My family always had little gardens, all my neighbors did too. I lived in the Métis area of the community. Everybody had gardens. The church had huge gardens, huge potatoes fields, it kind of all died off... it's starting to slowly come back. (McLeod, 2018)

> In Fort Providence, like for our restaurant... my mom and dad owned Big River's Service Station. That's where I grew up. My dad started that in 1957 and so by 1960 I was living there. That's how I eventually ended up in Fort Providence. We had a garden that was 75-80 feet across and about 200 feet deep with a greenhouse right at the end of it. We grew all our own tomatoes, and all our own carrots... some were the size of... oh I don't know, but as big as you can imagine! (Arychuk, 2018)

It is clearly demonstrated, through the voices of local community members, that there is a deep spiritual and traditional connection to local food procurement. This mainly includes harvested, fished, trapped or gathered foods, but it cannot be overlooked that the history of Fort Providence is intertwined with narratives of gardening as well. Furthermore, many community members recognise that food is more than simply 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 notes:

> 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. (2018)

Local Dene woman, Charlene Bonnetrouge indicates:

> You have to believe in your values and your Dene ways of trying to, you know... speak your language and expand your traditional knowledge, use your land and try to keep those values, your background, and your culture. That's our way forward! (2018)

The above interpretation provides insight into the complexities of food security within a northern Indigenous context, suggesting that local food procurement helps to address pressing food security issues by supporting culturally important food-related activities. Many interviewees expressed their deep connection to the land and the cultural connotations associated with land-based foods. Member of the Legislative Assembly of the Northwest Territories for the Deh Cho Region, Michael Nadli, eloquently articulates this connection:

> It's the spirit of the land. When you're eating moose meat, you are what you eat. 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. (2018)

The cultural connections to the land cannot be overstated when discussing land-based food procurement and its importance in realizing food security. Michael Nadli speaks to the complex relationship surrounding local food procurement and food security, as it begins to becomes less about the food itself, and more about what food represents in regards to cultural resilience and cultural continuity. In a northern Indigenous framework, the dimensions of the natural environment and of the culture, over time defines the food system and contributes to the health of individuals and community as a whole. Not only in the sense of physical health, but also emotional, mental and spiritual aspects of health, healing and protection from disease (Kuhnlein, Erasmus & Spigelski, 2009). Although the interviews did highlight a number of local food procurement challenges, the discussions demonstrate the resilience of the community through the continued consumption and preference of land-based foods.

## Assessing Local Perceptions: Defining the Barriers

In isolated northern communities, adults living in food insecure households tend to have lower consumption rates of land-based foods, and obtain more energy from sugary and expensive market foods (Rosol et al., 2016). This indicates that food insecurity can take a serious toll on individuals and, ultimately, community health and well-being. These social and economic stressors are typically experienced in combination with climate change. With parts of the NT warming up to four or five times faster than global averages (GNWT, 2008), environmental impacts are being felt more readily across the North and thus must be addressed promptly. By identifying the barriers and depicting the gaps in realizing food security, this section examines the multifaceted and compounding challenges of local food procurement.

### *Climate Change*

The impacts of environmental changes and food insecurity have multiple interrelated risks for societies and ecologies (Wheeler & Von Braun, 2013). These risks range from socio-cultural and economic issues such as the loss of traditional harvesting knowledge and the rising price of gasoline, to include environmental issues such as shifting ice conditions or the introduction of new diseases. Climate change has affected the abundance of wild game and consequently land-based food procurement (Thompson et al., 2018). Based on local perspectives, environmental changes have emerged as a main barrier to land-based food procurement and thus to realizing food security. Through analyzing the data collected, broad responses relating to environmental challenges are broken into three comprehensive themes: changing ecosystems, shifting hydrologic systems and unpredictable weather patterns.

Throughout the course of interviews, there was a sense of unease relating to observations of changes in local ecosystems. Some interviewees expressed their concerns

regarding potential risks from invasive species as observed over the course of the last decade. This included personal observations and secondary accounts of deer, cougars, hummingbirds, unidentified fish species, magpies, pine beetles, ticks, and an array of other unidentified insects. As Brandon Thom describes:

> 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 colours. That's because it's warmer... and bugs are starting to travel more. (2018)

As McLeod reveals, 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. (2018)

Many interviewees remain concerned about new species making their way into the local ecosystem and the potential ramifications that could arise from an array of new plants and animals. This is reflected in Charlene Bonntrouge's comments, which expose her uncertainty about invasive species, "with all the predators coming up, like the cougars, will they eat more of our animals?" (2018) Throughout the course of this research project, it was noted that there was a lack of information surrounding invasive species, in general, in the community. A lack of knowledge, typically makes creating adaptation and mitigation plans problematic and causes undue anxiety regarding potential consequences. With a sparsely populated territory, it is vital to use citizen science and traditional ecological knowledge to manage the effects of invasive species. This indicates the need to incorporate local voices in the decision-making process, and highlights the importance of conducting research that documents local ecological knowledge. While some of these invasive species do not pose a substantial risk to the local ecosystem, others are capable of causing significant harm. Some species are deteriorating northern land-based food procurement activities by stimulating stressors on the vulnerable ecosystem. As Charlene Bonnterouge explains:

> 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 so bad... you could see them all over. I don't know, if that moose survived... because there were so many of them... It created a sore on the moose... on its back, by its butt area. (2018)

Winter ticks are common on moose in southern Canada, but their range was thought to be limited and not yet common in the NT; but recent sightings of affected animals have led biologists to track local observations (GNWT, 2009). This suggests that local ecological knowledge remains key in identifying new trends, and allows appropriate mitigation and adaptation planning to occur. McLeod's comments that environmental changes are not limited to just the introduction of new species:

> Not only are we seeing invasive species, but also diseases... I had never heard about anthrax[7] in the north until the bison were introduced. I never had heard about brucellosis[8] either or the other new diseases being introduced. I had never heard our Elders talk about these diseases before that just killed the animals, just like that. (2018)

McLeod explained that when the last anthrax outbreak hit the wood bison population in the Fort Providence area, over 300 bison carcasses were identified and burned. During this timeframe, dead moose and black bears, which had also been affected by the disease, were being discovered. With changing ecosystems comes the potential for devastating consequences, which can ravage the natural environment but can also cause socio-economic issues for Indigenous people who rely on the environment for subsistence. As land-users' successes depend on the stability and predictability of environmental conditions, wildlife and ecosystems, it can be argued that land-users have an intimate knowledge of their environment, thus remain vital knowledge holders. Therefore, northern Indigenous communities' reliance

[7] Anthrax was first reported in the NT when wood bison were introduced in 1962. The first reported anthrax caused bison mortality occurred in August of that year (Dragon & Elkin, 2001). Anthrax is an acute and fatal disease that predominately impacts bison in the NT.

[8] According to the Species at Risk Status Report for the NT, one of the greatest threats to bison are three infectious bacterial diseases: anthrax (Bacillus anthracis), bovine tuberculosis (Mycobacterium bovis), and bovine brucellosis (Brucella abortus) (GNWT, 2016).

on land-based resources indicates that climate related impacts on ecosystems have a particularly significant effect on subsistence and food security (Thompson et al., 2018). For example, the availability of land-based foods is influenced by ecological conditions that shape the health, abundance, distribution and migration of wildlife populations (Kenny et al., 2018). As Dene women Pamela Richardson and Charlene Bonntrouge explain:

> I think climate change has had a big effect on the herds of wildlife, like the caribou. Hunters used to know where the herds would be at a certain time of year, and now they have to go looking for them because the paths or routes the herd take has changed due to weather changes and climate. (Richardson, 2019)

> [Climate change] is scary... I don't know how it is affecting the animals. Because the animals have their routines of how the weather works for them. Right? 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 okay: 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. (Bonnetrouge, 2018)

While large game, such as caribou, bison or moose, typically dominate the dialogue around land-based food procurement, small fur bearing mammals and aquatic species, such as fish, remain a vital part of land-based food procurement and subsistence in Fort Providence. Aquatic species are just as susceptible to environmental changes, and must be incorporated into the discussion. The aquatic species who 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. The Fort Providence area was traditionally used as a key fishing site. For example, as long as Fort Providence residents can recall, the dependable jumbo whitefish spawn and run by the community in the fall. This became a key cultural, social and subsistence tradition, as land-users set nets in the fall looking to stock pile 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: Joachim Bonnetrouge describes:

> Even the various fish around here, for me, are different now... especially in our area here, where we primarily look forward to harvesting a lot of white fish, eh. 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]*, holy man we're getting some big coneys and they kind of dominate the fish nets now. Even about two weeks ago we had to pull our nets because all we were catching, in those usually good whitefish spots, we were primarily catching jackfish... big ones too. So, that's something I've really noticed. (2018)

According to Fort Providence residents, the harvesting of jumbo whitefish in the fall remains an important cultural tradition related to this key food procurement activity. The locals call these whitefish 'jumbos' because they are extremely large, full of eggs, and delicious! As Michael Nadli affectionately describes, "everyone loves those [jumbo] fishes. Big, fat, juicy whitefish! You know, people were raised on that" (2018). Arychuk adds to this by saying:

> Well, the jumbos... Just huge whitefish. They are very important and we all love them. Them jumbos were what life was about. When they started to run in the fall, we would eat fish until we just about looked like one! (Arychuk, 2019)

The impacts of environmental changes on the jumbos are causing concerns among the interviewees as species migratory patterns are possibly being disrupted. As Elder Theresa Bonnetrouge states:

> 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. (2018)

Changes in migratory patterns due to environmental influences on waterways will continue to add to the challenges concerning land-based food procurement. It is clearly demonstrated through the voice of local residents that a changing environment brings new diseases, creates stress on vulnerable ecosystems, impacts migratory routes, disrupts wildlife, influences the health of land-based foods, and impacts land-based subsistence, food security and cultural resilience.

The second theme that emerged from the interview data was shifting hydrologic systems. Fort Providence's northern location and the long duration of cold temperatures causes

the Mackenzie River and surrounding bodies of water to remain covered in ice for about 6-7 months a year. This stability and predictability of ice coverage has provided a stable environment to conduct fishing, harvesting, trapping and procuring of land-based foods. The solid, predictable ice coverage provides a key transportation route to access winter harvesting grounds for local land-users. The few ice-free months throughout the summer also plays a key role in land-based food procurement via fishing, harvesting ducks and other semi-aquatic species. The observations and experiences of interviewees included winter-based changes such as ice depth, breakup patterns and permafrost degradation; and summer-based changes such as low water levels, warm water temperatures, and a drying water table. These hydrologic-based changes are having substantial impacts on food security, and are creating multifaceted barriers to land-based food procurement activities. Nimisha Bastedo, a science teacher at the Deh Gáh Elementary and Secondary School, points 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. (2018)

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

> You know, the ice is more thin now. Because some places, you know the ice will freeze then it will snow right away and the snow insulates the ice, eh. The ice will stay thin with all the snow on it. Then it gets dangerous for people going out on the ice. (2018)

As the snow weighs heavily on the newly formed ice, the ice does not freeze properly which causes water to seep into the layer of snow becoming statured and producing slush (Bengtsson, Hersey & Fairbridge, 2012; Prowse & Beltaos, 2002). This slush is also 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 explains further:

> 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. (2018)

Thin ice and overflow create problems with respect to safely for land-users. Grand Chief of the Deh Cho, Gladys Norwegian, shares her experiences with overflow:

> You know at times in mid-winter, you would have to be very safe to be skidooing on the ice. In my experience with that is we had a close call with one of my brothers who went through the ice in the middle of February where it was open water. That was just like last year or actually the winter of 2016... not open water, but it was overflow. That is very atypical in February. He was okay... but people are now encouraging each other to not 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 and all that kind of stuff. (2018)

This personal experience demonstrates the real risks associated with land-based food procurement, and also provides insight to potential adaptation measures already underway in the community. Strategies will be necessary to cope with the impacts of climate change for the health and well-being of northern Indigenous communities (Rosol et al., 2016).

> 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. Years ago, I guess when people used dog teams, each dog team had their leaders and they would be able to get a sense to look for soft ice, eh. So... it's been challenging to harvest... (Joachim Bonnetrouge, 2018)

Joachim Bonnetrouge frames the realities of procuring land-based food with the impacts of environmental changes creating a multitude of barriers. This will only intensify as environmental change adds further stress to local ecosystems, disrupting critical habitats and altering the hydrologic system (Emmerton, Lesack & Marsh, 2007). Interviewees also noted that breakup patterns are changing. As vice-principal at the local Deh Gáh Elementary and Secondary School, Mike Leishman points out:

> Years ago at breakup, the ice would just smash and grind up. It was loud and there were ice chunks everywhere. Now it's quiet and the ice almost melts... you know instead of crushing up and flowing down the river. It was much louder before. (2018)

Norwegian supports this idea by explaining that:

> 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. It's just not quite the same as it used to be. (2018)

Many other community members interviewed indicated similar views, that conditions were not quite the same when it came to the breakup of the Mackenzie River. This is triggering a negative effect on the hunting season, as the solid, predictably thick ice is typically used for transportation. As young Dene adults, Brandon Thom and Christina Bonnetrouge explain:

> People use the ice for transportation when they're out harvesting. Now they are coming back earlier in the season, they have to wrap up their hunting sooner. (Thom, 2018)

> 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. (Bonnetrouge, 2018)

Key harvesting seasons are being impacted by environmental changes and this is having a crucial impact on land-based food procurement and ultimately on food security in the community. Considering that land-based food procurement is seasonal, the impacted hunting seasons are provoking food insecurity challenges. As described below:

> [What I eat] really depends on the season, so in the winter time we have a lot of moose and caribou, and in the spring, we'd have lots of rabbit... so rabbit soup. In the spring, we'd also have a lot of geese and duck soup too. (Christina Bonnetrouge, 2018)

> My oldest brother is 83, and my other brother is 82, they still go out seasonally for whatever they hunt for. Right now it's moose hunting season, so everyone's out. (Norwegian, 2018)

Another barrier to land-based food procurement has been permafrost degradation and the drying landscape. Permafrost is an important physical component of the northern landscape and plays an important role in local hydrology and ecology. Permafrost underlies the majority of northern communities, with Fort Providence resting on the edge of discontinuous and sporadic discontinuous zones of permafrost (GNWT, 2018). Joachim Bonnetrouge explains:

> 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. I guess, it all dried out. There was rain or snow in the spring and there is nothing around to hold the water any more. So, that's one thing too, our land is drying up. (2018)

Sanguez adds to the above point by mentioning the importance of permafrost to the ecosystem and ultimately to land-based food procurement:

> With permafrost going away…it's really affecting a lot of the water sources, because there is nothing to hold the water above ground anymore, as opposed to it sinking into the ground. Like spring time, 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 as well. In the spring time, there's not as much water as we would normally have back in the day. There's just no place for the birds to land now, so we don't get to see them as long as we used to. You know, same with probably every other animal as well... (2018)

Boris highlights the importance of water sources for birds, particularly with respect to migratory birds. As migratory birds routinely arrive at certain times of the year, during this period the community tends to hold culturally meaningful traditions (Andrachuk & Smit, 2012). For example, in Fort Providence, extended families hunt during the spring time for geese and swans. Land-based 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 are finding changes in the abundance and distribution of wildlife. Low water levels were also mentioned by a number of interviewees as a nuisance in accessing traditional harvesting areas. As long-time community member and retired Deh Gáh Elementary and Secondary school principal, Lois Philipp simply puts it, "the water levels are definitely lower" (2018). Albert Nadli adds:

> The water levels are always low, eh...very low. In some places, where traditional lands are, it becomes hard to access especially when the water is too low and the water is also more...it's warmer. Yeah, it's getting warmer. (2018)

Not only are the Mackenzie River water levels causing environmental stressors, but the warming water could potentially have a number of effects on local fish populations, for

example, according to a few interviewees this could impact the quality of meat. Charlene Bonnetrouge explains:

> 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. (2018)

Norwegian indicated that people around the Deh Cho have been expressing similar sentiments:

> Now we are finding we have to be very careful with the fish in the Mackenzie River. A lot of the fish just don't seem the same, like the meat is a little bit soft. People are saying that it's from the warm water. The water is starting to become a little bit warmer. I don't know if it's discouraging people from eating fish per say. But I think they're just puzzled about it or wondering about it. They still believe that there are normal fish. (2018)

As the quote above points out, it has not yet become a significant problem, but it remains important to note that the warmer water temperatures could quickly become an issue with severe consequences on land-based procurement and food security. This adds to the importance of utilizing local perspectives to address potential future environmental challenges. Another consequence of a warming Mackenzie River is explained:

> When the water is really, really warm, the dissolved oxygen levels in the water are not as great and you end up having a lot more fish mortalities. (Philipp, 2018)

> I don't remember what year it was, but we had bad fires all over the NT. I don't know if it was because of the smoke and ash getting into the water, but the water was, you know, were strangely warm. The fish were just popping up, floating and it was kind of disgusting. The fish were going belly up... after a while they started to rot and you could start to smell them. It was really bad that one year.... I don't remember how many fires we had, but that was a really bad year. That was, late '90s, maybe early 2000s? (Sanguez, 2018)

The many hydrologic-based changes that are occurring across the north are disrupting land-based procurement activities. This is creating pressures on local food systems, as many community members rely on land-based foods to sustain an integral part of their diet. Interview data based on the experiences and observations of land-users and knowledgeable community members reveal that changes in the Mackenzie River, such as ice depth, breakup patterns, low

water levels and warming water temperatures, are causing stress on land-based food procurement activities.

The third theme to emerge from the interviews was unpredictable weather patterns. In addition to the water-based impacts explored, changes in temperature and conditions will likely result in shifts in the movements and breeding success rates of terrestrial animals. A shift in temperature and weather patterns create concerns around degradation of habitat and feeding conditions, that could cause dramatic declines in many wildlife populations (Andrachuk & Smit, 2012). Given that land-based procurement is reliant on species survival rates and the ability to predict their movements, these changing ecological conditions will cause devastating implications for Indigenous communities:

> Things are ever-changing. We have shorter hunting and berry picking seasons... berries are drying out quick with the hotter climate and direct sun. (Brandon Thom, 2018)

> The Elders have been telling us, a number of years ago, that they are having a hard time getting a read on the seasons, especially in the fall... (Joachim Bonnetrouge, 2018)

Autumn is a critical hunting season that observes, for example, the running and spawning of the jumbo whitefish and the moose hunt. This season also signifies the importance of stock piling land-based foods for winter, as it becomes challenging to get out on the land before the freeze up of the Mackenzie River. However, as Charlene Bonnetrouge explains, there are risks:

> If somebody was going hunting for geese and it was -16 or -10ºC, 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. (2018)

In this scenario, the unpredictable weather patterns resulted in hunters getting trapped out on the land when the weather suddenly shifted. This can have significant socio-cultural implications, as environmental changes are potentially discouraging land-based food procurement activities and thus the transmission of crucial traditional ecological knowledge.

If land-users are unable to predict weather patterns accurately, safety issues emerge. These concerns could potentially discourage land-based procurement and disrupt traditional ways of life (Rosol et al., 2016).

> The weather patterns, it's either hot or cold... or lots of wind. Then it gets cold for a while and warms up, or the opposite happens. It makes it hard to get hunters and trappers out on the land. (2018)

Leishman expresses some of the difficulties associated with land-based food procurement and unpredictable weather patterns that make it challenging for locals to decide when to harvest or get out on the land. Successful land-based procurement excursions are critical to maintain food security levels. Apart from the discussion around safety, it is worth mentioning that unpredictable weather conditions also make it challenging to access land-based foods. For example, a late frost may ruin berry bushes and other herbs that would typically be harvested early in the season or, an unusually hot summer could dry out the landscape creating an unproductive environment for native species to flourish. This unpredictability adds to the intricacy of establishing programs that support local food procurement, as predicting and planning for the future remains ambiguous due to the erratic and volatile consequences of climate change.

> Well [the weather] is very unpredictable. You know, seasonal changes used to be very predictable. Even berry picking in July, when you pick blueberries and things like that, you get out there now... they're not ready or they're gone already. (Norwegian, 2018)

It is clearly seen through the voices of knowledgeable community members and land-users that local food procurement activities are currently threatened by a number of interrelated environmental factors. As the impacts of environmental change continue to grow, 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, land-users and local ecological

knowledge will be required to guide decision-makers toward effective, robust and resilient policies. Environmental change impacts all four pillars of food security: shifting ecological conditions impact the *availability* of land-based foods; while unpredictable ice conditions result in sporadic *access* to key harvesting sites; and inconsistent jumbo whitefish migratory patterns make it hard to predict the best harvesting times, thus reducing user's *utilization* of the land; and finally, the many environmental changes are influencing the *stability* of land-based food procurement.

*Socio-cultural and Economic Considerations*

In order to holistically understand the environmental barriers to food security in Fort Providence, a deeper examination of the socio-cultural and economic barriers is required. Traditional knowledge of a local environment, combined with the related skill sets for harvesting, travelling on the land and water, and food processing, can be understood as an array of cultural practices necessary to achieve food security (Council of Canadian Academics, 2014). These culturally important practices are threatened by food insecurity and environmental changes. Data collected through in-depth interviews and participant observations elicited broad responses relating to socio-cultural and economic challenges. Based on local perspective, the following three themes have emerged as fundamental barriers to land-based food procurement and to food security in Fort Providence: non-local harvesters, changing lifestyles and high costs of living.

As discussed above, many Fort Providence residents rely on land-based foods, such as fish and moose as a staple aspect of their diet, and environmental changes could have potential ramifications on their food security, overall community resilience and cultural continuity. These environmental challenges are combined with socio-cultural impacts, such as the

introduction of non-local harvesters. According to community members, there seems to be an aversion to the increasing numbers of non-local harvesters as they add pressure on already fragile ecosystems. As described by a number of community members, there are families from northern Alberta who make their way up each summer to Fort Providence to harvest large amounts of fish. According to residents, in the summer of 2018, a non-local fishing group boated up the Mackenzie River to a culturally significant harvesting area at the mouth of the Horn River. The Horn River drains from the Horn Plateau to the Mackenzie River, which has been a spiritual home for local Deh Cho Dene peoples for millenia (Michael Nadli, personal interview, 2018). This area is vitally important for land-based foods for a number of communities in the area[9]. Elder Sabourin explains some of the consequences of non-local harvesters in this culturally significant area:

> Just this year actually, they [non-locals] were taking too much fish out of our river… and we would chase all those Mennonites out of that area, the Horn River area. We had to monitor the [Horn] River and I think they did a pretty good job because I haven't seen the Mennonites down there after that. It's just our people down there now. (2018)

As non-locals are harvesting substantial amounts of land-based foods, this reduces the overall availability and access for locals. Local food insecure households should not have to compete against non-locals who are, as many community members suggest, overharvesting.

> During the spring, when the water first opens up and the campgrounds are opening up for the long weekends, there are a lot of visitors that come from the south... so like northern Alberta. They come and they fish. The fishing regulations in the Territories are super weak and not enforced as much as they could be. They need to be updated to protect our waterways. For most of the summer, it feels like visitors are harvesting the fish faster than the locals can. (Bradley Thom, 2018)

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[9] In October 2018, the Deh Cho First Nations Assembly designated these lands and waters, called Edéhzhíe, as an Indigenous protected area (IPA). This IPA is the first of its kind in Canada. Edéhzhíe is a plateau that rises out of the Mackenzie Valley to the west of Great Slave Lake and covers 14,218 square kilometres. A Dene elder previously referred to Edéhzhíe as the "breadbasket" of the Deh Cho people (Bird, 2018). This will help to protect key harvesting grounds and spiritual areas for local Deh Cho peoples, and will hopefully support local food procurement and cultural continuities.

During the period I was living in Fort Providence in the Spring of 2018, the local campground was booked solid for weeks, as extended families from rural northern Alberta came to fish northern pike from the Mackenzie River. According to the GNWT's posted Daily Catch Limits for northern pike in the Mackenzie River, non-residents are allowed 1 fish per person, with an overall Possession Limit of 1 fish per person (GNWT, 2017). With large extended families numbering up to 20 people, coming from Alberta, this equates to a lot of fish being taken out of the river. The societal constructs of the north allow for this type of mismanagement of resources, for example the vast nature of the territory equates to nominal enforcement. This is simply due to the sheer size and remoteness of the Mackenzie River and its tributaries, such as the Horn River. It is not just Albertans who are adding more harvesters into the mix, which creates growing stresses on the local ecosystem capacity. Interviewees also indicated that big game hunters have been coming into the Fort Providence area in increasing numbers. Philipp explains that, "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" (2018). In addition to this new threat from non-local harvesters, many interviewees also cite deep concerns regarding the low overall number of moose in the area.

> I noticed we never had any moose before because of the fires. We never had moose for quite a while. Like after the big forest fires about... how many years ago? We've hardly had any moose around here. No moose. Nothing. (Theresa Bonnetrouge, 2018)

Albert Nadli adds to the above point by explaining, "I've noticed less animal abundance, especially with the moose... for about four or five years they were hardly around" (2018). The local ecosystem is being impacted by environmental changes that causes disruption in habitat ranges, which creates drastic consequences for species survival rates. Now local wildlife populations also have to cope with increased hunting activities in the area. Sanguez expresses his concerns over the growing number of big game hunters coming into the region:

> 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, 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. (2018)

Due to the direct importance of land-based food procurement on food security levels for, it will be critical to include traditional knowledge into the decision-making processes to effectively manage increased non-local hunters. This could mean a number of possible ways forward, perhaps increasing funding for wildlife impact monitoring on abundance and distribution, or funding for wildlife and fisheries officers. It could also mean prompting local employment opportunities to efficiently manage non-local harvesters, while gaining economic revenue through a tourism-based operation. Regardless of approaches taken in the future, it will be critical to dig deeper to gain a better understanding of the issues, while allowing local opinions, experiences and perspectives to guide the discussions and decision-making processes.

The second theme to emerge from the interview data relating to socio-cultural factors was changing lifestyles. Across the north, communities are witnessing higher rates of market food consumption and this is having direct implications on traditional and culturally-orientated lifestyles. For example, although some of the younger community members indicated they enjoyed harvesting and hunting, it could be argued that land-based 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 land-based food procurement for community-wide resilience and adaptive capacity to climate change cannot be overstated. By engaging in local food procurement activities, it helps support aspects of food security by encouraging the transmission of cultural and ecological knowledge ensuring the *stability* pillar of food security. Land-based procurement, regardless of the quantity, addresses short term manifestations of food insecurity, such as hunger and a lack of nutrients. By having a higher consumption of

land-based foods in one's diet, the purchasing of market foods can be reduced, providing potential economic benefit. While this may be the case in some instances, research has shown that land-based foods are expensive, and there are considerable economic costs associated with, for instance, hunting and fishing. Moreover, based on human energy requirements alone, research has determined that communities would need to procure sizeable amounts of land-based foods regularly to be able to satisfy minimal nutritional requirements (Robidoux, 2017). However, this does not take away from the importance of land-based foods in northern Indigenous diets nor does it diminish the fact that community members are fiercely proud of their consumption of land-based or traditional foods, which support cultural and linguistic continuities as food procurement is tightly linked to the transmission of cultural knowledge.

Land-based food procurement may provide community members with some economic return, such as through selling land-based foods, 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 the pelts, which requires a certain skill set and traditional knowledge of bountiful harvesting areas. However, as Albert Nadli states, "one of the challenges is dropping fur prices" (2018). With less economic incentives now than in previous decades, communities are witnessing less trapping, which can be argued, correlates 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 (Wohlberg, 2015; GNWT, 2007). Whereas trapping plays a marginal role in overall land-based food procurement initiatives it still has many socio-cultural and economic benefits.

> Years ago, I used to trap for lynx. Back then one pelt would be $1,200 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 mean, I still do some trapping in the winter. Now I usually go for martins. (Albert Nadli, 2018)

Sanguez adds to point above, by explaining:

> 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 $1,000 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. (2018)

The reduction in economic incentive to trap certain fur-bearing mammals, who also provided subsistence, creates a number of challenges. Theresa Bonnetrouge revealed that her husband does trap less and the driving force to trap no longer incudes the economic incentive, but instead is more about food procurement and personal enjoyment.

> My husband goes trapping every year, every winter. He goes across to our camp, because everybody is on this side [of the Mackenzie River] so he goes across. 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 too. (2018)

Despite the drop in market demand for mammal furs, many provide economic value and a source of food, creating a two-fold reason to maintain trapping as a vital food security measure to address both the socio-cultural and economic barriers present. For many Indigenous communities across northern Canada, ongoing socio-economic challenges influence land and resource use patterns, and impact the ability of communities to adapt to environmental change (Wesche & Armitage, 2014). In Fort Providence, with many community members working wage-based employment[10], it can be difficult to access the land:

> I try to [get out on the land]. I really try to, but it's just 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. Like my son he is in school, and I think last summer was the only chance we had to go out. We went out for about 4 or 5 days and we were out at Bouvier Creek. We stayed there

[10] Wage-based employment for the purposes of this thesis is described as salary work in which employees are payed an arranged amount at steady intervals (Government of Canada, 2019).

> for a couple of nights, and he really liked that, and me too, I really enjoyed it. (Michael Nadli, 2018)

This passage describes the complexities of wage-based employment and suggests that food procurement activities are changing. Individuals engaged in wage employment may have economic resources to address food insecurity levels via market foods, but lack the time required to efficiently and adequately procure land-based foods, which ultimately results in the loss of ecological knowledge. Typically, wage-based employment incorporates a 9am-5pm, Monday-Friday, work week. This limits community members' ability to access the land and can have other unintended impacts on local ecosystems, as Bastedo explains:

> [Wage-based 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 over-harvested. (2018)

Christina Bonnetrouge adds to the quote above and indicates:

> When I was younger, I used to go [on the land] a lot with my family but as I got older, when I got summer jobs and stuff... I didn't have a lot of access to get out, so it was a lot harder. A lot of the camps that run in the community, run throughout the week days, so it makes it hard when you work, you know? (2018)

These quotes explain the barriers of wage-based employment at the cost of the diminishing traditional ecological knowledge. If the community's youth are unable to find the opportunities to get on the land, this could result in gaps of harvesting and land-based knowledge required to be a successful harvester. Livelihoods in Fort Providence are characterized as a mixed-economy and incorporate land-based and wage-based income and, like many northern communities, face pressures due to the dwindling participation in traditional harvesting and lack of consistent full-time employment opportunities (Andrachuk & Smit, 2012). This situation is not dissimilar to many Indigenous communities throughout rural Canada.

The third theme to emerge was the high cost of living in the NT. It must not be overlooked that a key factor in determining overall food security is income (Skinner et al.,

2013). Food insecurity typically results from a household's inability to access food for financial reasons, it is not surprising that income is the strongest predictor of food insecurity in Canada (Tarasuk et al., 2016). This proves accurate for northern Indigenous households in a number of ways, as food security is highly dependent upon socio-economic factors, such as being able to purchase market foods or equipment for land-based harvesting. In Fort Providence, there are many barriers to land-based food procurement, but the rising price of gasoline remains a crucial economic challenge. As Michael Nadli says:

> A barrier to getting out and doing more hunting would be gas. The price of gas has sky rocketed. If you are living, say in Fort Providence, it is common that a lot of people are living on income support. They're living on almost a fixed income, where they have to appropriate some of their dollars to apartment, food and clothing. Then whatever is left, they maybe would have to buy some gas. Think about this: one 5-gallon jerry can is about $30 – $35 bucks, and one jerry can from Fort Providence would get you, maybe to Axe Point. That's probably as far as you could go on the Mackenzie River. Then if you shoot something, you need another extra maybe 10-gallons to go back because you're carrying a lot of weight, and going upstream. So, you'd need about 15-gallons to go to Axe Point and back, if you get a moose. (2018)

Elder Sabourin adds that harvesters also require equipment to go out on the land to procure food:

> I would say that the number one thing would be money, like to buy boats, kickers, skidoos and traps and 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. You know, my brothers do that all the time… they get these young guys to go out with them and they teach them. (2018)

As the quote above insinuates, the community is already employing adaptation strategies to ensure cultural resilience and the transmission of traditional ecological knowledge. The informal strategy employed by community members, for example includes sharing resources in order to support land-based harvesting. Despite this, livelihoods and the economic capacity of local individuals is greatly influenced by the high cost of living and the variability of

employment opportunities, which ultimately impacts food security. Dene woman Charlene Bonnetrouge provides some insight into this issue:

> 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. I think that might be a reason why people don't go out as much as they used to. You know, it's just maybe the next generation, because I don't see much of our younger people going out to do stuff traditionally. (2018)

This quote suggests that it is simply easier and potentially economically cheaper to purchase market based foods. The need of financial income is necessary in the Canadian economy, however participation in employment, education and training allows less time and flexibility for harvesting (Andrachuk & Smit, 2012). This implies a linear relationship between unemployment rates in small communities across northern Canada and land-based procurement activities. If unemployment rates decline, so would land-based procurement, which perhaps could correlate to higher rates of land-based food insecurity. The increasing costs of hunting, fishing, gathering, and land-based procurement compounded with low income levels, limits the ability of many Indigenous harvesters to go out on the land and procure food; but at the same time, those engaged in wage economy may have the resources but lack the time required for land-based food procurement.

## Conclusion

By identifying the barriers and depicting the gaps in realizing food security, this chapter examines the complexities of food procurement in Fort Providence. The goal of this chapter was to establish land-based procurement as a critical component in identifying the environmental, socio-cultural and economic challenges to overall food security. Indigenous peoples in Fort Providence depend on the local environment for subsistence and a changing ecosystem, unpredictable weather patterns and rising costs of living leave the community

vulnerable to negative consequences. Moreover, the many socio-cultural and economic complications presented in this chapter add another dimension to the climate change discussion, and provide a deeper understanding to the interconnected impediments to food security. The environmental changes explored in this chapter demonstrate their influence on Fort Providence residents' consumption and overall procurement practices, as land-users are forced to adapt to procure available land-based foods. This establishes that as environmental changes intensify, local food procurement activities must change in order to adapt, adjust or cope with the consequences of climate change. Despite the complexities discussed in this chapter, northern Indigenous communities will need to actively adapt to environmental changes in order to create efficient adaptation strategies, local perspectives, opinions and experiences will be required to lead discussions and efforts to improve food security rates across northern Canada.

Robust and effective policy outcomes should be driven from local perspectives and incorporate traditional ecological knowledge. The importance of lived, northern experience and traditional knowledge in defining and addressing issues surrounding food security is a critical gap in the literature (Council of Canadian Academics, 2014). The findings from this research address these gaps by acknowledging community members' perspectives to direct the research project and highlight the issues deemed most critical by participants. This research was able to provide insight into the current state of food security in Fort Providence, while emphasizing the opinions and needs of knowledgeable community members and land-users. As a result, the situation in Fort Providence is probably not very different from those of other northern communities, where compounding environmental, socio-cultural and economic changes are placing undue stress on vulnerable, rural Indigenous communities forcing their hand: adapt, adjust or cope with the consequences.

# CHAPTER 3: EXAMINING LOCAL ADAPTIVE CAPACITIES AND RESILIENCE TO ENVIRONMENTAL CHANGES

Global climates are already warming at unprecedented rates, creating risks across food sectors and could exacerbate ongoing challenges relating to shifting environmental conditions (Adger et al., 2003; IPCC, 2018). All societies across the globe will need to cope with environmental changes that are widely predicted to impact temperatures, soil conditions, weather patterns, rising sea levels and changing ecosystems (Adger et al., 2003). Adaptation strategies to shifting environmental conditions will help support vulnerable communities and, if well managed, could help improve food and water security, reduce risks of climate related disasters and support ecosystems (IPCC, 2018). Adaptation can encompass both autonomous responses by affected individuals and communities or planned responses by governments and institutions (Ebi & Semenza, 2008). This is important to note as successful, efficient and robust adaptation strategies will need to be guided by local communities and supported by government initiatives. This requires partnerships at all levels, but communities who are directly threatened by evolving environmental conditions and food insecurity should be at the center of these discussions.

In the NT, Indigenous communities continue to rely on the environment for subsistence, which supports, to a degree, food security and cultural resilience. Using traditional ecological knowledge throughout times of abundance and scarcity, Indigenous peoples across northern Canada have developed dynamic relationships with the environment in which they live, this includes practices of harvesting available plants and animals that have both spiritual and nutritional value (Council of Canadian Academics, 2014). The intimate connection that Indigenous peoples have with their environment has been explored through food security research and through academic literature investigating the intersections of

traditional knowledge with academic study (Mazzocchi, 2006; Rosol et al., 2016; Gerlach & Loring, 2013; Ford et al., 2010). However, there remains a gap in literature that examines and identifies local-scaled adaptation strategies to climate change. In particular, research that assesses community perceptions of the dynamic relationship between shifting environmental conditions and local food procurement in the NT.

By exploring localized adaptation strategies, this chapter aims to provide a deeper understanding of local perspectives regarding community-wide resilience to climate change and cultural continuities to socio-economic constraints. Through the use of IM and semi-structured interviews, topics explored include, harvesting programs for community youth; the complex nature of northern bureaucracy; and economical, technical and infrastructural capacities. This chapter argues that engaging in local food procurement supports overall community resiliencies, cultural continuities and adaptive capacities because it reduces stressors associated with environmental change and food insecurity. The following key questions are addressed in this chapter: 1) What are the current benefits and risks of engaging in local food procurement?; 2) Do local food procurement strategies help increase the community's adaptive capacity and resilience to climate change; 3) What are the constraints to developing adaptive capacities at local, regional and national levels?

**Considering Constraints to Adaptation**

Individual and societal adaptations to a changing climate are well-established. For example, irrigation, insurance and weather forecasting are just three of the many human institutions which have shaped our relations to the continuously changing physical world (Adger et al., 2009). Across what is now Canada, Indigenous peoples have relied on their regional ecosystem for subsistence and autonomy. Over many centuries, Indigenous peoples

formed complex relationships with their local ecosystems and adapted to changing ecological conditions, while simultaneously managing resources to ensure future conservation (Mazzocchi, 2006). This dynamic relationship is being disrupted for communities across northern Canada by shifting environmental conditions, which severely impacts local ecosystems, species and land-based subsistence. As explored in Chapter 2, environmental changes in Fort Providence compounded with socio-cultural and economical barriers, creates challenges for adaptation strategies and frameworks. For example, a number of risks in regards to land-user safety were identified. Also, the economic expenditures associated with land-based food procurement creates constraints for harvesters. Young adult and Dene woman Christina Bonnetrouge, explains the consequences of climate change that are already being felt in Fort Providence:

> Especially, with the way the weather has been unpredictable… we're already seeing a decline in the animal populations... and also the rising price of gas. These are all factors for land-users. (2018)

In order to understand how a community can adapt land-based food procurement to volatile environmental changes and socio-economic constraints, it is first imperative to understand where community vulnerabilities lie. These vulnerabilities are determined by resources on which residents depend upon and also by the availability, access and stability of those resources (Adger et al., 2003). Community vulnerabilities to environmental changes can be conceptualized as a function of exposure-sensitivity to shifting environmental risks and adaptive capacity to deal with those risks (Ford, Smit & Wandel, 2006). Exposure-sensitivities reflect the susceptibility of people and communities to biophysical conditions that represent risk, while adaptive capacity reflects a community's potential to address, plan for, or adapt to exposure-sensitivities (Ford et al., 2010). Adaptation research is typically framed around a community risk assessment, which gathers data about livelihoods, resilience, and hazards

(Aalst, Cannon & Burton, 2008). Although this research project did not focus on a formalized risk assessment, instead it focuses on identifying local food procurement initiatives by recognizing their importance in supporting overall community resilience and adaptive capacity. Semi-structured interviews allowed participants the opportunity to identify the multifaceted aspects of community vulnerabilities they consider important and permitted a greater understanding of the complexities around adaptation strategies.

As depicted by Fort Providence community members, local food procurement activities are currently threatened by a number of interrelated factors. Michael McLeod, Member of Parliament for the Northwest Territories, points out that climate change has caused major concerns regarding ice conditions and water levels, but also that complex socio-cultural challenges are adding more stressors to the situation. He describes the connected risks that northern Indigenous communities currently experience in regards to food security and local food procurement in shifting environmental conditions:

> Climate change has made a big impact in the north. Number one, it has caused a lot of concern around the issue of safety when you're out hunting, fishing, gathering berries or whatever you want to do on the land. We now have ice conditions that are different than they were before, historically. We have more storms... bigger storms. We have forest fires... huge forest fires. We have new animals and new bugs that are making their way north. It's caused people to hunt less. It also means people are spending less time out on the land, which is resulting in diminished knowledge. Our culture is based on passing our history on, down through generations. Our history is oral, right? So, people are losing the ability to be able to tell you where... to find a good berry patch. Where the blueberries are? What the place names are, in the Dene language? They're forgetting... They don't know anymore, where the historic sites are and the best migration routes for different animals are, or when the fish are running... Those things are starting to really become eroded. It's causing a lot of concern, because now we are starting to see a cultural disconnect. We are starting to see a disconnect between the Elders and the youth... we used to turn to our Elders. All of that traditional knowledge, we need from our Elders. Now... things have changed so much. We have a lot of different words in our language for different elements, for example, snow has many different variations of how to describe it. As the conditions change, as it gets harder to hunt, and harder to trap. That's really challenging our culture, you lose a language, you lose traditional skills, and you end up losing all these things. (2018)

Robust adaptation strategies must be created to overcome the many challenges and barriers acknowledged above. In terms of action, adaptation to shifting environmental conditions may take the form of reducing dependencies on vulnerable systems, such as diversifying food procurement activities, decreasing community sensitivities by avoiding building infrastructure in high-risk locations, or by strengthening existing systems so they are less likely to be damaged by unusual events (Adger et al., 2003).

As remote northern Indigenous communities attempt to address these socio-cultural, economic and environmental challenges, the importance of engaging in local food procurement activities remains vital to support food security and cultural continuities. Throughout the course of the interviews, it was noted that land-based foods are becoming increasingly difficult to acquire, which correlates with rising food insecurity rates in the community. A number of interviewees recalled a time when there were ample land-based foods available, and that it was shared amongst all, to ensure everyone had enough. As Elder Laura Sabourin fondly remembers:

> They used to get hundreds of these muskrats. They used to gut them and dry them. Oh my goodness… they were so tasty! After it's dried, you boil it and it is just so delicious! I can just see it you know... all the dry fish and dry meat. We used to have so much food. Every camp also had a big boiling pot of ribs and beaver meat, ducks, geese, just everything you could think of. Everyone also had fresh bannock! It was so good back then. (2018)

As Sabourin recalls, land-users harvested large quantities of available, easily accessible, stable populations of land-based foods. While it is imperative to note that cycles of plenty and drought have always impacted resources, land-users possessed the knowledge in terms of processing the meat and hide, to ensure that every aspect of the animal was put to use. Many interviewees recall the amount of land-based foods available and its stability in their diets, correlating with higher rates of food security in the community, and more broadly, across the north. However, research has noted disruptions to Indigenous food systems based on colonial

impacts and policies (Mason, 2018). As traditional food-based knowledge erodes in northern Indigenous communities, harvesting households tend to distribute land-based foods in particular patterns. This is based on families sharing amongst each other or with other harvesters. This means that many vulnerable community members are missed in the local food distribution networks, such as Elders who no longer have harvesting family members, single-mother households who do not possess the skills to regularly access fresh land-based foods, or family units where substance or chronic disease are impacting their lives.

> As for meat… you have to practically go hunting every day… and nobody is going to give you that much… Moose meat is hard to give out because nobody goes out that often which means we usually don't have a lot of it. People now don't share as much, maybe just around their immediate family… or if you are friends with them, then you would be lucky if you would get a piece of meat! [laughs] So you had to be nice to everybody! [laughs] (Laura Sabourin, 2018)

As Elder Sabourin points out, it is getting more challenging to acquire land-based foods. Dene woman Pamela Richardson and Dene harvester and skilled land-user Boris Sanguez reflect on land-based food available when they were younger:

> Growing up we always ate caribou meat, or moose meat. There was never a shortage of dry meat. We had our deep freezers full of wild game and fish. (Richardson, 2019)

> I remember when we were kids, we used to pick a lot of wild mint, wild carrots and wild berries. (Sanguez, 2018)

However, as many residents reminisce on these memories, it led to the realization of just how drastically environmental conditions have changed. Elder Joachim Bonnetrouge explains, "for traditional foods, it's been a real struggle for the last 10-15 years... especially the last few years... hardly any moose" (2018). This suggests that there is a steady decline of land-based foods in the diets of Fort Providence residents, and this is caused by a number of socio-cultural, economic and environmental factors that must be addressed through adaptation strategies. Research has shown that offsetting land-based and culturally significant foods with market foods can be a satisfactory coping strategy for some families, while for others, land-based food

procurement is desired to supplement consumption requirements (Ford et al., 2010). Elder Joachim Bonnrtrouge adds that negative impacts of forest fires and new diseases to local big game populations, has caused stress on local land-users:

> Two years after the bad anthrax outbreak, we were devastated by forest fires. For the traditional economy and for traditional food, it's just added more stress, more challenges... If you really wanted a moose, you would have to pick your boat, and try to travel light, but because it's fall time, you still need good gear. Get some food and you pretty well have to go about 100 miles down the river, or if you go up the river, you're dealing with the shallows. But you pretty well need to do that. Even for me, that's a big commitment. And you still need income, eh. (2018)

As the above quote points out, in addition to the significant time commitment required, economic investment in harvesting equipment and supplies, land-users require somewhat of a fixed income to be able to afford procuring foods from the land. This does not include the economic costs associated with adaptation requirements to ensure safe land-use. As shifting environmental conditions exacerbate ongoing land-user safety issues, technical equipment, such as satellite phones, can be purchased as an adaptation tool to reduce risks. However, due to limited economic capacity in many small, remote northern Indigenous communities, such adaptation strategies remain out of reach for many land users. This suggests the need to enhance finance mechanisms to help cover the costs of adaptation for land-users. Moreover, technology does not reduce vulnerabilities directly, unless an individual possesses the ability to use and adapt with the technology (Ford et al., 2010). This suggests that autonomous coping responses must be combined with governmental support through funding, training and adaptation frameworks to enhance on-the-ground responses to shifting climatic conditions. Fort Providence residents cannot rely exclusively on land-based food procurement to address all pillars of food security, but instead must adapt land-based food procurement activities to become a holistic tool to help support overall food security, cultural continuities and community resilience.

**Identifying Adaptive Capacity to Environmental Changes**

A combination of local food procurement activities will support food security and adaptive capacities, as the community must adjust food procurement activities to confront the manifestations of food insecurity and to cope with unpredictable environmental changes. As Michael Nadli, the Honorable Member of the Legislative Assembly for the Deh Cho, points out, Fort Providence residents are resilient and are already adapting to environmental changes:

> One of the strengths of the community of Fort Providence is, in some ways and the people from the community don't see it themselves... but it's their resilience. The resilience of the people here. When they go out hunting and trapping, they're really good at it. They're very skillful, it's just a natural gift for them to do that. The traditional skills are very strong in [Fort] Providence. It can be a reflection of the defiance to the governmental system, you know. It could be a reflection of survival mode, to say: you know, I'm not going to feed my kids pork chops, steaks and canned corn from the store, when we can eat wild chicken, beaver or moose meat! (2018)

This quote suggests that in spite of shifting environmental conditions, community members still partake in land-based food procurement as an important food security activity and culturally meaningful practice. Warmer temperatures and changing ice conditions for example, indicate that land-users are adjusting their harvesting habits to reduce the risks associated with erratic environmental conditions. These are autonomous adaptation responses that are being generated from the ground up. An example of this would be a local land-user's flexibility. This flexibility accounts for shifting migratory patterns or unpredictable environmental conditions to avoid potential hazards. Adaptability is the process of continual learning, readjusting and improving skills that are gained thought personal experiences on the land which are transmitted across generations to create a wealth of opportunity and a breadth of cumulated knowledge (Pearce, Ford, Willox & Smit, 2015). Long-time land-user and Elder, Albert Nadli, explains the ways in which he adjusts his land use to cope with shifting environmental conditions:

> I fish more now. But there's lots of ways in which we adapt. Sometimes, the Band provides the community with bison tags. Sometimes, if we don't have that much moose, we will get more bison tags, or at least it feels like that. Or we fish more…now we fish more... (2018)

As young Dene adult and Dene Bradley Thom indicates:

> [Land-based foods] have a great deal to do with tradition and culture. It is always adapting. Nothing is ever set in stone. I feel like, it's growth. We need to continue to grow. We need to continue to work towards sustainability in our food sources. (2018)

Another autonomous adaptation includes the sharing of land-based foods amongst community members. As local Métis male, Mike Leishman describes:

> My mom brings over traditional food…like fish and other freshly harvested meats. It's mostly my family from Kakisa [community situated on Kakisa Lake, 70 kms to the south east] that will bring us traditional foods. (2018)

Michael Nadli adds to Leishman's point:

> Sometimes like my cousins once in a while gives me some moose meat. Others, once and a while give me fish. My neighbour across the way, gives me some meat once in a while. I'm surrounded by relatives there so... I do get some wild meat from time to time. (2018)

This demonstrates the community of Fort Providence is already employing ad hoc and autonomous responses to environmental, socio-cultural and economic challenges. These localized autonomous responses must be paired with governmental strategies to be truly effective going forward.

Governmental approaches include formalized programs and initiatives implemented by governments or agencies; however, theses do not always reflect the specific and unique nature of the communities and individuals they are attempting to include (Ebi & Semenza, 2008). Early climate change adaptation research took a more top down approach; and researchers are slowly moving from global climate model scenarios, to more localized assessments of adaptation options (Aalst, 2008). This is a critical shift, as blanket programs do not address pressing localized needs, especially in the face of shifting, unpredictable climatic conditions.

For northern subsistence harvesters without full-time wage-based employment, the economic adaptation requirements to address the risks of environmental changes can sometimes be too high to manage. Thus, governmental support of harvesters is a critical component to provide a safety net for households, to help harvesters recover from climate related losses and provide financing for adaptation (Ford et al., 2010). This indicates the importance of strengthening existing harvesting support programs, and developing new frameworks and policies to ensure they reflect community adaptation requirements. As Albert Nadli describes:

> I just heard on the radio, when I was driving down here, that people can put an application in, to help harvesters with gas. So, that's one way [governmental programs] are helping. But probably, if we could... get someone that knows more government programs and stuff like that to help guide us through the processes to get more funding. Get someone to get more information on it, and stuff like that. You know, we don't use all the programs available to us because we don't know about them, or we don't know how to apply for them. Maybe you could be that person! (2018)

The quote outlines some of the human resource challenges that occur in rural northern communities as there is a gap in technical knowledge to apply for these programs. This constraint adds to the many limitations that land-users face. Grand Chief for the Deh Cho, Gladys Norwegian, adds to Albert Nadli's comment:

> I do know that they are continuing to provide harvesters with some money, you know. But other than that, I don't know if they are making any provisions or safety prevention programs for hunters to go out…or for harvesters to go out. (2018)

Current programs can be improved in a number of ways, such as through enhanced financial support, better communication of program requirements or different funds distribution avenues to avoid favoritism in small communities. Moreover, building in a climate change adaptation dimension and a transmission of knowledge component, remains a critical piece in policy and program development. This is one way to further build community resilience and enhance community adaptive capacity. According to retired principal of the Deh Gáh Elementary and

Secondary School, Lois Philipp, there are a number of interrelated barriers that hinder governmental program effectiveness and policy development:

> In a sense, there is an increase sense of bureaucracy. I suspect that some of the policies and procedures put in place to be very aware of risk management, are actually hindering the process... something like criminal records checks, which if you look within a residential school context, has tremendous limits[11]. It's a very... what's the right words... you know it's not really indicative of who the communities are. When we are dealing with multi-generational trauma, and then you get some bureaucrat in Yellowknife that's put these policies and procedures in place, hindering our students from being able to go out versus supporting them. [Policy] privileges a voice and whenever you are dealing with systemic privilege, you almost need to step into that quagmire of chaos and say: okay, what's really important here? If experimental outdoor education is important, then what are the systemic barriers that we need to address? That excludes white privileged voices, and you go to the communities directly and you ask: well, what is really important for you? (2018)

As Philipp suggests, top down blanket approaches, like regionally or nationally implemented programs, do not always directly meet community needs. She argues that current programs are not doing enough to support the adaptation component needed for the stability of long-term land-based food procurement. Despite these setbacks, there is currently a number of land-based procurement and cultural programs, directed by the Deh Gáh Elementary and Secondary School in Fort Providence, that involve the youth of the community. As these programs are community-driven, they reflect the needs of the community in terms of the transmission of traditional ecological knowledge and academic knowledge. As Philipp's explains:

> We start off in our primary programs where the kids spend 3 or 4 weeks [out on the land]. They will do a winter camp for 1-2 weeks. They will do the same in the spring. Those are all day trips, with a focus on land-based foods. The winter focuses on the hunting and trapping program. In the spring, it focuses on the fish camp. In the summer/fall, we're focusing on getting back into school within the language component. Uh, when we get into the elementary / junior high program, it's all overnight camps. They will be out for... on average 2 or 3 weeks. In terms of the long-term benefits, you look at the community, it's giving our kids the opportunity to really

[11] For Indigenous peoples in Canada, food insecurity is rooted in the colonisation of North America, beginning with the arrival of Europeans and the fur trade. Food insecurity is the cumulative effect of colonial-style governmental policies, residential schools and race-based legislation disadvantaging Indigenous peoples (LeBlanc & Burnett, 2017).

> experience a lot of cool experimental outdoor opportunities, which leads to their academic success. (2018)

This clearly demonstrates the benefits of formalized land-based food programs, which are guided by local needs and priorities. The impact of these programs include capacity-building for increased food access, socio-cultural ramifications that include relationship-building, knowledge transmission, and cultural continuity (Wesche et al., 2016). The real benefits of these school programs are reflected in past-student Bradley Thom's experiences with land-based programs:

> I feel like I personally wouldn't know how to skin a moose if it wasn't for the Deh Gáh School allowing me to go out on the land with Elders and land-users who taught us all of that. (2018)

As local high school science teacher Nimisha Bastedo explains, "for some of the kids, the school has been their main exposure to fixing wild game" (2018). Elder Sabourin adds that the importance of the transmission of traditional ecological knowledge remains embedded with cultural significance and that it is an important part of overall educational requirement:

> We are teaching the kids now, like this is a rabbit track, this is a martin track and stuff like that. This summer we got to see moose tracks, so we showed all the young people out with us. It was Stuart and all those hunters, this is what they look for. Then they will just dig in there and they will know how old it is, they will know how many days ago the animal came by and they will track it. They will follow these tracks and eventually will find the animal and shoot it. The kids were like: oh that is so cool! (2018)

Local elementary school teacher and Elder, Theresa Bonnetrouge explains, this program has important cultural benefits:

> A lot of those kids that get to have meaningful experiences, it will stay with them. A lot of them, that don't usually go out, will get a chance to learn how to pitch a tent and put spruce bows on the ground. With the smaller, younger groups that's exactly what we do. They get to see us putting the tent up and put the spruce bows down, cooking on the fire, you know things like that. Traditionally, that's what our people did, by having our kids watch, then they would do it later on as they get older. I hope the school continues to do that kind of stuff, with the programs. The kids... maybe it's just the way the school rooms are, but when the kids are out in the bush the kids are just calm. They will be running around in the bush, but they're okay, they're

> exploring and everything like that. I really like it because sometimes with these kids, that's the only time they will get to go out. Because not all the parents go out with them anymore. (2018)

It is not just the Deh Gáh Elementary and Secondary School that coordinates these land-based programs. Governmental supported programs implemented by the GNWT includes, for example, the Take-A-Kid-Trapping Program. This program pairs with local schools across the Territory to introduce youth to trapping by funding local initiatives.

> The Take-A-Kid-Trapping... the kids go out with an Elder from the community who would show them how to set different types of traps. It could be snares for lynx or traps for smaller game like beaver. In the winter time, we went to check the beaver trap. I didn't know this, but you put two sticks and you cut a hole, it's not a round hole, it's a square hole. I thought I knew some things about trapping, but I guess I don't [laughs]! The guys are fixing the beaver and the kids are just sitting there and watching and they say: oh this is the hand, this is the teeth! Then they all wait around until you're finished cooking the beaver tail. Everybody waits around for the beaver tail! (Theresa Bonnetrouge, 2018)

This community-territorial partnership takes into account the needs and capacities of the community to provide foundations for success in a localized context (Wesche et al., 2016). Clearly, as demonstrated through community members' experiences, these programs are successful and extremely beneficial to community-wide resilience, and for building local technical capacities. Nonetheless, shifting environmental conditions continue to aggravate the shortcomings in funding allocations, and future climate change will further increase pressures on support programs (Ford & Smit, 2004). As Michael Nadli explains:

> Take-A-Kid-Trapping Program, you know, maybe the GNWT gives close to $5000 to Fort Providence and in the end, it's for gas money and grocery money, you know that's something to say. Like a local harvester takes maybe two boys, to Willow Lake on his trap line for two weeks, so that money will cover his gas and groceries. He'll be happy with that. But from a government standpoint, you know, how do you measure the accountability in that? That's where some of the challenges arise, the policies... so that's just one example of at the local level where you're trying to be adaptive. (2018)

This quote outlines the complexities that arise when trying to mitigate the impacts of environmental change on food security adaptation strategies, as the transmission of traditional

ecological knowledge is imperative in maintaining cultural practices. As formalized programs typically require tangible results, it can be problematic at the local level where there are positive yet unmeasurable cultural outcomes. Indigenous youth in northern communities are spending less time involved in subsistence activities, beyond organized land-based camps. This has resulted in fewer opportunities to learn hands-on knowledge and to gain skills necessary for safe and successful land-based food procurement practices (Pearce et al., 2015). Therefore, the importance of maintaining government supported programs, such as Take-A-Kid-Trapping, is an important short and long term strategy to cope with socio-cultural, economic and environmental challenges. Essentially, Take-A-Kid-Trapping was viewed in a positive light, as many interviewees expressed its importance.

In the context of a contemporary Indigenous communities, key determinates of adaption include the ability to cope with and adjust to biophysical changes that affect subsistent land-based procurement. This is associated with a profound knowledge of the local ecosystem and land-based harvesting skills, which allow land-users the ability to make dynamic and flexible use of the shifting environment and available resources (Pearce, et al, 2015). According to interviewees, another way in which adaptation is taking place in Fort Providence, is through the buying and selling of local foods. As Michael Nadli explains:

> What's common right now is people buying a lot of wild game from each other. Then the harvesters use that money to buy more gas. That's a common adaptive measure that people are taking, I guess. For those people who cannot go out in the bush and harvest fish or moose, and instead of buying frozen steaks or frozen ribs from the Northern [Store], they will buy fish and wild game from harvesters that come in. (2018)

Norwegian describes that it is not just in Fort Providence, but across the north, communities are informally selling locally procured land-based foods as an adaptive strategy to environmental, socio-cultural and economic barriers. "Kakisa is doing something like that, selling fish. They've starting up something on a very small scale" (Norwegian, 2018). Small-

scale fishing operations are viable in the Northwest Territories, and could become an important economic industry, as fishing remains an important cultural practice and food security strategy. However, it will require substantial governmental intervention, in order to efficiently revitalize the industry.

> You have people in Kakisa who are trying to get fish and end up selling their fish in Hay River. You know, so once in a while you get people, who run from Kakisa to Fort Providence to sell fish... usually the summer time. I don't know how often it happens but the guy usually sells pickerel and whitefish. In Yellowknife, by chance, I sometimes see one of the Buckley guys outside of the Independent [Grocery Store], he has a sign out there and I go and grab some lake trout or whitefish, that's my favourite! When I'm in Hay River, I go see this one guy and he has them all packaged and frozen. You can buy trout fillets, whitefish, pickerel, grayling, you can buy them in fillets or a whole fish. It's usually deboned pretty good. Like it could be done in Fort Providence. (Michael Nadli, 2018)

Hay River and Yellowknife, the larger hubs in the NT have seen a fair share of commercial and private fishery operations on Great Slave Lake (GNWT, 2017). In the past decade, the commercial fishing industry has declined substantially, and now, slowly there's ongoing work to revitalize it. A key part in the GNWT's strategy includes facilitating the entry of young Indigenous fishers, as a way to combine industry as well as preserving a traditional way of life (GNWT, 2017). This suggests there is potential to explore a fisheries strategy for the Mackenzie River, in terms of something a bit more formalized, to support regional food security and local economic capacity. While understanding that this type of strategy would primarily support middle-class and more economically viable Indigenous families, it cannot be disregarded that the engagement in a capitalist economy of selling land-based foods disadvantage and marginalize vulnerable community members, while simultaneously impacting climate change and threating a healthy ecosystem. Moreover, the engagement in this type of economy is contrary to local Dene values of sharing with community members who may have less access or resources. This topic is complicated and requires further

investigation to assess community perceptions and capacities to create localized opportunities for a fisheries industry.

Local autonomous adaptation strategies in combination with formalized governmental policy initiatives is key to address the complexities of shifting environmental conditions and food insecurity. This suggests the need for a multifaceted approach to address the different pillars of food security, while dynamically instituting initiatives that directly support localized food procurement strategies, cultural continuity and community-wide resilience to environmental changes. Grand Chief of the Deh Cho, Gladys Norwegian explains that other communities across the Deh Cho have made some efforts to address climate change and adaptation strategies:

> Last year in Jean Marie River, we were looking to dry food. So, moose meat... kind of having moose meat jerkies and different things like that. We bought a whole bunch of dehydrators to make dry foods. There was a lot of people who do that themselves, like drying kale and other vegetables. All of that. (2018)

Across the north, Indigenous peoples remain intimately connected to local ecosystems, which creates susceptibilities to shifting environmental conditions with widespread implications for human-environment relations and vulnerabilities (Ford et al., 2006). Given the potentially serious risks associated with climate change, a considerable effort is underway to understand adaptation, while mitigating the effects of a changing environments (Adger et al., 2003). These efforts include both formalized institutional and local autonomous responses. In Fort Providence, community members proposed a range of adaptation strategies throughout the course of interviews, which included selling land-based foods, growing foods locally, and adjusting harvesting strategies to shifting environmental conditions. This demonstrates that the community is continuing to build adaptive capacity, while supporting food security and cultural continuities.

**Alternative Food Production Models**

In northern Canada, to date, climate change adaptation strategies have been largely short term, ad hoc and reactive in nature (Wesche & Armitage, 2014). In the NT vast territories of land remain uninhabited and remote, and this suggests that economic, technical and infrastructural capacities will struggle to address long-term formalized adaptation strategies. This is unsurprising, as many small and isolated northern communities lack the necessary resources and overall capacity to address compounding environmental changes already underway. Fort Providence resident Jason Collard describes that there is a number of local food procurement activities underway in the community, and around the north, in attempts to address food insecurity through alternative food procurement initiatives:

> There is a lot of exciting things happening within the hydroponics…aquaponics…or container growth systems, you know. So, it's all possible, but it's about building that capacity locally to start with. Like why leafy green is what everyone starts with [in an aquaponics system] is because there is such a low margin for error. Yes, you can grow conceivably everything in these systems, but you have a much larger margin for error when you don't have the experience and/or technical capacity. You are going to end up with a greenhouse full of rotten or dead plants, and that's not good for building a sense of what's possible. Now by the same token, by having more parsley then we can shake a stick at isn't great for selling this idea either [laughs]! (2018)

Collard highlights the intricate balancing act of adapting northern food procurement activities. On the one hand, for any alternative food-based activity to be successful, there needs to be positive outcomes. As leafy greens are not a staple of local Indigenous people's diets, having too much parsley, as Collard suggested, is not going to help address food insecurity either. Collard adds:

> [The aquaponics system] is part of a long-term vision for building capacity and ultimately food security, as well as self-sustainability in the north. It's demonstrating successfully, stories of what's being done. It's not to look at the entirety of the solution without taking steps along the way. So, I really see this as an incremental step, but we are trying to involve the community in showing them what they're capable of and what's possible. You know, it's a learning opportunity and starting to build that kind of resiliency. (2018)

This indicates the importance of an ongoing partnership with communities, because what works in one community will not necessarily work in another. This is due to a wide range of factors, such as a local champion taking a lead role, community priorities or preferences, environmental changes, and overall technical, economical and infrastructural capacities of the community. In Fort Providence, Philipp and Collard are spearheading an alternative food procurement initiative, by means of growing food locally through an aquaponics system. As a local science teacher and volunteer with this alternative food procurement initiative, Nimisha Bastedo, explains:

> I know there has been interest in growing more food locally. I've heard multiple people talking about wanting to do that. This aquaponics project is just a demonstration project to show that it is possible to grow food locally and throughout the winter. It was open to anyone who wanted to volunteer or help out. Eventually, the idea is that people who help out can take home some of the vegetables that will grow in it. (2018)

The aquaponics project currently underway is building capacity at a community level, to promote what is truly possible in regards to small-scale agriculture in the north. This implies that by strengthening community technical capacities in relation to alternative food procurement, it will increase overall community resilience to environmental changes and food insecurity. Unfortunately, current infrastructural and economic capacities remain somewhat limited in Fort Providence, as Collard explains:

> Some of the early challenges facing most northern communities, when starting up anything in regards to their own agricultural systems, is the lack of capacity. Especially, seen through a traditional perspective or a peer-to-peer perspective. That's completely lacking. Also in terms of most agricultural set-ups, it requires capital to do anything meaningful. Most northern Indigenous communities are on unceded land, so there is no capital to put up against borrowing money to receive the financing. Even if they get that, even if they get the training, it becomes culturally relevant to them and then they get the capital to build it. Then your cost really is the infrastructure, and more on the support and capacity building side of things. Right? Around this town, there's 4 or 5 buildings that are abandoned because someone invested in them, but didn't think about the long-term sustainability of it. (2018)

Despite the lack of local technical, economic and infrastructural capacities, food procurement initiatives such as the aquaponics system reduces stressors associated with environmental change by supporting community resilience and adaptive capacity building. A few community members are involved with the aquaponics system, but all described a number of barriers and setbacks, such as: hefty regulations that took longer than expected to navigate; issues with heating; and delays with transporting key aspects of the system north. This is to be expected with a pilot project in the north, as volunteers lack the technical capacity to procure foods from a modern system. Regardless of the setbacks, the excitement and community interest around the project remains high, as local volunteer Bradley Thom described:

> I feel like aquaponics will take off in the community, like I really want it to be a thing, because it can go all year around. We can make it sustainable with solar panels and all of that. We would have such local diversity; in combination with fishing and going back out to the traditional trap lines. We could have some moose too! (2018)

Across the North, unique alternative food procurement strategies are being employed to support local food systems, combat manifestations of food insecurity, address stressors associated with environmental change, and support cultural activities (Nunavut Food Security Strategy and Action Plan, 2014). Erratic and unpredictable weather patterns, as a result of climate change will likely increase in the future, which becomes problematic for agricultural opportunities and damaging for land-based food procurement. This is where innovative solutions to growing food locally come to fruition. Closed systems, like the aquaponics system currently underway in Fort Providence, is not reliant on fickle and irregular weather patterns (Jason Collard, personal interview, 2018). This means that even if it pours rain all of June or is unseasonably hot in May, the local aquaponics system will continue to flourish. This could be very useful for the community to increase food security as fresh produce, grown sustainably and locally, has positive effects on overall health and decreases community reliance on costly imported market foods. As Michael McLeod explains:

> The GNWT has been doing really great for advocating for gardens, community gardens, and personal gardens. People are starting to see the benefits of it and it could work, you know. It could work. Even in little communities like Fort Good Hope, they've modified how they do gardening. They do above ground gardening in boxes, they have Sea Cans that they've converted with solar panels so they can control the climate or the temperature, so they can store the vegetables for longer periods. There's greenhouses and community gardens across the north, but not enough though... But it could work! When I was in Inuvik I saw their greenhouse. They converted their old hockey arena to a greenhouse, and it does well, really well. (2018)

As this quote indicates, there are a number of grassroots and governmental initiatives underway in the north, to help adapt food systems to the impacts of shifting environmental conditions. In Fort Providence, as maintained by a number of interviewees, the soil is very rich for growing vegetables, which suggests the community must take advantage of this opportunity to cope with the impacts of environmental change. As Métis male and avid gardener Alex Arychuk explains, "there's 115 growing days a year in Fort Providence (2018). This means that there are a lot of different varieties of plants to grow. Fort Providence's Chief, Xavier Canadien adds, "we have really good soil around here for growing stuff" (2018). The number of growing days is expected to increase, as warming temperatures in the Canadian sub-arctic present an opportunity to investigate the potential for local, sustainable food production (Barbeau et al., 2015). To date, there has been a number of contemporary community gardens and greenhouse initiatives that have been attempted in Fort Providence, as Chief Canadien reveals:

> The friendship centre started off with a community garden. That I don't know what happened to it. And then, some people made a greenhouse, well they tried... we ended up taking over. Asked for funding, but the project is too big and the funding that we got was not enough. That one is on hold. The project is on pause, because we were asking the person to make the proposal [the community greenhouse] smaller. So not that 1-million-dollar project. We're asking to amend the greenhouse proposal, so we can make it more manageable. (2018)

The quote indicates the economic capacity to support community-wide food security initiatives is not quite there yet. Perhaps with local lobbying and if the community could obtain additional funding sources to promote a community garden or greenhouse, these initiatives can gain some

momentum. It is also important to touch on financial constraints as a barrier to future agrarian opportunities, especially in northern regions, where seeds, soil and equipment must be imported (Barbeau et al., 2015). As Chief Canadien states, "we need funding. Funding is the major barrier" (2018). Regardless of the economic viability of a community greenhouse or garden, there is certainly no lack of community enthusiasm in regards to alternative food procurement. Elder Theresa Bonnetrouge explains:

> I know some ladies who were interested in a community garden and they were the ones who came out and helped me. I'm pretty sure there's a decent amount of interest in a community garden. If the Band is going to open up a greenhouse year-round, then you know maybe the ladies who are interested, maybe they'll work there and make a little bit of money. (2018)

This economic component to the community garden can help create a long-term adaptation strategy by building local capacity around alternative food procurement which may possibly reduce stressors associated with shifting environmental conditions, as well as food insecurity with local sustainable food sources. But, as Bastedo indicates, not every community wants a garden or greenhouse, and tailoring adaptation strategies to specific communities is required for the long-term success of local initiatives:

> One of my friends worked for ITI [Department of Industry, Tourism & Investment, GNWT] doing a community garden project that was going down the Mackenzie River dropping off seeds. She said it was kind of weird. [People not knowing or wanting] was the case in a lot of the communities, where ITI drops off a bunch of stuff to help start up a garden, and sometimes they would stick around for a few days to help with the community garden or something, but then they would leave. She would come back later in the summer to find out that no one had looked after the garden or anything. But it kind of seemed like… I don't know, you really need to talk to communities first to see if they even wanted a garden or what they wanted to plant so that they would actually eat it. (2018)

This passage builds on the notion that supports the need of local voices in decision-making processes. Top down interventions into food insecurity should be framed by local community member's voices, while modifying adaptation strategies to best suit needs, priorities and strengths of individual communities. Norwegian reinforces this point by reflecting on a

community greenhouse initiative in another community in the Deh Cho region that did not work out as planned:

> When I was living in Jean Marie River, we tried to have a greenhouse. We put in a garden and we wanted to have a berry orchard. It just didn't happen the way we envisioned it. We were aiming to have an all-weather greenhouse, and I think a lot of attempts were made to lessen the cost of food. The greenhouse was unsuccessful. We were approaching it in a way, like how our fathers used to work together… such as taking ownership of it. Whenever we need to weed it, we looked after it, as much as it needed to be looked after. But I guess people are now just not taking that responsibility. Also trying to find a good water irrigation or to deliver water so it can be watered was challenging. We went through a hold for about two or three weeks of very warm weather, so people just didn't get out there to the greenhouse to do what needed to be done. It pretty well dried up or at least some of the parts just didn't grow. We pretty much need a community effort, for sure. You know people getting together and really making an effort to have an effective greenhouse. (2018)

This demonstrates the significance of including local voices into decision-making processes, as well as ensuring responsibilities are laid out at the outset. Moreover, it is important to note that this alternative food procurement initiative did not include a wage-based employee tending to the greenhouse, unlike what was envisioned for Fort Providence. If a local greenhouse is run on a volunteer basis, it is imperative to build up local technical expertise to be successful. Understanding the present-day effects and responses to environmental change is a prerequisite for studying the effects and responses to future climate change and for identifying determinates of successful adaptation in the future (Adger et al., 2003). This implies that communities must act now to reduce current climate vulnerabilities and target socio-economic as well as policy objectives alongside managing the effects of current and future environmental changes (Ford & Smit, 2004).

Another ongoing food-based adaptation initiative in the NT, is the YK Food Rescue, which receives donations of food from local grocery stores, wholesalers and local community members. This food is then distributed to local non-profit groups around the community and region. This was all made possible with the introduction of Bill 19 in the Legislative Assembly

of the Northwest Territories (NWT Legislative Assembly Bill, 2009). This is a great example of a top down approach that directly impacts food security. As long-time Yellowknife food rescue volunteer Marg Henderson explains:

> The Donation of Food Act, I think it's called... it was a legislative bill that passed in the Assembly in 2008, and it is territorial wide. It covers the grocery stores from any liability if they give away food. We had a problem when we first started, about getting food from wholesalers, and as it was mostly produce, you had to really deal with it. So when this Bill passed, and it was the fastest Bill ever passed in the legislature at the time, it was passed unanimously... It is like the Good Samaritan Act for first aid, so unless you plan to harm someone you cannot be held responsible. So, if... say one of the stores gave us something and we thought it looked good and gave it to a client for them, and somebody got sick, you can't go back to the store and basically it can't come back to us, because we, in good faith, gave it to them because it looked fine. Now, as far as I know nothing has even happened, and we haven't had that problem. But it was good for the stores because they actually ran it by their lawyers and came back and said oh yeah, we can do this now. Which they wouldn't do before... It's territorial. It's only here. Most of the provinces I don't think have anything like that, and some provinces are really strict about their best before dates. They don't seem to realize that they are not expiry dates. (Marg, 2018)

These types of approaches can be somewhat problematic as they do not take into account the perceptions, experience and knowledge of individuals and communities directly impacted. For the example Henderson provides above, Fort Providence and other small communities in the NT do not utilize Bill 19. This initiative does not reach the most vulnerable, remote communities and food insecure individuals. Henderson explains another barrier:

> The other issue that we have with stores, and something that would definitely happen in a place like Fort Providence, is... if they give too much food away, then people aren't going to buy their food. They will wait until it goes... until the store goes, okay well I'm going to throw this out or I can give it to them. So maybe the people will just wait? Most people won't do this obviously, but some people will, and it cuts back on their sales. I am always amazed by actually how much food we do get from the grocery stores. (2018)

As Henderson suggests, while this government-instituted legislation works in bigger centers such as Yellowknife, Inuvik and Hay River, the small communities in the north will struggle to benefit from this type of initiative. Nonetheless, intervention by different levels of government is necessary to enhance existing climate risk management strategies and to create

an enabling environment for adaptation policies (Ford et al., 2010). Another example of a top down, governmental strategy is Nutrition North Canada, which is administered under the Federal Government and designed to provide northern residents with reliable, affordable access to nutritious, perishable foods. However, prices of food in northern communities remain high, and the program fails to respond to distinct community concerns (Gallway, 2017). This suggests that without the incorporation of local voices into adaptation strategies, governmental initiatives will fail to address the real concerns around localized food insecurity. Given that shifting environmental conditions will be expressed in unpredictable and irregular ways, adaptation policy targeted at reducing vulnerabilities to current climatic risks will inherently help to reduce vulnerabilities to future climate change (Ford & Smit, 2004).

The data collected throughout the course of this research reveals that community members are already implementing a range of local food procurement activities to help support adaptation to environmental changes, while promoting food security activities. Despite the many challenges related to local food procurement, community members continue to adapt to support youth initiatives, land-based procurement, and cultivate local foods. While outlining current food-based procurement initiatives, community members suggested potential programs and strategies going forward. These adaptation approaches will support overall community resilience, food security and adaptive capacities, by reducing the stressors associated with shifting environmental conditions.

## Conclusion

It is clear that individuals and societies will adapt, and have been adapting, to environmental changes over the course of human history as climate has fluctuated and shaped the environmental landscape of human habitation (Adger et al., 2003). For northern

Indigenous communities, this means that Elders and land-users must be at the center of the dialogue to guide decision-makers. Land-users are key knowledge holders and play a critical role in the development of land-based adaptation strategies to climate change. Whereas Elders provide wisdom and guidance, they remain central in the support of cultural continuities and the transmission of traditional knowledge. This reinforces the significance of these key voices in the ongoing dialogue about adaption to climate change and food security. Traditional knowledge of the local environment is a key piece in decision-making processes. This intimate familiarity with the land is based on long-term empirical observations suited to local conditions, which ensures a sound use and control of the environment, and enables Indigenous peoples to identify and respond to environmental changes (Mazzocchi, 2006). Traditional knowledge also plays a key role in overall community resilience to climate change and cultural continuity.

Local food procurement supports all pillars of food security in Fort Providence: an aquaponics system provides *availability* to fresh and sustainable produce; selling land-based food locally increases the *access* and *use* of culturally important foods in local diets; and technical capacities increase the long term *stability* of alternative food procurement. This supports decentralized policy development that focuses on integrating local voices into decision-making processes and program development. The need to understand the implications for human systems in the North has stimulated a range of research, with particular emphasis on Indigenous peoples and a focus on vulnerability and adaptation (Wesche & Armitage, 2014). This study examines local food procurement as a key tool to support overall community resilience and adaptive capacities in the community of Fort Providence. Engagement with local residents, who have vested interest in their own well-being, health and security, is needed to ensure that vulnerable communities guide decision-makers regarding

possible ways forward. Incorporating local experiences and knowledge fosters the development of adaptation strategies in the context of local conditions, that may not be clearly evident to outside decision-makers. Adaptations to environmental changes are the adjustment of a system to moderate the impacts of climate change, to take advantage of new opportunities or to cope with consequences (Adger et al., 2003). This means that local food procurement will need to adjust to moderate the impacts of environmental changes to create a resilient community, support food security initiatives, and benefit from new climatic opportunities. In regards to land-based procurement, this could mean that land-users must adjust harvesting practices, for example, to mitigate changing mammal, fish, bird and plant migratory patterns.

# CHAPTER 4: ADDRESSING MULTIFACIDED CHALLENGES TO FOOD SECURITY IN A NORTHERN CONTEXT

Food security issues across northern Canada are complex, requiring a multifaceted approach. However, despite academic investigations, sizable governmental subsidies, programs and strategies, northern Indigenous households continue to experience disproportionately high rates of food insecurity in Canada. With global warming occurring at unprecedented rates, environmental changes are placing stress on northern Indigenous communities by impacting local ecosystems, traditional lifestyles and land-based subsistence. Socio-cultural and economic challenges are also adding compounding constraints to local food procurement activities, as costs of living are increasing across northern Canada. Regardless, climate change needs to be addressed through adaptation and mitigation actions conducive to building strong and resilient communities. This emphasizes the need for continued research to reduce the effects of climate change on food security for rural Indigenous communities.

Despite the existence of new scholarships regarding food security and community resilience in the sub-arctic (Andrachuk & Smit, 2012; Barbeau et al., 2015; Douglas et al., 2014; Gerlach & Loring, 2013; Robidoux & Mason, 2017; Rudolph & McLachlan, 2013; Skinner et al., 2013; Thompson et al., 2018; Wesche et al., 2016), there has been extremely limited research that highlights local food procurement activities and community adaptive capacity in the Deh Cho region of the NT (Spring et al., 2018). This research helps frame local perspectives surrounding the multidisciplinary challenges of food insecurity and climate change. The intent of this study was to address gaps in the academic literature by demonstrating the importance of local opinions and experiences as contributing factors in the creation of local food-based policies and programs, that are designed to address pressing food security issues in Fort Providence. By documenting the perspectives, experiences and

knowledge of community members, this research can be used to help tailor local food procurement activities to meet localized needs. For example, the importance of traditional land-based foods was highlighted by many interviewees. This is reflected in a number of studies which demonstrate that land-based foods are vital to the overall health and cultural well-being of northern Indigenous peoples. In addition, the procurement, harvesting, sharing and consumption of land-based foods plays an integral part in local culture and identity. This project provides a holistic position by considering socio-cultural and economic aspects of local food procurement, while highlighting the complicated challenges arising from shifting environmental conditions.

The findings from this research can be used to inform decision-makers and program planners as well as to advocate for policies and strategies at the local level. Initiatives to address its various dimensions range from short term autonomous adaptations, such as flexibility, which allows land-users to mitigate environmental changes, to long term efforts that can include governmental programs and policies that address the manifestations of food security designed to adapt to the impacts of shifting environmental conditions. Findings from this research suggest that local food procurement is critical to support food security initiatives in Fort Providence. By examining local adaptive capacities and community resilience in Fort Providence it is clear that land-based procurement activities, such as trapping, fishing and harvesting, remain important cultural outlets; while alternative food procurement activities, such as gardening and aquaponics, continue to be significant micro-pieces in addressing community-wide food insecurity.

The exposure-sensitivities of Fort Providence, in relation to shifting environmental conditions and food insecurity, are mirrored by countless rural communities across northern Canada. This research will add to the growing body of literature surrounding the benefits of

local food procurement in northern Indigenous communities, to address the current manifestations of food insecurity, while adapting to existing and future climate related changes. 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; whereas, in the long-term, there should be emphasis placed on local and decentralized policy development to increase the adaptive capacity of the community. 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 & Armitage, 2014).

Indigenous Methodologies, semi-structured interviews and ethnographic participant observation methods were employed to help frame an understanding of the socio-cultural, economic and environmental changes related to food security in Fort Providence. It is recommended that future studies consider employing Indigenous Methodologies as it supports projects that not only reflect the perspectives of local Indigenous community members, but lead to greater ownership of the work by participants. The use of IM and semi-structured interviews was also well received by participants, as they were able to share their thoughts and guide the project based on their knowledge and main concerns. Research that solely relies on quantitative data can lack the deep, rich information gathered through interviews, as the perspectives of participants are not prioritized. The combination of the methodological approach and research methods encouraged a stronger connection between researcher and community members. Participant observation helped the researcher to unravel some of the complexities of northern food security by understanding local motivations towards land-based and alternative food procurement, and also to understand the dynamics within local institutions of power, as interviewees and participants held a number of different offices and positions.

However, due to the overall sample size of participants, these findings are certainly not generalizable to all NT Indigenous communities, as they only represent a portion of community members and stakeholders. The number of participants was a delimitation, as the value of the data collected was in the breadth of information and scope of knowledge. Other methods that tend to dominate research in northern Indigenous communities, such as nutrition surveys, while valuable, could not achieve the same results.

The results of this research project can be applied to a broader environmental context, by adding to the diverse literature surrounding topics of food security, land-based subsistence and alternative food procurement in the NT. This research supports regional and national efforts to reduce food insecurity across northern Canada by documenting traditional knowledge surrounding environmental changes, ecosystems and local food systems. By fostering community-driven, collaborative and decolonizing research, this study connects pressing community issues and policy outcomes together, to develop proactive responses. In order to influence policy-makers, the findings from this research will help address policy development at all scales.

This research identified a number of growing barriers related to land-based food procurement which include the growing gaps in traditional ecological knowledge, shifting environmental conditions that impact land-user safety, and the increasing costs of participation. Shifting environmental conditions will continue to be a significant stressor to local ecosystems and food security across northern Canada, particularly amongst Indigenous communities who rely heavily upon local food systems. This accentuates that proactive development of adaptive capacity to address these environmental challenges is essential. As outlined, community adaptive capacity is the ability to moderate potential damages associated with shifting environmental conditions, to take advantage of opportunities presented by a changing climate

or, to cope with the consequences. By using community vulnerabilities as drivers for adaptive capacities, food insecurity in Fort Providence can be partly managed by increasing locally produced and harvested foods, promoting individual and cultural empowerment, and encouraging community resilience. In realizing food security for Fort Providence, local food procurement is integral for increasing overall adaptive capacity and community resilience.

To support community resilience alongside increasing food security, a number of diverse strategies and local food procurement programs need to be coordinated and implemented, which includes both government funded and localized approaches. The intent would be to generate a food system with built-in flexibility so community members could respond to changing availabilities of specific food resources. This will only be possible with collaboration amongst stakeholders, with local voices guiding decision-making processes and with decentralized policy development. In order to advance and support meaningful adaptive capacity in the face of climate change, researchers must work in partnership with communities and other stakeholders to continue to develop, support and implement diverse local food procurement initiatives, programs and strategies. These research outcomes have implications for the community of Fort Providence, as findings can inform both government and community-driven food procurement policies and strategies that can help to deconstruct the Euro-Canadian centric policy decisions around environmental governance, land use, food sovereignty and environmental changes.

The results of this research demonstrate the importance of using community voices to guide decision-making processes at local levels, such as by lobbying municipal and Indigenous governments to further support existing food procurement programs in the community, but also by supporting the formation of new policies aimed at both agricultural opportunities and land-based and traditional food activities. At the Territorial level, this research aligns with

policy development currently underway by contributing to the overall dialogue, by demonstrating the importance of localized voices in the decision-making process. Additionally, the GNWT has created a new unit to directly support communities in on-the-land activities. This unit will work towards supporting land-based food procurement based on academic research, such as this study, which supports local voices guiding policy-outcomes. Federally, this research is important because it adds to the growing body of research fighting for Indigenous voices to be at the center of adaptation and resilience dialogues. This research project informs broader policy objectives at the local, regional and national levels and adds critical voices from the community of Fort Providence, to the body of academic literature on northern food security.

This research aligns with northern priorities to improve food security by encouraging local food procurement and supporting community resilience, while maintaining traditional and cultural values. Future areas of study should consider specific food procurement activities in Fort Providence. By working in partnership with community members, future research could build upon this study by providing a broader range of recommendations, insights and understandings. As environmental changes remain erratic and volatile, autonomous adaptions are continually occurring and evolving at the community level. This academic topic would therefore greatly benefit from ongoing research examining, addressing and implementing activities to address the many barriers present to achieving food security and food sovereignty in the Deh Cho.

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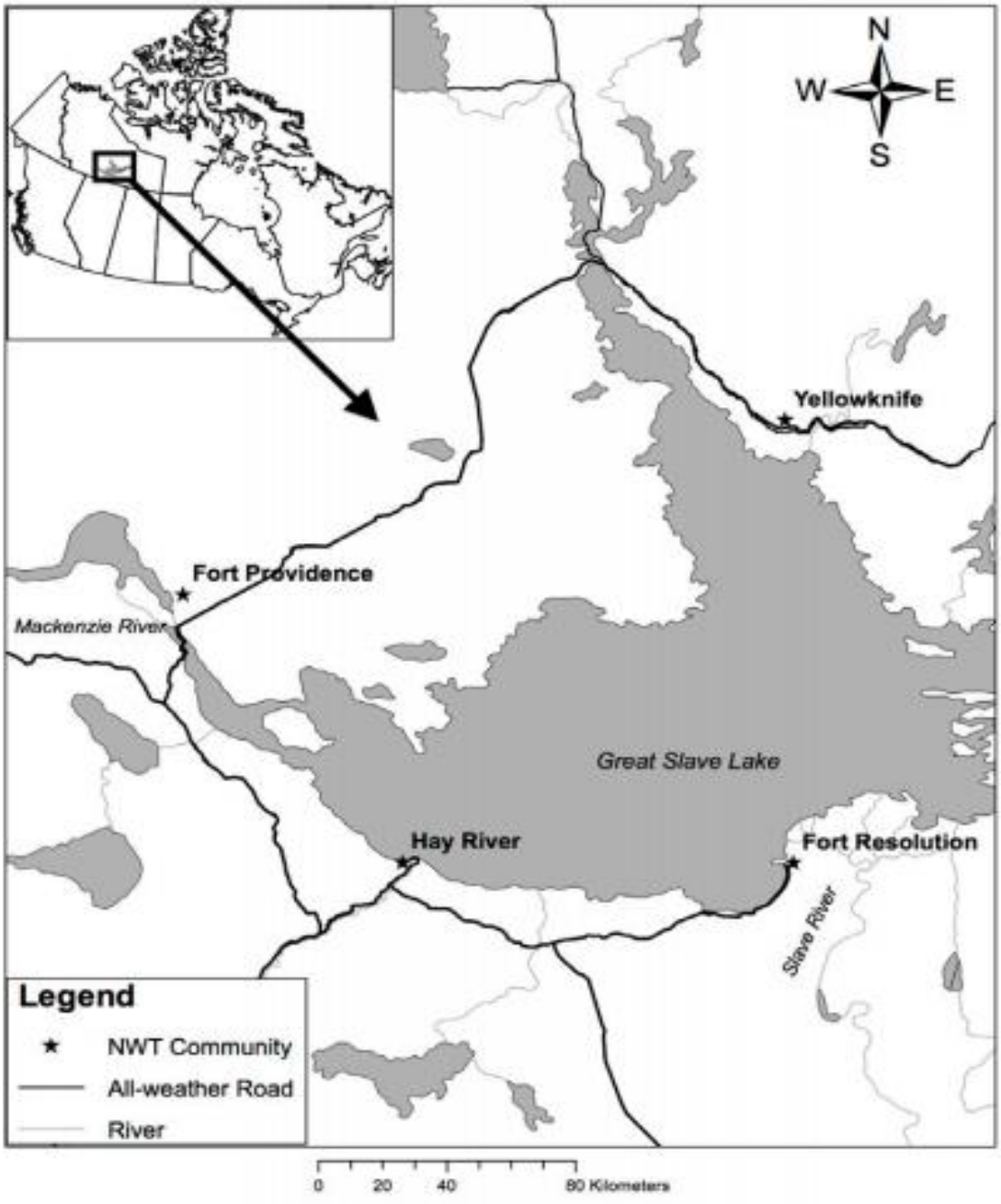
# APPENDICES

## Appendix A: Fort Providence Regional Maps

**Fort Providence, NT**

61.35º N, 117.66º W




Location of case study: Fort Providence [Map], 2016.

**Horn River Delta**

Horn River Delta, Mills Lake and Fort Providence


Location of case study: Fort Providence [Google Maps], 2019

**Appendix B: Interview Guide**

1. Can you tell me your name, age and number of years you've lived in Fort Providence?

2. Can you tell me the number of people in your household?

3. In general, can you tell me about the types of food that are usually found in your household?

4. Prompt: Is it mainly land-based or grocery store foods?

5. What is your favorite type of food?

6. Can you tell me about land-based foods in your household? What types of land-based foods do you mainly eat, and how often do you eat them?
   a. Prompt: Has there been changes in the availability of land-based food sources?
   b. Prompt: What types of land-based foods do you mainly eat?
   c. Prompt: On average, how often do you eat land-based foods?
   d. Prompt: Do you eat more or less land-based foods now than in the past?

7. (If applicable) How often do you get out on the land?
   a. Prompt: Has there been any changes in availability of land-based food sources?
   b. Prompt: Have you seen climate change affecting land-based foods? In which way? What have you seen? Can you give an example?
   c. Who do you usually go out on the land with?
   d. Have the opportunities for going out on the land changed? Why or why not?

8. Has climate change affected the community's consumption of land-based foods relative to store bought foods? Have there been an increase in store-bought food because of climate change?

9. (If applicable) What are the biggest environmental challenges that you're experiencing when going out on the land?

10. Do you think unmitigated climate change will have a negative impact in the future in terms of land-based foods? How big of an impact and what behavioral changes would you make to adapt to climate change?

11. (If applicable) Can you tell me about local programs that support you to go out on the land?
    a. Prompt: What specific programs do you find effective?
    b. Prompt: In your opinion, in the past, what programs were unsuccessful?
    c. Prompt: What type of program do you think would be successful and effective in helping community members get out on the land?

12. What type of support would you like to see in order to help more people go out on the land?

13. What is the significance for you, your family, and your community to continue to eat land-based wild foods?

14. Have you taken adaptation measures to protect land-based foods? What type of measures? How costly are these measures?

15. Can you tell me about store-bought foods, and where you usually shop?
    a. Prompt: Do you ever grocery shop in Yellowknife, Hay River or elsewhere?

16. Based on your years in the community, have prices of grocery store foods changed?

17. What are some of the programs or strategies in Fort Providence that support local food harvesting, growing or distributing?
    a. Prompt: In your opinion, are these programs successful? How so?
    b. Prompt: Can you tell me about what types of programs you are specifically involved with?
    c. Prompt: Tell me more about your role within this program?
    d. Prompt: How did you initially become involved with this program?

18. From your experience, what are some of the main barriers to local food programs?

19. In your opinion, what are some of the ways to address these barriers?

20. What types of programs or strategies do you think would be effective in helping support community members' needs for accessing culturally relevant foods?