Barriers to and Opportunities for Indigenous Involvement in the Management of Chronic Wasting Disease in Alberta, Canada

by

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ABSTRACT

The management of Chronic Wasting Disease (CWD) in Alberta is a complex issue that affects multiple stakeholders, including Indigenous communities who highly value the affected species both nutritionally and culturally. Despite the relevancy of CWD management to the livelihoods of these Indigenous communities, particularly in central Alberta where the disease is an immediate threat, the focus of much of the existing research on the social aspects of CWD, as well as the provincial monitoring program, have been recreational hunters. The purpose of this thesis is to answer three questions: how do Indigenous hunters in central Alberta feel about CWD, what are the barriers that Indigenous people in central Alberta face to participating in current CWD management, and what are the best practices that could be utilized to develop a community-based monitoring program for CWD in Alberta? This thesis uses the concepts of knowledge and power, access theory, and the perception of risk to identify why the current CWD monitoring program in Alberta does not adequately reflect the views of Indigenous communities impacted by this disease, and presents community-based monitoring as a potential solution. Through a research partnership with Samson Cree Nation in Maskwacîs, Alberta, Indigenous hunters expressed that they were concerned about CWD and that this concern has some affect on where they choose to hunt, adding to existing barriers to accessing safe traditional foods. A series of best practices for the development of a community-based monitoring program for CWD in Alberta were developed with the aims of overcoming knowledge and cultural gaps that create barriers to participating in the provincial monitoring program, managing the risks associated with CWD, and increasing community confidence in traditional foods.

PREFACE

This thesis is an original work by Hannah Cunningham. This research project received research ethics approval from the University of Alberta Research Ethics Board, the project name being "Tracking Change - Traditional Knowledge and Wildlife Health Monitoring in Alberta", Pro00100730.

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ACRONYMS

BSE: Bovine Spongiform Encephalopathy
CBM: Community-Based Monitoring
CBPR: Community-Based Participatory Research
CFIA: Canadian Food Inspection Agency
CWD: Chronic Wasting Disease
SCN: Samson Cree Nation
TEK: Traditional Ecological Knowledge
TSE: Transmissible Spongiform Encephalopathy
T7FNCA: Treaty 7 First Nations Chiefs' Association
vCJD: Variant Creutzfeldt-Jakob Disease
WIN: Wildlife Identification Number
WMU: Wildlife Management Unit

CHAPTER 1.0: INTRODUCTION

1.1 Introduction

The health of humans, wildlife, and domestic animals are linked through the diseases we share (Decker et al. 2012; One Health Initiative, n.d.). This inter-species connection is the foundation of the threat that Chronic Wasting Disease (CWD), an unpredictable and fatal disease affecting animals of the *Cervidae* family, holds over the province of Alberta, and particularly the Indigenous peoples who rely on these species as a source of traditional food (Parlee et al. 2021; Willows 2005). This objective of this research is to answer the questions *how do Indigenous hunters in central Alberta feel about CWD, and what are the barriers to participating in CWD management that Indigenous people in central Alberta face? Further, what are some of the best practices that could be utilized to develop a community-based monitoring program for CWD in Alberta?* In answering these questions, this thesis explores the concepts of knowledge and power, resource access, and risk perception to provide insights on the local risk perception of CWD in Maskwacîs, Alberta, how Indigenous hunters are engaged through the Government of Alberta's CWD management program, and suggestions for how to use community-based monitoring as a tool for knowledge co-creation in the complex field of wildlife management.

This thesis is written in five chapters, and is constructed in a paper-based format, meaning that Chapters Three and Four are written in stand-alone paper format with the intent of future publication. The purpose of this first introductory chapter is to introduce

the theoretical frameworks used in this thesis, as well as introduce the concepts that are used in both paper chapters. The literature review provides a description of the disease of concern, CWD, as well the issue of Indigenous food security in Canada, and descriptions of the role of hunting and sharing of food in Cree culture, conventional wildlife management on a broad and CWD-specific scale, and a description of co-management and community-based monitoring.

Chapter Two, Methodology, provides a description of how this thesis research was developed and executed. Two guiding methodologies, decolonizing research and community-based participatory research, are first discussed to provide a foundation for how the research activities were developed. The sections on research scoping describes how my supervisor and I built relationships with people from the First Nations of Maskwacîs, and specifically Samson Cree Nation, and how together we developed the scope of the project. The participant recruitment and data collection sections describe the process through which we connected with hunters from Maskwacîs and how data on perceptions of wildlife health and CWD were collected through a survey tool. A description of how the survey data was analyzed follows. Chapter Two also provides a description of this project's adherence to proper research ethics through the development of a research agreement, the compensation of participants for their time and shared knowledge, and how the resulting data is shared and stored. Finally, potential benefits to participants are described, and I provide a statement on my own positionality as the author of this thesis.

Chapter Three, titled "Local perspectives on wildlife health and Chronic Wasting Disease in Maskwacîs, Alberta" is the first of two paper chapters. This chapter addresses the lack of Indigenous perspectives in social research about CWD, despite the importance of the affected cervid species both nutritionally and culturally for the Cree of central Alberta. Using data collected through a survey conducted with 31 Indigenous hunters from the Maskwacîs region, this chapter provides locally specific insights into the level of knowledge about CWD in the Maskwacîs hunting community, how information about the disease is shared, and perceptions of risk about the disease and potential impacts on hunting behavior. The conceptual foundation and research themes section provides a more in-depth description of the issues of Indigenous food security, CWD, access theory, and risk perception as they pertain to this chapter. A description of the research area and of the First Nations of Maskwacîs is provided in the setting section. The methodology section provides an explanation of the survey tool used, data collection, adherence to ethics, and how the COVID-19 pandemic affected our research activities. The results section presents the analyzed survey data relating to animal harvest and consumption, the sharing of wild meat, and knowledge and perceptions about CWD. Following is a discussion of the results and how they reflect the theoretical concepts and research themes introduced earlier in the chapter.

Chapter Four is the second of the two paper chapters, titled "Community-based monitoring: a tool for expanding knowledge on Chronic Wasting Disease". This chapter provides a set of best practices for developing a community-based monitoring program for CWD for Indigenous communities in central Alberta, and provides an explanation of

how these practices were developed through the respectful building of relationships and collaboration between the University of Alberta and Samson Cree Nation. The literature review section provides a description of a social-ecological perspective in resource management, Indigenous rights regarding wildlife harvesting, CWD, and community-based monitoring based in Indigenous knowledge systems. As this chapter is written in stand-alone paper format, there is a setting section that provides information about Maskwacîs and the research area that is similar to that in Chapter Three. The approach section provides a description of how my supervisor and I built relationships with our research partners in Samson Cree Nation, as well as a description of the Samson Community Freezer Program, with which we worked closely throughout the project. The findings section provides a description of the best practices for creating a community-based monitoring program for CWD in central Alberta, which were developed through conversations with hunters and leadership, as well as the development of educational materials and community workshops. Lastly, a discussion on the importance of community engagement in the monitoring of wildlife disease, specifically in the Alberta context, is provided, along with the challenges and limitations of these kinds of programs.

Chapter Five, the concluding chapter, provides an overview of the major themes and arguments made in this thesis, and links together the two separate paper chapters. A discussion on the significance of this research is provided, as well as suggestions for further research.

1.2 Theoretical Framework

This thesis is informed by the literature and theory pertaining to knowledge and power, and in particular how knowledge, including Traditional Ecological Knowledge (TEK), influences wildlife resource management in the province of Alberta, as well as the theory of access and how social factors influence who is able to gain benefits from resources, and the perception of risk and how it is shaped by social and cultural factors. The following section explores these three theoretical concepts and explains how this thesis work utilizes them to investigate my research objectives.

1.2.1 Knowledge and Power

Scholars have explored the relativity of truth, and the influence that class, affiliations, and perspectives have on it (De Gré 1941). In the literature on the relativity of knowledge, researchers suggest that knowledge should be understood in relation to those who produce it, their existence, and their social experiences (De Gré 1941; Purcell 1998). Since the 17th century and the epistemological revolution, 'legitimate' knowledge has been identified as that which aligns with the western, and eurocentric, scientific method and standards including objectivity, replicability, verifiability, and the division of the natural world into siloed subject areas (Purcell 1998; Holling et al. 1998; Dudegon & Berkes 2003). This Western concept of knowledge and knowing excludes knowledge that is intuitively known through historical uncontrolled observation, or knowledge that may only be legitimate or true within a specific cultural context (Purcell 1998). Western knowledge, which has awarded itself a foundation based on reason, has utilized colonial

forces to present itself the authority to deem other knowledge as legitimate or illegitimate (Doxtater 2004; Purcell 1998; Reid et al. 2021).

The production of knowledge is exercised to assist individuals or groups in overcoming challenges they face. If said challenge is one group's attempt to control another, then the resulting knowledge would justify domination and tipping the scales of power in favor of its creator (Akena 2012; Sikor and Lund 2009). Following this perspective, we can look at how European colonizers have and continue to legitimize the western scientific way of knowing through its universalization and deem other knowledge systems, such as Indigenous knowledge, illegitimate (Murove 2018; Akena 2012). In order to argue for inclusivity in the representation of knowledge and argue against the ability of colonial knowledge systems to assume a status of universality, we must insist that all knowledge systems are relative and contextual (Murove 2018; Sikor and Lund 2009).

There is a strong argument for this recognition of the cultural context of knowledge and its production in the literature on Indigenous Knowledge. Without the recognition of social context as a determinant of the type of knowledge that is created and shared within a society, the resulting knowledge will be distorted through the lens of the colonizer (Murove 2018). The literature identifies the importance of recognizing knowledge types such as TEK not only as information, knowledge, or a management style, but also as a wider knowledge and belief system that exists within its cultural context (Berkes 1999).

Indigenous knowledge is defined several ways in the literature, but most definitions are used to refer to the local knowledge of Indigenous peoples, or the local knowledge of particular groups (Warren et al. 1995). Purcell's (1998) definition describes a body of knowledge that is built through the lived history of a group of people that is an integral part of their adaptation to their local environment. Akena (2012) defines Indigenous knowledge as a "multidimensional body of understandings" (pp. 601). An integral aspect of definitions of Indigenous knowledge is that the knowledge is situated in the knowledge holders' experiences and the environment it is engrained in, with one unable to be separated from the other (Reid et al. 2021). Of course, not all forms and contexts of Indigenous knowledge can be captured by these definitions, and especially definitions that are often developed within the space of academia and by non-Indigenous researchers (Reid et al. 2021). As a white settler in the Treaty 6 area of the province of Alberta, I recognize the problematic aspects of using these definitions developed in other contexts for this work in my using them for the dialogue of this thesis.

TEK can be thought of as a specific focus that exists within Indigenous Knowledge literature. TEK has been defined as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes 1999: 8). This focus within the realm of Indigenous Knowledge focuses on the relationships within the cultural context, relationships between different aspects of a particular ecosystem, and critically, the pattern of relationships between these two areas; interactions between people, ecosystems, and locally-oriented

ways of knowing (Dudgeon and Berkes 2003). TEK is referred to in the literature as being a holistic knowledge system (Dudgeon and Berkes 2003), with holism being defined as the differentiation and interaction of different parts of a whole system (Bateson 1979).

The holistic perspective within TEK research allows it to focus on the differences between modern science and Indigenous ways of knowing and philosophies, but also the similarities between these Indigenous ways of knowing and some alternative approaches to science. For example, conventional technical scientific approaches to environmental monitoring often include observations of quantifiable things like water levels or animal populations, and Indigenous land users often hold experiential TEK that provides the same, or in some cases more accurate, observations of key indicators (Tremblay et al. 2006; Henri et al. 2018). Agrawal (1995) gives three major themes that separate Indigenous from western knowledge: differences in subject matter, epistemological and methodological differences, and contextual differences. Epistemological and methodological differences include how each knowledge type investigates and interprets their reality using different methods and worldviews. Contextual differences refer to how Indigenous knowledge is more deeply rooted in it historical and cultural context, while western knowledge attempts to separate itself from these contextual backgrounds by being guided by abstract principals (Agrawal 1995).

Critiques of the Indigenous knowledge literature include some researchers shying away from the political context in which this research takes place (Dudgeon & Berkes 2003).

Some Indigenous Knowledge research is done with the goal of preserving Indigenous Knowledge separately from the existing systems and structures of governance, creating opportunities for Indigenous knowledge to be utilized within databases that exist within centralized systems of bureaucracy (Agrawal 1995). This is a product of western institutions seeing Indigenous peoples as having existed in a synonymous way with the environment, and Indigenous knowledge as an important addition to discussion around sustainable resource use strategies (Agrawal 1995). This leads some researchers focus on the potential opportunities for Indigenous knowledge to advance scientific understandings, or interpret Indigenous knowledge in the context of western science and development (Sillitoe 1998). This vein of Indigenous knowledge research often lacks support for Indigenous peoples regarding ownership of knowledge (Dudgeon & Berkes 2003), which is an important aspect of engaging in decolonized research methods (Brant Castellano and Reading 2010).

Governments and governing bodies on a variety of scales have identified the need to value Indigenous knowledge, and have called for their inclusion in governance and resource management around the world. Globally, the United Nations Declaration on the Rights of Indigenous Peoples (United Nations 2007) recognizes that respect for Indigenous knowledge contributes to equitable and sustainable development, and states that Indigenous peoples have the right to maintain, control, and protect their traditional knowledge, sciences, technologies, cultures, and intellectual property over such knowledge (Article 31). In Canada, the Truth and Reconciliation Commission Calls to Action (Truth and Reconciliation Commission of Canada 2015) call for the federal,

provincial, and territorial governments to work with Indigenous peoples and educators to work towards including Indigenous knowledge in primary and secondary education institutions (Article 63).

In my thesis research, instead of looking at Indigenous knowledge with a deficit lens (Spicer et al. 2020), I am acknowledging the validity that Indigenous knowledge, including TEK, experiential knowledge, and non-empirical observations, have for research on environmental issues such as wildlife disease.

1.2.2 Access Theory

The impetus of this thesis project was a problem of access being faced by an Indigenous community located near my home of Edmonton, Alberta. A wildlife disease affecting deer, moose, and elk, species that are culturally as well as nutritionally important in nêhiyawêwin or Cree culture, has been spreading westward toward the four First Nations of Maskwacîs, Alberta for decades (Government of Alberta 2021). A monitoring program lead by the Alberta provincial government is in place, but there are certain barriers that make it difficult for Indigenous hunters to participate in this program. Later chapters in this thesis will contain more information about this disease and the monitoring of it, but in this section I will focus on Access Theory and how it can be used to examine the various social factors that prevent Indigenous communities in Alberta from accessing safe traditional foods in the context of CWD.

Access is defined by Ribot and Peluso (2003) in their seminal work 'A Theory of Access' as "the ability to derive benefits from things" (p. 153). Instead of focusing purely on the

rights to resources, this work focuses on the broader range of social factors that prevent or allow people to benefit from resources. In Access Theory, the two main groups of concern are those who control access to resources, and those who must work to maintain their access to resources through connections with those who hold the control (Ribot and Peluso 2003). Material, cultural, and political-economic factors affect people's abilities to fall into either category. The analysis of access presented by Ribot and Peluso (2003) allows us to unpack why some people or institutions can benefit from resources, regardless of they have the rights to them, and on the other hand, why those who have the rights to resources are not always the ones that are able to benefit from them.

MacPherson (1978) defines 'property' as having the right to use or benefit a resource through the use of 'enforceable claims', or a claim that is acknowledged as legitimate by society through laws or customs. Additional power is held by the institutions that are able to enforce or approve these claims, as this ability reinforces the institutions authority (Sikor and Lund 2009). However, thinking of resources in terms of property only confines the analysis to the context of defined social institutions of the legal and customs variety. By thinking about resource control and benefit in terms of access, we can open up the analysis to include a wider web of social institutions, political, economic, and social relationships (Ribot and Peluso 2003).

Ribot and Peluso (2003) use the term 'mechanisms' to refer to the means, processes, and relations through which access is gained (p. 160). Structural and relational access mechanisms include technology, capital, markets, labour, knowledge, authority,

identities, and social relations (Ribot and Peluso 2003: 162). Of these mechanisms, there are several that specifically apply to the situation of CWD management in Alberta and Indigenous access to traditional foods.

Access to technology

Ribot and Peluso (2003) describe access to technology as having the ability to benefit from resources that cannot be extracted or used without tools or technology. In the case of CWD in Alberta, the only way to ensure that the deer, moose, or elk meat that a hunter harvests is safe to eat is to have it tested for the disease. Currently, only the provincial CWD monitoring program is able to test animal samples for CWD (Government of Alberta, n.d.).

Access to capital

This mechanism is described as access to monetary wealth that can be put towards acquiring the resource in question, or the labor and equipment required to derive benefits from resources (Ribot and Peluso 2003). For Indigenous hunters, time and financial stressors act as barriers to participating in hunting activities (Nelson, Natcher & Hickey 2005), and there are additional time and monetary costs to participating in the provincial CWD monitoring program, especially when submitting samples during non-peak hunting seasons or from a remote community

Access to knowledge

Ribot and Peluso (2003) state that "belief, ideological controls, and discursive practices, as well as negotiated systems of meaning, shape all forms of access" (p. 168). Access to resources is shaped by the power that certain people or groups hold to produce

knowledge that is deemed legitimate by wider society (Moore 2005). Being deemed an expert in a field provides certain individuals with access to resources, as well as the authority to have weight in saying what is 'true' regarding resource management, granting them with the ability to influence what others think and what resource management should look like (Ribot and Peluso 2003). In the case of wildlife disease management in Alberta, the 'western' system of knowledge production utilized by academia holds more legitimacy in institutions of governance than Indigenous knowledge, allowing academic experts to hold influence over resource access and controlling the access of others (Wobeser 2002).

In resource co-management systems, the differentiation between rights and access are not always clear (Ribot and Peluso 2003). A community having the rights to local control of the resource does not always equate to possessing the ability to access the resources needed to fully exercise their rights (Addison et al. 2019). While a management system may be participatory in nature of the management process, the control of rights of access to the resource benefits may still rest with state governments or institutions (Ribot and Peluso 2003; Addison et al. 2019). Resource users may remain in a position where they are attempting to maintain their access to a resource by having to invest in and maintain relationships with the institutions that control resource access (Ribot 1995).

While I am not actively performing access analysis in this study, I found that Ribot and Peluso's (2003) work provided a lens to think about the relationship between the

Government of Alberta and Indigenous hunters in terms of CWD management that was useful.

1.2.3 Risk Perception

Just as access to benefits are unequally distributed and influenced by power, so is exposure to risks (Kojola 2019). The definition of risk utilized for this thesis is a product of people's exposure to a hazard and their social vulnerability, with vulnerability referring to the combination of factors that influence the amount that someone's life or livelihood are affected by a risk or hazard event (Collins 2010: 259; Wisner et al. 2004: 11).

Risk is a social construct, with social and economic interests, as well as cultural values, shaping individual perceptions of environmental risk (Kasperson et al. 1988; Shtob 2019; Mayer et al 2017; Freudenburg 2005; Van Wassenhove et al. 2012; Spicer et al. 2020). A specific risk event, or hazard, will interact with these social, economic, cultural, as well as psychological contexts to influence the public's perceptions about said risk. Personal risk, pre-existing knowledge of the risk, novelty of the risk, and level of trust in decision-makers are also factors that can affect an individual's perception of a risk (Millman et al. 2020). In the case of natural resources, the use of and knowledge about natural resources are shaped by factors such as gender, race, and class, and perceptions of risks affecting said resources vary between groups of people and geographical locations (Kojola 2019; Spicer et al. 2020).

Information about a risk or hazard also affects how people perceive that risk. If an individual hasn't directly experienced the risk before, they will form their perception from

the media or people they know within their community (Kasperson et al. 1988). The previously described socio-demographic variables are important in providing context for people's perceptions about risk and related policies, as not all social groups have the same level of access to information about risks (Mayer et al. 2017; Beck 1992). For example, marginalized communities often face greater risks and 'burdens' when it comes to environmental hazards or issues, but tend to have less access to information or power in the decision-making about these issues that affect them (Kojola 2019: 142).

Scientific experts and other people in positions of power may chastise the public for behaviors associated with risk perception that they deem to be based in ignorance (Slovic 1993), and the subjectivity of risk perception may be dismissed as illegitimate, especially in the field of environmental science that tends to be based on technical methods of data collection (Spicer et al. 2020). These elitist attitudes also affect the participation of marginalized communities in conversations about risk, which may be muted by factors such as racism, colonialism, as well as other social influences such as sexism or classism (Kojola 2019: 132). Additionally, marginalized communities may have an unequal ability to engage with avenues like public forums or technical and legal discourse which are often required to participate in public discourse about management decisions. Even if access to avenues of discourse are provided, if the communication is done in the language of western science, if experts are privileged over the public, and Indigenous sovereignty and rights are not recognized, then the playing field is not equal (Kojola 2019).

Technical and statistical studies of risk have been criticized for not addressing issues of equity in their analysis (Kasperson et al. 1988). The social or psychological factors that are not always represented in technical risk assessments have been shown to affect the public's reactions to risk (Slovic 1993). Additionally, this type of risk communication that sees the public as a group to be educated through one-way communication can be perceived as condescending, and does not engage people in decision-making or assist in building dialogue (Van Wassenhove et al. 2012). While engagement of community stakeholders is encouraged, limited, performative, or superficial community engagement can lead to a lack of trust in institutions such as government (Kojola 2019). When developing risk management processes, the involved stakeholders or wider public, or most of all, those bearing the risks, should be included to make the management plan more inclusive and robust in terms of how to manage the risk at hand (Van Wassenhove et al. 2012; Fabisiak 2020). In the context of the relationship between Indigenous people and government agencies, it is important to recognize the colonial legacy that has shaped interactions between these two groups. Trust is fundamental, but also fragile. In some cases, it may have to be accepted that some relationships between communities and risk managers, governments, or industry may be so tarnished that building trust and resolving conflict cannot be achieved in the short term (Slovic 1993).

Wildlife disease is an environmental issue with a complicated cast of involved actors, including Indigenous hunters, government agencies, recreational hunters, and in the case of CWD, farmers of the affected species. All of these different groups have different social, political, and economic contexts that affect their level of perceived risk about the

disease. In this thesis, the literature on risk perception is used to examine how information on CWD is being communicated to Indigenous communities, and how hunters are interpreting it.

1.3 Literature Review

The following section introduces numerous concepts that are presented and examined throughout this thesis. Additionally, this section positions this research within the existing relevant literature.

1.3.1 Chronic Wasting Disease

Chronic Wasting disease is a fatal and untreatable type of transmissible spongiform encephalopathy (TSE), or prion disease, that affects the Cervidae family that includes deer, elk, moose, and caribou (Williams and Young 1980; Rivera et al. 2019). Throughout this thesis, deer, elk, moose, and caribou may be referred to collectively as cervid species. The first identified case of CWD occurred in a captive mule deer in Colorado in 1967, and the first wild case was discovered in a wild elk in Colorado in 1981 (Rivera et al. 2019), making CWD the first and only known prion disease to occur in wild animals (Zimmer, Boxall & Adamowicz 2011). The first Canadian case of CWD was discovered in a farmed elk in Saskatchewan in 1996 (Kahn et al. 2004), with the first case in Alberta following in 2002 (Government of Alberta, n.d.). The highly transmissible nature of this disease has resulted in CWD being found these two provinces as well as 25 states (CDC 2021), South Korea, and Norway (MyHealth Alberta 2018). The infection of animals with CWD is a slow process, with some cases not showing observable symptoms until years after infection (Chronic Wasting Disease Alliance, n.d.).

A variant of the human-associated TSE called variant Creutzfeldt-Jakob disease (vCJD) can be acquired by eating meat from cattle affected by bovine spongiform encephalopathy (BSE), commonly known as 'mad cow disease' (National Institute of Neurological Disorders and Stroke 2018). There has been no known transmission of CWD to humans (CFIA 2020a), but due to the uncertain nature of prion diseases, the Canadian Food Inspection Agency (CFIA 2020) instructs that tissues from an animal that has been affected by CWD should not be consumed.

1.3.2 Indigenous Food Security in Canada

The forces of colonialism, past and present, have affected all aspects of Indigenous livelihood, including nutrition and wellbeing (Settee and Shukla 2020). The United Nation's Committee on World Food Security (2021) defines food security as when people have "physical, social, and economic access to sufficient, safe, and nutritious foods that meet their dietary needs and food preferences" (p. 6). Traditional diets, including wild-harvested meat, and the practice of hunting provide important contributions to food security by providing connections to both personal and cultural wellbeing for Indigenous peoples (Furgal, Powell & Myers; Willows 2005). Due to economic and colonial constraints including the cutting of traditional ties and disruption of the passing of knowledge between generations through state-sanctioned residential schools (Pedersen 2016), the transfer of knowledge about traditional foods has been affected, contributing to a lack of food security in many Indigenous communities across Canada (Smylie & Firestone 2016). A national study on nutrition, food security, and food safety in First Nations in Canada found that almost half of the participating households reported being

food insecure, which is a rate three to five times higher than the general Canadian population (FNFNES 2019).

Indigenous communities in Canada engage in subsistence hunting and the consumption of traditional foods despite the barriers linked to social and cultural changes put in motion by the colonial foundations of Canadian society. Most households surveyed in the national study on nutrition and food security in First Nations engaged in food harvesting and production, however, almost half of households reported running out of traditional foods before they were able to replenish their supply (FNFNES 2019). The decline in traditional food supplies can negatively impact all members of Indigenous communities, but low-income households are especially at risk, as they may rely on their local traditional food-sharing networks to meet their basic nutrition needs (Nelson, Natcher & Hickey 2005).

1.3.3 Hunting and Food Sharing in Cree Culture

The practice of hunting in Cree culture is an important means for food collection, but also acts as a connection to the identity, social fabric, and culture of the community. The adherence to cultural principals and protocols is a critical part of the hunting process; principles such as the law of ohcinêwin, which directs against the breaking of a law against non-human life (McAdam 2019), guides the instruction of Cree hunters on teachings that emphasize honoring and respecting the animals that give their lives to sustain the community (Johnson 2017).

Previous to the high degree of time and social limitations placed on Indigenous community members by modern Canadian society, the social fabric of communities was

strong, and relationships were formed and maintained through the acquisition of resources from the land (Natcher 2019). While more stressors are placed on these social networks, their value remains strong; for those that do not hunt, local food-sharing networks are an important way to access traditional foods and strengthen social relationships and connections to culture (Nelson, Natcher, Hickey 2005). In some cases, a small percentage of households in a community act as the food gatherers that provide for the rest of the community, emphasizing value of reciprocity in Cree culture; as Natcher (2015 p. 236) found in research with Indigenous communities in Northern Alberta, "food sharing extends beyond an individual's expectation of reward or recognition, to a higher level of what it is to be Cree".

The ability to maintain close connections to Cree values and culture is being impaired by societal forces that demand Indigenous peoples redefine their culture in order to integrate with western societal norms (Nelson, Natcher & Hickey 2005). Despite these challenges, there are numerous successful Indigenous community food-related programs and projects across Canada that are resisting the colonized reality of Canadian society and are rebuilding relationships with food and cultural practices (Martens 2015; Fida 2021; Nikolopoulos et al. 2020). While these programs do work to promote food security in their communities, they also work towards food sovereignty, defined by global peasant's movement La Via Campesina (2021) as peoples' right to healthy and culturally appropriate foods produced in a sustainable way, and the right to define their own food and agriculture systems. This movement aims to address the issues affecting modern food systems, especially for communities affected by the social, economic, and cultural

damages of colonialism (Kamal et al. 2015). In the case of this thesis project, the importance of traditional foods, including wildlife such as the deer and moose at risk of contracting CWD, to traditional food systems highlights the intersection of animal health and wildlife disease with human health and cultural wellbeing.

1.3.4 Conventional Wildlife Management

Conventional management of wildlife in North America is rooted in scientific areas of study including population ecology and veterinary medicine, as well as the colonizers' ideology of civilizing the landscapes and living things (Sandlos 2001). The imposition of government control over previously locally occupied or managed lands and resources resulted in these areas becoming governed by policies and regulations established by non-local state actors (Spaeder and Feit 2005). The rule of scientific knowledge and subsequently trained experts over these areas, without consideration for the social and cultural contexts of the area, created a rift between Indigenous resource users and state resource managers that is characterized by often strained relationships (Natcher 2000).

The management of wildlife diseases is similarly based in areas of study including epidemiology and population ecology (Wobeser 2002). However as the motivation for its study is based in the interest of benefits to human populations, there exists an opportunity in the world of wildlife disease management to integrate human dimensions research (Decker et al. 2006). Wildlife diseases have real and perceived implications for human health and economies, requiring the understanding of not only disease and animal biology, but the human values and contexts that fuel concerns about diseases in wildlife (Decker 2012; Vaske and Miller 2018).

The basic forms of management strategies include prevention of disease, control of existing disease, or eradication (Wobeser 2002). In the Canadian context of CWD management, eradication was the first management strategy to be attempted by the Canadian Food Inspection Agency (CFIA), with a CWD eradication policy being implemented in the fall of the year 2000 (CFIA 2020b). However, the numbers of wild and domestic cases of CWD climbed despite the implementation of the eradication policy, including re-infection in herds that had previously depopulated, followed decontamination procedures, and restocked animals. These events led the federal agency to switch from the eradication policy to a disease control program, after establishing that they were unable to eradicate the disease in areas where it was endemic in wild cervid populations. The CFIA's current CWD control program uses a compartmentalization concept to track the health of individually identified groups of animals and assigning them a distinct health status. The compartmentalization of herds applies to farmed cervids, for which producers are able to participate biosecurity management through herd certification programs (CFIA 2020b). For wild cervids, CWD management currently exists as provincial monitoring programs that rely on hunter participation to submit the heads of harvested cervid species for testing (Government of Alberta n.d.1; Government of Saskatchewan n.d.).

1.3.5 Co-Management and Community-Based Monitoring

The control over natural resources by centralized government structures has generated conflict as well-developed systems of resource management and traditional ecological knowledge were replaced with government-led resource management (Spaeder and Feit

2005). Due to the history and continuation of strained relationships between the Canadian and provincial governments and Indigenous peoples, co-management agreements between Indigenous resource users and government resource managers are relatively new in the realm of land and resource management (Natcher 2000). First Nations in Canada have negotiating with the federal government since the 1970s for co-management agreements that would allow them to increase their participation in decisions regarding their land and natural resources (Houde 2007).

One method of research that offers opportunity for those seeking greater engagement in the monitoring of the environment, or for government or resource management programs seeking to learn from hunters and land users, is community-based monitoring. Community-based monitoring (CBM) is defined in the literature as the monitoring of natural resources by local stakeholders in ways that relate to the aims and objectives that are of concern to them (Danielsen et al. 2014). The process includes a multitude of stakeholders, including the public, government agencies, industry, academia, and community groups coming together to address common problems or concerns (Whitelaw et al. 2003). In partnerships between researchers and Indigenous communities, the braiding together of TEK and western scientific knowledge can be used in CBM programs to widen the scope of resource monitoring through indicators from both knowledge types (Tremblay et al. 2008; Brook et al. 2009).

However, it is important to recognize that Indigenous involvement in CBM programs does not limit them to the role of 'knowledge holder' (Wilson et al. 2018). As with other

types of participatory research methods, when working with Indigenous communities, the benefits of community-based monitoring can only be recognized if the decision-makers in government and academia recognize Indigenous sovereignty (Wilson et al. 2018). To this end, Indigenous organizations are using CBM as a way to express their concerns about inequities in the production of knowledge and how management decisions are made about wildlife and other natural resources (Kutz and Tomaselli 2019)

CHAPTER 2.0: METHODOLOGY

2.1 Introduction

This project was developed in collaboration between the University of Alberta and Samson Cree Nation, out of a resolution for research partnerships on CWD called for by Chiefs at a gathering of the Confederacy of Treaty Six First Nations, Treaty 8 First Nations of Alberta and the Treaty 7 First Nations Chiefs' Association (T7FNCA). Establishing this partnership, which included community members, community organizations, and Council members of Samson Cree Nation, was crucial for ensuring that the project was developed for and met the needs and concerns of community members. Project objectives that were established with community members include the creation and distribution of information about CWD and its implications for Indigenous communities, the addressing of the current barriers to participation in the Government of Alberta's CWD monitoring program, and emphasis of the importance of access to traditional foods.

2.2 Decolonizing Research

Research, in a multitude of disciplines, has a colonial underpinning, with academics from varying fields building careers from the study of Indigenous peoples (Castleden et al. 2012). Research involving Indigenous peoples has a track record of exploitation and misrepresentation of Indigenous knowledge at the hands of non-Indigenous researchers, resulting in research products that Indigenous people feel do not serve their needs (Ball and Janyst 2008; Castleden et al. 2012; Brant Castellano and Reading 2010). As a result, Indigenous communities are demanding for more control in the factors that affect their

wellbeing and livelihoods, including information ownership and having a role in the creation of knowledge and research priorities (Brant Castellano and Reading 2010). The decolonization of research methods means to include Indigenous ways of knowing in academia, and to value them as equal to western, or eurocentric, ways of creating and understanding knowledge (Held 2019). Additionally, the power that researchers hold to produce findings that can be used to legitimate arguments for or against values, policies, and practices, must be shifted to Indigenous communities so they may be true partners in research (Ball and Janyst 2008).

2.3 Community-based Participatory Research

One of the recommended methods for working to decolonize research is community-based participatory research (CBPR). The goal of this method is to place the research process and the use of the results with the community partners, which is done through mutual learning and knowledge co-creation by acknowledging different ways of knowing and providing equal weight to both scientific knowledge and TEK (Schensul et al. 2008; Fletcher 2003). The engagement of Indigenous community members in all aspects of the research project, from development to dissemination, is an integral part of CBPR, and helps to ensure that the project is designed to address the needs ands concerns of the community (Castleden et al. 2012). This is unlike conventional research, which tends to conduct research on Indigenous peoples instead of with them (Ball and Janyst 2008), with "parachute" researchers that collect data with little to no communication before, during, or after (Castleden et al. 2012 p. 175). There are numerous examples of CBPR being used in resource management and environmental monitoring projects with Indigenous communities (Tomaselli et al. 2018a; Tremblay et al. 2006; Brook et al. 2009; Wilson et

al. 2018). The literature on CBPR interested me greatly, as it appeared to be the most appropriate way to work with my Indigenous research partners and their community as a white settler, first of all, and secondly, to ensure that the project properly addressing the needs of the community.

2.4 Project Scoping

The impetus for this research project was the identification of CWD as an issue of concern by Chiefs at the Confederacy of Treaty Six First Nations, Treaty 8 First Nations of Alberta and the Treaty 7 First Nations Chiefs' Association (T7FNCA), resulting in a resolution for ongoing research collaboration with the University of Alberta about the spread of the disease. In adherence with this resolution, this research investigates 1) the development process for a community-based CWD monitoring program in Maskwacîs, Alberta, and 2) local perceptions of wildlife health and risk perception of CWD. Components of this project are a continuation from previous research done between Dr. Brenda Parlee and research partners with the Treaty 8 First Nations of Alberta that also investigated local perceptions of wildlife health and perceptions of risk of CWD. I was invited to participate in this project as the focus of my thesis research. The funding for this project was provided by Genome Canada and the Alberta Prion Research Institute in a grant to my supervisor, Dr. Brenda Parlee.

My participation in the project began in the project's scoping phase. After the passing of the resolution by Alberta First Nation Chiefs, my supervisor had identified Samson Cree Nation as a potential community partnership after a connection of hers, Robbie Potts, had expressed interest in working on such a type of project. I first met with members of

Samson Cree Nation in 2019, when Dr. Parlee and myself attended a meeting with representatives of the Samson Cree Nation band office and health center in order to discuss the potential for a project focused on CWD management in central Alberta and the implications of the wildlife disease for Indigenous peoples in the area. After the community representatives expressed approval of the project, meetings with representatives with Ermineskin Cree Nation, also located in Maskwacîs, were had. After these two meetings, a research agreement was signed with Samson Cree Nation. At this time, Robbie Potts was hired as my community research partner.

Taking the time to build relationships with your community partners is an important part of CBPR. For the first summer of my field research period, I spent a significant amount of time learning from Robbie about the culture and history of Maskwacîs, as well as the local concerns about CWD and the impact it could have on Cree ways of life. During this first summer, Robbie and myself worked together to develop a CWD information toolkit and brochure for hunters, adapted for use in Treaty 6 from a previous version made by Dr. Brenda Parlee and Kevin Ahkimnachie, who works for Treaty 8 First Nations of Alberta. I attended a band council meeting to introduce myself and to share the toolkit. A video providing information about what CWD is, how to participate in the monitoring program, and demonstrating how to properly prepare an animal head for testing was also produced with Robbie Potts, Kacey Yellowbird, Kevin Ahkimnachie, and Treaty 8 First Nations of Alberta staff Sharlene Alook and Cheryl Moberly. This video production featured our Indigenous research partners, and focused on why monitoring CWD was important to them and to their communities. Robbie and I also began offering to use our

vehicles to pick up cervid heads from community members in Maskwacîs who had a harvested animal they wanted tested for CWD and drive them to the provincial laboratory in Edmonton. Through this process, I became acquainted with Kacey Yellowbird, who runs the Community Freezer Program based out of the Howard Buffalo Memorial Centre.

Near the end of the summer of 2019 was when we began conducting surveys and participating in community workshops. Having the first summer of my thesis research dedicated to building rapport with Robbie and others in the community allowed for me to learn more about Maskwacîs, the hunting community, and some of their concerns, and I am grateful for the time I was able to take to do so.

2.5 Participant Recruitment

For the perceptions of animal health and risk of CWD portion of this project, which involved a survey, participants were identified by recommendation by Robbie Potts, who was familiar with local hunters. Additionally, at community events such as CWD information workshops, I would ask attendees if they were interested in participating in the survey project. Once a participant was identified and expressed interest in participating in the research project, a meeting time was scheduled for them to complete the survey. Surveys were done in person, and Robbie and I would travel to visit participants in their homes, or often meetings would be arranged at the Howard Buffalo Memorial Centre. At the beginning of 2020, safety restrictions put in place due to the COVID-19 pandemic required me to create an online alternative for the survey portion of the project. I used Google Forms to create an online version of the survey, and the link was distributed by text message to potential respondents by Robbie. Additionally, Kyra

Northwest, the Traditional Knowledge Lead with the Samson Cree Nation Band Office, would post the link to the survey in The Acimowin, the nation's monthly newsletter, and on the Samson Cree Nation Facebook page.

2.6 Data collection

The research objective of investigating how you might develop a community-based monitoring program for CWD in Maskwacîs, Alberta, was executed through researcher observations, communications with community organizations such as the Samson Cree Nation Community Freezer Program, communication with the Government of Alberta provincial CWD monitoring program, and listening to the experiences and concerns of local Indigenous hunters during survey completion and at community workshops. The process of developing the foundation for a community-based CWD monitoring program with Indigenous communities in the Alberta context is described in full detail in Chapter Four.

2.6.1 Surveys

The second research objective of investigating local perceptions of wildlife health and risk perception of CWD was carried out through a survey adapted from previous work by Dr. Brenda Parlee with Indigenous communities in northern Alberta (Parlee et al. 2021). A copy of the survey can be found in Appendix C. During data collection in 2019 and the first months of 2020, surveys were completed in person, which allowed for participants to ask questions about the survey and provide extra details about their answers to the multiple choice survey questions. I would ask the participant if they preferred to fill out the survey themself, or if they preferred to have me read the survey to them and fill in

their answers while they verbally answered. In the case where participants filled out the survey independently, I instructed them that any extra information could be written down in the blank boxes below the survey questions. If I was filling out the survey for the participant, I wrote all extra information down on the survey sheet.

2.7 Research Agreement

A research agreement was signed in 2019 between my research group from the University of Alberta and Samson Cree Nation. Due to the nature of information collected during this research, which included discussions about TEK and spirituality surrounding cultural practices such as hunting, the creation of a research agreement was an important step in empowering Samson Cree Nation in the research process, and building trust between researchers and community partners.

2.8 Consent Forms

A critical step in conducting ethical research is obtaining informed consent before data collection activities begin. Survey participants were given a plain language summary, which can be found in Appendix B, that described the objectives of the research project, how their answers would be used, and contact information for if they had any questions. After reading the plain language summary, participants were given a consent form. I would verbally go over the consent form as the participant read the document, reiterating that they had no obligation to participate in the study and could stop at any time. The consent forms had a place for participants to indicate whether they wanted their name to appear in research products such as future publications, or if they would prefer to be anonymous. All research participants gave written consent for their survey answers to be

used in this project. Due to the quantitative nature of the survey portion of the project, no names are used when referring to survey answers in Chapter Three. Consent forms can be found in Appendix B.

2.9 Compensation

Providing a gift in the form of honoraria is a culturally appropriate way to develop a relationship of respect with Elders and knowledge holders in Cree culture (Council on Aboriginal Initiatives, 2012). Before in-person surveys, participants were given a box of tobacco. For completing the survey, participants were given a $50 gift card, either to a gas station or to the hunting store Cabela's, to thank them for their participation. For Elders who completed the survey, a blanket was also gifted in addition to the giftcard in order to show an additional sign of respect for the depth of their knowledge. These honoraria choices were made with input from the Samson Cree Nation band office, which has guidelines for the amount of honoraria to pay community members for research activities. When the transition to online surveys was made during COVID-19, online giftcards were purchased from the Cabela's website, and delivered via email to survey participants. Honoraria purchases were made with the help of Tracy Howlett, Dr. Brenda Parlee's research coordinator, who used the appropriate credit card to make purchases and claim expenses. For the purchase of online giftcards, all receipts were forwarded to Tracy Howlett.

2.10 Analysis

2.10.1 Database Creation

I developed a codebook for the survey that assigned numerical values to the answer sets for the multiple-choice questions. This codebook was used to take the answers from the 31 completed surveys and translate them into a data spreadsheet I created in Microsoft Excel. Once the answers were all translated into numerical format in the spreadsheet, I was able to use a statistical program to perform my data analysis. I used the RStudio interface for R for my analysis, which is a free and open-source statistical computing program. Due to the work-from-home orders put in place by the University of Alberta due to COVID-19, I was not able to access other statistical programs such as SPSS that are available on campus. I have some experience working with R for data analysis, and the fact that it was free to download and use made it a suitable option for me.

Due to the relatively small number of respondents that participated in the survey, I was not able to perform complicated analysis on the data. I used descriptive statistics and cross-tabulations to gain insight into key trends and relationships in the data. Due to the fact that I was not able to perform an analysis that provided a numerical confirmation of statistical significance, along with the cultural and geographic context of this study, the findings of this research cannot be applied Indigenous communities as a whole, and remain specific to Maskwacîs, Alberta.

2.10.2 Verification with Community Partners

The verification of data with community members is an important step in community-based participatory research, as it allows those involved with the research to provide their own interpretation of the data (Fletcher, 2003). Hosting a community workshop to discuss the results of the survey and the educational materials produced (CWD toolkit, brochures, and the informative video) would have been my preferred method of verification, but due to COVID-19, visiting the community was not permitted due to safety restrictions put in place by Samson Cree Nation and the University of Alberta. Instead, a data report with a summary of key findings and relationships of interest that were identified by my community research partner was created and shared with community partners. For the work surrounding the development of a community-based CWD monitoring program in Maskwacîs, Chapter Four was provided to both Robbie Potts and Kacey Yellowbird for revisions as part of the writing process.

2.11 Data Storage

During the period where surveys were completed in-person, physical copies of the completed survey and consent forms were stored in a secure cabinet in my office at the University of Alberta campus. However, when work-from-home orders were put in place due to COVID-19, I took all secure documents, including the completed surveys and consent forms, home with me to ensure their safety. Once I am able to return to campus, these documents will be stored in a locked filing cabinet in Dr. Parlee's office, where they will be stored for five years in accordance with this project's ethics approval. After the five-year period, the surveys will be destroyed.

The electronic Excel file that stores the survey response data has no personal information associated with it, as each survey was given a numerical code that is used as an identifier in the Excel file. This file is stored on my password-protected personal computer.

2.12 Benefits for Participations

Community members who participated in this research project benefited through the gifting of an honoraria payment for sharing their time and knowledge. Other benefits include having the opportunity to share their concerns or feelings about issues of hunting accessibility, their perception of risk about CWD in the Maskwacîs area, and observations of general wildlife health. Participants were also able to benefit through establishing connections to Robbie Potts, Kacey Yellowbird, and myself, who would collect, tag, and deliver deer, moose, or elk heads for testing at the provincial facility in Edmonton. The ability to have harvested animals tested for CWD can be seen as a benefit as not all community members have the time or means to acquire the appropriate CWD sample tags and make the hour-long drive to Edmonton to have the animals tested themselves.

2.13 Limitations

A survey was chosen as a method for data collection in investigating the local perceptions of wildlife health and risk perception of CWD so that a long-term dataset could be developed to compare responses over time. However, surveys do provide a limitation in that they do not allow for the same kind of rich, in-depth reflections that qualitative research methods, such as interviews, often provide. Additionally, the use of Dr. Brenda

Parlee's previously created survey was used so that future comparisons between Indigenous communities from Treaty 8 Territory and those surveyed in Treaty 6 Territory could be made. However, this limited the survey in how specific the questions were about the Maskwacîs area, resulting in the questions being more general in nature about hunting, wildlife health, and CWD. Lastly, the small sample size did not allow for analysis that was statistically significant, so the findings cannot be applied to other Indigenous communities.

2.14 Author Positionality

I am a non-Indigenous settler born and raised in Amiskwacîwâskahikan, or so-called Edmonton, Alberta. I grew up in the city, and much of my knowledge about the environment that I live in was gained in educational settings, or while recreating in different places around Alberta. I became interested in this research project because of my background in animal science, and throughout my undergraduate degree I became very interested in the intersectionality of race and class in the management of environmental issues.

My background is much different than many of the people I came to know during my fieldwork in Maskwacîs. The time that I was provided to build a relationship with my community research partner and meet with other community members allowed me to address my own positionality in the work that I am doing. At times, I still struggle with deciding if it is appropriate that I, a white woman from the city, am the one doing this work and receiving a degree for it. However, through conversations with my research partners, I began to acknowledge that it is also important in the spirit of reconciliation to

actively build these relationships so that we can learn from each other, and use each other's strengths to address challenges together. It is important to me that the outcomes of this thesis research are able to continue to be built on by the Nations of Maskwacîs after my degree is completed, and that this work is able to continue on without being tied to me.

CHAPTER 3.0: Local perspectives on wildlife health and Chronic Wasting Disease in Maskwacîs, Alberta

3.1 Introduction

Infectious disease outbreaks are occurring more often than ever before, with the health of humans, domestic animals, and wildlife linked through shared diseases (Decker et al. 2012; One Health Initiative, n.d.). The staggering effects that the COVID-19 pandemic has had on societies around the globe is a sobering example of how the link between animal and human health can impact livelihoods, food chains, as well as local and international economies (Foddai et al. 2020). A disease that is of growing concern in North America's free-ranging wildlife populations is Chronic Wasting Disease (CWD), a type of fatal prion disease of species in the Cervidae family that has affected mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), elk (*Cervus canadensis*), and moose (*Alces alces*) in two Canadian provinces and 25 states (Williams and Young 1980; Rivera et al. 2019; CDC 2021). Social research on the affects of CWD have largely focused on the perceptions of recreational hunters and wildlife managers (Schuler et al. 2016; Haus et al. 2017; Heberlein & Stedman 2009; Vaske & Miller 2018; Needham & Vaske 2008; Muringai & Goddard 2018; Vaske et al. 2004; Zimmer, Boxall & Adamowicz 2011), with little specific representation of Indigenous peoples who rely on the affected species as a source of traditional food (Parlee et al. 2021; Amick, Clark & Brook 2015). To address this gap, this research project was developed between the University of Alberta and Samson Cree Nation in Maskwacîs, Alberta, which is located on the western edge of CWD's range in the province (Government of Alberta 2021). A survey was conducted with 31 Indigenous hunters from the region where they offered

their observations about local deer, moose, and elk health and populations, as well as the role that wild meat plays in local diets. Specifically in relation to CWD, we investigated the level of knowledge about the disease in the hunting community, how information was being shared, as well as perceptions of risk about the disease and potential impacts on hunting behavior.

3.2 Conceptual Foundation and Research Themes

3.2.1 Indigenous Food Security

Food is an important part of personal identity, and traditional foods can act as stabilizing connections to cultural and personal wellbeing (Furgal, Powell & Myers 2005; Willows 2005). For many Indigenous communities, the acts of hunting and the sharing of traditional foods are important for strengthening social relationships as well as connections to culture (Nelson, Natcher & Hickey 2005; Natcher 2019). In central Alberta, in nêhiyawêwin or Cree culture, animals of nutritional and spiritual importance include moose, deer, and elk (Nikolopoulos et al. 2020; Willows 2005). In Canada, Indigenous Treaty Rights allow for the use and occupation of lands and resources in order to fulfill traditional hunting and fishing rights (Crown-Indigenous Relations and Northern Affairs Canada 2020). In Alberta, generally, eligible Indigenous peoples may hunt for food without licenses at any time of year on unoccupied Crown lands and other areas where they have hunting access (Government of Alberta 2016). Areas that are not permissible for hunting include spaces being actively used for industrial purposes, fenced or cultivated lands, lands containing occupied buildings, or lands where livestock or domestic animals may be present (Government of Alberta 2016).

Subsistence hunting and traditional food consumption remain strong practices in many Indigenous communities in Alberta and across Canada (Natcher et al. 2021; Natcher 2019; Christie et al. 2018; Peloquin and Berkes 2009). Threats to this practice include social and cultural changes that have taken place, including the bureaucratic nature of contemporary society that places demands on peoples' time, as well as the interruption of inter-generational knowledge sharing caused by colonial practices such as the separation of families and removal of Indigenous peoples from their traditional territories (Nelson, Natcher & Hickey 2005; Pedersen 2016). Additionally, the decision to purchase store-bought foods that may not be as nutritionally dense as traditional foods is also influenced by similar economic, social, and environmental factors (Willows 2005). These issues of accessing traditional foods for Indigenous peoples can lead to food insecurity, referring to the limited or inadequate access to sufficient, safe, nutritious, personally acceptable foods to meet an individual or household's dietary requirements (Tarasuk 2001: 2).

A decline in the amounts of traditional foods available can negatively impact many members of a community, but especially low-income households, who may rely on their local food-sharing networks to meet their basic needs (Nelson, Natcher & Hickey 2005). To combat this, food-sharing networks such as community-freezer programs are used in some Indigenous communities to provide those facing food insecurity on reserve or in remote areas with access to traditional foods (Fida 2021; Willows 2005). These community-based projects and networks that engage local hunters and community members with traditional hunting practices and food sharing are a step towards food

sovereignty and the right to healthy and culturally appropriate food produced in local food systems, which can be important in the journey towards attaining food security (Nikolopoulos et al. 2020).

3.2.2 Chronic Wasting Disease

Chronic Wasting Disease (CWD) is an untreatable prion disease, or transmissible spongiform encephalopathy (TSE), of the Cervidae family, which includes deer, elk, moose, and caribou (Williams and Young 1980; Rivera et al. 2019). CWD is the only known prion disease to be detected in wild animals (Zimmer, Boxall & Adamowicz 2011). The infection process of CWD is slow, with some animals not showing observable symptoms of the disease for several years after infection (Chronic Wasting Disease Alliance, n.d.). In the late stages of the disease, animals may become emaciated, uncoordinated, salivate and urinate excessively, and display unusual behaviors (CFIA 2020b). Unlike other TSEs that have the ability to cause similar diseases in humans, such as bovine spongiform encephalopathy, there has been no known transmission of CWD to humans (CFIA 2020a). However, the Canadian Food Inspection Agency (2020a) instructs that meat from an animal that has tested positive for CWD should not be consumed.

CWD was first identified in a captive mule deer in Colorado in 1967, and the first wild case was discovered in elk in Colorado in 1981 (Rivera et al. 2019). The first Canadian case of the disease was discovered in a farmed elk in Saskatchewan in 1996 (Kahn et al. 2004). The first case in Alberta was identified in 2002 in farmed elk, with an additional case in farmed white-tailed deer found later that year (Government of Alberta, n.d.2) In 2005, the first Albertan case of CWD in a wild deer was discovered (Government of

Alberta, n.d.3). In species such as wild cervids, which range over huge territories, management becomes difficult (Leiss et al. 2017). The Canadian Food Inspection Agency (CFIA) began an eradication program in the year 2000, but after cases of CWD in wild and farmed cervids increased despite CFIA program efforts, it was concluded that eradication measures were unsustainable and that efforts should be focused on controlling the disease (CFIA 2020b).

Since the early 2000s, CWD management in Alberta has varied in its approach, at different times using combinations of herd reduction programs as well as hunter and landowner involvement in surveillance, including the mandatory submission of deer heads in Wildlife Management Units (WMUs) of concern (Government of Alberta, n.d.2). Since the discovery of CWD Alberta's wild deer population in 2005, the prevalence of the disease has increased annually (Government of Alberta, n.d.2). Currently, the surveillance program monitors the prevalence of CWD in the free-ranging elk, mule deer, and white-tailed deer populations within the province by collecting animal heads for testing through hunter submissions and coordinating with monitoring programs for farmed cervid species (Government of Alberta, n.d.3).

3.2.3. Access Theory

For individuals and communities that engage in subsistence hunting to fulfill their physical and cultural needs, access to resources like land and wildlife becomes an issue of public health. Ribot and Peluso (2003) define access as "the ability to derive benefits from things" (p. 153), and emphasize the difference between the rights to resources and the ability to access them, highlighting the broad range of social, cultural, and political-

economic factors that can allow or restrict people from benefitting. The threat that CWD places on cervid populations in Alberta is not the only factor that is preventing Indigenous peoples from accessing safe traditional foods; the positions they hold in social relationships with other groups, political and economic circumstances all affect the terms of access to resources such as land and wildlife populations (Ribot and Peluso 2003; Sikor and Lund 2009).

The United Nations' Declaration on the Rights of Indigenous Peoples (United Nations 2007), of which Canada is a signatory, acknowledges the territorial rights and interests of Indigenous peoples to be 'secure in the enjoyment of their own means of subsistence and development, and to engage freely in all their traditional and other economic activities' (Article 20.1). Additionally, in Canada, Indigenous Treaty Rights allow for the use and occupation of lands and resources, including hunting and fishing rights (Crown-Indigenous Relations and Northern affairs Canada 2020). While these formal rights to resources such as land for hunting and local species of wildlife exist, this does not necessarily mean that the rights-holders, the Indigenous hunters, are able to collect all the benefits from the resources that the rights apply to (Sikor and Lund 2009; Cousins 1997). Indigenous communities face distinct environmental justice issues rooted in colonialism, with indigeneity being an important dynamic in struggles over land and resources (Kojola 2019).

Ribot and Peluso (2003) describe several structural and relational mechanisms of access that can affect how individuals or groups are able or unable to access the benefits of

certain resources, and there are several that specifically apply to the issue of CWD management in Alberta, including i) access to knowledge, ii) access to technology, and iii) access to capital (Table 3-1).

Table 3-1: Mechanisms of access in relation to CWD management in Alberta

Mechanism of Access	What grants you access?	Sources
Access to knowledge	The power that specific individuals or groups hold to produce knowledge 'Expert' status and the authority to deem what is 'true' regarding resource management Western knowledge systems used in academia hold more legitimacy in government institutions than Indigenous knowledge	Ribot and Peluso 2003
Access to technology	Many resources cannot be extracted or used without tools or technology, such as access to testing facilities or equipment to help ensure food safety	Ribot and Peluso 2003
Access to capital	Access to monetary wealth that can be put towards resource acquisition, or the labour and equipment required to derive benefits from resources	Ribot and Peluso 2003 Natcher 2019

3.2.4 Risk Perception

When a part of a food system becomes deemed unsafe for human consumption in some way, whether from environmental contaminants or wildlife disease, often recommendations are put in place to limit or halt consumption (Willows 2005). In the case of CWD, it is recommended by health authorities provincially, nationally, and

globally, that humans not consume tissue from CWD-affected animals (CFIA 2020a; Government of Alberta n.d.4). While the impact that this disease could have on human health is uncertain (Government of Alberta n.d.4), the historical and current dependence that Indigenous people have on the affected cervid species could result in risk to their lifestyle and culture (Leiss et al. 2017).

Numerous factors can impact how individuals interpret and perceive a risk in their community. How the risk is communicated to community members and the cultural context in which the risk is deciphered can impact how individuals respond to advisories (Willows 2005; Furgal, Powell & Myers 2005). For example, when CWD was discovered in Wisconsin, hunting license sales had a record decline (Vaske et al. 2004), which social researchers suggest could be attributed to the uncertainty in the messaging around the human health impacts of the disease (Vaske and Miller 2018; Needham and Vaske 2008; Heberlein and Stedman 2009), as well as the media's constant coverage of CWD (Heberlein and Stedman 2009). Other factors that may influence the perception or reception of a risk include the level of trust in the authority or decision-maker dealing with the issue, the perception of seriousness of the risk, and the perception of control over the risk (Furgal, Powell & Myers 2005; Vaske and Miller 2018; Needham and Vaske 2008). Trust is a particularly important aspect of the relationship between environmental management departments and Indigenous communities, due to the long history of toxic relationships between Indigenous peoples and government agencies (Furgal, Garvin, & Jardine 2010).

Strategies for communicating risks with the public or affected groups vary, but in the case of communicating about the risks of contaminated foods with Indigenous peoples, Furgal, Powell & Myer (2005) argue that little 'true communication' (p. 111) has likely taken place between researchers and Indigenous peoples, with the tendency being to resort to one-way dissemination of scientific information. To break from this patronizing practice, authors like Powell and Leiss (1997) suggest that risk managers should engage in two-way communication. This model identifies the importance of both the scientific understanding as well as the public or community perception of risks; the scientific understanding aims to assess and quantify the risk, explain uncertainties, and identify gaps in understanding, while the public or community's perception informs the context of the issue, identifies specific concerns that should be addressed, and identify conditions that will help the community build capacity to understand and participate in the management of the risk (Powell and Leiss 1997). The process of developing a risk management plan should be dynamic between these two groups, as both are important parts of the risk communication process (Powell and Leiss 1997).

3.3 Setting

Four First Nations are located within the Maskwacîs reserve in central Alberta: Samson Cree Nation, Louis Bull First Nation, Ermineskin Cree Nation, and Montana First Nation. Maskwacîs is surrounded by urban centers, including the cities of Edmonton, Red Deer, and Wetaskiwin. Samson Cree Nation, who we share a research agreement with for this project, is the largest of the four bands with a population of 3,825 (Statistics Canada 2016). The area in which Maskwacîs is located has a significant industrial presence, with

agriculture and oil and gas exploration and development being large contributors to the economic base of the area (Count of Wetaskiwin, n.d.)

The traditional territory of the Nêhiyaw-Askiy, or Plains Cree, is located within a parkland ecosystem that is populated by a variety of cervid species including white-tailed and mule deer, moose, and elk (Alberta Wilderness Association, n.d.). Alberta's cervid species hold importance not only for traditional diets and nutrition, but also culturally for the Cree people (Natcher et al. 2021; Natcher 2019). Maskwacîs is located on the border between two WMUs that represent the eastern range of CWD in Alberta, with WMU 226 being a location of a positive CWD test (Figure 3-1). The location of Maskwacîs and the importance of these cervid species to traditional diets and Cree culture makes the spread of CWD into central Alberta a concerning issue.

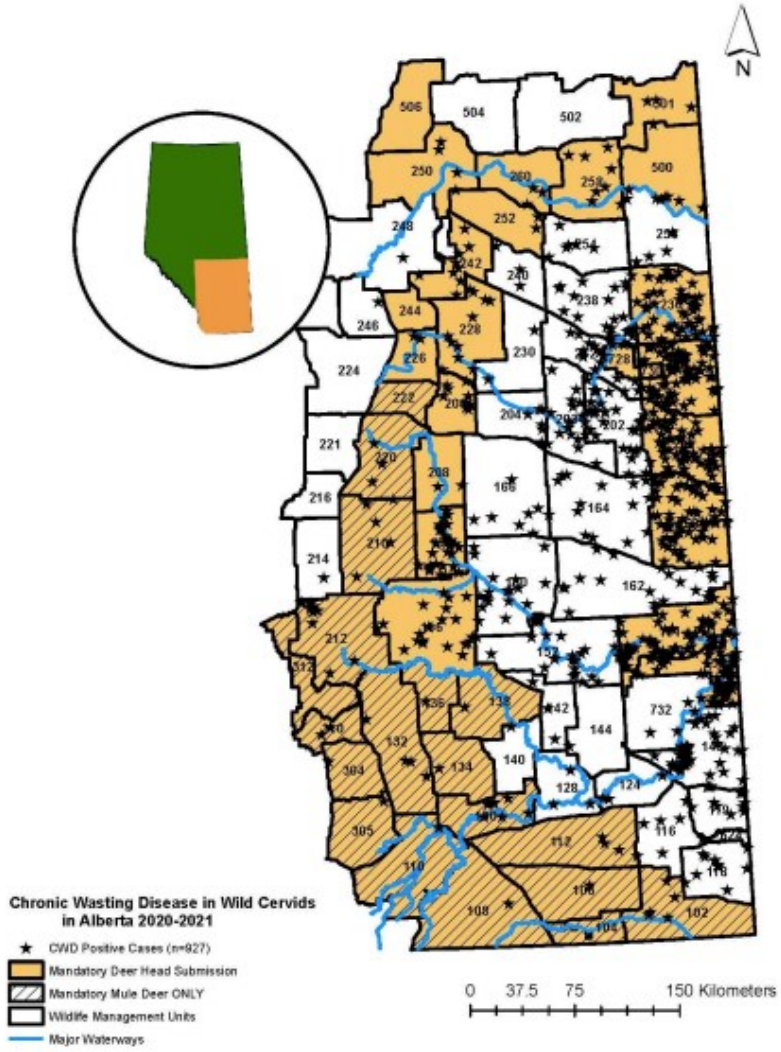

Figure 3-1: Map of current Alberta WMUs with CWD present (Government of Alberta 2020a)

3.4 Methods

Methods for quantitative data collection and analysis, such as survey use, tend to be used in Western science and can be used in an extractive manner. Quantitative research and data collection, whether it is in the form of census data or other statistical reporting, often reflects the dominant cultural context in which they are used, which lack in their efforts to act in the interests of Indigenous peoples (Walter and Andersen 2013). However, there

are growing examples of these methods being used in research that is led by or done in cooperation with Indigenous peoples (Parlee et al. 2021; Steel et al. 2021; Spoon 2014). Quantitative data is powerful, and the ability to have ownership of data can serve as an act of Indigenous sovereignty over the knowledge that is so often used by settlers to describe and manage them (Parlee et al. 2021; Morphy 2016)

In an effort to contribute to the decolonization of research, the tenants of participatory action research (PAR) and community-based participatory research (CBPR) guide this project. PAR involves community members as community researchers and academics collaborating in research that supports community growth, solidarity, and social action (Schensul et al. 2008). Similarly, CBPR is a set of ethical guidelines that requires community members be involved in all stages of the research process, and works towards outcomes of social change (Wilson et al. 2018). In the realm of wildlife health research and management, these participatory approaches to research can be used to assert Indigenous soveignty over resources (Wilson et al. 2018), such as the rights to traditional food and hunting practices, and allow traditional knowledge and indicators to claim space in the realms of research and wildlife management (Reid et al. 2021; Tomaselli et al. 2018b).

A survey titled "Tracking Change: Traditional Knowledge of Wildlife Health in Alberta", was developed to collect information on hunters' and land users' perceptions of wildlife health in the Maskwacîs area, how animal health may have changed over time, how access to hunting areas may have changed over time, and the amount of information and

levels of concern that participants have regarding Chronic Wasting Disease. The research project was developed in response to concerns about CWD expressed by Chiefs of the Confederacy of Treaty 6 First Nations, Treaty 8 First Nations, and the Treaty 7 First Nation Chiefs Association during meetings in which the University of Alberta was involved. The survey was developed with the intention that it be redistributed to hunters and land users on a recurring basis to provide long-term tracking of observed wildlife health in the Maskwacîs area, and was developed in adherence with the Tri-Council of Canada ethical research procedures as well as the research agreement with Samson Cree Nation. This survey was adapted for use in the Maskwacîs and central Alberta area from a previous iteration that was developed by Parlee et al. (2021) for work done between the University of Alberta and Treaty 8 First Nations for use in northern Alberta beginning in 2008.

The data discussed in this paper was collected from 2019 to 2021. In 2019, the project's community research partner (second author) from Samson Cree Nation would identify potential participants, and then a meeting would be arranged with hunters and land users who expressed interest in the project to conduct the survey in person with the principal investigator (lead author) and the Community Research partner. Snowball sampling was also used, as participants were encouraged to tell others who they hunted with about the opportunity to participate in the survey project. All survey respondents self-identified as Indigenous. Surveys were also completed at CWD community demonstration workshops hosted by the Samson Community Freezer Program. Before completing the survey, participants were required to read an informative summary of the project and outline of

the survey objectives, and sign a consent form. The University of Alberta's Research Ethics Office reviewed the survey package, including the information sheet, consent form, and questionnaire, was reviewed for its adherence to ethical research guidelines.

In March of 2020, due to the COVID-19 pandemic and safety precautions put in place by both Samson Cree Nation and the University of Alberta, the survey was transitioned to an online format and was conducted through Google Forms to allow hunters and landusers to participate remotely. The community research partner distributed links to the survey by text message, and a link was posted in the Samson Cree Nation monthly band newsletter.

3.5 Results

During the data collection period, 31 surveys were completed. In 2019 and the first three months of 2020, 9 respondents completed the survey in-person with the research team. The remaining 22 respondents that participated in 2020 and 2021 completed the survey online due to the restrictions on in-person research that were put in place due to the global COVID-19 pandemic. Due to the small sample size, variable response rate for different sections of the survey, and the situated nature of the observations expressed in the data, the results of this paper cannot be generalized to the wider Cree hunter experience.

3.5.1 Harvest, Consumption, Meat Sharing

When asked how long they had hunted in the study area, 35% of respondents answered that they had hunted in the Maskwacîs area for the past 10 years, and another 25% answered that they had been hunting in the area for their whole life (or more than 25

years). At 23%, a similar amount of respondents answered that they were new hunters to the area, and had only been hunting there for the past few years.

The survey questions regarding hunting asked participants to recall information about their hunting activities over the past six months (Table 3-2). The majority (80%) of respondents had gone hunting for both moose and deer at least once in the last six months, while 58% of respondents had gone hunting for elk at least once in the same period. Most respondents had gone on between one and four hunting trips in the past six-month period, whether it was for moose, deer, or elk. Figure 3-3 illustrates the number of animals harvested per species, and highlights which deer species is most often harvested; when hunting for deer, respondents reported harvesting fewer mule deer than white-tailed deer. The data from this survey suggests that moose and white-tailed deer are the most frequently consumed cervid species by community members in Maskwacîs. The low response rates for questions related to elk are attributed to the lower number of respondents who participated in elk hunting during the six-month recall period.

The survey included a space for respondents to reflect on whether their hunting areas had changed over time. Out of the total amount of respondents (n=31), 61% answered 'yes' when asked if the areas that they hunt in have changed over time. For those who provided expanded answers on how their hunting areas have changed over time, all answers referred to how the accessibility of the areas has changed. Figure 3-2 illustrates four themes that emerged from these qualitative answers. Of the 10 respondents that provided detailed accounts of these changes, 6 noted that increases in private property, farmland,

or industry activity prevented them from accessing hunting areas that they had used in the past.

> *No hunting signs on people's properties* (Survey respondent)
>
> *[I hunt] in pastures out west, some of which are no longer accessible because they have been leased out, and 'no hunting' signs have gone up* (Survey respondent)
>
> *Some areas [I] used to hunt in aren't accessible anymore, [I think] due to population growth, industry and private land causing issues* (Survey respondent)
>
> *Construction activity, oilfield development, land clearing has changed the areas* (Survey respondent)
>
> *Farmers have removed a lot of the forest around my area I use to hunt as a child* (Survey respondent)
>
> *Industry such as oil and gas, logging companies has moved in the area... chased wild game out of [my] hunting area. Too much activity to hunt* (Survey respondent)

One respondent noted that they no longer hunt in areas where CWD is present, which applies to WMUs to the south and east of Maskwacîs.

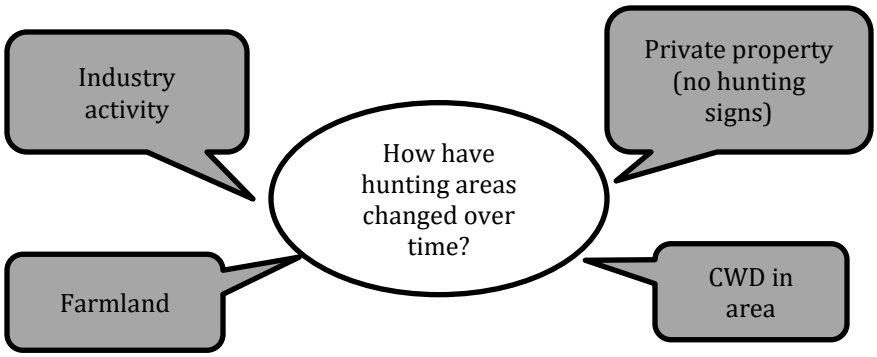

Figure 3-2: Qualitative responses to how the hunting areas of respondents have changed over time

Table 3-2: Number of hunting trips per animal in the past 6 months

	None	1-4 trips	5-7 trips	> 7 trips	Response
Moose	19%	45%	19%	3%	97%
Deer	19%	42%	19%	16%	97%
Elk	42%	42%	13%	0%	97%

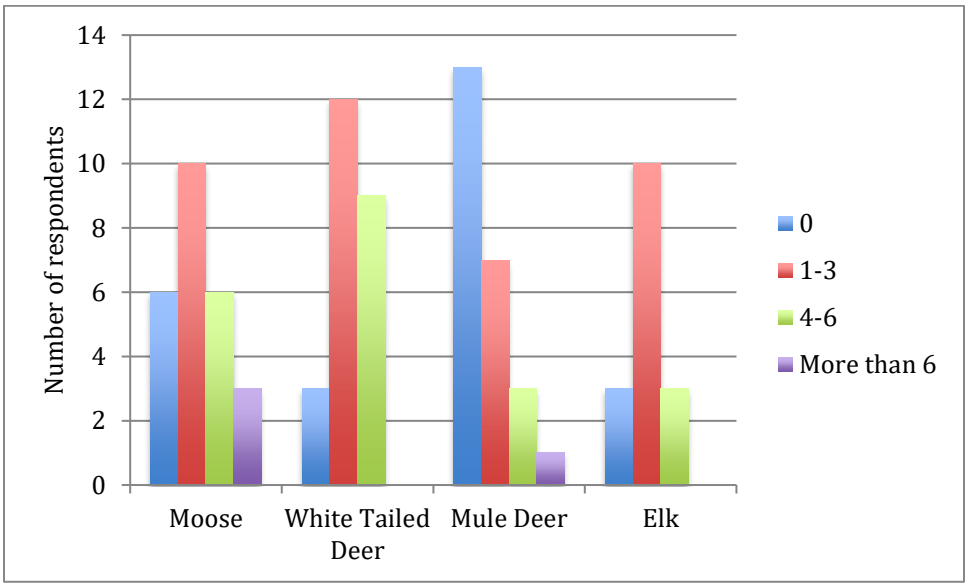

Figure 3-3: Number of animals harvested in the last 6 months, per species. Response rate: moose (81%), WTD + MD (77%), elk (52%)

The survey contained several questions about the significance of wild meat to the diets of people in Maskwacîs. Figure 3-4 illustrates the frequency at which respondents typically consume wild meat during the week. 90% of respondents reported consuming wild meat at varying frequencies, with only 10% stating that they do not eat wild meat. An additional variable that speaks to the significance of wild meat in the diets of local Indigenous communities is the sharing of meat with family and community members (Table 3-3). A large percentage of respondents (94%) shared meat outside of their households, along with sharing meat with family outside of their community (83%).

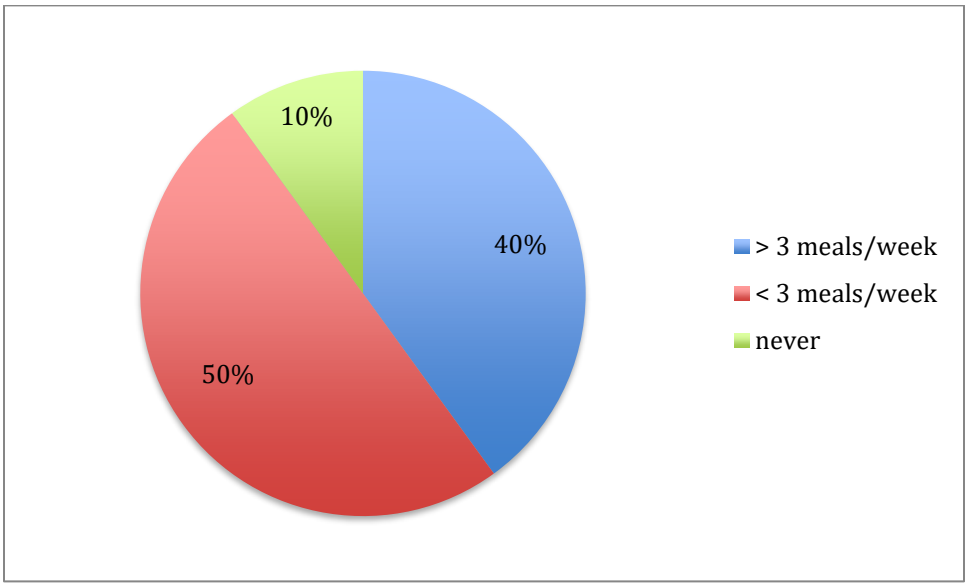

Figure 3-4: Weekly rate of wild meat consumption (percentage). Response rate: 100%

Table 3-3: Reports of wild meat sharing with family and community (percent)

	All	Most	Some	None	Response rate
How much meat shared outside household?	10%	32%	52%	6%	100%
	Always	**Usually**	**Sometimes**	**Never**	**Response rate**
Do you give meat to family living outside your community?	17%	23%	43%	17%	97%

3.5.2 Knowledge and Perceptions about CWD

Respondents were asked about whether they had received information about CWD and if so, from which sources. The majority of respondents stated that they had received information about CWD, with 29% having received 'a lot' of information about the

disease (Figure 3-5). While it was a small proportion of the sample, 10% of respondents stated that they had received no information about CWD.

The sources of this information are illustrated in Figure 3-6. The top three reported sources of information on CWD are others in the community, community meetings, and community posters. Due to the nature of this survey in that it was adapted for use in the Treaty 6 area from Parlee et al.'s (2021) survey from 2008, social media was not included as an option. However, from communication with respondents during in-person surveys, we can gather that information pertained through social media would fall into the 'others in the community' category.

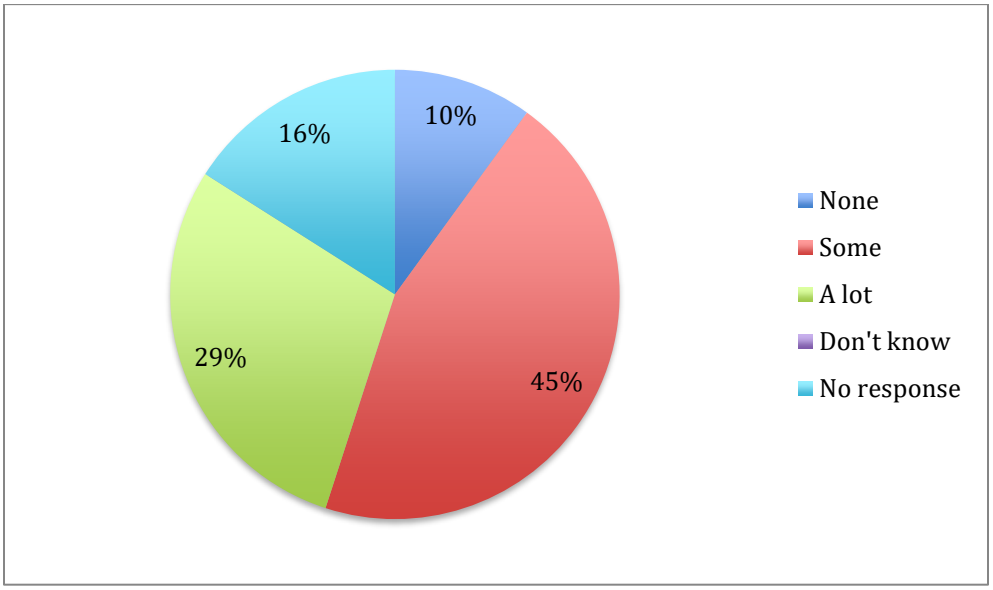

Figure 3-5: Amount of information on CWD received by survey respondents

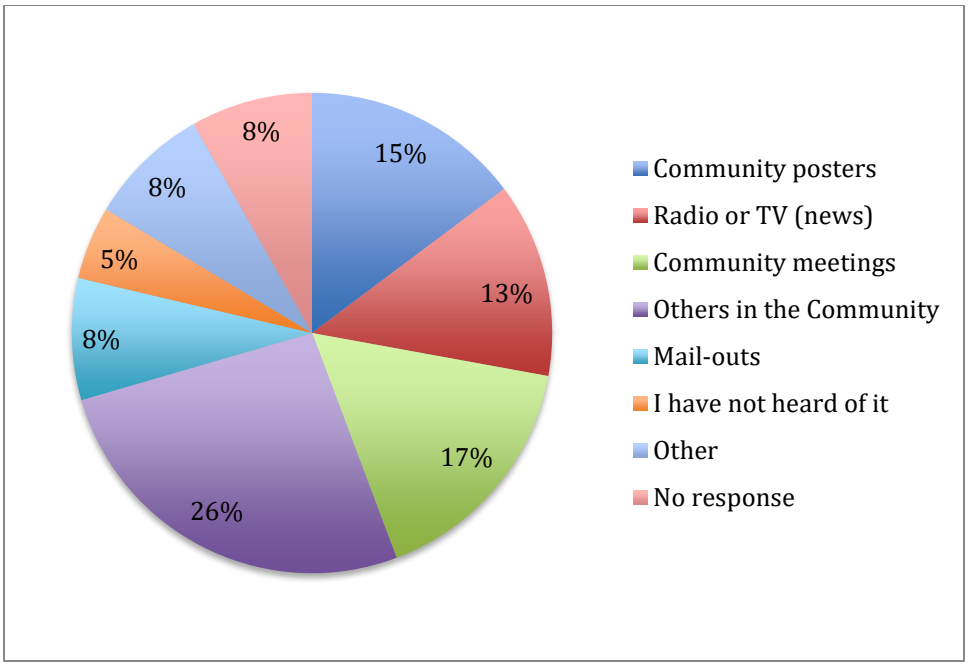

Figure 3-6: Sources for information on CWD

Given the importance of cervid species to the diets of Indigenous peoples in central Alberta, information was collected about hunters' level of concern about moose, deer, and elk, as well as about CWD in general. For moose and deer populations, 64% and 48% of respondents, respectively, expressed some amount of concern for the populations of these animals, ranging from somewhat concerned to very concerned (Table 3-4). The data reflects a higher level of concern for moose as a species than deer or elk. The response rate for survey questions about the level of concern for moose and deer populations was 68%. When asked about elk, 38% of respondents expressed some amount of concern about the health of the population, ranging from somewhat concerned to very concerned. This lower percentage could be partly attributed to a lower response rate (48%) for the question about elk, likely due to the smaller number of respondents who had hunted elk within the time frame of the survey.

Respondents were asked several questions about their perceptions of the risks associated with CWD. The majority of respondents (74%) felt some level of concern about CWD, with only 3% expressing that they were not concerned about this wildlife disease (Figure 3-7). When level of concern for CWD is compared to the variable for level of hunting experience, we can see that out of the respondents that hunt in the Maskwacîs area, the group who had more than 25 years of hunting experience had the most respondents report that they were 'very concerned' about CWD (Figure 3-8). The majority of hunters within the other groupings of hunting experience reported feeling 'somewhat concerned' about CWD. The non-hunting group of respondents, which during survey completion identified themselves as users of the land for other purposes, or family members of hunters, all reported that they felt 'very concerned' about CWD.

Table 3-4: Level of concern about CWD per animal species

	Not concerned	Somewhat concerned	Very concerned	Response Rate
Moose	3%	48%	16%	68%
Deer	19%	42%	6%	68%
Elk	10%	32%	6%	48%

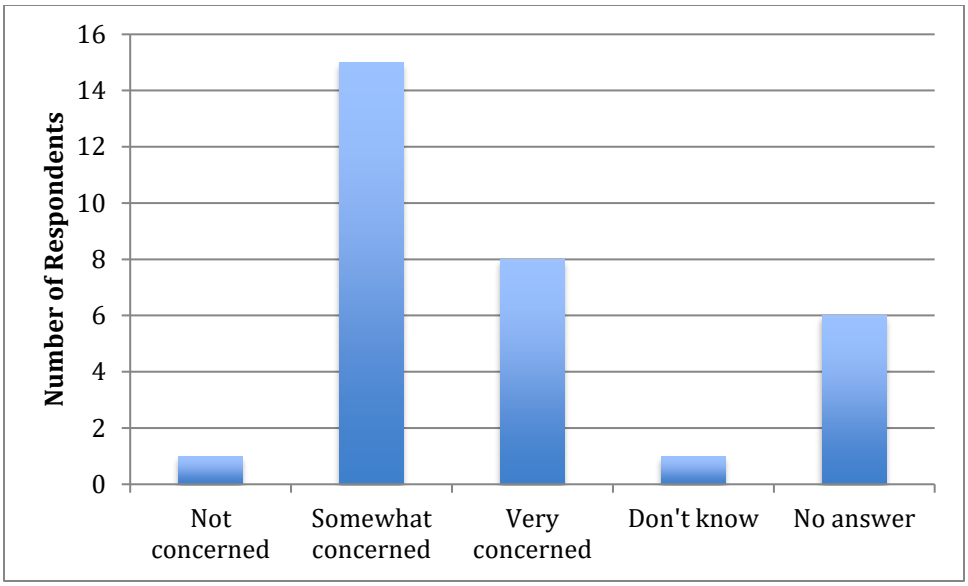

Figure 3-7: Level of concern about CWD

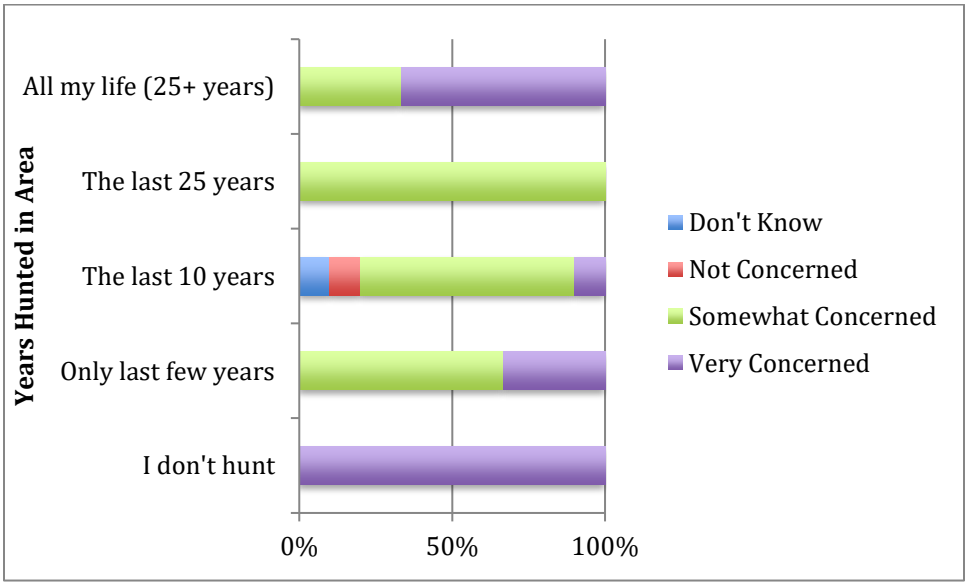

Figure 3-8: Level of CWD concern by hunting experience

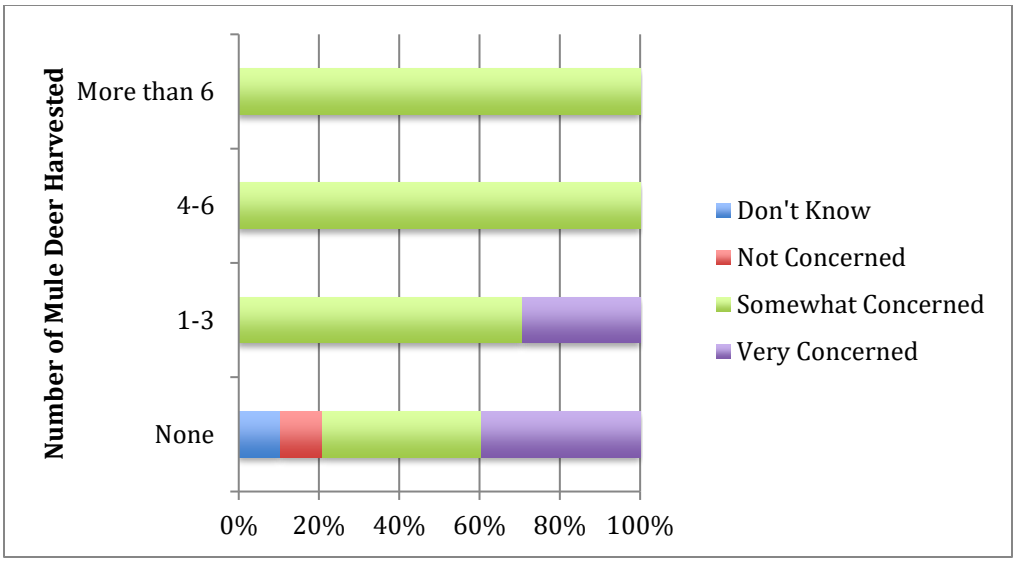

Figure 3-9: Level of CWD concern by mule deer hunting frequency

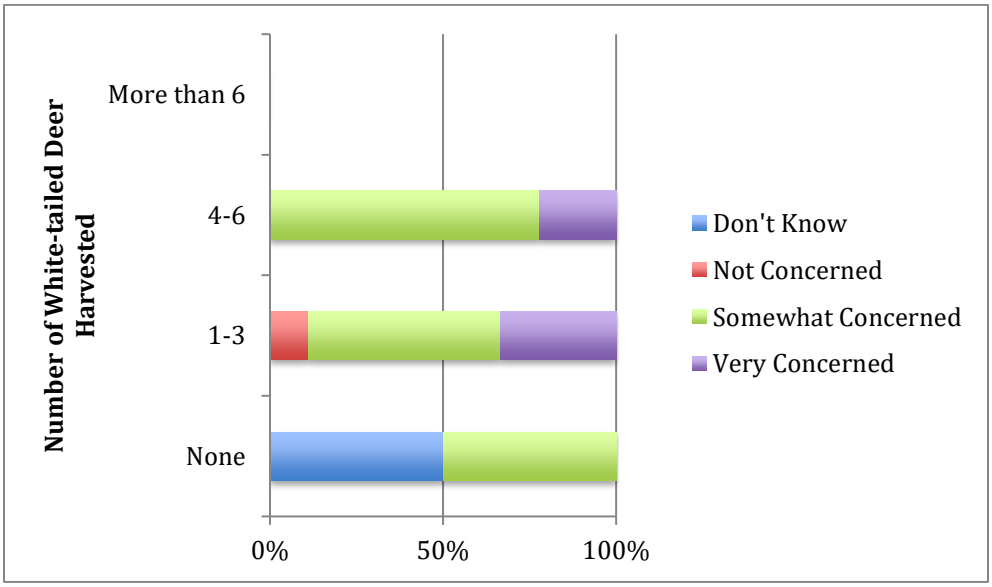

Figure 3-10: Level of CWD concern by white-tailed deer hunting frequency

Table 3-5: CWD concern and hunting choices

	No	Yes		Don't know	Response Rate
Does your level of concern about CWD affect whether you choose to go out hunting or not?	32%	26%		13%	71%
	None	**Some**	**A lot**	**Don't know**	**Response Rate**
How much does your level of concern about CWD affect where you choose to hunt?	6%	39%	19%	6%	71%

Table 3-6: Opinions on current and past CWD management

	Yes	**No**	**Maybe**	**Don't know**	**Response Rate**
Do you agree with the culling of deer populations to limit the spread of disease?	26%	13%	23%	16%	77%
	Yes	**No**	**Maybe**	**Don't know**	**Response Rate**
Would you be willing to participate in monitoring by submitting tissue samples of harvested deer or moose?	45%	10%	16%	10%	81%

Only 26% of respondents said that their level of concern about CWD affected whether they chose to go hunting or not (Table 3-5). However, 58% of respondents said that their level of concern about CWD had some affect on where they choose to hunt. In addition, survey respondents were asked about both CWD management practices that have been and are currently implemented in Alberta. Almost half of respondents answered that they would be willing to participate in submitting tissue samples or heads of harvested deer, elk, or moose in order to assist with the monitoring of CWD (Table 3-6). When asked

whether they agreed with the culling of deer populations to manage the spread of CWD, 39% of respondents said that they were unsure, while 26% said they agreed with the culling of deer (Table 3-6).

3.6 Discussion

This project was developed as a continuation of the work by Parlee et al. (2021) with Indigenous hunters in northern Alberta to document the importance of cervid species to their diet and cultures, as well as how risks of CWD are being communicated to and interpreted by communities. The research presented in this paper expands this work into central Alberta and the territory of Treaty 6 First Nations, where CWD is present and has an annually expanding range (Government of Alberta 2021b). This paper seeks to fill the gap in the literature on wildlife management and CWD where there is a limited representation of Indigenous peoples from central Alberta and their relationship to this issue.

3.6.1 Harvest Levels, Food Consumption, and Importance of Cervid Species to Local Diets and Culture

The survey data highlights the importance of cervid species to Indigenous communities in central Alberta that engage in subsistence hunting. The frequency of consumption of wild meat (Figure 3-4), as well as the large proportion of respondents that reported sharing harvested meat outside of their households (Table 3-3), speaks to the importance of wild meat in not only the diets of hunters and their families, but also others in the community who are a part of the food-sharing network. These findings are consistent with other

research on traditional foods and livelihoods done with Indigenous communities in Alberta (Natcher 2019; Natcher et al. 2021; Parlee et al. 2021).

Research based in northern Alberta speaks to the relationship that CWD-affected cervid species, especially moose, have to the livelihood of Indigenous communities that participate in subsistence hunting (Natcher 2019; Parlee et al. 2021). In the Maskwacîs area, moose and deer were equally represented as the animal being sought after by respondents, with 81% of respondents reporting going on some number of hunting trips for both animals, with 'deer' representing both white-tailed and mule deer (Table 3-2). Only 55% of respondents reported going on hunting trips for elk (Table 3-2). White-tailed deer and mule deer were differentiated in questions relating to animal harvest. While there were more respondents that reported harvesting white-tailed deer in varying amounts, moose was the most frequently represented animal in the 'higher-catch' category of six or more animals. The lowest number of reported harvests was for mule deer.

3.6.2 Risk Perception of CWD

The literature on risk and environmental hazards points to the differences in risk perception between scientific experts and the public (Decker et al. 2012; Fabisiak 2020), with the often-assumed more objective perception of risks that experts hold being just as influenced by cultural, social, economic, and political context as the wider public or other stakeholder groups (Bickerstaff 2004; Slovic 1987; Kasperson et al. 1988; Spicer et al. 2020). Much of the research on risk perception around CWD in Alberta and in the United States focuses on the perspectives of white settler hunters or landowners (Zimmer, Boxall and Adamowicz 2011; Schuler et al. 2016; Heberlein and Stedman 2009; Vaske et al.

2004; Vaske and Miller 2018; Needham and Vaske 2008; Muringai and Goddard 2018), leaving a gap in the literature where Indigenous perspectives on the issue are underrepresented, despite the direct impact that CWD could have on subsistence food systems in central Alberta (Zimmer, Boxall and Adamowicz 2011).

CWD researchers and health authorities such as the Canadian Food Inspection Agency state that there is no current evidence that the disease could cross the species barrier into humans (CFIA 2020b). However, the same health authorities recommend that no part of an infected animal should be consumed (CFIA 2020b), and that caution should be taken when handling carcasses, especially with tissues such as the brain and spinal cord (Belay et al. 2004). In Alberta, mule deer are the animal that are most affected by CWD, with the prevalence of CWD in male mule deer reaching up to 55% in WMUs of concern in the 2019 surveillance period (Government of Alberta 2020b).

The majority of survey respondents stated that they felt some level of concern about CWD (Figure 3-7), and with deer being the most affected species in the province, this metric was compared with the frequency of trips taken for deer hunting as well as the level of harvest for both types of deer. While respondents who felt both 'somewhat concerned' and 'very concerned' about CWD were present in all deer hunting frequency groupings, half of respondents who reported going on no hunting trips for deer felt 'very concerned' about CWD (Table 3-4). However, this question referred to deer in general, and did not differentiate between white-tailed deer and mule deer. In an attempt to determine if the low rate of mule deer harvested by survey respondents is due to concern

about CWD, the metric of harvest frequency for each deer type was compared to the reported level of concern about CWD. For those that responded to the question about how many mule deer they had harvested in the past six-month period, the grouping that had the highest proportion of respondents who felt 'very concerned' about CWD was those who had harvested no mule deer (Figure 3-9). However, each other mule deer harvest grouping had a large proportion of respondents who felt 'somewhat concerned' about CWD. In comparison, there were more respondents who harvested white-tailed deer who felt 'very concerned' about CWD than those who harvested no white-tailed deer (Figure 3-10). Consistent with interpretations by Parlee et al. (2021) of Indigenous hunters surveyed in northern Alberta, survey respondents who feel a heightened level of concern about CWD may avoid hunting mule deer due to the prevalence of the disease in this species.

Survey respondents were also asked about how their risk perception about CWD affected their attitudes about hunting in general and hunting locations. A higher percentage of respondents (Table 3-5) reported that their level of concern about CWD did not affect whether they choose to go hunting or not. However, 58% of respondents said that concern about CWD did have some affect on where they choose to hunt. Research on CWD and the risk perception of hunters in North America has demonstrated that hunters who are more risk-sensitive are more likely to change their hunting habits in response to CWD being present in their hunting range (Schuler et al. 2016; Zimmer, Boxall & Adamowicz 2011; Vaske and Miller 2018; Miller 2004; Vaske et al. 2004). These findings can be compared to previous studies on risk perception of CWD in recreational

hunters, which found that the impact of CWD on hunting in Alberta did not appear to be significant (Zimmer, Boxall & Adamowicz 2011). Social and cultural factors that could influence the higher levels of risk perception around CWD in a community such as Maskwacîs include the roles that traditional food, and the species threatened by CWD, play in both cultural and personal wellbeing (Furgal, Powell & Myers 2005) as well as food security, especially for low-income households (Nelson, Natcher & Hickey 2005).

These findings suggest that paired with other reported factors such as land privatization including agricultural spread and industry activity (Figure 3-2), the encroachment of CWD on central Alberta contributes to Indigenous hunters' issues of access to areas for subsistence hunting. While the loss of physical access to traditional territories is only one aspect of how colonial systems and their constraints on Indigenous communities affect food security and cultural wellbeing (Nikolopoulos et al. 2020), it does bring attention to the difference between rights to traditional land and the ability to access it for benefits like safe traditional foods. The UN Declaration on the Rights of Indigenous Peoples (2007), of which Canada is a signatory, states that Indigenous peoples have the right to "be secure in the enjoyment of their own means of subsistence and development, and to engage freely in their traditional and other economic activities" (Article 20.1). The issues of access to the kind of suitable land with healthy wildlife populations for subsistence hunting and cultural activities brought forward by survey responses, including the threat of CWD, bring to light the broader range of social factors that prevent groups or individuals from benefiting from resources, even if they have the rights to them (Ribot and Peluso 2003).

3.6.3 Risk Management and Community-Based Monitoring

The way that risk is communicated about a food-related risk, as well as the cultural context of the people interpreting the risk and receiving the communication, can influence how they respond to health advisories concerning food (Willows 2005). With the majority of hunters surveyed in this study expressing some level of concern about CWD (Figure 3-7), and the reported effect this concern has had on hunting behavior (Table 3-5), there is concern that local perceptions of risk could negatively impact traditional food consumption when it comes to cervid species (Miller 2004).

Risk perception can change depending on personal level of control and involvement in the management of the issue at hand (Heath, Bradshaw & Lee 2002). In the case of a wildlife disease like CWD, allowing for the communities most affected by the disease to have a significant role in the risk management process and to be engaged in the monitoring could provide a sense of control and provide more certainty in the health of wildlife and traditional foods in their area (Fabisiak 2020). Many social scientists have advocated for participatory decision-making in issues of environmental risk to allow for a wider range of perspectives to contribute to management, which not only addresses differences in preferences and values, but also provides an opportunity to check the scientific or bureaucratic communities for knowledge gaps and expert biases (Bickerstaff 2004; Slovic 1987; Van Wassenhove et al. 2012). It is from these approaches to risk management that community-based methods of research and monitoring have become methods of choice (Fabisiak 2020; Heath, Bradshaw and Lee 2002), and have been incorporated into resource management with multiple stakeholder groups including

Indigenous peoples and nations (Henri, Jean-Gagnon & Gilchrist 2018; Tremblay et al. 2006; Wilson et al. 2018). The engagement of community members that are affected by an environmental issue such as wildlife disease can help risk managers to identify aspects of the problem that were previously unknown to them (Fabisiak 2020), such as cultural sensitivities that may impact management activities. Additionally, non-scientific conceptualization of risks that tend to be expressed by the public or stakeholder groups that are deemed 'non-experts' can be much richer than some technical assessments, and better reflect the legitimate concerns of the community that are often lacking in expert risk assessments (Slovic 1987).

Critics of participatory risk management methods point to the lack of scientific or theoretical foundation in the public's perception of risks, and suggest that basing policy decisions off of experiential knowledge would result in complicated, biased policies (Bickerstaff 2004; Cross 1998). While the complicated nature of participatory research and management cannot be understated, in order to acknowledge the inherent connection of social context and how it influences risk perception and management, decision-making must involve more than just the dominant governing group (Fabisiak 2020; Furgal, Powell, & Myers 2005). Instead of a patronizing model of risk communication that utilizes one-way dissemination of information from the expert scientific and governing branches to the wider public, a 'two-way communication model' (Powell and Leiss 1997) that addresses the complex social and cultural factors that can influence risk perception and behavior, and addresses a need to build trust between risk managers, scientific experts and Indigenous communities (Furgal, Powell and Myers 2005; Fabisiak 2020).

For the management of a wildlife disease like CWD in Alberta, which relies heavily on the participation of hunters across the province to monitor its spread, working alongside Indigenous communities to address local perceptions of risk and engage hunters in the monitoring of the disease would not only better address the high perception of risk about CWD in Maskwacîs, but would also increase the amount of hunters contributing data to the provincial monitoring program by addressing the issues of access with the current program.

3.7 Conclusions

The fatal and highly transmissible nature of CWD as a wildlife disease of cervid species makes it a direct threat to the traditional diets and culture of Indigenous peoples in central Alberta (Zimmer, Boxall, & Adamowicz 2011). The significance of this threat is expressed in the local perception of risk about CWD; some Indigenous hunters are changing their hunting behaviors to avoid areas affected by the disease (Table 3-5), and the majority of hunters surveyed reporting some level of concern about CWD (Figure 3-7). Despite the high level of concern felt by Indigenous hunters, the provincial CWD monitoring program remains oriented towards recreational hunters. For example, drop-off freezers for accepting samples in rural areas are only available during the fall licensed hunting season (Government of Alberta, n.d.1), when Indigenous hunters are able to hunt throughout the year. The Government of Alberta's CWD monitoring program relies on hunter participation to track the spread of the disease, but may be alienating Indigenous hunters from participating, despite almost half of survey respondents expressing interest in participating in the program (Table 3-6).

Addressing knowledge gaps, cultural gaps, and disagreements between all the groups in charge of and impacted by CWD and its management will allow for decisions to be made that reflect the views and risk perceptions of everyone involved (Schuler et al. 2016). However, this is a difficult task, especially when the relationship between those who regulate and those who are regulated is often strained, and true participation is often limited by racism and colonialism as the perspectives of certain communities or groups are devalued (Schuler et al. 2016; Kojola 2019). The decision-making process becomes more inclusive through improvements in its addressing of barriers to participating in conversation, including providing the resources to attend meetings, access to the required information, participatory forms of discussion, and importantly, the recognition of Indigenous knowledge and sovereignty (O'Faircheallaigh 2007). The allowance of other knowledge systems into the risk assessment and planning process broadens the scope of the technical experts, checking for knowledge gaps and the biases that scientists, like the public and other stakeholders, base their assessment techniques on (Bickerstaff 2004). Lastly, in working towards a constructive and realistic system of decision-making that acknowledges the strain in relationships between stakeholders and those that govern the resource, especially between Indigenous communities and governments with colonial foundations, a constructive way forward together must be developed even for situations where trust may not be immediately attainable (Slovic 1993).

CHAPTER 4.0: Community-based monitoring: A tool for expanding knowledge on Chronic Wasting Disease

4.1 Introduction

Community-based approaches to monitoring and citizen science have increased in their application in the last decades, particularly those that involve Indigenous communities. Many of these programs aim to create new knowledge about valued places, species or issues with the aspiration of improving the sustainability of ecosystems and communities (WHO 2015). A growing number of monitoring initiatives that are inclusive of Indigenous knowledge and/or are led by Indigenous peoples themselves in Canada, have specifically dealt with questions of wildlife ecology (Nyhus 2016; IPBES 2019a; Wisely 2019; Messmer 2020). To date, however, very few programs have focused on issues of wildlife disease including prion diseases in ungulates (deer, moose, elk) (Witmer 2005; Rivera et al. 2019; Gillin & Fischer 2018; Williams & Young 1980; Indigenous Services Canada 2019; CFIA 2020a). As Chronic Wasting Disease (CWD) continues to spread across Alberta from the eastern provincial border, concern about the disease's potential impact on cervid species in the region and the health and food security of Indigenous communities in affected areas has been expressed by Indigenous leadership. Building on previous relationships and research experience on animal health and CWD with Dene and Northern Cree in Alberta (Witmer 2005; Leiss et al. 2017), this paper discusses the process of developing a community-based monitoring program for CWD in Maskwacîs, Alberta. Under the direction of the leadership of the Treaty 6 Confederacy a research collaboration was developed with the Samson Cree Nation Community Freezer Program and work carried out between 2018-2020. This paper shares the outcomes of this

collaboration; more specifically we share principles of design that were developed around five key questions: a) why is community-based monitoring important and needed to address the issue of chronic wasting disease?; b) what kind of knowledge should be the basis of monitoring? c) who should be involved?; d) what are the most appropriate practices and methods for monitoring?; and e) what knowledge needs can the monitoring program address?

Outcomes of this collaborative design process suggest the importance of ground community-based monitoring of CWD around Indigenous and Treaty rights to harvest wildlife and in recognition of the value of wild meat to local food security. Embracing Indigenous knowledge, practices and beliefs as well as cultural protocols for respecting animals and people. Insights about monitoring as a socio-political process also emerged through this collaboration; as such the "community-based monitoring program" that was developed not only aims to generate knowledge about the spread of CWD; it is also an act of sovereignty over local lands and resources. By designing and implementation the monitoring program, Samson seeks to manage the risks associated with the spread of CWD and by so doing increase confidence of local members in the health of traditional food. We posit that by doing this work, Samson Cree Nation is also confronting the significant inequities that exist in wildlife management in the province of Alberta, rooted in two centuries of colonization and creating new opportunities for the co-production or braiding of Indigenous knowledge and other knowledges (e.g., prion science) that are needed to manage the spread of CWD. Given concerns about wildlife disease and human-wildlife health questions have growing as a result of the COVID-19 pandemic,

greater opportunities for community-based monitoring are urgently needed both in Canada and globally.

4.2 Literature Review

4.2.1 Social-Ecological Approach

It is becoming increasingly recognized that the management and conservation of natural resources, such as wildlife, both impacts and is impacted by social, economic, and ecological drivers (Cumming & Allen 2017; Parlee et al. 2012). In complex social-ecological systems, the individual resource system, units of the resource, users of the resource, and the governance system have the capacity to affect each other in a way that produces changes on the social ecological system level, which can then feed back to affect the resource system or other social ecological systems (Ostrom 2009; Berkes 2017; Folke et al. 2016). A perspective that takes into account the connectivity of the social and ecological aspects of resource use and its impacts has much to offer to resource-dependent communities, resource managers, and policy-makers (Cumming & Allen 2017). While science plays an important role in working towards the sustainability of these systems (Ostrom 2009), academia and governments have turned to Indigenous knowledge systems to develop a better understanding of the social-ecological nature of the systems, which aligns with the holism of Indigenous ways of knowing (Thompson et al. 2019; Berkes & Berkes 2009; Bohensky & Maru 2011).

A social-ecological perspective is crucial to the understanding of indigenous knowledge in the monitoring of environments and natural resources (Stenekes et al. 2020). Through a social-ecological approach to monitoring, the environment of interest and the social

systems that interact with it are seen as connected, and the consideration of multiple values as the environment as a cultural landscape are taken into account (Stenekes et al. 2020; Whitney et al. 2017). The contributions of multiple knowledge types, including western science and indigenous knowledge, are thus useful for monitoring projects with a social-ecological approach in order to attempt to understand the complexity of the resource system (Folke et al. 2005; Folke 2006; Folke et al. 2016; Berkes 2017).

4.2.2 Indigenous Rights and Wildlife Harvesting

Wildlife harvesting by First Nations and Métis peoples in Alberta is a protected right under historic treaties with the state (i.e., Crown) and Supreme Court case law (Wobeser 2002; Decker et al. 2006; Berger-Tal & Lahoz-Monfort 2018; Lunstrum 2015; Parlee 2017; Duffy et al. 2019; Berkes 1998; Brook & McLachlan 2008). Despite this strong legal foundation, Indigenous values and practices of wildlife harvesting is often little understood or respected by governments, industry or the public at large (Parlee et al. 2005). Centuries of colonization in Canada led to the marginalization of Indigenous peoples including their "enclosures" onto reserve lands, criminalization of cultural and subsistence practices and efforts at cultural assimilation (e.g., residential schools). These histories of colonization are also visible in the Alberta *Wildlife Management Act* and decisions about wildlife use in Alberta which have privileged recreational hunting rather and Indigenous subsistence and cultural uses (Witmer 2005; Parlee 2017). Such biases in wildlife management systems are also visible in the kinds of opportunities that have been created for Indigenous peoples (including Samson Cree Nation) to access knowledge about the risks of prion diseases in their hunting territories and harvested animals.

4.2.3 Chronic Wasting Disease

The COVID-19 pandemic has created many new questions about human-wildlife interactions and their impacts on human health and socio-economic systems (Messmer 2020). In that context, monitoring of wildlife populations is of urgent importance (Witmer 2005). Among the diseases of growing concern in western Canada is Chronic Wasting Disease (CWD), a fatal, highly contagious transmissible spongiform encephalopathy (TSE) that affects species in the cervidae family, including but not limited to deer, elk, and moose (Rivera et al. 2019; Gillin & Fischer 2018). First diagnosed in deer housed at a wildlife research facility in the state of Colorado in the 1960s (Williams & Young 1980), the disease has now spread from the United States into Canada, where it has been detected in three provinces; Alberta, Saskwatchewan, and Quebec (Indigenous Services Canada 2019). Internationally, CWD has been found in South Korea, Norway, Sweden, and Finland (Gillin & Fischer 2018; Indigenous Services Canada 2019). While there is currently no definitive evidence that CWD can be transmitted to humans, the Canadian Food Inspection Agency (2020a) recommends against the consumption or use of meat or tissues from an infected animal. The cultural and dietary importance of moose, deer, and elk to Indigenous communities in Canada means that the spread of CWD presents significant risk to the traditional lifestyle and cultures of these communities (Leiss et al. 2017). Much of the knowledge produced about the causes and symptoms of CWD, as well as tactics of surveillance, have been produced within a narrow field of research and among a small number of scientific experts. How other knowledges of wildlife health (i.e., Indigenous knowledge) can contribute to learning about the spread of the disease has been little studied.

4.2.4.Community-Based Monitoring Based on Indigenous Knowledge

There are growing concerns about wildlife diseases and their impacts on ecosystems and people. In addition to issues of animal welfare and conservation, growing losses and degradation of wildlife habitat and protection is leading to increases in human-wildlife interaction (WHO 2015; Nyhus 2016; IPBES 2019b; Wisely 2019). Thus, the monitoring of wildlife and their associated diseases has become increasingly important for wildlife managers (Nusser et al. 2008; Artois et al. 2009; Mörner et al. 2002).

Contemporary methods of wildlife monitoring and management are rooted in population ecology and veterinary medicine, operationalized in a top-down institutional framework (Wisely 2019; Wobeser 2002; Decker et al. 2006) with the tendency towards invasive methods, technologies and procedures (e.g., capture-mark-recapture). Indeed, a common feature of many of the technologies used by conservation biologists is that they were originally developed for military purpose and use, rather than inspired by principles of human-wildlife co-existence and care (Berger-Tal & Lahoz-Monfort 2018; Lunstrum 2015; Parlee 2017). Technological solutions to surveillance are also expensive and there is "a lack of transparency about the effectiveness of such technologies, the costs of which run into millions of dollars" (Duffy et al. 2019 p. 67). Finding viable alternative approaches and technologies has been challenging, and is thus of growing interest to academics, governments, NGOs and communities with long term relationships to valued wildlife species. Among those who can offer viable alternatives to conventional monitoring are Indigenous peoples.

Indigenous peoples have approaches to monitoring wildlife that have developed over many generations of sustainable use (Berkes 1998; Brook & McLachlan 2008; Parlee et al. 2005). Indigenous knowledge practices and institutions (or rules) have been critical to the conservation of wildlife in northern Canada and many areas of the globe (IPBES 2019b; Schultz et al. 2019; Alcorn 1993; Huntington 2008). Although evidence of the systematic way in which knowledge is gathered and the unique insights of culturally developed indicators have been explored, Indigenous peoples and knowledge systems have been marginalized in monitoring and management in Canada when compared to academics, governments and conservation organizations (Parlee et al. 2018; Alcorn 1993; Dowie 2011; Howitt 2001). This can be due to concerns expressed by government bodies and environmental management institutions that monitoring data collected by volunteers is not as credible as scientific data; in many cases, Western science tends to dominate over alternative ways of understanding such as Indigenous traditional knowledge (LaRiviere & Crawford 2013; Nadasdy 1999). A growing number of Indigenous organizations are engaged in community-based monitroing (CBM) as opportunities to address inequities in the production of knowledge, including that which informs the management of wildlife and other valued natural resources (Parlee et al. 2014; Kutz & Tomaselli 2019; Whitelaw et al. 2003).

Citizen science and CBM offer a potential solution for individuals and communities seeking greater engagement in monitoring and for governments and resource managers seeking to learn more from hunters and other land users. Citizen scientists are volunteers or others who engage in collecting data for the purpose of building and sharing

knowledge about an ecological phenomenon. There are a burgeoning number of citizen science programs globally, the oldest known being the Audubon Christmas Bird Count which began in the United States in 1900 (Silvertown 2009). CBM programs involve the monitoring of natural resources that by local resource-users and stakeholders, government agencies, and academics with the objective of addressing the specific needs and wants of the community (EMAN and CNF 2002), and can also refer to local stakeholders using community resources to engage in monitoring to achieve objectives that are appropriate for their own needs (Danielsen et al. 2009).

Opportunities created by community-based monitoring to address specific community needs and address inequities in knowledge production are thus important. There are also opportunities for community-based monitoring to create new kinds of knowledge that might be braided together with that created through prion science. These opportunities may be in the form of new observations of unhealthy animals, their distribution and other related aspects of ecology; however, other ontological aspects of wildlife disease risk may also be developed through Indigenous led monitoring (Witmer 2005). As evidenced elsewhere, scientific 'experts' and Indigenous peoples tend to view health risks differently (Howitt 2001; Silvertown 2009; EMAN & CNF 2002). This may be the result of a host of socio-economic factors but may also be rooted in different values, beliefs and uses of wildlife (i.e., as food) as well as long term relationships of stewardship. Other research also shows Indigenous peoples have a level of trust in their own knowledge and capacities to assess wildlife health and use this knowledge to make decisions about harvest and consumption of traditional foods as well as in respect of other aspects of conservation (Witmer 2005; Danielsen et al. 2009; Stokes et al. 1990). It is in this

context of strong trust of their own knowledge (and long histories of mistrust of government) that community-based monitoring plays an important niche role CWD surveillance as well as in the management of perceived risk of CWD as it relates to harvest and food security.

A key design consideration is how knowledge produced from community-based monitoring of CWD can dovetail with other types of knowledge (i.e., prion science), management institutions and processes. In the spirit of reconciliation and building more robust and equitable systems of wildlife management in Alberta and elsewhere, community-based monitoring outcomes and those produced through other kinds of methods and surveillance efforts may contribute to the decolonization of science and new opportunities for shared learning and management (Howitt 2001; Battiste 2005; Ball & Janyst 2008; Nadasdy 1999). It is in this context that we discuss a community-based monitoring program collaboratively designed by researchers and leaders of the Samson Cree Nation Community Freezer Program in Maskwacîs, Alberta.

4.3 Setting

Samson Cree Nation along with three other First Nations Bands (Louis Bull, Ermineskin, and Montana) are located on the Maskwacîs (The Bear Hills), reserve but have histories of land and resource use that extend into many parts of the prairie regions of present-day Alberta and Saskatchewan. With a population of 8,436, Samson Cree Nation is one of the largest Bands in Canada (Indigenous and Northern Affairs Canada 2017). The Canadian government named the community Hobbema in 1891 after a Dutch landscape painter, but the name was changed back to its name of Cree origin – Maskwacîs - in 2004. The Cree

name means Bear Hills referring to the historic importance of the area to bear populations who were attracted to the area (Samson Cree Nation 2013).

The population of Maskwacîs is young with a median age of 18-23 years. Although close to the major urban centres of Edmonton and Red Deer and having access to oil and gas and agricultural resources, the community continues to engage in subsistence food harvest with the hunting of deer, moose, elk and ungulates making an important contribution to local diets. A community freezer program, which involves the harvest, storage, and distribution of meat for community Elders and families in need, is located at the Howard Buffalo Memorial Centre. The Samson Cree, like other First Nations in Alberta and Canada have rights to hunt, which are protected under Treaty and the Canadian Constitution. Hunting is done not only for subsistence but also as part of the identity and culture of the community. Cree hunters work together in harvesting and animals are respected in the harvest in ways that reflect local cultural principles and protocols (Table 4-1).

Table 4-1: Principles of Samson Cree Nation Governance (Samson Cree Nation n.d.)

Principles	Description
Pimacihowin: Way of Life	The knowledge and guidance of Elders make meaning to our Cree thought, language and way of life. We sustain and maintain the essence of promoting the ideal quality of living for all People by maximizing our human resources. We will collectively promote socio-economic growth within our community and for future generations.
Wahkohtowin: Kinship	We believe in strengthening families and building positive relationships within our community.
Sakitowin: Love	We will continue to move towards productive lives, promoting our Cree culture, language and traditional values by being caring and compassionate with all our People. We believe that love and sharing are essential for the development of a safe and healthy community.
Tapwewin: Honesty	We believe truth and honesty are fundamental in empowering our Nation. We will provide guidance and make collective decisions, which benefit the community and future generations.

For example, Cree hunters are instructed on important teachings that focus on respecting and honouring the lives of animals taken to sustain the community (Johnson 2017). These teachings are tied to the law of ohcinêwin, which covers the breaking of a law against any non-human life (McAdam 2019). Only selecting certain parts of an animal to take, overhunting, and the hunting of pregnant animals are disrespectful to the spirit of the animal. There is also a planning and decision-making process before carrying out the hunt; people do not simply harvest in an adhoc fashion, as trophy hunting or hunting for purely recreation is seen as disrespectful (Johnson 2017).

> *You see, the hunting of course we do in the physical, right, but I've learned through the years that hunting is a very, very, very spiritual process.* (Kacey Yellowbird, Samson Community Freezer Program organizer)

> *I believe, you know, that's why we're able to harvest our animals when we do go out, and to make sure we're always in balance. We're always offering a proper protocols, and we're always respecting the land, but also respecting the animals that we've harvested.* (Kacey Yellowbird, Samson Community Freezer Program organizer)

4.3.1 The Chronic Wasting Disease Context

Cases of CWD in cervid species in Alberta have been spreading west and north in the province, with 10 wildlife management units (WMU) reporting positive CWD cases in the 2019 surveillance season that had not previously had positive cases (Figure 4-1) (Government of Alberta n.d.1). Maskwacîs is located on the edge of WMU 226, whose neighbouring WMUs have reported CWD cases since 2017 or earlier. In 2019, WMU 226 reported its first positive case of CWD.

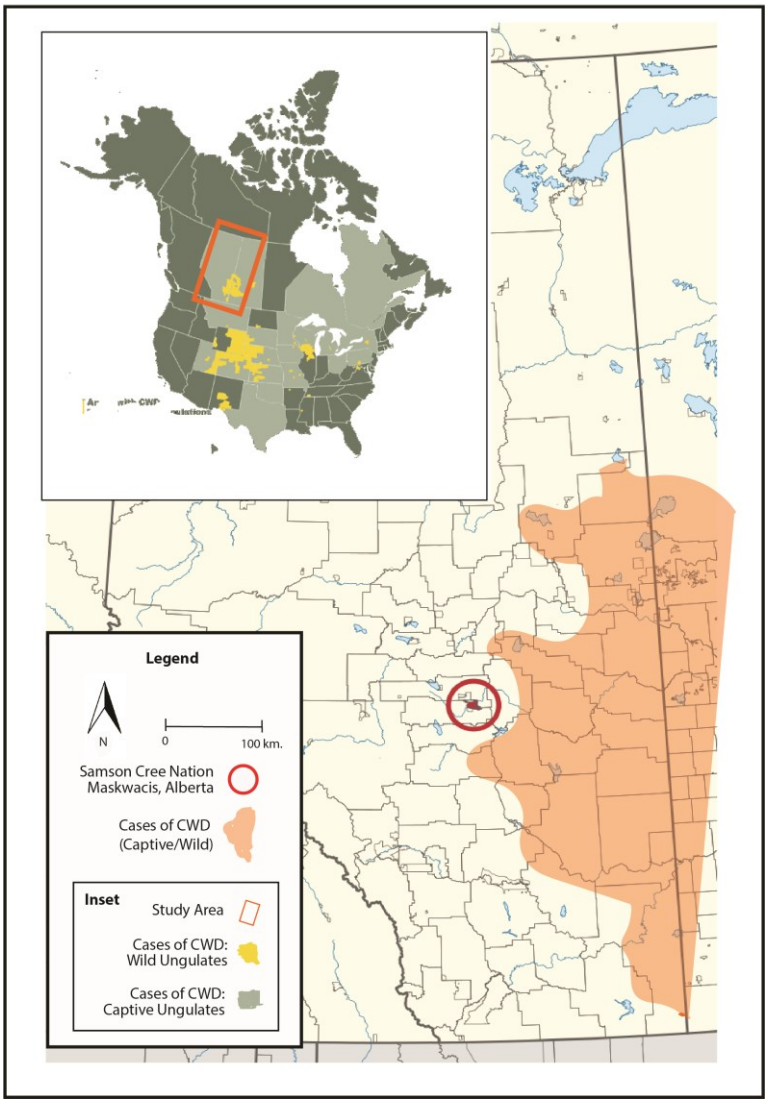

Figure 4-1: Range of positive CWD cases in Alberta 2019.

With CWD having reached Maskwacîs, the wildlife within the territories of the four First Nations, including Samson Cree Nation, are at a higher risk of contracting the disease. WMU 226 was placed on the list of WMUs that require mandatory deer head submission for the testing of CWD for the 2019 surveillance year (Government of Alberta 2019a). Considering the level of engagement in subsistence harvesting that takes place in Maskwacîs and the close proximity of CWD, the monitoring of this disease in the Maskwacîs area would not only provide important environmental health information for

the Indigenous Nations in the area, but would also supplement the provincially-led monitoring program with information specific to the newly affected CWD border area.

The following sections will describe how the pilot community-monitoring program for Chronic Wasting Disease was developed in Maskwacîs, Alberta between Samson Cree Nation and the University of Alberta in adherence to the principles of community-based research.

4.3.2 Methods

A collaboration was developed between the researchers and members of the Samson Cree Nation Community Freezer Program which was established in 2010, and is led by the manager of the Samson Youth and Sports Development department out of the Howard Buffalo Memorial Centre in the townsite of the Samson Cree Nation reservation in Maskwacîs (third author).

This program involves the harvest, storage, and distribution of meat to Elders and community members in need. Each year, six hunts are organized during the hunting season and winter months, with successful harvests being brought back to the Howard Buffalo Memorial Centre for cleaning, butchering, and distribution. Through these activities, young or new hunters have the opportunity to engage in hunting and butchering and learn from experienced hunters. The Samson Community Freezer Program has the capacity to hold approximately 800lbs of wild meat; even when the freezers are full, the meat is gone within several days. Over the decade it has been in operation, the Samson

Community Freezer Program has benefited over 400 families by providing meat for both cultural events and personal needs.

> *[The] program itself didn't really work out because I took a top-down approach ... People weren't buying into it. So what I did was I started talking to our community members, to grassroots people, and I asked them, I said 'Hey look, this is what I'm doing' and really had to introduce myself to our community members. Because, we see people on a day to day constantly, but you don't really know somebody until you have an in depth conversation with them. So I went to my community members, I told them 'Hey, this is what we're going to do, this is a project we're going to run, do you guys support it?'. And slowly and slowly it started to build and started to gain interest and now it's a fully flourishing and community project, you know, for the people, by the people, and I'm very thankful.* (Kacey Yellowbird, Samson Community Freezer Program organizer)

This kind of program has the foundation upon which a CBM program specific to CWD monitoring could be built - it is comprised of a group of community members that have a strong connection with the land and wildlife in and surrounding Maskwacîs, including experienced hunters that have the experiential knowledge to recognize the signs of healthy and unhealthy animals. Additionally, the Samson Community Freezer Program has a strong connection to the community's values and needs; in 2019, the program recieved a prestigious award from the Alberta Recreation and Parks Association's Communities Choosewell program for its innovation, strong community spirit, and its relevance for working to maintain food security within the community (Communities Choosewell n.d.). Collaborating with already established community programs such as the Samson Community Freezer Program for the development of a CWD CBM program will help ensure that community voices and concerns are the foundation for this monitoring program.

The collaboration between the freezer program and the University of Alberta developed after interest was shared by members of the nation about other work led in other regions of Alberta.

Twenty meetings held between 2019-2021 between the lead researcher and members of Samson Cree Nation leadership. More specifically, these meetings dealt with fundamental questions such as: a) why is community-based monitoring important and needed to address the issue of chronic wasting disease?; b) what kind of knowledge should be the basis of monitoring? c) who should be involved?; d) what are the most appropriate practices and methods for monitoring?; and e) what knowledge need can a monitoring program address? These meetings included a meeting with Chiefs of the Confederacy of Treaty Six First Nations, Treaty 8 First Nations of Alberta and the Treaty 7 First Nations Chiefs' Association (T7FNCA) that resulted in a resolution for ongoing research collaboration around the spread of Chronic Wasting Disease with the University of Alberta. Guided by this resolution, and the invitation of leaders from Samson Cree Nation, a project was initiated with funding from Genome Canada and the Alberta Prion Research Institute with a (grant to fourth author). A graduate student (lead author) and an undergraduate student member of the Samson Cree Nation (second author) who had facilitated relationship building with the leadership were hired to carry out the design and implementation of the research. The manager of the Samson Cree Nation Community Freezer Program (third author) worked closely with the research team to carry out this work. Once the study approach was defined, human research ethics approvals were sought and granted in 2019 (Pro00061804).

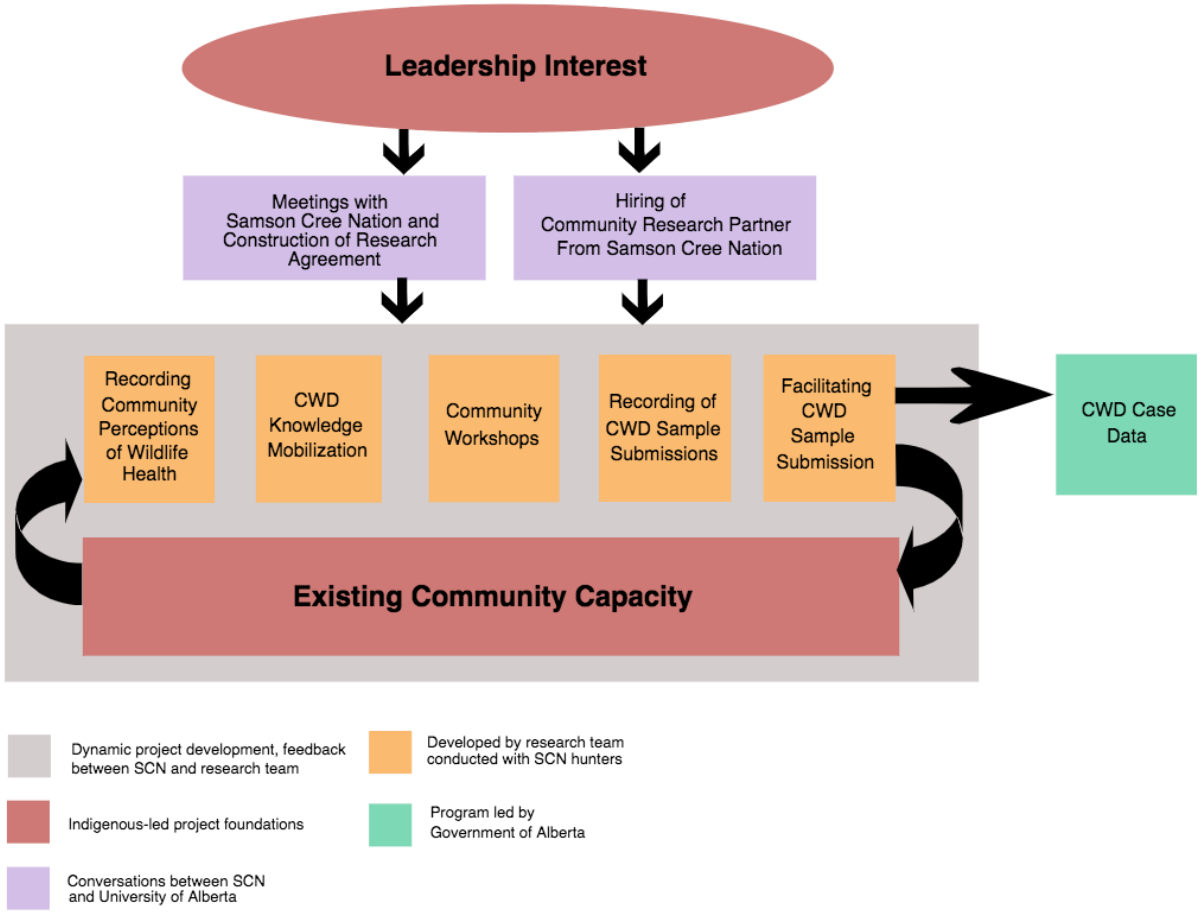

Figure 4-2: Chart showing research activities conducted between Samson Cree Nation (SCN) and the research team to initiate the development of a community-based monitoring program for Chronic Wasting disease.

The work was carried out with inspiration from methodologies of community-based participatory action research (Schensul et al. 2008), and decolonizing research methodologies which challenge research to consider their positionality in research as both an enterprise of social justice and as an opportunity for reconciliation (Kouril et al. 2015; Parlee et al. 2014). The inclusion of community members as research partners at all stages of the project, from planning to execution to the use of the resulting data, align with the tenants of community-based participatory action research through the co-creation of knowledge, project co-ownership, and the dissemination of the results in a

way that is mutually beneficial for both the research institution and the community (Wilson et al. 2018). This process is illustrated in Figure 4-2.

4.4 Findings - How-to: Community-based Monitoring of CWD

4.4.1 Ensuring Guidance from Indigenous Leadership

Representatives from Samson Cree Nation expressed interest in becoming involved, setting into motion several months of communication with the University of Alberta and hunters, organizers of programs such as the Community Freezer Program, and local leadership. After several meetings to discuss Samson Cree Nation's wants and needs for the purpose and scope of the project, it was approved by the Samson Cree Nation Band and Council, a research agreement was signed in June of 2019, and a community research partner from Samson Cree Nation was hired.

4.4.2 Respecting Indigenous Rights to Harvest and Other Treaty Rights

Samson Cree Nation has long histories of hunting and other land uses of the reserve lands currently defined as Maskwacîs. But their traditional territory for hunting extends well beyond these borders. Research about CWD in ungulates requires not only recognizing but embracing these rights such that hunters and other land users from the Nation are key actors of the project – they are knowledge holders with expertise garnered through their hunting activities. They are also beneficiaries of research outcomes who can learn from the project and utilize that knowledge in their harvesting practices. This approach is unique from many other framing and of Indigenous peoples in relation to surveillance of CWD or in other kinds of research. In many most other examples of CWD research in

Alberta, Indigenous harvesters are not considered or engaged or are framed as passive recipients of information created by scientists and government 'experts'.

4.4.3 The Importance of Cervids to Diet, Economy, and Cultural Continuity

A key starting point with the project is the recognition that cervid species have an important place in the diets and livelihoods of Samson Cree Nation. The majority of current CWD surveillance is led by technicians and scientists for whom deer, elk and moose are an object being studied rather than a source of food or basis of culture, spirituality and economy. Many members of Samson Cree Nation are food insecure and depend on meat from the Samson Community Freezer Program to feed their families. Changing from a traditional foods-based diet of wild meats like deer, moose, and elk to store-bought domesticated meats like pork and beef can have nutritional and health implications for Indigenous people (e.g., increased risk of cardio vascular disease). In addition to being a healthier option than store-bought meats, traditional foods and the hunting and on-the-land activities that procure them are more than just physically healthy - they are an important part of spiritual and respectful relationships between humans, the animals, and the land. The expression of Indigenous culture and identity through the collection and consumption of traditional foods is an important part of overall well-being.

4.4.4 Broader Social-Ecological Approach

The design of the CWD monitoring program by Samson Cree Nation is also based on the recognition that this prion disease is only one aspect of the stresses on ecosystems and wildlife in their traditional territories. Climate change impacts including decreased precipitation, forest fire events as well as extreme weather events (e.g., spring ice-over

events) have also been a major stress for wildlife. However, agricultural development, ranching, urbanization, pipeline development and recreational land use are critical stresses on wildlife which have complicated population dynamics, predator prey relationships as well as health conditions (e.g., bioaccumulation of contaminants etc.). Social conflicts between non-Indigenous peoples and Samson Cree Nation members (e.g., land holders, government officials) and the privileging of non-Indigenous recreational hunting of moose, deer and elk rather than subsistence harvesting by Indigenous peoples is also important context to understanding how the risks of CWD affect people from Samson Cree Nation. The community-based monitoring project led by Samson Cree Nation thus designed to confront and include these broader dynamics.

4.4.5 Barriers to Learning and Sharing Knowledge

A key issue that is confronted through the design of the monitoring program relates to access to knowledge about CWD. Much of the knowledge created about the risks of CWD as well as the mechanisms for testing are not accessible to Indigenous peoples in Alberta. This is in part due to social factors (e.g., levels of education and lack of Indigenous representation in the fields of STEM) but also have to do with the biases that exist in academic institutions and government agencies where Indigenous peoples are poorly presented. One of the most specific barriers in the context of CWD is access to testing by government laboratories. In addition to physical and economic barriers for those living a long distance from the testing facilities in Edmonton, there are long histories of poor communication and lack of collaborating in managing wildlife, there administrative barriers associated with submitting heads for testing. Many experiences of hunters from Samson Cree Nation suggest that if the tag is not fully filled out by a hunter,

testing cannot be completed.. In other words, labels provided for the Alberta Chronic Wasting Disease Program require a Wildlife Identification Number (WIN), and tag number which Indigenous peoples are not given by government. As a result, few animals harvested by Nation members had been tested, prior to the start of our community-based monitoring program. Given that results from testing can take more than 3 months to deliver to hunters (long after meat is consumed in the community) there is little incentive to try and meet government administrative requirements for testing. Additionally, a lack of trust in elite, and majority white, science and ongoing tensions and conflict with government officials involved in wildlife management (e.g. fish and game wardens) have also contributed to the landscape of poor communication and learning between scientists, wildlife managers, and Indigenous peoples.

A key consideration in the design the project was creating opportunities for the Nation and other Indigenous peoples. Designing the project to determine the knowledge needs of the community and the best fit for the project was a key starting point. This was done in three ways: i) increasing availability of CWD information for community members, ii) inclusion of community voices into CWD education and management materials, and iii) increasing communication between Samson Cree Nation and existing government-led monitoring programs (Table 4-2).

Table 4-2: Project design goals and outcomes

Project Design Goal	Outcomes
Increasing availability of CWD information for community members	**Creation of toolkits and guidebooks:** information on CWD in portable formats developed by the research team and distributed throughout the community (ie. band office, health centre, community centre, etc.) **Community workshops:** hosted by the Samson Community Freezer Program and University of Alberta, providing opportunities for communication between community members and researchers to share knowledge on CWD, community concerns, and observe demonstrations (ie. how to properly prepare an animal for CWD testing).
Inclusion of community voices into CWD education and management materials	**Semi-structured interviews with elders and hunters:** conducted in order to document a baseline understanding of ungulate health, contemporary social-ecological context observations, and a broad understanding of the community's perspectives on the risks posed by CWD **Surveys:** when permitted, in-person surveys were conducted with hunters and landusers to record perceptions of local wildlife health. In March 2020, surveys were translated to an online format in accordance with COVID-19 remote work protocols. **Creation of informative video:** Made in collaboration with Samson Cree Nation, Treaty 8 First Nations of Alberta, and the University of Alberta, the video features perspectives from Indigenous project partners on the importance of monitoring CWD, along with information on the disease.
Increasing communication between Samson Cree Nation and existing government-led monitoring programs	**Facilitating ungulate head delivery to GoA lab:** To assist in overcoming barriers members of SCN face in participating in the GoA CWD monitoring program, the research team and Samson Community Freezer Program coordinated delivering ungulate heads to the lab in Edmonton for CWD testing. The research team also acted as a conduit for community members to express concerns about the testing process.

4.4.6 Cultural Protocols for Sharing Knowledge

Centering the voices and needs of the members of Samson Cree Nation was a key design elment of the community-based monitoring program. Ensuring that this was done in a respectful and inclusive way required researchers to learn about the landscape and wildlife in and around Maskwacîs from Elders in the community and oral histories. The nature of this knowledge is sacred; the Nêhiyaw (Cree) worldview emphasizes the connectivity of all living things, and the act of hunting and interacting with wildlife is a personal experience that can be closely connected to one's sense of spirituality. When sharing this kind of sacred knowledge, cultural protocols are to be followed to show the appropriate amount of respect to the knowledge-holders. Cree protocols include the sharing of tobacco from the researcher to the knowledge-holder before the information is shared, the payment of honorarium and gifts to the knowledge-holder after the information is shared, and the acknowledgement of territory. Engaging in knowledge-sharing activities with Elders require additional protocol to be followed, including paying a higher rate of honorarium for the knowledge shared, as well as the gifting of other items such as blankets.

In implementing the program, cultural protocol was followed for the participation in interview and survey-based knowledge sharing activities. The appropriate levels of honorarium and types of gifts were established by a community research partner, the Samson Cree Nation Band Office, and the guidelines from the University of Alberta's Council on Aboriginal Initiatives.

4.4.7 Respecting the Cultural Relationships to Place

In addition to understanding the how the risk of CWD spread affects Indigenous communities in Alberta like Maskwacîs, situating the issue of wildlife disease within wider concerns of the community in order to create a context-specific and accessible monitoring program was an important part of the development of this project. After the appropriate cultural protocols were met, we engaged in preliminary interviews with hunters, land-users, and Elders that focused on the participant's own knowledge of the history of wildlife health and hunting in Maskwacîs, and how these may have changed over time. The privitization of land surrounding Maskwacîs and the encroachment of agriculture and other industries minimize the amount of nearby land that is accessible for Indigenous people to exercise their treaty rights on. These concerns about access to suitable land for hunting is further complicated by the threat of CWD affecting wildlife in the Maskwacîs region. For those who do not have the ability to travel farther afield for hunting, having a healthy wildlife population in the remaining nearby areas that are suitable for hunting is crucial for ensuring that traditional activities and foods remain available to everyone.

4.4.8 Working with Hunters - Creating Tools

One of the initial tasks in the development of the CWD community-based monitoring project was to create materials to encourage knowledge mobilization about CWD in Samson Cree Nation, and to focus on information that was relevant to Indigenous community members. Two types of material were developed in coordination with hunters, i) a CWD toolkit manual and pocket brochure for hunters, and ii) a survey tool

for use by hunters and land-users to track perceptions of wildlife health in the community over time.

i) *CWD toolbox manual and pocket brochure:* Using an existing CWD toolkit that was developed for Treaty 8 First Nations in northern Alberta during previous research, the authors and the community research partner adapted a version for First Nations in Treaty 6 Territory in central Alberta. This toolbox is titled *Tracking Wildlife Health in Alberta: Lessons for Treaty 6 First Nations of Alberta*. Maps within the toolkit were adapted to include the locations of Treaty 6 communities located in areas where wildlife health monitoring is needed, as well as maps that illustrate where the current spread of CWD is located in terms of the Treaty 6 territory boundaries. A brochure was developed using the information from the updated toolkit with the intention of a more portable, concise source of information that hunters could carry with them. Both the toolkits and brochures were distributed to band offices, health centres, and community gathering spaces within Maskwacîs.

ii) *Survey tool to track perceptions of wildlife health:* A survey tool designed by University of Alberta researchers and Treaty 8 First Nations of Alberta was adapted for use by Treaty 6 First Nations to gather information about animal harvest, consumption, and observations about animal health in the area. The survey contains questions relating to the accessibility of hunting areas in the region, perceptions and observations of the health of cervid species in the area, the consumption of traditional foods, and questions specifically about the participant's current level of knowledge about CWD. As part of the

development of this community-based monitoring program, the authors have conducted this survey with hunters and land-users in the Maskwacîs region to gain understanding about the current perceptions of wildlife health in the area and gain an awareness of outstanding concerns. The intention for this survey is for it to be done on a continual basis and lead by community members, with community research partners conducting the surveys to build a continual dataset of perspectives on wildlife harvest and consumption.

4.4.9 Communication and Relationship Building with the Province of Alberta

Another design principle that emerged related to the healing of relationships between the province of Alberta and hunters from Samson Cree Nation. Many hunters feel that the provincial government authorities do not respect Indigenous hunters nor their rights. As a result there is a reluctance to reach out to government for information need about CWD and its risks in the community. Providing opportunities for communication and engagement between Samson Cree Nation and the provincial government is an important step in working towards a mutually beneficial relationship that is based on co-learning and co-knowledge creation.

In order to assist in overcoming the barriers to Indigenous hunters accessing CWD testing, a part of this community-based monitoring program includes facilitating sample submissions between hunters in Maskwacîs and the Government of Alberta laboratory. University of Alberta researchers and the community research partner would organize a sample pick-up with hunters in Maskwacîs when a deer, elk, or moose had been harvested, and deliver it to the Government of Alberta laboratory in Edmonton on behalf of the hunter. Members of the research team also assist in facilitating communication

between the Government of Alberta laboratory staff and hunters in Maskwacîs on matters of the cultural importance of certain parts of the animal head and nervous system to Indigenous hunters, issues with testing results being shared with Indigenous hunters, and questions about the testing process. While this work acts as a starting point for relationship-building and improving communication, actions must be taken to ensure that this relationship becomes reciprocal; unless the Government of Alberta shows an increased willingness to share testing data, address the barriers to Indigenous hunter participation in the current provincial CWD testing program, and involve First Nations in the decision-making processes of CWD management, the benefits of community-based management for both parties may not be realized.

4.5 Discussion

The health of wildlife as well as the decline of biodiversity and ecosystem services are a global concernThe COVID-19 pandemic has created many new questions about human-wildlife interactions and their impacts on human health and socio-economic systems (Schultz et al. 2019). In this context, monitoring of wildlife populations is of urgent importance (Alcorn 1993). Among the diseases of growing concern in western Canada is CWD. Knowledge and capacity to track the impacts of this disease are currently limited; access to knowledge and expertise about the risks of the disease are also siloed in government and academic institutions. Among those with the least access to such knowledge are Indigenous peoples including Samson Cree Nation who depend on ungulates (moose, deer, elk) for food and whose rights to harvest are protected as part of Canadian law (i.e., Treaty and inherent rights).

The need for community engagement in the monitoring of wildlife and wildlife disease is strong; the rich knowledge and experience held by subsistence-oriented landusers has the potential to result in earlier detection of diseases in wildlife populations (Tomaselli 2018b). In Indigenous communities that have a long history tied to a specific geographic area, a long-term understanding of the ecological characteristics can contribute to applicable conservation knowledge (Berkes & Turner 2006). In this context, we have shared the outcomes of a collaborative design of a community-based monitoring program that involved members of Samson Cree Nation and university researchers. Community-based monitoring programs are increasing in Canada and around the world, however few have focused on issues of wildlife disease and even fewer have been based around Indigenous knowledge systems (Pollock & Whitelaw 2005; Kouril et al. 2015). It is in this context that these design principles for monitoring have been shared.

Outcomes of this design process suggest the importance of grounding community-based monitoring of CWD around Indigenous and Treaty rights to harvest wildlife and in recognition of the value of wild meat to local food security, embracing Indigenous knowledge, practices and beliefs as well as cultural protocols for respecting animals and people. Insights about monitoring as a socio-political process also emerged through this collaboration; as such the "community-based monitoring program" that was developed not only aims to generate knowledge about the spread of CWD; it is also an act of sovereignty over local lands and resources. By designing and implementing the monitoring program, Samson seeks to manage the risks associated with the spread of CWD and by so doing increase confidence of local members in the health of

country/traditional food. We posit that by doing this work, Samson Cree Nation is also confronting the significant inequities that exist in wildlife management in the province of Alberta, rooted in two centuries of colonization and creating new opportunities for the co-production or braiding of Indigenous knowledge and other knowledges (e.g., prion science) that are needed to manage the spread of CWD. Given concerns about wildlife disease and human-wildlife health questions have grow as a result of the COVID-19 pandemic, greater opportunities for community-based monitoring are urgently needed both in Canada and globally.

The building of capacity for communities to assess their own local concerns and issues is one way that community-based monitoring programs can fill the gaps left by existing government or expert-led monitoring programs that may be insufficient due to the lack of funding for environmental monitoring and existing programs' inability to deal with the increasing complexity of modern environmental problems (Conrad & Hilchey 2011). These insufficiencies are evident in the case of Chronic Wasting Disease in Alberta. In 2012, a program review report of the provincial CWD monitoring program states the program was facing challenges that included Chronic Wasting Disease not being viewed as a "budget line item" (Pybus 2012 pg. 5), and that seeking funding to assist in the control of the disease was difficult to find, and that it was unlikely to improve in the future (Pybus 2012). Budget documents released by the Government of Alberta in 2019 and 2020 showing funding estimates and targets for the Chronic Wasting Disease Monitoring and Management until 2023 show stagnant or decreasing levels of funding (Government of Alberta 2019b; Government of Alberta 2020e). When government

agencies and professional programs lack the resources to collect the data and facilitate the communication between affected groups that is needed to make management decisions about issues such as wildlife disease, CBM programs have become an alternative that allow for cooperative learning and a more robust and inclusive approach to wildlife management through the collection of conventional biological data as well as the inclusion of knowledge systems such as traditional knowledge (Indigenous and Northern Affairs Canada 2017; Berkes 2004; Conrad & Hilchey 2011; Pattengil-Semmens & Semmens 2003).

However, despite the potential of CBM programs, they are often not used in their full capacity by most government or scientific agencies (Sharpe & Conrad 2006). If decision-makers do not have the intention of linking CBM programs to the decision-making processes instead of simply using them for data collection, then many of the benefits of collaboration between stakeholders and capacity-building within the community may not be realized (Conrad and Hilchey 2011; Sharpe & Conrad 2006). In programs that involve Indigenous communities and government or scientific agencies, it is imperetive that the inclusion of Indigenous peoples in environmental monitoring does not end after the sharing of knowledge. First Nations should be consulted from the initiation of the project on project direction, or on how to adapt an existing program or develop new alternative programming to best meet their needs (Wilson et al. 2018). As with our work with Samson Cree Nation, the monitoring of a community's local environment and the wildlife within it can provide a way of asserting Indigenous sovereignty and juristiction over traditional rights (Wilson et al. 2018). Ensuring that community perspectives and

concerns are rooted in the development of the monitoring program and facilitating communication between existing management agencies and communities can move CBM beyond the act of data collection and into working to influence decision-making in a way that benefits the communities (Whitelaw et al. 2003).

4.6 Conclusion

This research examined Using community-based programs for the monitoring of wildlife disease has the potential to benefit all involved if developed and executed in a participatory manner. The proposed community-based monitoring effort may be considered more meaningful and by extension become more sustainable than other kinds of monitoring that do not consider and respect these socio-political and cultural aspects of the work. The monitoring program is also unique from conventional kinds of CWD surveillance in the province of Alberta in its recognition of Indigenous peoples as experts with valuable insights about the wildlife disease and the broader social and ecological drivers of its spread within their traditional territories. Although there are challenges to developing and maintaining successful CBM programs, such as barriers to accessing testing equipment, lack of funding, and decision-maker's lack of percieved utility of the community-collected data, recommendations of best practices on how to overcome challenges have been discussed by researchers, often through the sharing and comparision of case studies and their challenges and successes (Conrad & Hilchey 2011). The documentation and sharing of the development of new CBM programs such as the CWD monitoring program in Maskwacîs is important to provide a framework for future CBM programs and to provide a geographic and socio-ecological context specific example of the creation of this kind of monitoring program (Kouril et al. 2015; Conrad &

Hilchey 2011). Given the growing interest in community-based monitoring by Indigenous peoples and the gap in examples of programs that focus on issues of wildlife disease these design principles may be useful to other organizations as well as those interested in supporting the weaving of Indigenous knowledge and science in addressing growing concerns about wildlife disease globally.

CHAPTER 5.0: Conclusion

5.1 Thesis Overview

This study was a continuation of Dr. Brenda Parlee's work with First Nations in northern Alberta to track both observations of wildlife health as well as knowledge about CWD and local perceptions of risk about the disease. Extending this work into Treaty 6 Territory, where CWD is a current threat, allowed this research to investigate issues around risk perception, issues of resource access, and issues of knowledge and power in Maskwacîs, Alberta. Through the documentation of building relationships with community members and organizations, creating community-oriented information products about CWD, and facilitating sample submissions and communications with the Government of Alberta CWD monitoring program, a "how-to" for the development of a community-based CWD monitoring program were formed. The "how-to" provides suggestions on how to approach the large task of creating a community-based monitoring program through addressing the knowledge and cultural gaps in the current government-led program, as a gap in the current literature exists for how to approach this task in the context of CWD's impacts on Indigenous communities in Alberta. The surveys completed with 31 hunters and land users suggest that people in Maskwacîs, who harvest, share, and consume wild deer, moose, and elk meat, are concerned about CWD. When the threat of CWD is considered along with the pre-existing barriers to hunting through loss of access to physical land, there is concern about the future of traditional food consumption and the activity of hunting, which both play an important role in personal and cultural wellbeing.

The separate papers in Chapters Three and Four could be presented as the first identifying the issues at hand, and the second presenting a possible solution. Chapter Three provides a geographically and contextually-specific picture of issues of access to traditional foods that Indigenous communities in central Alberta face, and provides insight into how the threat of CWD to local wildlife populations and the perceptions of risk about CWD create additional access barriers. Knowledge gaps, cultural gaps, and power imbalance between western and Indigenous knowledge systems result in management decisions being made that do not reflect the views and risk perceptions of all communities impacted by an issue such as CWD (Schuler et al. 2016). To address these barriers, Chapter Four presents a set of best practices for the development of a community-based monitoring program for CWD in central Alberta that were developed in an attempt to improve opportunities for participation in resource management, create space for multiple knowledge systems in management processes and decision-making, and provide an opportunity to create constructive relationships between Indigenous communities and government management programs.

5.2 Study Significance and Future Research

The findings of this research indicate that the capacity and interest to engage in community-based monitoring of CWD is present in Maskwacîs, and that work must be done to improve the accessibility of current CWD management in order to adhere to Treaty rights, and to care for one another as Treaty people. My hopes for this research is that the involved communities, such as Samson Cree Nation, can use the findings of this thesis to supplement any arguments for the inclusion of Indigenous communities in the monitoring and management of species that are important to both their diets and culture.

There are many questions that were raised during the construction of this thesis that could be avenues for future research. Indigenous hunters in central Alberta are interested in participating in CWD monitoring and management, and more in-depth research on the current Alberta CWD Monitoring Program and the experiences that Indigenous hunters in Alberta have had with this project could provide more concrete suggestions on how this program could be made more inclusive and accessible. Additionally, expanding this research on risk perception into southeast Alberta where the prevalence of CWD in the cervid populations is much higher would complete a broader picture about Indigenous hunter perceptions about the disease in Alberta when paired with work by Parlee et al. (2021).

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APPENDIX A: Survey Participant Information Sheet

RESEARCH PROJECT SUMMARY:

Tracking Change: Traditional Knowledge of Wildlife Health in Alberta

Dear Participant:

I am working with the University of Alberta on a research project wildlife health in your region. Surveys have been completed with hunters and land users in your community. We would like to carry out interviews with land users to learn more about changes in wildlife health from your perspective including patterns or changes observed and experienced by hunters/land users as well as perspectives on wildlife management.

The research is being carried out in an effort to understand the level of concern and knowledge in local communities about overall wildlife health in the Treaty 6 region.

Timeline: The project is taking place from 2019 and 2020.

Scope: The interview will last about one hour. The interview questions will focus on your knowledge, observations, and experience of changes wildlife health and wildlife management.

Participation, Time Requirement and Honoraria: You will receive an honorarium (gift card) of $50 to compensate for the time you spend in the interview.

Risks: You are not required to participate in the interview and can choose not to answer questions that are asked and can withdraw (quit) from the interview at any time without prejudice or consequence. You will be asked to sign a consent form to confirm your willingness to participate in the interview, your consent to the use of the interview data in public documents and consent to the storage and ownership of the transcript by the University of Alberta. You can choose to withdraw from the interview at any time without penalty and can choose to withdraw any of your interview material within 3 months from the date of the interview.

Recording, Transcripts and Storage of Transcripts: Your information will be recorded and may be shared publicly (e.g., through a report, publication or thesis). Your name will be used in these public documents unless otherwise indicated by you on the consent form. All results from interviews will be stored at the University of Alberta for five years. Any future use of the data beyond that defined in this project summary will require your consent.

If you have questions or require additional information, please contact:
Brenda Parlee
Department of Resource Economics and Environmental Sociology
Faculty of Agricultural, Life and Environmental Sciences 507
GSB University of Alberta, Edmonton Alberta T6G 2H1 Tel:
(780) 492-6825 Fax: (780) 492-0268
brenda.parlee@ualberta.ca

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta (**Pro00061804**). For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615

APPENDIX B: Survey Consent Form

SURVEY CONSENT FORM:

Tracking Change - Traditional Knowledge and Wildlife Health Monitoring in Alberta

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Researcher: Brenda Parlee

Affiliation: University of Alberta

Purpose: The purpose of the project is to learn more about hunter observations of wildlife health and experiences of wildlife management in Alberta.

Timeline: Surveys will be carried out between 2019-2020

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1. You are being asked to complete a survey for our project. Have you understood the attached project summary as you have read it or as I have read it to you?

Yes ____
No ____

The survey will take about 1 hour to complete. Information will be recorded in hand-written notes and on audio recording equipment.

---

2. Have all of your questions about the survey or research project been answered?

Yes ____
No ____

3. Consent to Interview: Do you understand and agree to participate in this research project as outlined above. Do you understand that you are not required to participate in this research project. You can choose not to complete the survey and can withdraw (quit) the project at any time without prejudice or consequence.

Understand and Agree _____

Disagree _____

4. Consent to Use your Name in Public Documents: I would like to use the results of this research in a report and or publications such as journal articles. These will all be public documents. A copy of the final report will be housed at the University of Alberta. Data will not be used in any public exhibition without your permission.

I would like to acknowledge you by name in all research documents and materials, or if you prefer the results of your survey can be coded to Person A or 001 etc. so that the public does not know who shared the information. If there is any information that you would not like to share publicly, please let me know.

I DO ___ want my name to be shared in public documents/ presentations.
I DO NOT ___ want my name to be shared in public documents/ presentations.

5. Consent for Storage of your Survey Results
Once all surveys are completed, I will share a summary of the findings of the surveys with the technician in your community. I will also keep a copy of the survey you completed for the purposes of reporting and publication. To ensure that your information is valued over the long term, we would also like to store copies at the University of Alberta

I DO ___ want my information stored at the University of Alberta.
I DO NOT ___ want my information stored and would prefer that it be destroyed once the research project is completed.

By signing below I am acknowledging that I have read, understand and agree to the above terms and conditions for this interview.

Interviewee _____ Date: _____

If you require additional information or have any concerns about this project, please contact:

Brenda Parlee
Faculty of Agriculture, Life and Environmental Sciences
507 General Services Building.
University of Alberta, Edmonton Alberta T6G 2H1
Tel: (780) 492-6825
Fax: (780) 492-0268
brenda.parlee@ualberta.ca

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. The approval reference is: **Pro00061804.**

For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615

APPENDIX C: Tracking Change: Wildlife Health Survey

Section A: Hunting
How many years have you been hunting in this region?
[ ] All my life (more than 25 years)
[ ] The last 25 years
[ ] The last 10 years
[ ] Only the last few years
[ ] I don't hunt

Have the areas that you hunt in in this region changed over time? Are there areas that you used to hunt in that you can no longer visit?

If you hunt with others, would you be able to share their names so we can ensure we do not duplicate information?

Section B: Moose Health
How often have you gone hunting for moose in the last 6 months? If answer is 'no hunting trips', do not complete the rest of section B, move on to section C.
[ ] No hunting trips
[ ] Between 1-4 trips
[ ] Between 5-7 trips
[ ] More than 7 trips

How many moose did you observe during these trips?
[ ] None
[ ] A few (between 1-9)
[ ] Some (between 10-20)
[ ] Many (more than 20)

Were the moose you observed during these trips mostly bulls, females or calves?

Was this more or less than in the last 5 years?
[ ] A lot less than previous years
[ ] Somewhat less than previous years
[ ] Same as previous years
[ ] More than previous years
[ ] A lot more than previous years
[ ] Don't know

How many moose did you harvest during the last six months?
[ ] None
[ ] 1-3
[ ] 4-6
[ ] More than 6

How would you describe the area (habitat) where you harvested these moose?

_____

How would you describe the condition of the moose you have hunted in the last six months?
[ ] A lot skinnier
[ ] Somewhat skinnier
[ ] Same
[ ] Somewhat fatter
[ ] A lot fatter
[ ] Don't know

How would you describe the condition of antlers of bull moose?

_____

How would you describe the condition of the liver and organs?

_____

Did you notice any ticks?
[ ] No ticks
[ ] Some ticks
[ ] A lot of ticks (more than considered normal)

Did you notice any worms?
[ ] No worms
[ ] Some worms
[ ] A lot of worms (more than considered normal)

Did you notice any changes in the condition of the hide?
[ ] No marks (lesions)
[ ] Some marks (lesions)
[ ] A lot of marks (lesions)

Did you notice any of the following behaviour issues in moose? If you did not notice any of these behaviour issues in moose, leave the boxes blank.
[ ] Unnaturally sluggish or disoriented
[ ] Unnaturally aggressive
[ ] Frothy mouth (foamy)
[ ] Unnaturally skinny

How concerned are you with the health of moose populations?
[ ] Not concerned
[ ] Somewhat concerned
[ ] Very concerned

If you have seen changes in the health, population, or distribution of moose, what do you consider to be the cause of this change? Select all that apply.
[ ] Natural variability
[ ] Winter temperature extremes
[ ] Summer temperature extremes
[ ] Predation
[ ] Wildlife disease
[ ] Agricultural activity
[ ] Clear cutting (habitat loss)
[ ] Distance from drilling
[ ] Disturbance from roads
[ ] Stress from recreational land users
[ ] Stress from other hunters
[ ] Forest fire

Section C: Deer Health
How often have you gone hunting for deer in the last six months? If answer is 'no hunting trips', do not complete the rest of section C, move on to section D.
[ ] No hunting trips
[ ] Between 1-4 trips
[ ] Between 5-7 trips
[ ] More than 7 trips

How many white-tailed deer did you observe during these trips?
[ ] None
[ ] A few (between 1-9)
[ ] Some (between 10-20)
[ ] Many (more than 20)

How many mule deer did you observe during these trips?
[ ] None
[ ] A few (between 1-9)
[ ] Some (between 10-20)
[ ] Many (more than 20)

Do you think you have seen more or less white-tailed deer this year than in the last 5 years?
[ ] A lot less than previous years
[ ] Somewhat less than previous years
[ ] Same as previous years
[ ] More than previous years
[ ] A lot more than previous years
[ ] Don't know

Do you think you have seen more or less mule deer this year than in the last 5 years?
[ ] A lot less than previous years
[ ] Somewhat less than previous years
[ ] Same as previous years
[ ] More than previous years
[ ] A lot more than previous years
[ ] Don't know

How many white-tailed deer did you harvest during the last six months?
[ ] None
[ ] 1-3
[ ] 4-6
[ ] More than 6

How many mule deer did you harvest during the last six months?
[ ] None
[ ] 1-3
[ ] 4-6
[ ] More than 6

How would you describe the condition of the deer you have hunted in the last 6 months
[ ] A lot skinnier
[ ] Somewhat skinnier
[ ] Same
[ ] Somewhat fatter
[ ] A lot fatter
[ ] Don't know

How would you describe the condition of the antlers of the bucks?

_____

How would you describe the condition of the liver and organs?

_____

Did you notice any ticks?
[ ] No ticks
[ ] Some ticks
[ ] A lot of ticks (more than considered normal)

Did you notice any worms?
[ ] No worms
[ ] Some worms
[ ] A lot of worms (more than considered normal)

Did you notice any changes in the condition of the hide?
[ ] No marks (lesions)
[ ] Some marks (lesions)
[ ] A lot of marks (lesions)

Did you notice any of the following behaviour issues in deer? If you did not notice any of these behaviour issues in deer, leave the boxes blank.
[ ] Unnaturally sluggish or disoriented
[ ] Unnaturally aggressive
[ ] Frothy mouth (foamy)
[ ] Unnaturally skinny

How concerned are you with the health of deer populations?
[ ] Not concerned
[ ] Somewhat concerned
[ ] Very concerned

If you have seen changes in the health, population, or distribution of deer, what do you consider to the cause of this change? Select all that apply.
[ ] Natural variability
[ ] Winter temperature extremes
[ ] Summer temperature extremes
[ ] Predation
[ ] Wildlife disease
[ ] Agricultural activity
[ ] Clear cutting (habitat loss)
[ ] Distance from drilling
[ ] Disturbance from roads
[ ] Stress from recreational land users
[ ] Stress from other hunters
[ ] Forest fire

Section D: Elk Health

How often have you gone hunting for elk in the last six months? If the answer is 'no hunting trips', do not complete the rest of section D, move on to section E.

[ ] No hunting trips
[ ] Between 1-4 trips
[ ] Between 5-7 trips
[ ] More than 7 trips

How many elk did you observe during these trips?

[ ] None
[ ] A few (between 1-9)
[ ] Some (between 10-20)
[ ] Many (more than 20)

Do you think you have seen more or less elk this year than in the last 5 years?

[ ] A lot less than previous years
[ ] Somewhat less than previous years
[ ] Same as previous years
[ ] More than previous years
[ ] A lot more than previous years
[ ] Don't know

How many elk did you harvest during the last 6 months?

[ ] None
[ ] 1-3
[ ] 4-6
[ ] More than 6

How would you describe the condition of the elk you have hunted in the last six months?

[ ] A lot skinnier
[ ] Somewhat skinnier
[ ] Same
[ ] Somewhat fatter
[ ] A lot fatter
[ ] Don't know

How would you describe the condition of the antlers of the elk?

_____

How would you describe the liver and organs of the elk?

_____

Did you notice any ticks?
[ ] No ticks
[ ] Some ticks
[ ] A lot of ticks (more than considered normal)

Did you notice any worms?
[ ] No worms
[ ] Some worms
[ ] A lot of worms

Did you notice any changes in the condition of the hide?
[ ] No marks (lesions)
[ ] Some marks (lesions)
[ ] A lot of marks (lesions)

Did you notice any of the following behaviour issues in elk? If you did not notice any of these behaviour issues in elk, leave the boxes blank.
[ ] Unnaturally sluggish or disoriented
[ ] Unnaturally aggressive
[ ] Frothy mouth (foamy)
[ ] Unnaturally skinny

How concerned are you with the health of elk populations?
[ ] Not concerned
[ ] Somewhat concerned
[ ] Very concerned

If you have seen changes in the health, population, or distribution of elk, what do you consider to be the cause of this change? Select all that apply.
[ ] Natural variability
[ ] Winter temperature extremes
[ ] Summer temperature extremes
[ ] Predation
[ ] Wildlife disease
[ ] Agricultural activity
[ ] Clear cutting (habitat loss)
[ ] Distance from drilling
[ ] Disturbance from roads
[ ] Stress from recreational land users
[ ] Stress from other hunters
[ ] Forest fire

Section E: Food on the Table

How many people live in your household?
[ ] 1
[ ] 2-3
[ ] 4-5
[ ] More than 5

How much of your household's meat is bought from the store?
[ ] All
[ ] Most
[ ] Some
[ ] None

Do you harvest or receive enough wild meat to meet your family's needs?
[ ] All
[ ] Most
[ ] Some
[ ] None

How has your diet of moose meat changed since last year?
[ ] I eat more moose now than I did last year
[ ] I eat the same amount of moose as I did last year
[ ] I eat less moose than I did last year

How has your diet of moose meat changed since five years ago?
[ ] I eat more moose now than I did five years ago
[ ] I eat the same amount of moose as I did five years ago
[ ] I eat less moose than I did five years ago

How has your diet of moose meat changed since ten years ago?
[ ] I eat more moose now than I did ten years ago
[ ] I eat the same amount of moose as I did ten years ago
[ ] I eat less moose than I did ten years ago

How has your diet of deer meat changed since last year?
[ ] I eat more deer now than I did last year
[ ] I eat the same amount of deer as I did last year
[ ] I eat less deer than I did last year

How has your diet of deer meat changed since five years ago?
[ ] I eat more deer now than I did five years ago
[ ] I eat the same amount of deer as I did five years ago
[ ] I eat less deer than I did five years ago

How has your diet of deer meat changed since ten years ago?
[ ] I eat more deer now than I did ten years ago
[ ] I eat the same amount of deer as I did ten years ago
[ ] I eat less deer than I did ten years ago

How has your diet of elk meat changed since last year?
[ ] I eat more elk now than I did last year
[ ] I eat the same amount of elk as I did last year
[ ] I eat less elk than I did last year

How has your diet of elk meat changed since five years ago?
[ ] I eat more elk now than I did five years ago
[ ] I eat the same amount of elk as I did five years ago
[ ] I eat less elk than I did five years ago

How has your diet of elk meat changed since ten years ago?
[ ] I eat more elk now than I did ten years ago
[ ] I eat the same amount of elk as I did ten years ago
[ ] I eat less elk than I did ten years ago

How often do you share meat from your hunting trips?
[ ] Never
[ ] Sometimes
[ ] Usually
[ ] Always

How often do you eat wild meat?
[ ] Never
[ ] Less than 3 meals a week
[ ] More than 3 meals a week

How much of this meat is harvested by you or your household?
[ ] None
[ ] Some
[ ] Most
[ ] All

How much meat do you share outside of your household?
[ ] None
[ ] Some
[ ] Most
[ ] All

Do you give wild meat to family living outside your community?
[ ] Never
[ ] Sometimes
[ ] Usually
[ ] Always

How old are you?
[ ] Between 18-24
[ ] Between 25-34
[ ] Between 35-44
[ ] Between 45-54
[ ] Over 55

Are you employed?
[ ] Yes - full time
[ ] Yes - part time
[ ] Yes - casual
[ ] Yes - seasonal
[ ] No - not employed

If you are not employed, is there a member of your household that is employed full time or part time?
[ ] Yes
[ ] No

Section F: CWD
How much information have you received about Chronic Wasting Disease?
[ ] None
[ ] Some
[ ] A lot
[ ] Don't know

How concerned are you about wildlife diseases such as Chronic Wasting Disease?
[ ] Not concerned
[ ] Somewhat concerned
[ ] Very concerned
[ ] Don't know

If you are aware of Chronic Wasting Disease in deer and moose in Alberta, where did you receive this information? Select all that apply.
[ ] Community posters
[ ] Radio or TV (news)
[ ] Community meetings
[ ] Others in the community
[ ] Mail-outs
[ ] I have not heard of it
[ ] Other

How much does your level of concern about CWD affect where you choose to hunt?
[ ] None
[ ] Some
[ ] A lot
[ ] Don't know

Does your level of concern about CWD affect whether you choose to go out hunting or not?
[ ] Yes
[ ] No
[ ] Don't know

Do you agree with culling (killing) of deer populations to limit the spread of the disease?
[ ] Yes
[ ] No
[ ] Maybe
[ ] Don't know

Would you be willing to participate in monitoring the health of deer and moose populations in your area by submitting tissue samples or heads of harvested deer or moose?
[ ] Yes
[ ] No
[ ] Maybe
[ ] Don't know