Listening to Perspectives of Animbiigoo Zaagi'igan Anishinaabek Elders, Hunters, and Youth on Environmental Contaminants and Their Impacts

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Abstract

Traditional foods are integral to the Animbiigoo Zaagi'igan Anishinaabek (AZA) First Nation in Northwestern Ontario. More than simply sustenance, they also play an integral role in the community's culture, health and well-being, knowledges, and teachings. The impacts of environmental contaminants on their territories, located near Jellicoe, Ontario, are a significant concern for community members. While much of the scientific research has deemed these contaminants safe, many Elders, Knowledge Keepers, hunters, gatherers, and youth have expressed negative impacts on their food systems. This research aimed to explore the experiences and perspectives of AZA First Nation members regarding the impacts of environmental contaminants on food self-determination. It is based on a collaborative project between AZA First Nation, Understanding Our Food Systems, the Thunder Bay District Health Unit, and Lakehead University. Together, we explored the impacts of glyphosate spraying, a non-selective herbicide used to control unwanted vegetation, on AZA First Nation's lands, peoples, and non-human kin and what can be learned using different ways of knowing to advance healthy communities and environments. This research adds to existing conversations on glyphosate's impacts on human and environmental health and well-being and contributes to ongoing Indigenous food sovereignty work in the community and across the region. It also aims to add to the existing literature on using different ways of knowing when addressing complex issues.

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Table of Contents

Author's Declaration ii
Abstract iii
Acknowledgements iv
Table of Contents v
Chapter 1: Introduction 1
1.1 Background 1
1.2 Rationale 6
1.3 Research Questions, Goals, and Objectives 8
1.4 Thesis Overview 9
Chapter 2: Literature Review 11
2.1 Indigenous Peoples' Health in Canada 12
2.2 Environmental Contaminants 16
2.2.1 Direct and Indirect Impacts of Glyphosate on Human and Environmental Health 17
2.3 Indigenous Perspectives on Glyphosate Use 21
2.4 Knowledge Gaps in the Scientific Literature and Different Ways of Knowing 23
2.4.1 Knowledge Gaps in the Western Scientific Literature 23
2.4.2 Different Ways of Knowing 25
Chapter 3: Methodology and Methods 30
3.1 Positionality 32
3.2 AZA Community Background 36
3.3 Study Context 39
3.4 Data Collection 40
3.5 Data Analysis 44
3.6 Ethical Considerations 45
3.7 Dissemination of Information and Results Verification 47
Chapter 4: Findings 49
4.1 Environmental Contaminants & the Land 51
4.2 Environmental Contaminants & Relationships with the Government 57
4.3 Environmental Contaminants & Indigenous Knowledge 63
4.4 Advocacy, Solutions, & Calls to Action 68

4.5 Conclusion 74
Chapter 5: Discussion and Conclusion 75
5.1 Discussion 75
5.2 Strengths, Limitations, Next Steps & Future Research 86
5.3 Concluding Thoughts 89
References 91
Appendix A – Talking Circle Question Guide 114
Appendix B - Information Letter 117
Appendix C – Consent Form 120

List of Figures

Figure 1 Comparing Traditional Ecological Knowledge and Western Science 6

Figure 2 First Nations Perspective on Health and Wellness 14

Figure 3 DeKalb Corn Genetics 33

Figure 4 Understanding Our Food Systems Community Map 36

Figure 5 Thematic Roadmap for this project. 50

Chapter 1: Introduction

1.1 Background

Environmental contaminants affect all facets of the planet: humans, animals, plants, watersheds, air, and food systems. Generally, environmental contaminants are the product of natural sources (i.e., occurring in nature) or anthropogenic (i.e., human activities) and can be a physical, chemical, biological, or radioactive substance that has a detrimental impact on living organisms, water, air, and/or soil (Calvo-Flores et al., 2018; D'Surney & Smith, 2005). Environmental contaminants enter the environment through a variety of different pathways. They are often defined as direct (e.g., dumping, waste flow from pipes, stormwater discharge, etc.) or indirect (e.g., runoff from paved areas, agricultural areas, acidic or toxic pollutants suspended in the air, food chain pathways, etc.). Indirect ways of entering the environment are considered a significant source of pollution in our air, waters, and soils. While contaminants can exist in nature, such as mercury that can occur naturally in the soil or waterways, they are usually in amounts small enough that they do not pose a threat to the environment (Calvo-Flores et al., 2018). When contaminants have anthropogenic origins, such as extractive industries releasing large amounts of contaminants into the environment, we start to see negative impacts because it is at this point that they become pollutants. Industrialization, along with the mining and energy extraction, fossil fuel, agriculture, and forestry industries, are considered to be the worst offenders when it comes to environmental contaminants turning into pollutants that affect water quality (Munir et al., 2024) and the overall environment (D'Surney & Smith, 2005).

The Lancet Commission reported that as of 2019, "pollution remains responsible for approximately 9 million deaths per year, corresponding to one in six deaths worldwide," a number that has not changed since 2015 (Fuller et al., 2022, p. e535). Of these nine million

deaths, the most significant burden, 92%, occurs in low-income and middle-income countries (LMICs). Fuller et al. (2022) define pollution as "unwanted waste of human origin released to air, land, water, and the ocean" (p. e535). Further, the Lancet Commission reports that an increase in human deaths can be attributed to air and toxic chemical pollution due to industrialization and urbanization and that pollution, climate change, and biodiversity loss that is occurring are "intricately linked and solutions to each will benefit the others (Fuller et al., 2022, p. e535). Deaths attributable to these risk factors have "risen by 7% since 2015 and by over 66% since 2000," (Fuller et al., 2022, p. e535). Fuller et al. (2022) argue that the:

> Undercounting of the disease burden attributable to chemical pollution is probably substantial because only a small fraction of the many thousands of manufactured chemicals in commerce have been adequately tested for safety or toxicity, and the disease burdens attributable to these chemicals cannot be quantified (p. e538)

Fuller et al. (2022) attribute this to their view of an inadequate reporting of the toxicity levels of over two hundred chemicals (e.g., lead, mercury, pesticides, etc.) on our neurological, reproductive, and immune systems. The Planetary Boundaries Framework, developed by the Stockholm Resilience Centre, consists of nine planetary boundaries: climate change, novel entities, stratospheric ozone depletion, atmospheric aerosol loading, ocean acidification, modification of biogeochemical flows, freshwater change, land system change, and biosphere integrity (Richardson et al., 2023). The introduction of synthetic chemicals and substances released into the environment without enough safety testing is covered in the novel entities' boundary, which is currently in a high-risk zone, and of all the boundaries, the one we have surpassed more than any other. This boundary is relevant to the work in this thesis because it is specific to anthropogenic introductions of "synthetic chemicals and substances (e.g.,

microplastics, endocrine disruptors, and organic pollutants)" into the Earth system (Richardson et al., 2023, p. 6). Chapter 2 of this thesis will discuss indirect pathways of environmental contaminants, specifically glyphosate and glyphosate-based herbicides (GBHs), and how they make their way through the food chain. This is illustrated by how environmental contaminants make their way into our waterways and the uptake of plants, which are then consumed by animals or humans (Dean, 2007).

Environmental chemicals end up in our bodies through three primary routes: inhalation (i.e., indoor/outdoor air), ingestion (i.e., food, water), and skin/eye contact (New Hampshire Department of Environmental Services, 2023). Nadal and Domingo (2013) discuss the food chain and how our dietary intake plays a key role in how specific contaminants, particularly persistent organic pollutants (POPs) or pesticides, end up in our bodies. Galli et al. (2024) highlight the widespread distribution of glyphosate in the environment and how the general population is exposed to glyphosate through different routes, emphasizing the consumption of plant and non-plant foods. Soares et al. (2021) discuss how several studies suggest "glyphosate residues have been detected in a large number of [food] samples, sometimes in values that exceed legally permitted limits" (p. 18). The contaminant and the route through which it enters the human body play a significant role in how it will impact human health.

Globally, food is more than just sustenance. Food is a powerful tool for cultural expression, identity, and history. Food has a way of creating connections between people that can foster diversity and inclusion. For Indigenous Peoples[1] in particular, food is an essential part of their identities, cultures, languages, knowledge systems, self-determination, histories, health, and

[1] Indigenous Peoples in this thesis refers to First Nations, Metis, and Inuit of Canada.

relationships with each other and the land (Levi, 2020; Morrison, 2020; Reed et al., 2024; Settee & Shukla, 2020). Since time immemorial, Indigenous Peoples of what is currently known as Canada have had a relationship with the land and watersheds by sustainably cultivating, producing, and harvesting foods (Batal et al., 2021; Morrison, 2011; Reed et al., 2024). However, human-produced climate change, environmental contamination, and restricting access to traditional lands have had immense impacts on Indigenous livelihood, self-determination, and food sovereignty. Since the arrival of European settlers over five hundred years ago to what is now known as Canada, Indigenous Peoples are continually displaced, which disrupts Indigenous food systems, due to enclosures and private property, industrial forms of agriculture, mining, and development (Batal et al., 2021; Brant et al., 2023).

When compared to the general population in Canada, Indigenous Peoples on and off reserve face significantly higher rates of food insecurity, with many communities lacking access to safe drinking water (Bradford et al., 2016) and basic necessities (Dawson, 2020; Levkoe et al., 2019; Rotz et al., 2023; Shafiee et al., 2022). Rates of disease among First Nations Communities are also on the rise and can be "directly linked to colonization, the brutal dispossession of homelands, globalization, migration, and culture and language loss" (Coté, 2016, p. 2). This includes higher rates of diseases such as hypertension and cardiovascular disease, autoimmune diseases, cancer, and diabetes (Batal et al., 2021; Chan et al., 2021; Coté, 2016). Diabetes and cardiovascular disease, in particular, have been linked to diets that have transitioned from traditional food sources to a non-traditional diet consisting of foods high in refined carbohydrates and saturated fat (Damman et al., 2008; Hackett, 2021; McAuley & Knopper, 2011).

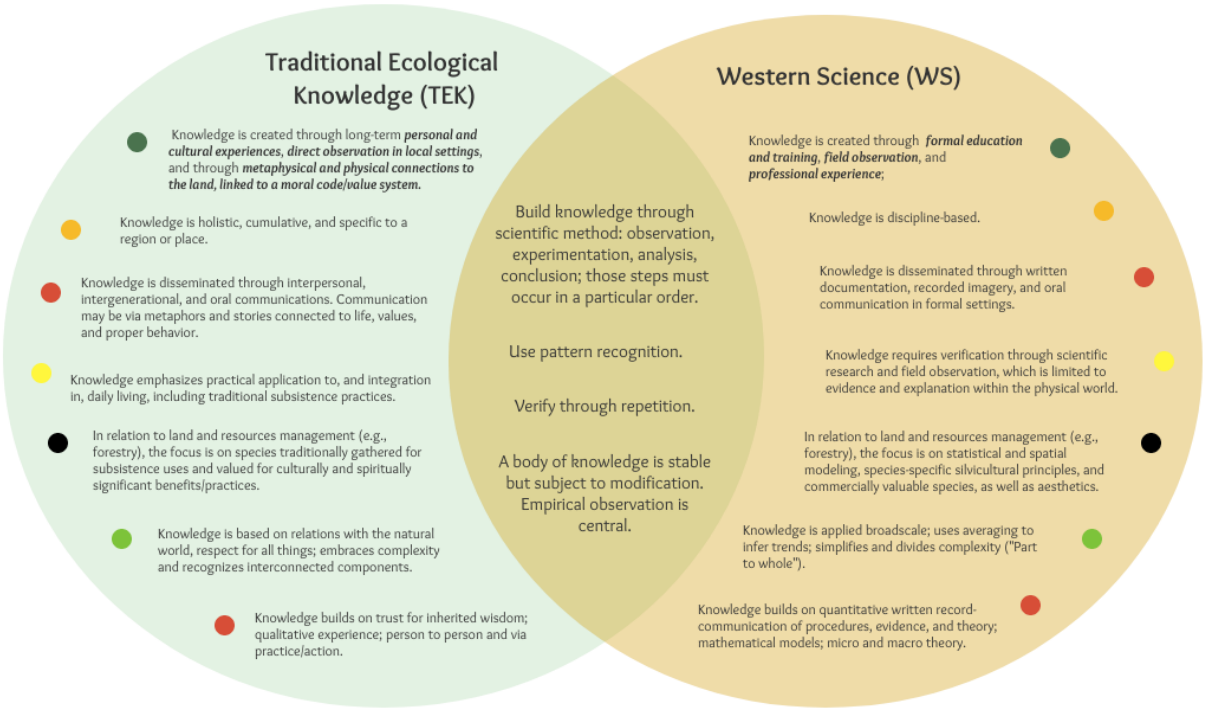
Despite these challenges, Indigenous Peoples are not victims. First Nations in Northwestern Ontario rely heavily on hunted, fished, and gathered foods to maintain their health

and support their food sovereignty. Indigenous food sovereignty "is an approach to understanding how the regeneration of Indigenous food systems and practices contributes to decolonizing efforts, resisting state power, and achieving self-determination" (Brant et al., 2023, p. 144). Indigenous food sovereignty is a growing movement of Indigenous communities across the globe, restoring their relationships with people and the land by taking control of food systems by utilizing traditional and modern methods of hunting, fishing, growing, gathering, and affirming cultural responsibilities and relationships with their environment (Brant et al., 2023; Coté, 2016).

Indigenous knowledge systems vary from nation to nation, historically and at present, and some key aspects remain consistent across the many different systems. Indigenous knowledge systems view all aspects of a person, which includes the spiritual, emotional, physical, and intellectual, as interconnected to the land and in relation to others (Althaus, 2019; Cull et al., 2018). Indigenous knowledge systems are specific, experiential (i.e., knowledge gained through lived experiences), place-based, and are often communicated intergenerationally through stories (Althaus, 2019; University of Minnesota – Great Lakes TEK, n.d.). Western or scientific knowledge systems also vary historically, in the present, and across nations. However, they differ from Indigenous knowledges in that they are often tied to formal education and training that require verification through scientific research methods that are often limited to the physical world. While this is a general overview of these different systems, it should be noted that there is overlap between knowledges and there are always exceptions. Knowledge acquisition and teachings are never in absolutes and are not binary. Both knowledge systems acknowledge this and can (and do) change. They both build knowledge through "observation, experimentation,

analysis, and conclusion," verifying findings through pattern recognition and repetition (see University of Minnesota, Great Lakes TEK, Figure 1).

Figure 1 Comparing Traditional Ecological Knowledge and Western Science



Note: Infographic comparing Traditional Ecological Knowledge and Western Science (University of Minnesota - Great Lakes TEK, n.d.)

1.2 Rationale

This thesis reports on a community-based research project, where I worked closely with Animbiigoo Zaagi'igan Anishinaabek (AZA), the Thunder Bay District Health Unit (TBDHU), and the Understanding Our Food Systems (UOFS) project communities. UOFS is a community-engaged and action-oriented project led by fourteen First Nations communities in Northwestern

Ontario in collaboration with the Thunder Bay District Health Unit and the Sustainable Food Systems Lab at Lakehead University.[2] UOFS aims to better understand the region's Indigenous food security and food sovereignty through community-led projects and initiatives developed by community members, researchers, facilitators, and other community development professionals. The 2022 UOFS Food Sovereignty Assessment (UOFS FSA), written by Mercer, Ray, & Co. for the TBDHU (2022), clearly identified concerns from the participating First Nations about the impacts of environmental contaminants on their food sources. The communities requested additional research to better understand the challenges and potential solutions. In response, I was hired through the UOFS project in the summer of 2023 to review the scientific literature on glyphosate, focusing on understanding the impacts in Northwestern Ontario and sharing them with the fourteen First Nations. I was asked to focus on the impacts of environmental contaminants on traditional foods, human health, and the environment. I created a short report for the communities and presented my findings to community members who attended a UOFS fall gathering in 2023. After this, AZA approached the UOFS management team to see how we could explore these issues in greater depth.

From these discussions with AZA and the UOFS management team, I co-developed a research project to listen to the experiences and perspectives of people living and working on the land (e.g., Elders, Knowledge Keepers, hunters, gatherers, and youth) about their concerns with environmental contaminants and the impacts on traditional food sources. My research aimed to connect Traditional Knowledge and existing scientific research to share learnings with AZA to support their efforts to build knowledge and evidence to take action around environmental

[2] See Understanding Our Food Systems: https://www.understandingourfoodsystems.com/

contaminants in their communities. Stories were collected with AZA community members living and working on the land through a sharing circle and in a series of one-on-one interviews. The overall goal was to provide information and support that AZA and other regional First Nations requested that would help them to protect the lands and waters they access to hunt, harvest, and grow foods and medicines on to ensure the health and well-being of human and non-human kin.

1.3 Research Questions, Goals, and Objectives

As noted in the previous section, one of the long-term recommendations in the UOFS FSA (TBDHU, 2022) was for more advocacy and research about spraying (i.e., glyphosate) and mercury levels in waterways from industry (e.g., forestry, mining, etc.) because the participating communities expressed concern, anxiety, and worry about the impacts on their lands and communities. Our AZA community contacts, Dorothy Rody (AZA Band Council Member) and Priscilla Graham (Band Administrator), drove this project and made this all possible. After reading the UOFS FSA recommendations and listening to what AZA was hoping to gain from this research, we developed two primary research questions: What are the experiences of AZA members living and working on the land concerning the impacts of environmental contaminants? What can be learned from different ways of knowing to advance healthy communities and environments?

While Western scientific research is essential, experiential and Traditional Knowledge from Indigenous People living and working on the land is equally important in bringing together different ways of knowing and perspectives on the issues we face as all people living on this land. Combining different ways of knowing and using decolonizing approaches is important in this research. As Martin (2012) argues, if health inequities that Indigenous communities face

stem from colonization, which has an express purpose to silence the voices of Indigenous people, Indigenous voices must be included when we are discussing Indigenous health and well-being. We need partnerships and frameworks that centre Indigenous Peoples – their knowledges, experiences, contributions, and perspectives on all issues affecting their communities.

The focus of this research is on the perspectives of the Animbiigoo Zaagi'igan Anishinaabek and their experiences with environmental contaminants, particularly glyphosate and glyphosate-based herbicides (GBHs). This research will contribute to the theory and practice of why different ways of knowing are imperative in solving the complex issues we face as a society, so that we can all move forward together in a good and purposeful way for the betterment of all.

1.4 Thesis Overview

In this chapter, I have provided the background and rationale of this project and the research questions, goals, and objectives. Chapter 2 will present context in the form of a literature review that touches on Indigenous Peoples' health in Canada, focusing on environmental contaminants and their impacts on the health of all living beings, including the lands they reside on. It finishes by discussing Indigenous perspectives on these topics and the benefits of different ways of knowing and knowledge gaps in the Western scientific literature. Chapter 3 discusses the methodology and methods used in gathering the data for this research project and the analysis, as well as the study context, a background on AZA, ethical considerations, and knowledge mobilization. Chapter 4 summarizes the main findings of the research through themes of environmental contaminants and the land, environmental contaminants and relationships, with a focus on government relationships and the impact of colonization on the community, as well as environmental contaminants and Indigenous

knowledges. This leads into discussions around potential solutions and calls to action. Chapter 5 discusses the findings in the context of the research questions and literature and ends with next steps and a conclusion with some potential avenues for future research.

Chapter 2: Literature Review

To gain an understanding of glyphosate's impacts on both human and environmental health within Indigenous communities, it is imperative to delve into Indigenous perspectives on health and to review existing knowledge on glyphosate. This literature review focuses on multiple themes. The first theme I address is Indigenous Peoples' health in the context of Canada and exploring social and ecological determinants of Indigenous well-being. I discuss the disproportionate reality of Indigenous health in Canada and the approaches used that leave out Indigenous perspectives on their health and well-being. I then speak about environmental contaminants with a specific focus on glyphosate, and the ensuing effects on human and environmental health, as well as the significance of Traditional Indigenous foods, the land, and all beings from an Indigenous perspective. Section 2.2 gives a general overview of environmental contaminants and discusses glyphosate's direct and indirect effects on human and environmental health. This section is broken into two smaller subsections that focus more on the impacts of glyphosate and glyphosate-based herbicides (GBHs) on human and environmental health. This is followed by a look at Indigenous perspectives on glyphosate use. Section 2.3 addresses knowledge gaps in the scientific literature regarding glyphosate and its direct and indirect impacts on human and environmental health in Northwestern Ontario and First Nations communities and priorities. It also explores different ways of knowing and how braiding together Indigenous and Western knowledges helps to see problems more clearly when addressing complex societal issues.

I explored the current literature using a variety of approaches, including searches through the Lakehead University Omni System, recommendations from faculty in the Department of

Health Sciences at Lakehead University, references from academic sources, course materials[3], and a targeted Google search for grey literature. Stephanie Commisso, a librarian from the Thunder Bay District Health Unit (TBDHU), had done an initial literature search for my work with Understanding Our Food Systems (UOFS) and TBDHU in the summer of 2023 for the report I crafted. She refined search terms and helped identify relevant databases for that report.[4] I used articles from that search, which also helped me find more articles and avenues to do more searches from the works cited in many of those articles. For the grey literature search I did on Google, the terms included "Indigenous People*", "Indigenous communit*", "First Nation*", "Anishina*", "Traditional Food*", alongside specific references to traditional sustenance such as "moose", "fish", and "plant*", as well as broader environmental concerns such as "land" and "environmental contaminant*". Additionally, terms related to glyphosate and its application, including "glyphosate", "glyphosate-based", "spraying", "aerial spraying", and "herbicid*", were included, reflecting the core themes of this research endeavor.

2.1 Indigenous Peoples' Health in Canada

When compared to the general population, Kim (2019) argues that Indigenous Peoples in Canada "suffer from disproportionate increases in diabetes, hypertension, substance abuse, mental health concerns, and overall morbidity and mortality in addition to having significantly reduced life expectancy" (p. 378). Colonialism, dispossession of lands, and oppression by

[3] Course materials from Lakehead University included Qualitative Inquiry I (HESC 5035), Current Issues & Trends in Health Science (HESC 5015); Climate Change and Health: Impacts, Action, and Equity (HESC 5710); and Perspectives in Ecological Health (HESC 5012).

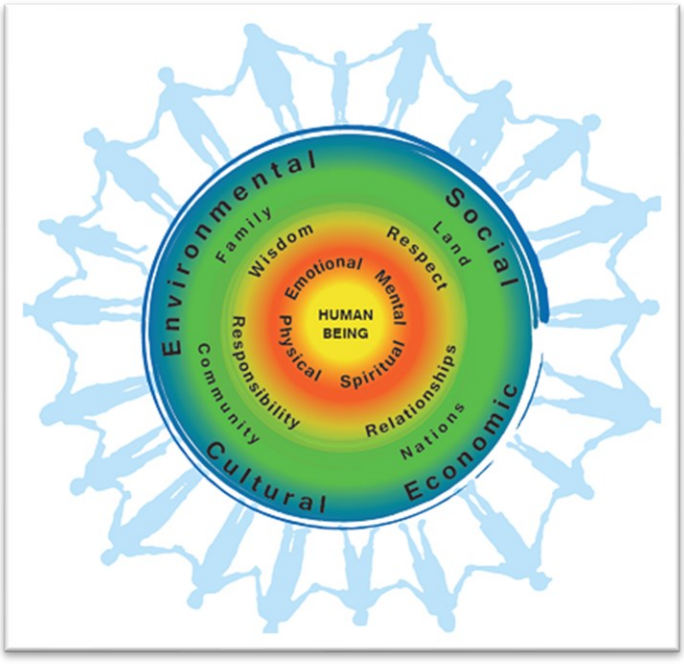
[4] Databases used included Environment Complete, GreenFILE, Medline, I-Portal: Indigenous Studies Portal, Native Health Database, and Google.

colonial governments play a major role in the inequities that Indigenous Peoples face in healthcare (Crocetti et al., 2022; George et al., 2019; Redvers et al., 2023). As George et al. (2019) argue, "The lack of social determinants in policy is prevalent across colonised countries and Indigenous Peoples globally have experienced health inequity and lower life expectancy than non-Indigenous people" (p. 1). Further, the implementation of policies directed at improving the health inequities by addressing social determinants of health, Indigenous rights, and self-determination that Indigenous Peoples face does not always result in effective action. This is due to how colonization forms the very structural and systemic foundations from which healthcare policy in Western nations (e.g., Canada, USA, Australia, etc.) is built (George et al., 2019; Josewski et al., 2023).

Western health perspectives prioritize an individualistic biomedical approach to healthcare practices that primarily focuses on disease with a secondary emphasis on prevention (Thiessen et al., 2020). Indigenous perspectives on health recognize that the health and prosperity of individuals and communities are intertwined with much broader factors than these (Greenwood et al., 2015). Indigenous knowledge systems embrace concepts of health that encompass the physical, spiritual, emotional, mental, and social dimensions, with the interrelatedness of these dimensions having particular significance to Indigenous Peoples (Crocetti et al., 2022; Reading & Wien, 2009). Indigenous health is also tied to place, as Josewski et al. (2023) so eloquently state, "Indigenous people – who are different from each other around the world – may nevertheless be understood (broadly) as tethered to and rooted in very specific place," (p. 3). Many Indigenous People assert that their relationship to the world and their relations are fundamentally rooted in land, water, and all human and non-human kin.

The First Nations Health Authority (FNHA, n.d.) published the First Nations Perspective on Health and Wellness, depicted by a visual image encompassing these concepts' interconnection (see Figure 2). This perspective, depicted in the image, starts with human beings at the centre because the individual is responsible for playing a part in their own wellness. The second circle shows the basic elements needed to lead a balanced, whole life. The third circle symbolizes the overarching values that sustain and promote wellness. The fourth circle includes all the critical components of a healthy life, which include the people and the places that influence us. Lastly, the final circle shows the economic, cultural, environmental, and social determinants that impact health.

Figure 2 First Nations Perspective on Health and Wellness



Note: Diagram of First Nations Perspective on Health and Wellness framework (First Nations Health Authority, n.d.)

In mainstream approaches to public health and medicine, the idea that social circumstances also play a role in health and not just individual biology alone is captured in the concept of Social Determinants of Health (SDoH) (Greenwood et al., 2015). In the Canadian context, the Canadian Public Health Association (2017) defines the SDoH as "the conditions in which people are born, grow, live, work, and age, [and are] shaped by the distribution of money, power, and resources, which causes health inequities within populations" (p. 6). They include "income, education, gender, physical environment, social environment, access to health services, and healthy childhood development" (p. 6). The Ecological determinants of health (EdoH) include "adequate amounts of oxygen, water, and food" (Canadian Public Health Association, 2017, p. 6). This also includes the ecological processes and natural resources that are essential for our health and well-being, which are "the ozone layer, nitrogen and phosphorus cycles, systems to detoxify wastes, and abundant fertile soil, fresh water and marine aquatic system to grow food and other plants" (Canadian Public Health Association, 2017, p. 6).

According to Jardine & Lines (2018), Indigenous Peoples deeply feel the social and ecological determinants of health because they consistently rank lower in almost every single determinant of health. Indigenous Peoples also experience these multitude of social and ecological health determinants in different ways than non-Indigenous Canadians, with the experience of colonialism as a very distinct health determinant (Schiff & Møller, 2021). More recently, social determinants of Indigenous health have been mapped into an Indigenous social determinants of health framework (ISDoH) that are categorized as "distal (e.g. historic, political, social, and economic contexts), intermediate (e.g. community infrastructure, resources, systems, and capacities), and proximal (e.g. health behaviours, physical and social environment)" (Reading & Wien, 2009, p. 7; see Schiff & Møller, 2021). These determinants of health also

make accessing food, especially traditional foods, much more difficult, resulting in impacts to First Nations cultures and well-being (Proverbs et al., 2020).

2.2 Environmental Contaminants

Environmental contaminants and their impact on traditional foods have been a concern for many First Nations communities across Canada (Chan et al., 2021; McAuley & Knopper, 2011; Reed et al., 2024; Rotz et al., 2023). The contaminants of primary concern are from extractive industries, such as mining and forestry, and include chemicals such as heavy metals (e.g., mercury), pesticides (e.g., glyphosate), and other persistent organic pollutants (e.g., POPs, PCBs). Animbiigoo Zaagi'igan Anishinaabek (AZA), as well as other First Nations communities in Northern Ontario, have shown a particular concern about the effects of glyphosate and glyphosate-based herbicides (GBHs) as they are most used in commercial forestry practices in Canada, as well as globally (Patterson et al., 2023). The lived experiences of Indigenous Peoples living on the land and their perspectives around the use of glyphosate and GBHs have largely been ignored by governments and regulatory agencies "on the grounds that they pose no significant risk to human health or the environment" under current regulatory systems and assessment frameworks (Patterson et al., 2023, p. 2). Newer information has emerged in contrast to this, "regarding the potential impacts of glyphosate herbicides on wildlife, and ecosystem functionality," though "conclusions about potential impacts on human health and safety are highly contentious amongst the academic community and national and international regulators" (Patterson et al., 2023, p. 2). Current assessments do not reflect chronic low-level exposures or cumulative and synergistic effects of glyphosate on human or environmental health (Gillezeau et al., 2019; Vandenberg et al., 2017).

Dr. Henri Martin first developed glyphosate in 1950 (Hosseini Bai & Ogbourne, 2016), but it was not until 1974 that Monsanto developed and commercialized it into an herbicide (Soares et al., 2021). While industry names such as Roundup or Vision are more commonly known, today, hundreds of glyphosate and GBH products are commercially available in over one hundred countries worldwide. The global use of glyphosate and GBHs "rose more than 12-fold from about 67 million kg in 1995 to 826 million kg in 2014" (Benbrook, 2016, p. 6). In the United States, "the use of glyphosate-based herbicides (GBHs) increased [about] 100-fold from 1974 to 2014" (Vandenburg et al., 2017, p. 613). They are the most used herbicides worldwide (Soares, 2021), as well as the most widely used herbicide in Canada (CAREX Canada, n.d.), and account for about 54% of all pesticide use across Ontario (ECCC & USEPA, 2022).

Glyphosate and GBHs are non-selective herbicides that are absorbed through the leaves and stems of plants, transported throughout their system, and work by reducing specific amino acids necessary for plant growth, ultimately ending in plant death (Henderson et al., 2010). Aerial spraying of glyphosate is used in forestry practices to control and reduce unwanted plants and trees not seen as economically valuable, such as broad-leaved plants and trees (e.g., paper birch, blueberries, pin cherry, elderberry), to increase the growth of conifer trees on logging sites (Boulet et al., 2014; CELA, 2022; Patterson et al., 2023; Thompson, 2011).

2.2.1 Direct and Indirect Impacts of Glyphosate on Human and Environmental Health

Glyphosate and GBHs have direct and indirect impacts on human and environmental health. There are a range of exposure pathways in which glyphosate and GBHs can move throughout the environment, impacting plant, animal, and human health outcomes. The following subsections discuss these direct and indirect human and environmental health impacts.

2.2.2.1 Glyphosate Impacts on Human Health, Safety, and Wellbeing. Globally, the use of glyphosate and GBH continues to be a contentious issue. Based on the available research and government investigations in Canada, glyphosate has not been shown to cause cancer or impact the reproductive or endocrine systems in humans when used according to the label, which the federal government must approve (Boulet et al., 2014; Hunt & Matute, 2019). According to a statement from Health Canada (2019), "no pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed" (para. 7).

The International Agency for Research on Cancer (IARC) is a part of the World Health Organization that promotes, coordinates, and conducts scientific research on the causes of cancer in humans and aids in developing prevention strategies (IARC, 2024). They developed the IARC Monographs program that evaluates the "carcinogenic risk of chemicals to humans…expanded to include the evaluations of carcinogenic risks associated with exposures to complex mixtures, lifestyle factors, and biological and physical agents, as well as those in specific occupations" (IARC, 2017, p. ii). The IARC (2017) has identified glyphosate as Group 2A - probably carcinogenic to humans based on two main aspects: limited human evidence for carcinogenicity and sufficient evidence for carcinogenicity found in animals. This was determined from a systematic review of about 1,000 independent studies available to the public, including documented exposures (i.e., inhalation, skin contact, and ingestion), and cancer found in scientific studies conducted on animals that included glyphosate and GBHs. Evidence also indicates that glyphosate-based formulations over pure glyphosate may be more carcinogenic (Mesnage et al., 2022). Other human health issues that have been connected to glyphosate in

Western science include cancer (esp. non-Hodkin lymphoma) (Galli et al., 2024; Zhang et al., 2019), endocrine system disruption (Galli, 2024; Stone et al., 2025), which can be linked to metabolic disorders (e.g. diabetes), respiratory diseases, neurological disorders (e.g., Parkinson's, Alzheimer's), as well as liver, kidney, gut (Galli et al., 2024), and reproductive issues (Rani et al., 2020; Stone et al., 2025; Zhang et al., 2019). Globally, there is no clear consensus on what level of glyphosate is considered safe (Jefferies, 2022; Patterson, 2023; Peillex & Pelletier, 2020). There are also questions regarding whether current glyphosate thresholds considered safe by regulatory assessments are too high and should be reevaluated (Jefferies, 2022; Vandenberg et al., 2017). This is a concern when studies are now linking chronic low-dose exposure to glyphosate to chronic health outcomes, including negative impacts to gut health (Hu et al., 2021; Lehman et al., 2023), liver disease (Riechelmann-Casarin et al., 2025), and endocrine disruption leading to fertility issues (Ingaramo et al., 2020). Vandenburg et al. (2017) argue that much of the scientific research used by the IARC and other governing bodies in their risk assessment processes, including exposure science and animal studies, is outdated and not reflective of the large body of research on glyphosate that has come out in the last decade.

2.2.2.2 Glyphosate Impacts on Biodiversity and Environmental Health. Biodiversity can be defined as the:

> Variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well as changes in abundance and distribution over time and space within and among species, biological communities, and ecosystems" (IPBES, 2019, p. 1033).

It is the "diversity within species, between species, and of ecosystems" (IPBES, 2019, p. XIV). A wide range of ecological issues associated with glyphosate spraying impacting biodiversity has been addressed within the literature.

First, many issues associated with glyphosate spraying are identified as indirect impacts on non-target species of plants and animals (Helander et al., 2012; van Bruggen et al., 2021; van Bruggen et al., 2018). Helander et al. (2012) conclude that a colder climate and the increased use of herbicides in forestry lead to longer-lasting impacts on northern ecosystems, profoundly impacting non-target species. Surface and groundwater can get contaminated due to glyphosate run-off and its absorption into surrounding soil (Mahmood et al., 2016; Myers et al., 2016; Van Stempvoort et al., 2016). Furthermore, there are adverse effects on aquatic species, such as fish, because they absorb chemicals through their skin, gills, and the water they drink. Pesticides lower dissolved oxygen (D.O.) levels in the water, and extremely low levels of D.O. cause fish to suffocate and can affect their ability to breed and parent their offspring (Mahmood et al., 2016). There are also impacts on macroinvertebrates, which, besides being fish food, are also indicators of the overall health of aquatic ecosystems (Robichaud et al., 2022). There is also a decline in pollinator species, such as bees, because of the chemical effects on insects and the vegetation they need for survival (Castelli et al., 2021; Straw et al., 2021).

Glyphosate spraying can degrade soil health, impact soil fertility, and decrease beneficial mycorrhizae bacteria and fungi in the soil (Helander et al., 2018; Marques et al., 2021; Newman et al., 2016; Ruuskanen et al., 2023; Vazquez et al., 2021). Plants need these beneficial bacteria to absorb nutrients and achieve optimal plant health. Issues are also being raised about the persistence of glyphosate in the soil, water, and plants, as studies show that it stays around longer than previously thought (Myers et al., 2016; Wood, 2019). A study in Northern British Columbia

found glyphosate residue persistent in some plant tissues for up to 12 years (Botten et al., 2021). It was also shown to stay longer in root samples from colder climates than in warmer climates.

In forest areas treated with glyphosate, moose tend to avoid treated areas after an active spray and for some time, since food availability is so low and plants take a while to rebound and regrow (CELA, 2022; Connor, 1992). The forestry industry also harvests and replants trees, such as spruce, which moose do not eat, limiting their food choices (Anishnabe Moose Research Committee, 2022). Since glyphosate can make its way into both the land and the waters, it could then make its way into the diets of moose through the plants they eat and the water they drink, which humans consume when they eat moose.

Glyphosate can also reduce edible and medicinal plants that are available, like blueberries, which are plants that both humans and animals, such as deer and moose, rely on for survival (Chiblow, 2019; Lamy & Finnegan, 2019; Lowitt et al., 2023). This has a lasting impact on species distribution and abundance due to these adverse effects on habitats.

2.3 Indigenous Perspectives on Glyphosate Use

Indigenous knowledge systems consider how all elements in an ecosystem act together – people, plants, animals, and the land (Patterson et al., 2023). Everything serves a purpose and is integral to the overall system because eliminating one thing takes away from something else (Patterson et al., 2023).

Plants "play key roles in the traditional practices of Indigenous People as medicines, food, and through ceremony and other cultural practices," and glyphosate and GBHs affect these practices (Patterson et al., 2023, p. 5). A participant from this same article stated, "the Elders say that if it hurts one blade of grass, you can't use it" (p. 5). This statement illustrates that from an

Indigenous perspective, all relations are important, no matter how big or small. Chief Marcus Hardy of Red Rock Indian Band has explained that, in their community, "there are a few elders that were adamant on explaining exactly what their concerns were," adding, "We saw less growth in the bush; we saw less plants, medicine plants, blueberries and all that" (Baxter & Dunne, 2021, para. 16). Concern about key species for First Nations communities includes berries (i.e., blueberries, strawberries, raspberries, and cranberries), paper birch, elderberry, pin cherry, and eastern white cedar trees (Patterson et al., 2023). According to the Final Report: Climate Change and Food Insecurity Study, which was prepared by First Peoples Law and co-authored by Brett Campeau and Alison Porter (2022), an elder from Wahnapitae First Nation discussed how they believe that industrial and forestry activities that are happening in their region have made the soil unsuitable for growing food, so they had to construct raised beds and bring in soil to grow food safely.

There have also been concerns over animal biodiversity and health, such as the impact on pollinators and other insects, birds, fish, amphibians, and mammals (Patterson et al., 2023). Patterson et al. (2023) report that the impact of glyphosate on invertebrate populations (i.e., pollinators, insects, arthropods) shows variable results and is often controversial. Documented adverse effects vary from acute toxicity to various sub-lethal effects which may negatively impact overall colony survival and success" (p. 6). Other studies negate these findings, showing no adverse effects on bee health or development. No studies were found examining the impact of glyphosate on birds, and very few studies have been found for fish in freshwater environments, reptiles, or small or medium-sized mammals (Patterson et al., 2023).

Concern has been shown for large mammals, especially deer and moose. Elders from Biinjitiwaabik Zaaging Anishinaabek and Red Rock Indian Band have brought forth issues their

communities have faced regarding the aerial spraying of herbicides. One Biinjitiwaabik Zaaging Anishinaabek Elder observed "yellow spots on moose meat and fish, which he links to these environmental contaminants" (Campeau & Porter, 2022, p. 33). A Red Rock Elder spoke about how his "community no longer eat the organs of many animals, including moose, partridge, and rabbit because they have become like "goo" with the spraying of herbicides" (Campeau & Porter, 2022, p. 33). In the Patterson et al. (2023) study, participants mentioned the impacts they are seeing in their communities from glyphosate and GBHs: "Hunters are seeing the deformities. They are seeing the sickness. So it is there" (p. 7). These communities also see "white spots on the liver, abnormal growth, and hermaphroditism" in the deer and moose (Patterson et al., 2023, p. 7). Compared to the scientific findings, these Indigenous individuals are witnessing and experiencing the impact of glyphosate spraying in their communities differently from what has been reported in the scientific literature. These perspectives emphasize experiential knowledge through their hunting practices and are shared between communities.

2.4 Knowledge Gaps in the Scientific Literature and Different Ways of Knowing

2.4.1 Knowledge Gaps in the Western Scientific Literature

There are many knowledge gaps in the Western scientific literature regarding glyphosate and its direct and indirect impacts on human and environmental health in Northwestern Ontario that focus on First Nations communities and priorities. As noted in Patterson et al. (2023), there is limited research on the direct and indirect effects and persistence of glyphosate and GBHs on the plants, animals, and ecosystems of the Great Lakes region. Understanding what impacts there are to the Great Lakes region is important because many communities in both the United States

and Canada, Indigenous and non-Indigenous, live in this region. The *State of the Great Lakes* (2022) technical report which was written in partnership between Environment and Climate Change Canada and the U.S. Environmental Protection Agency, states that "based on the 2020 U.S. census and the 2021 Canadian census of population, the resident population within the Great Lakes Basin was 35,371,814" and these numbers go up every year. These populations, in addition to others outside of the Great Lakes region, depend on the Great Lakes for drinking water, food, recreation, and ceremony (ECCC & USEPA, 2022). Invertebrate populations, birds, amphibians, reptiles, freshwater fish, and small, medium, and large mammals within the Canadian context are understudied. The mobility and persistence of glyphosate and GBHs in the Great Lakes are not well understood or even studied. This includes aerial drift, soil movement, and concentrations on and within plant structures (Patterson et al., 2023). Patteson et al. (2023) also acknowledge that within the existing body of literature "there is not enough unbiased peer-reviewed research regarding glyphosates, its formulations, and its metabolites and their mechanisms of action in order to make informed decisions regarding its potential impacts on human health" (p. 9), in addition to little research on the use of glyphosate and GBHs and their impacts on mental health and cultural well-being. Also, regulations tend to be based on outdated data on glyphosate use since current glyphosate and GBH usage levels have increased dramatically in the last couple of decades (Vandenburg et al., 2017).

Very few studies acknowledge and honor Indigenous perspectives and contributions to the issues presented here due to the primacy of Western knowledge and continued settler-colonialism (Patterson et al., 2023). Patterson et al. (2023) argue that research conducted from an Indigenous perspective on the impacts of glyphosate-based herbicides on Indigenous community well-being and culture is lacking. There are also gaps in research using Indigenous methods, led

by Indigenous communities, which answer the questions Indigenous Peoples want answered. An article by Rotz et al (2023) suggests:

> Traditional Ecological Knowledge is not held at the same standard. It's not recognized ... but we're seeing the effects of spraying glyphosate ... We know that things like glyphosate don't break down the same way in northern soils, it's more acidic up here, it's slower, it stays around for at least three seasons ... It leads to so many health implications. So when we talk [about] epistemology ... they think that their way of knowing is top dog ... And yet Traditional Ecological Knowledge holds the ecology and has the answers (p. 98).

The interplay between the processes and knowledge of Indigenous food systems and cultural values is understudied, particularly for community members living on reserve (Young et al., 2024). Young et al. (2024) argue that "strengthening social and cultural traditions and values is vital in working towards Indigenous food governance, sovereignty, and revitalization of Indigenous food systems" (p. 1).

2.4.2 Different Ways of Knowing

Historically, scientific literature and research look at the world from a Western point of view. This includes scientific research data gathered, analyzed, and shared through academic institutions and private research firms. The scientific literature often excludes and disregards different ways of knowing, including the lived experiences and knowledge of Indigenous Peoples. Indigenous Peoples are uniquely positioned in conversations surrounding the environment, food systems, and health because "Indigenous cultures are shaped by [their] unique relationship to the land and food systems within [their] respective traditional territories"

(Morrison, 2011, p. 97). Indigenous philosophies follow that people do not manage the land and instead manage their behaviors and beliefs about the land, and this is juxtaposed with the Western philosophy that tends to want to dominate or control nature (Morrison, 2011). While this thesis discusses different ways of knowing and knowledge systems in a more heuristic way, there is much more nuance to knowledge than what is described here. Knowledge and teachings are not binary, nor are they exclusive to any one group of people. Indigenous knowledges and ways of knowing differ across communities, and there is no one way of knowing amongst Indigenous peoples.

Spirituality and living knowledge are at the heart of Indigenous knowledge, emphasizing "change, wholeness, and balance" (Bartlett, 2011, p. 1). In contrast, Western science does not include spirituality, relies heavily on books, and focuses on parts rather than the whole (Bartlett, 2011). Two-Eyed Seeing is an approach created by Mi'kmaq Elder Albert Marshall, a member of the Eskasoni First Nation,

> Two-eyed Seeing refers to learning to see from one eye with the strengths of (or best in) Indigenous knowledges and ways of knowing and learning to see from the other eye with the strengths of (or best in) Western knowledges and ways of knowing … and, most importantly, to using these eyes together for the benefit of all. Two-Eyed Seeing adamantly, respectfully, and passionately asks that we bring together our different ways of knowing to motivate people, Aboriginal and non-Aboriginal alike, to use all our understandings so we can leave the world a better place and not compromise the opportunities for our youth (in the sense of Seven Generations) through our own inaction (Marshall, Marshall, & Bartlett, 2015, p. 17-18).

Combining multiple ways of knowing is important because all knowledge serves a purpose, and combining them will give us a more complete understanding of the complex issues we face as a society. There are more calls to action and discourse surrounding the fusion of Indigenous Knowledge and science within research and policy development (Bradford, 2024).

Many examples within the literature illustrate how beneficial it is to combine different ways of knowing and utilize a community-based participatory approach (CBPR) when working with First Nations communities. An example of this is the Messengers for Health (MFH) project, a partnership that began in 1996 between the Crow Nation and Montana State University (Simonds & Christopher, 2013). Initially, the partners combined CBPR and decolonizing methods to develop a program combining Indigenous and Western knowledges to educate Crow women about cervical cancer through a more empathetic and culturally appropriate lens. Now, the program not only provides cervical cancer support, but it also does community outreach, providing ongoing educational opportunities and training for community members, advocates, youth, caregivers, spiritual and emotional support for survivors, and public workshops for community members and healthcare providers (Messengers for Health, n.d.). Community members and researchers co-produced and developed protocols for partnering and agreements for how the work should be approached (Simonds & Christopher, 2013). Community members decided who would interview them and how (e.g., one-on-one, small groups, etc.), and after the data were transcribed, the data were co-analyzed between the community and the researchers. This process provided unique and invaluable insights that otherwise would not have happened without the community being involved every step.

Kerr et al. (2024) discuss that while working with Indigenous People, settlers must critically assess organizational processes. They explain that settlers bring biases and assumptions

and often take their ways of knowing for granted without recognizing the privilege in their actions, thinking their ways are the only way to do something. Through this process of reflexivity, they can move together and start to repair relationships. By de-centring the settler, they can build capacity and reciprocity into relationships and realize they are in it for the long-term (Kerr et al., 2024; see Stein et al., 2024). Settlers must develop reflexivity and understand that this work takes stamina and confronting difficult, painful, and often uncomfortable histories from colonial impacts. It is about practicing gratitude and integrity to move beyond "good intentions" – to reflect on institutional processes, how we speak to others, and tempering our expectations to move together in a good way. Larry McDermott, as cited in Kerr et al. (2024), speaks about the importance of a "mutual commitment to integrity" in that:

> Integrity is about knowing who we are as individuals. It is that universal place of consciousness, of life, that is part of all creation. Integrity is a commitment to the mental, physical, emotional, and spiritual ways of knowing … Integrity can mean speaking my truth as I know it, but it is also to be humble enough to know that I am always growing (p. 180).

Considering different ways of knowing and using decolonizing approaches is important in the context of this research since there is a distrust that exists within the current research and findings, notably when it comes to industry-based studies reporting on environmental contaminants, because there is little transparency (Patterson et al., 2023). A recent study by Patterson et al. (2023) demonstrates this perception of a lack of transparency by drawing on discussions through a knowledge-sharing workshop with First Nations across the Robinson-Huron Treaty Area. In the study, a participant remarked that "they [industry] give answers agencies want to hear rather than the actual truth about the impacts of glyphosate spraying" (p.

10). This distrust is understandable when there is a lack of consensus between academics and the government and between governments and their regulatory bodies regarding safe levels of glyphosate. Many participants in the Patterson et al. (2023) study mentioned concerns that the government and industry often prioritize the economy over the environment when making decisions.

In conclusion, this literature review lays the groundwork for the following chapters in this thesis so that readers better understand glyphosate's impact on human and environmental health within Indigenous communities and why it is imperative to delve into Indigenous perspectives and different ways of knowing. I have also acknowledged gaps in the scientific literature regarding glyphosate and its direct and indirect impacts on human and environmental health in Northwestern Ontario and First Nations communities, addressing the need for combining Western and Indigenous ways of knowing so we can more fully address the complex problems we face as a society.

Chapter 3: Methodology and Methods

This research project builds on the Understanding Our Food Systems Food Sovereignty assessment (UOFS FSA) conducted in partnership with the Thunder Bay District Health Unit (TBDHU) and Lakehead University (TBDHU, 2022). The UOFS FSA collected insights and stories from fourteen First Nations within the Thunder Bay District through large gatherings, small group discussions, and individual interviews to provide recommendations for the UOFS project partners to assist in providing ongoing support for First Nation communities and the organizations working closely with them. Land stewardship was one of the key themes that emerged from the assessment. Specifically, participants expressed confusion and concern about the impacts of environmental contaminants, particularly glyphosate, on their traditional territories and their effects on berries, animals, medicines, fish, and the ecosystems that sustain all life. From this, the UOFS FSA (TBDHU, 2022) recommended that the UOFS communities work with partners to collect and share information about these issues to support their ability to make informed decisions and advocate for their communities. Specifically, the recommendations were to share existing scientific research and to listen to Indigenous Peoples' experiences and knowledge about these issues. As previously mentioned, community leaders from Animbiigoo Zaagi'igan Anishinaabek (AZA) wanted to advance this recommendation. Dorothy Rody (AZA Band Council Member) and Priscilla Graham (AZA Band Administrator) were our primary community contacts for this research. Kim McGibbon, a Public Health Nutritionist at TBDHU, was my AZA community liaison during this project and accompanied me to the August 2024 community gathering, where we held a sharing circle with community members to collect data for this project.

This project used community-based participatory research (CBPR) as a process that develops collaborative research goals with community partners – in this case, AZA and UOFS - based on a shared vision and goals that have a benefit to communities (Castleden et al., 2012; Poirier & Neufeld, 2023). This CBPR project drew on Indigenous perspectives (i.e., the community's research through the experiences and perspectives of AZA community members), with my role to collect this information and synthesize it based on the themes that emerged from the data. CBPR was chosen to ensure the research structure was developed and implemented to be mutually beneficial and support knowledge sharing and co-creation (Poirier & Neufeld, 2023). This was particularly important because we were working with Indigenous communities where research has historically been done on Indigenous communities rather than in partnership to meet their goals and needs (Koster et al., 2012; Kovach, 2015; Toombs et al., 2019). In the literature, there is much said about the necessity for research with First Nations communities that echo Kirkness and Barnhardt's (1991) Four R's of respect, relevance, reciprocity, and responsibility, when conducting research with Indigenous communities, with reciprocity and relationships playing a key role in doing any work with Indigenous Peoples (Gaudry, 2015; Rogers Stanton, 2014; Toombs et al., 2019). As Kovach (2015) writes, "To serve Indigenous Knowledge Systems there must be ethical, epistemological, and methodological inclusion of Indigenous voice, understandings, and practices" (p. 50).

This co-research, co-learning, and co-teaching opportunity worked closely with AZA's needs and protocols. The parameters of this project aligned with CBPR because the project took place within a specific place (i.e., AZA community and lands), and the community was actively engaged in and directly influenced all aspects of the research process itself (Israel et al., 1998). This project recognized that AZA is a unit of identity and built on their existing strengths by

integrating their knowledges and adaptations in a co-learning environment that aimed to empower and address inequities in a cyclical and iterative process, addressing health from multiple perspectives with ongoing knowledge exchange and feedback, which are all key principles to CBPR (Israel, 1998).

3.1 Positionality

Soedirgo & Glas (2020) argue that positionality "is not reducible to demographic characteristics (e.g., race, age, gender, and class); it is also informed by our personal and professional experiences, our political and ideological stances, and other aspects of our social biography" (p. 1–2). Positionality is contextual and will vary depending on the context and those we are working with. I am the sum of my parts and continually evaluate them through my work in the community with others throughout this project. I come to this research with an open mind and heart, a sincere dedication to unlearning settler colonialism, and a commitment to work in social justice, advocacy, and anti-racism. In a community-based research context, there is a constant need to be "self-reflexive, engaged, and self-critical" in the role of researcher (Israel et al., 1998, p. 181). I am a white settler currently occupying space on Fort William First Nations' traditional territory, in so-called Thunder Bay, Ontario. I was born and raised on the lands of the Potawatomi, Ojibwe, and Odawa in what is referred to colonially as DeKalb, Illinois (NIU, n.d.). I am aware of my privilege as a white settler and how settler colonialism impacts Indigenous Peoples and other members of the Global Majority. In my home state, it was not until April 19, 2024, that an Indigenous Nation, specifically the Prairie Band Potawatomi Nation, had federally recognized land (Prairie Band Potawatomi Nation, 2024). The city I grew up in, DeKalb, is surrounded by farmland, mostly corn and soybean fields. Bayer, formerly Monsanto, the creator

of Round-Up, purchased DeKalb Genetics Corporation in 1998 and still has an office there (DeKalb Genetics Corporation, Wikipedia, 2024). I remember fields being lined with the emblematic flying ears of DeKalb Corn signs:

Figure 3 DeKalb Corn Genetics

Note: Image of winged ear of DeKalb corn (Bayer Crop Science, n.d.).

Settler colonialism makes the Global Majority vulnerable through genocide, stealing land, extracting resources, and contaminating the environment. Settler colonialism is a means to extract as much as possible from our lives and the land for the benefit of the so-called economy. Being a white settler informs who I am and impacts how I see and interpret the data. This is why co-learning and seeking other worldviews are important when taking on this work, so that I can see outside myself and my experience.

I am also queer, agender, disabled, and chronically ill. These intersectional identities have made me vulnerable in ways that impact my physical, mental, and spiritual health. They also impact my ability to access the world and institutions in ways mostly unseen by the general population. My identities impact my access to healthcare, education, land, food, and work. On this note, I was paid for some of the work on this project as part of the larger Understanding Our Food Systems (UOFS) project.

My intersecting identities have taught me that advocacy is an important aspect of who I am and that community is the cornerstone of health, well-being, and survival. Relationships with humans and non-human kin are the pinnacle of moving through this life. More importantly, relationships built on empathy, trust, truth, love, and reciprocity are key to our survival. The work of this project is important to me because the relationship-building and care involved are essential to ensuring that we are all taking care of each other and the environment in ways that foster love and move in ways where every thought and opinion has equal value and recognition. Working with local First Nations communities through the UOFS project has taught me much about intentional relationship-building and care. It is important to me to continue to build these relationships as a member of the settler community. As someone who grew up surrounded by farmland planted with Monsanto products, I have seen the effects of settler colonialism and how it impacts us all. To avoid succumbing to its clutches, we need to work together, combining our ways of knowing, to do better as a community for the future.

My educational and work backgrounds also inform the work on these pages. I have an undergrad degree in sociology, which is where I was first exposed to the impacts of residential schools and colonization on Indigenous Peoples here in North America. My undergraduate thesis focused on doctor-patient interaction and complementary and alternative medicine use. I returned to the university realm after studying and practicing as a licensed massage therapist in the U.S. states of Illinois and Iowa. I wanted to continue to work with and better understand human beings and health. A few years after I relocated to Canada in 2012, I started volunteering with a permaculture garden growing food in Toronto, Ontario. This led me to pursue an apprenticeship in horticulture, where I spent time working with companies in Toronto and Guelph, Ontario, learning the trade. I pursued further coursework at Humber College as part of my apprenticeship.

Injury has since prevented me from continuing professional work as a gardener. I still wanted to work with plants and people, so I began the Natural Environment Technician Program at Sault College in Fall 2021. The program coursework consisted of forestry, fish, and wildlife industry practices and theory, in addition to GIS, data analysis, ecology, soil science, aquatic ecosystem surveys, and environmental monitoring, to name a few. As part of that program, I had to do a co-op placement and a project based on that work.

I was the Vice President of Campus Connections with the Sault College Student Union for the remainder of my time at the college. While there, I did research on the emerging food insecurity crisis at Sault College because part of our mandate was to organize and run a student food bank on campus, along with raised garden beds on loan to us from the Alumni Department, where I helped plant and grow food for students. This work is what informed by co-op project. From this here, I started researching graduate programs related to food systems, and Charles Levkoe came up in my search. I immediately contacted him about what I was working on and my areas of interest to see if he would be interested in working together. From there, I applied to Lakehead University for the Master's in Health Sciences program, got accepted, and I decided to pursue this endeavor.

As it happens, it came out that in my environmental monitoring course the semester before moving to Thunder Bay, Ontario, my cohort conducted a bioassay on glyphosate and how it would impact macroinvertebrates at different levels of glyphosate exposure. While this was a great experience and introduction into environmental monitoring, I lack a full foundational knowledge of toxicology, environmental epidemiology, and risk assessment. My interest in the topic of glyphosate at the time aligned with UOFS and the recommendations of the UOFS FSA (TBDHU, 2022), in which communities wanted further information on glyphosate and its

impacts on human and environmental health. All of this led to my work on the UOFS project in the summer of 2023 and working with the Indigenous community partners. The symbiosis of my knowledge and the knowledge of the communities involved in UOFS and our experiences coming together made me hopeful that I would be able to work with them again in the future to continue this work, which is a big reason why we are here.

3.2 AZA Community Background

Figure 4 Understanding Our Food Systems Community Map

Note: First Nations participating in the UOFS project (Nelson, 2025).

AZA is a healthy, thriving, entrepreneurial, self-reliant community built on respect, family, and traditional values. This provides harmony, community members' safety, and land and environment protection. The community was historically located near Ombabika Lake and

Auden, Ontario, on Lake Nipigon's northeast side. Through the Lake Nipigon Reserve Negotiations, AZA focused their land negotiations on establishing their community near Auden/Ombabika Lake. Due to the remoteness, the government disagreed with establishing the community's chosen location, and the people were forced to negotiate and seek alternative locations. In 2002, an agreement was signed outlining the establishment of a reserve land base located at Partridge Lake near Jellicoe, and in 2008, the community celebrated the creation of their new community plot (Figure 4). AZA members are currently dispersed in municipalities along Highway 11 and 17 from Thunder Bay to Geraldton. Since 2024, the community has started to build permanent structures on the land, and members are looking forward to building homes on their land. The Band Administration provides services to all its members in these communities from its office in Beardmore. AZA continues to focus on developing their community while strengthening their members' resilience through engaging communities, households, and individuals in various programs. AZA has a registered community membership of 592 members.[5]

AZA is committed to food sovereignty-related work. According to a UOFS Evaluation Report (TBDHU, 2020), "as a dispersed community, most members live across Beardmore, Jellicoe, Geraldton, Thunder Bay, and Nipigon regions" (p. 28). The community is actively involved in cooking and working with traditional foods from the land, focusing on preparing food over the fire. Hunting, fishing, and foraging are essential to AZA's historic and contemporary identity and culture. The community hosts cooking classes, canning workshops,

[5] The information from this paragraph was collected from a personal communication with Priscilla Graham, the AZA Band Administrator.

and has an annual fish harvesting festival. Food programming involves actively distributing Good Food Boxes and working to bring more raised garden beds to members' homes. Due to COVID-19, some programming has been made more accessible by moving cooking programs and harvesting teachings online, but in-person programs are now resuming. AZA is invested in bringing cultural and language teachings to community members. They host annual Elder and Youth gatherings to pass knowledge on to the next generation.

Hunting and gathering account for more than half of the families' food for many of the community members, partly due to the cost of living, but also because it is what they know.[6] AZA members have been sharing their concerns about environmental contaminants concerning their food sources and community health for many years (e.g., increased rates of cancer, spots on the animals, and the decrease in abundance of plants and animals). People who live and work on the land have noticed many changes and expressed a need for research and action to address their concerns. A key concern from the UOFS FSA (TBDHU, 2022) for AZA was environmental contaminants, specifically the spraying of glyphosate and its impacts on all living things (i.e., people, berries, animals, medicines, and fish). As stated in the report:

> A major focus on the spraying of the traditional territory was very prevalent in the conversations with community members. It is their belief that the spraying of the vegetation, where the trees have been harvested, is affecting all the animals that the members hunt and eat. It was noted that rabbits, moose, and beaver are becoming spoiled.

[6] This information was collected from personal communication with Priscilla Graham, the AZA Band Administrator.

> The meat is not good for consumption, and the fish have also been impacted by this. It was also noted that the blueberries are also being impacted by the spraying (p. 17).

3.3 Study Context

This project is based on the needs of the AZA community and is something they have asked for and given approval to work together on. The 2022 UOFS FSA (TBDHU) identified concerns from the participating First Nations about the impact of environmental contaminants on their food sources and a request for additional research within their communities to understand the challenges and potential solutions. In response, I was asked to review the scientific literature on glyphosate with a focus on understanding the impacts in Northwestern Ontario, particularly the impacts on traditional foods, human health, and the environment. I produced a short report titled "The Impacts of Glyphosate Spraying in Northwestern Ontario: What Information is Out There about It," on the UOFS website (Lovell, 2023). I presented my findings at the UOFS Fall Gathering in Thunder Bay, Ontario, in 2023. Representatives from TBDHU, the fourteen First Nations, and Lakehead University attended this gathering.

The day started with a welcome speech, and introductions of the event were made. We then gathered into a sharing circle where Elder Gene Nowegejick conducted a pipe ceremony. Elder Gene blessed the tobacco and then lit it and said prayers. The pipe was passed around to those in attendance, where they could either touch it or smoke it. Pipe ceremonies are sacred to First Nations peoples. They are a way to open negotiations between people from different places and set the tone for truthful and respectful communications that come from a good place (Asikinack, n.d.).

A summary of the 2022 UOFS FSA was presented, and I presented my findings from the report in conjunction with this work. In the Q&A portion of my presentation, many communities showed interest in knowing more, especially the AZA and Long Lake #58 First Nation communities. In the afternoon, communities broke into smaller groups for different discussion topics. Afterwards, everyone came back together as one large group and collectively shared information from these smaller sessions, along with their visions and plans for what they see happening in the future for their communities and the future of UOFS. The day closed with a sharing circle led by Elder Gene Nowegejick, where each person was asked to share a bit about who they are, where they come from, and what their favorite food is and why.

After the gathering, several community members, including those from AZA, approached me to let me know how interested they were in my presentation and how they would like to get more information. This event and the discussions within were the impetus for this proposed project. Specifically, AZA approached us about pursuing further research and discussions with their community about their experiences with environmental contaminants and their lands. At this point, we decided this would be the work I did for my thesis research.

3.4 Data Collection

A sharing circle at an AZA gathering (Appendix A) was the primary method used for data collection. In addition, I held one-on-one interviews with community members whom AZA community members recommended due to their relationships with the land and traditional food collection, who could not attend the gathering. Recruitment of participants for the sharing circle and the one-on-one interviews was conducted by AZA, primarily through our community contacts Dorothy Rody (AZA Band Council Member) and Priscilla Graham (AZA Band

Administrator). I gave them an information letter to distribute to their members (Appendix B). AZA was integral in the recruitment process (and the whole research project) since they organized and implemented the community gathering that we were invited to attend in August 2024, as well as recruiting food champions in their community who were unable to attend the gathering and still wanted to contribute their stories and experiences.

The community gathering included Elders and youth, and the sharing circle occurred in August 2024. The sharing circle consisted of ten community members. Conversation prompts for the sharing circle and one-on-one interviews consisted of six questions (see Appendix A) focused on the kinds of foods being hunted, gathered, fished, grown, and trapped, and the importance of these foods to the AZA community. There were also questions around how the accessibility of these foods has changed over time, what their concerns related to pesticide use and/or other environmental contaminants are, and their experience related to these concerns. Lastly, a question on what should happen to address their concerns and what they would like to see happen moving forward. For both the sharing circle and the one-on-one interviews, it was a semi-structured format. I went in with six questions (see Appendix A), but left it open for additional questions, stories, and experiences. I did not keep discussions strictly to glyphosate and glyphosate-based herbicides (GBHs). The four one-on-one interviews were held over the phone, on Zoom, or in person, depending on the needs and preference of the individual being interviewed. I interviewed four Elders within the community, three of whom are now retired and one is still in an active profession. Of the four Elders I interviewed, two of them used to work in the forestry industry, where glyphosate is used, and one is a commercial fisher.

This research was only a small part of the overall gathering, which was hosted by the community on their land to discuss important community issues, gather together, and spend time

sharing stories and food. The Chief, Elders, youth, hunters, gatherers, fisherfolk, and other community leaders were in attendance. Kim McGibbon and I traveled to AZA's community near Jellicoe, Ontario, on August 21, 2024, where we collected the data. We spent the day with the community sharing food, stories, and experiences. At the gathering, Kim and I introduced ourselves. I presented a short synopsis of glyphosate impacts on human and environmental health from the Western literature, and then I read through the information letter. We had copies available for members to take for their records. Consent forms (see Appendix C) were read aloud, and members were asked to sign or give verbal consent if they chose to participate. It was emphasized that they were not required to participate, and if they chose to participate, they could withdraw their participation at any time. For community members who did not consent to participate in the research, it is unknown if they shared their stories with other community members or leadership. Community members were only asked to contribute what they were comfortable sharing. We also received consent from participants to record audio of the day's events and to take notes throughout. Community members who participated in either the sharing circle or the one-on-one interviews were also compensated for their time and knowledge shared in the form of honoraria that were paid directly to the community members by the Thunder Bay District Health Unit with monies from the Indigenous Services grant.

Sharing circles, also called talking circles, are an Indigenous method of group information sharing and discussion (Levac et al., 2018). While they share some commonalities with focus groups, they differ because of the "sacred meaning they have in many Indigenous cultures and in the growth and transformation bases for the participants" (Lavallée, 2009, p. 29). The approach focuses on cooperation within the circle by gathering participants and ensuring

everyone can speak and listen, often using a talisman to denote the speaker at the time (Hunt & Young, 2021; Levac et al., 2018). As Lavallée (2009) elaborates:

> Sharing circles use a healing method in which all participants (including the facilitator) are viewed as equal, and information, spirituality, and emotionality are shared … circles are acts of sharing all aspects of the individual – heart, mind, body, and spirit … The circle is nonjudgmental, helpful, and supportive. Respect is important, and this includes listening to others. Sometimes people speak as they are seated in the circle, either going in a clockwise or counterclockwise direction and hold an object such as a talking stick or eagle feather. Circles begin with a smudging ceremony to rid the circle and people of negativity. Items may be placed in the centre of the circle, depending on the purpose (p. 29).

The sharing circle was audio recorded and had more than twenty community members present in the same space, but only ten consented to share their information or contribute to this research. During the sharing circle, only those ten members who consented spoke directly to the questions being asked and stayed involved for the duration of those specific communications. For those who did not consent, they did not give a reason for doing so and chose not to participate or speak to the question prompts during the sharing circle. Each community member was invited to introduce themselves if they felt comfortable, but the recording device was not turned on until after introductions by community members were complete. I then started with the first question and invited participants to speak about their experiences from their hearts. For this reason, it was important to the community members and me to stay true to their words. I have

included extended quotations in the findings section because community members' voices are of great importance, and their thoughts should be in their own words as much as possible.

3.5 Data Analysis

I used the Happy Scribe tool for the initial transcriptions of the sharing circle and interviews. The goal was to have initial findings ready to present at the UOFS Fall 2024 gathering in October 2024, with members present from the fourteen First Nation Communities involved with the project. I then manually verified all the transcriptions with the audio from the gathering and interviews to ensure everything was recorded correctly. I then went through the data in Microsoft Word using an emergent approach where I developed keywords (codes) as I combed through the data. These keywords (codes) were extracted from Microsoft Word and copied into Microsoft Excel. The emergent keywords (codes) were then cataloged and grouped further into broader emergent themes using a thematic analysis approach. Thematic analysis at its core "is a method for identifying, analysing and reporting patterns (themes) within data," (Braun & Clarke, 2006, p. 79). This involves "searching across a data set – be that a number of interviews or focus groups, or a range of texts – to find repeated patterns and meaning" (Braun & Clarke, 2006, p. 86). The broader themes were then categorized into areas of key concerns, including subthemes, from community members based on what was shared by the members and the prevalence of these themes that occurred during the gathering and interviews (see Figure 5 in Chapter 4).

3.6 Ethical Considerations

An ethics application was submitted to and approved by Lakehead University's Research Ethics Board (REB) following Ownership, Control, Access, and Possession (OCAP) principles and Tri-Council Policy Statement (TCPS) 2 principles. Ethics approval is a necessary first step when collecting data involving people, and extra considerations were taken since I was working closely with an Indigenous community. Historically, research involving Indigenous Peoples has been extractive and harmful, with little reciprocity or feedback given to communities (Snarch, 2004). According to Tuhiwai Smith (2021), research is a term "inextricably linked to European imperialism and colonialism…[and] is probably one of the dirtiest words in the Indigenous world's vocabulary" (p. 1). Historically, research has been done on Indigenous communities by non-Indigenous researchers for their benefit versus working in partnership with Indigenous communities for the benefit of Indigenous communities (Snarch, 2004). First Nation communities often say that "we've been researched to death" (The First Nations Information Governance Centre, 2014, p. 6).

Community engagement is required for Indigenous research, and this project is built on existing relationships with AZA. A primary reason for this project coming together is that the community asked for and could see direct benefit from it. As is indicative of CBPR projects, all aspects of this project were a co-learning and co-creating experience where AZA's needs were prioritized. All data collection, analysis, and dissemination processes were designed with and informed by AZA. AZA decided how they wanted to be identified in the data and how consent would be managed. In short, they decided how and at what level they wanted to participate.

Prior to the sharing circle or interviews, Kim and I went through the information letter (see Appendix B) and the consent form (see Appendix C) with all participants so that they could

make an informed decision on whether or not they would like to be involved in this aspect of the project. Consent was then obtained either in written or verbal form. It was communicated that due to the nature of a sharing circle, confidentiality could not be maintained. Since the sharing circle discussions were recorded, verbal and/or written consent was also gathered before recording. I anticipated that some questions might be perceived as sensitive, and community members may not want certain information about themselves or their community made available to others. To address this concern, we emphasized the voluntary nature of the research and the questions that would be asked before participants of the sharing circle or interview (which was emphasized in the attached consent form – see Appendix C). Community members were made aware that they had the choice to have their information attributed to them by using their name in the research or to be confidential. Community members were also informed that their identities could not be kept confidential from the other members participating in the sharing circle because it was a group gathering. What and how much any participant contributed was up to them, and they may choose to end the interview or withdraw their participation until my final report to the community was complete and my thesis submitted. It is important to note that when going through the consent form with community members, a few said I could name them as long as there was no recourse or legal implications. Upon reflection and discussion with my supervisor, I decided to keep all participants confidential in this thesis and subsequent reports to honour their requests. My number one priority is the community's safety and protecting those who decided to participate, and I will not put anyone in danger.

It also made clear that AZA would own and control the collected data. I also held discussions with AZA to decide how they wanted the data flow to happen, what would happen with their data upon project completion, and how they could access their data. We agreed that

only the researchers and AZA leadership will have access to the sharing circle transcripts and identifiable materials (including audio recordings, hand-written notes, and consent forms). A member check was not completed. In addition, all documents (notes, audio recordings, and transcripts) were stored securely and will be kept for seven years on password-protected computers, and hard copies will be kept in a locked filing cabinet. Following the completion of the study, copies of these documents were also given to the leadership of AZA. AZA will have full access and ownership of the data and full decision-making regarding how that data will be accessed and used.

The TCPS 2 identifies that respect for persons, concern for welfare, and justice are at the core of ethics in Indigenous contexts (Tri-Council Panel on Research Ethics, TCPS 2, Section B, 2023). This is exhibited through the "securing of free, informed, and ongoing consent of participants…requiring consideration of participants and prospective participants in their physical, social, economic, and cultural environments…as well as concern for the community to which participants belong…[and] justice may be compromised when a serious imbalance of power prevails between the researcher and participant" (Tri-Council Panel on Research Ethics, TCPS 2, Section B, para. 2-5).

3.7 Dissemination of Information and Results Verification

As discussed with AZA, all results, including key findings and recommendations, will be shared through presentations, plain language reports, visuals (e.g., infographics), and video testimonials with participants, AZA community members, and the broader UOFS community. We also plan to draft a scholarly journal article to share the results and our methodologies with the

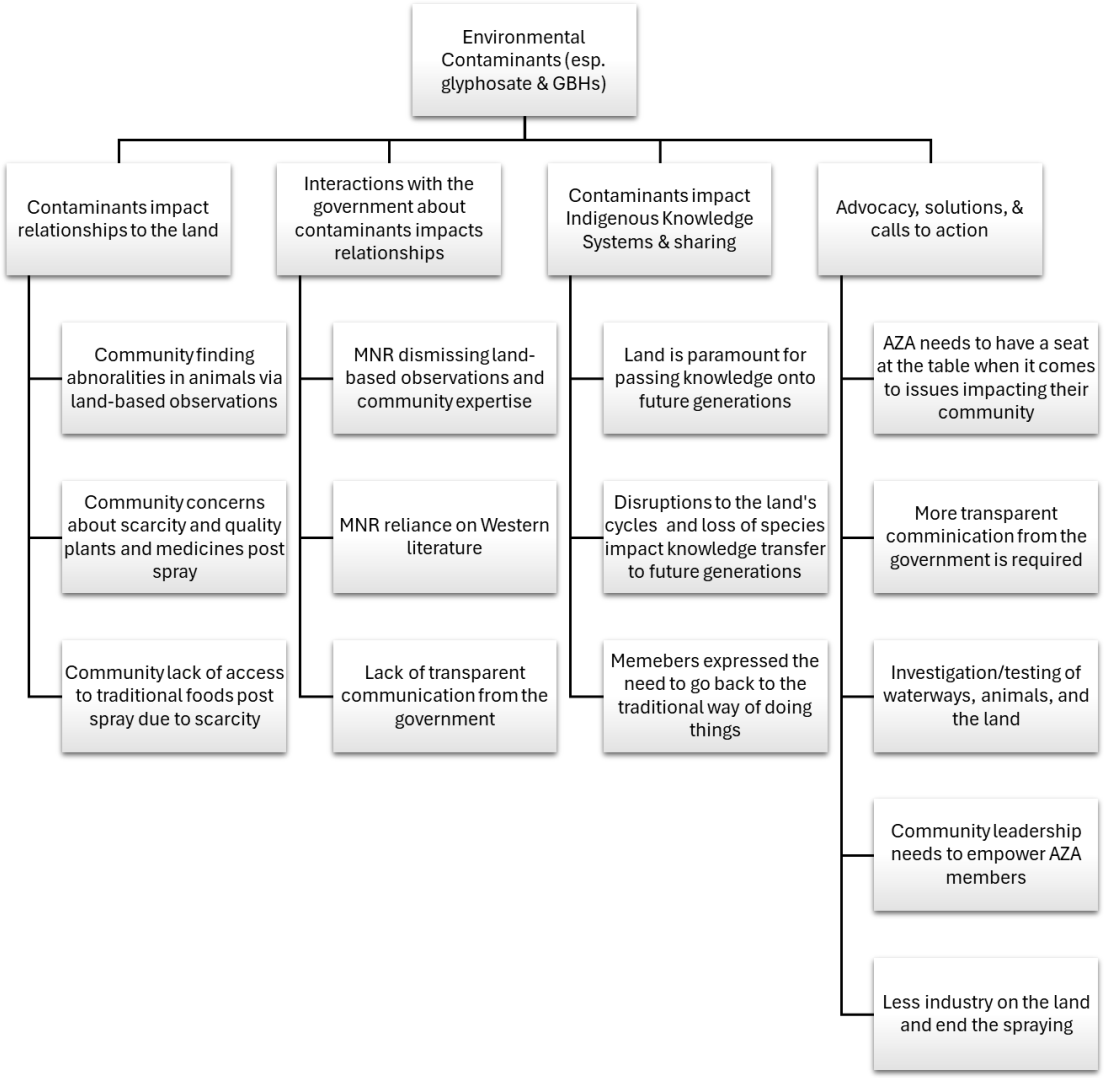
academic community following the acceptance of this master's thesis, which will be written based on this research project.

Chapter 4: Findings

In this chapter, I summarize four key themes that emerged from the sharing circle and interviews with the Animbiigoo Zaagi'igan Anishinaabek (AZA) community members who participated in this project. Within these four key themes, subthemes also emerged, which I have included in Figure 5 and are discussed further in each subchapter. The first theme that emerged from the data was how environmental contaminants (esp. glyphosate) impact the community's relationship with the land, including, but not limited to, how community members hunt, gather, and interact with the land. The second theme to emerge was how environmental contaminants (esp. glyphosate) impact the community's relationships with the government, particularly the Ministry of Natural Resources (MNR). This occurs from community members' interactions with the Government, particularly the Ministry of Natural Resources, which has left much to be desired from the community's perspective.

The third theme that emerged was how contaminants impact Indigenous Knowledges, teachings, and community health. This has implications for the community's access to food and medicines and impacts knowledge transfer to future generations. The last theme that emerged was giving voice to the community, which includes advocacy, solutions, and calls to action. As readers move through this section, it is important to note that while I have organized and synthesized the bigger themes and ideas, I deliberately included many of the quotations in full. A main objective of this project was to listen to Indigenous Peoples' voices and maintain the integrity of their perspectives. Because of this, it was important to the community members involved in this project and for me that people are heard in their own words.

Figure 5 Thematic Roadmap for this project.



4.1 Environmental Contaminants & the Land

When speaking to community members at the gathering and in interviews, it became clear that environmental contaminants, especially glyphosate spraying, were perceived to have enormous impacts on AZA members and their relationship with the land and their food systems. This was evident in how community members spoke about the impacts on plants and animals. Many community members have noticed unexplained diseases and are having issues accessing plants they need for food and medicine. Moose, for instance, have been found to have discolored organs, blisters, and worms, which community members have attributed to spraying.

One community member stated:

> I said even the moose is not as good. Years ago, we used to be able to eat the liver, and it was so good. Nice. And now you can't. Even sometimes you get a moose now, and it's got blisters in them. On the outside and the meat.

One Elder in the community had not shot a moose in 25 years because of what he had experienced when hunting on the land, and attributes this to glyphosate spraying. The experience he has had with moose is that:

> It smelled bad, so we had to load it back on and take it back to the bush to…what can we do? We can't eat that. I feel bad I have to give it back to the land and let other birds or animals eat it, but what can I do with it? I couldn't take it to the dump. It would have been the same thing. Seagulls would have got it. Eagles. So that's the last time I shot a moose...My little daughter was only, what, five or six years old when I did this. My daughter's over 30 years old now…So, I've never hunted since then. I don't even bother with the moose no more.

Another Elder in the community had similar experiences, making mention of the kidneys, livers, lungs, and tongues of the moose. He has had to bury a moose so that no other animals would eat it either. He has also heard similar things happening to other hunters. He stated:

> There seems to be problems with their liver and stuff like that, and they have boils and spots, and the liver is soft, and I'm blaming it on the stuff, The Vision [glyphosate] that they're spraying in the cutover because they're eating all the buds of these alders, and birch, and poplar that they spray… I personally got a moose myself and I was opening it up to dress it, and I thought, what's wrong with the liver on this? There's something wrong with the liver. The kidneys and liver had these boils on them and cysts. So, I just said, nah, I'm not going to have this animal at all…And then you open up the lungs, you see the lungs and I don't know if you've ever seen a picture of cancerous lungs. That's what you see. Then you look at their tongues, you know, pull up their tongues and you see these ulcers on them. You know, and that's a very sick animal. So, when I harvest one now, I try to get something that's a year, year and a half old. And trying to find an area where I think it hasn't been exposed to this. That's what I've noticed over the years, and I've seen a few hunters ask me, when they shot their moose, they said, come and look at this, what do you think? And I said, well obviously the moose is not well, he's sick, so when I do harvest one, I try to harvest the younger one or I go to areas that have not been harvested or sprayed because what's happening out there is when they spray this Vision [glyphosate] on there.

Community members are also finding fish with boils, blisters, open sores, and worms, and feel this is related to spraying. One community member talked about this, stating:

> Fish I noticed up in Longlac area where I live are fish have gone rotten. There's boils and blisters on the outside of their meat and like every 3 or 4 fish out of 10 would have one of these open sores and they look gross, and I'll tell you something too with these fish is that in Longlac we see it, something wrong with their head – eyes, deformed faced.

Another Elder also mentioned finding worms in the fish near Ombabika, their traditional territory. He said, "All the white fish have tiny worms coming out of their bodies, look like white threads. You can't even eat them."

Another Elder spoke about glyphosate and finding spots on the fish, and that the fish are full of worms. This same elder also spoke of abnormalities in animal organs:

> The fish even have cancer. The fish have little cancer spots on them. Organs are like goo in animals. I caught a fish that was full of worms…duck that was full of worms. I won't eat duck anymore…I won't eat fish unless in the store because I'm afraid of it. Won't eat rabbit, partridge anymore…the taste is gone, the colour is gone, the meat is not the same.

An Elder also spoke about fish having red spots, blisters, and worms:

> There's been findings of bubbles inside the fish, worms, and then even on the outside, my brother-in-law was fishing up in Auden, Ombabika River, right by the bridge, over there, CN Bridge, and he caught a pickerel. Nice size pickerel, maybe about two-pound, three pound. Nice size. And then when he took it out of the water, pulled it out of the water, that fish sorta looked different. It had bubbles on its sides, red spots, and bubbles, like blisters… That's not the same the way it's supposed to be, you know what I mean, like if it's injured or there's something growing on it, there's got to be something wrong what's causing that. So anyways, there's been a lot of findings like that about fish and now up in Summit Lake, that's north of Auden, Ombabika, where that river goes, Ombabika River,

> way up north. Well, that Summit Lake is our, one of our biggest food lakes that we had because we used to have whitefish slab there. Whitefish, their slabs, they're bigger than a normal whitefish. They're flat and bigger. So that's coming to an end, because last summer, one of our elders went and set a net there in Summit Lake and he says he didn't catch very much whitefish, but he said in his net all he found was these white worms hanging onto the net. So, these worms, I don't know what kind of worms they are, but I do believe if you did go set a net there now you'd find those worms again.

There is concern among the community about the spraying of the plants and how it impacts the plants and medicines. Many community members commented on the scarcity of berries after spraying and how there are no available berries that have not been sprayed with glyphosate. One community member said, "They took me out once, and I couldn't find any. That's because they've got spray in them." Another community member mentioned how in another spot that was sprayed, "They [the government] sprayed a long time ago, but they're starting to come back right now, they're so small it's hard to even pick." Another mentioned how the berries "they're not bouncing back yet."

An Elder spoke of how spraying affects their ability to harvest blueberries:

> Where we are in Auden there, they [the government] cut it that whole area back on the west side of the river. And now they started spraying over there. And there's blueberries growing, they're real nice. Now you can't go pick. You just look at your blueberries because you don't want to touch them because of that spraying.

Berries are important for the community and for the land. One Elder spoke about how they "eat berries every other day – blueberries are good for you. They take away toxins and are good for your blood…strawberries are a woman's medicine."

Another Elder spoke of how important blueberries are to every being on the land and how glyphosate spraying impacts that. He said:

> And it's evident of it, you know, and then they'll spray these areas once they harvest, and people are going out there to picking up blueberries. And the bears are eating the blueberries. The partridge are eating the blueberries. The sandhill cranes are eating the blueberries. Everything's getting affected with this stuff.

Another Elder remarked about things disappearing from the land after spraying. They said, "I'm seeing that when they spray in areas, there is no moose in it. There's no fur, there's no berries in there. So that's a major concern." One community member said, "Even when they [MNR] spray you don't see any moose." One Elder spoke about how animals are disappearing near a road they used to use after there was spraying, "There's nothing there now. Not even no rabbit trails. Not even a partridge. Another community followed up with this stating, "Nothing. Our wildlife has disappeared." One participant remarked about not seeing rabbits near his trapline, "I gotta big, big trapline, I've never seen a [not audible] or a rabbit, so something's knocking them off." Another community member said, "I think they kill the rabbits off when they spray because we don't see rabbits like we used to."

One Elder in the community who had worked in the forestry industry for most of his life spoke about industry spraying. He said:

> Hydro, when they spray their rights-of-way, they spray it at 100%, which kills everything. Everything. Trans Canada Pipeline does the same. It kills everything. They literally wipe out everything on there…Then you got this like Trans Canada Pipeline and Ontario Hydro, they're spraying their rights-of-way. They'll spray right across a creek. It

> gets into the water. You know, there's so much of that going on…I've been very vocal about this for years now.

This same Elder also spoke about the impacts of spraying on his trapline. He said:

> So, now they got this stuff out there and you know, I mean, I understand the purpose of it and I understand the reason of it, you know I've been in forestry many, many, many years, so I know about it, but they're [the government] just forgetting the fact, you know, when they sprayed that one area in my trap ground in the wintertime, there wasn't even a squirrel track in there. Nothing. Nothing in there. It was just…everything's gone. You know, the animals know there's something wrong in there, but then some animals, they feed on it, and then, of course, like I said, it's passed on, you know and I see it mostly in fox and that, you know, up there where my camp is there, there used to be an abundance of rabbits. Nothing. I don't even see a rabbit out there anymore.

Accessibility of traditional foods has been an issue for community members. In addition to a lack of access due to fewer animals, community members must travel farther to access food. At the gathering, one community member said, "You gotta spend more time hunting which means you gotta bring in more supplies, right? So that's all costly. Just to go hunting now especially if you're not catching any game, right? That's a big expense."

One Elder spoke about reduced access and increased costs in fishing because of the worms they find in their fish, "See, this is another thing is these worms. Where are they coming from? What's causing the worms? … There's people that go out there, like to go catch a couple of fish and have a fish fry. You spend so much money to go out there to pay gas, you buy your hooks, fishing rod, everything costs money. Then you get out there and you can't eat your fish."

In summary, community members are concerned about glyphosate and what they are seeing from their experiences being on the land. Community members have seen changes in the animals and plants when they are hunting and gathering, and they want to know the cause, with many feeling that glyphosate plays a role. This includes reports of abnormalities in animal organs and meat, as well as a scarcity of berries. They also noted increased costs and a lack of access to their traditional foods.

4.2 Environmental Contaminants & Relationships with the Government

It is evident from the discussions that AZA's relationships with the government are strained, and many community members do not feel heard or supported regarding their concerns about glyphosate spraying. Several community members spoke about the government's lack of communication about spraying and dismissing the community's needs for the benefit of industry. An Elder who worked in the forestry industry for over 40 years spoke about glyphosate:

> So, when they [MNR] go to plant all these trees, the spruce and the jack pine, they want to kill all this competition off so that these other trees will get full strength and they won't be blocked with all this other vegetation, you know, cause alder and everything else grows fast and it blocks out the sun and everything else, so this is the purpose of them doing that. So, I've been in the forestry and construction business for maybe 46, 47 years, and the forestry, what they use is Vision (glyphosate), and like I say, they dilute it I think 50/50 or something like that, whereas Hydro, when they spray their right-of-ways, they spray it 100%, which kills everything. Everything. Trans Canada Pipeline does the same. It kills everything, they literally wipes out everything on there. So, and it's very potent. It's a very potent stuff, and of course, you got your small rodents that are feeding on roots

> and seeds and then bigger animals are feeding on the rodents, which are the hawks, the owls, the fox, you know the bears and they are all getting sick with this stuff and then you got the squirrels that are feeding on the cones, you know, and the seeds and that and then the marten feed on the squirrels and the fishers feed on the squirrels, and the rabbits, and the partridge, the partridge are picking the buds off these trees and what I've noticed is the partridge are laying the eggs, but the eggs are not hatching and if they do hatch, maybe one or two will hatch. I've seen fox out there that are mange, they don't even have hair on their tails and it's all from this stuff. It's nothing else is causing it but this, but the MNR and the Government will not, will not admit that you know.

Multiple community members remarked about speaking with the MNR about glyphosate spraying and were told it was safe. One Elder spoke about an interaction he had with an MNR representative over a discussion on glyphosate:

> You know, the MNR, I remember, this was quite a few years ago when they first started to do this, this was back in the '80s when they were starting to do it, and I said, well, this stuff is poison, we were at the Beardmore Leave and Talk, and then the guy said, no, no, it's safe enough to drink. I said, oh, I just happened to have a glass here, why don't you pour some in there and have a drink of it if that's the case, he said, oh, no, no, he says, no, no. I said, I said, well, then if it's not poison prove it to us that you can drink it. He changed his tone, and I said, well, I think I proved my point.

Another Elder mentioned a similar encounter with someone working at the MNR when discussing glyphosate:

> It's also [not audible] the Lake, so he's right against the spraying, and we notice, and we talk to other trappers because my uncle was, my dad was, my uncle, two uncles were one

> has one side of Beardmore and the other one has one on the other side of the trap lines and stuff, so we noticed whenever they cut in that area, then they sprayed, like four or five years before we caught any half decent fur, the animal is just gone. So, it makes a big difference if you're spraying and then one biologist was there from the Ministry and the guy that was complaining about the spraying, he [MNR] said, oh, yeah, that's safe to eat and stuff like that you can go in there and eat right away. He [concerned member] said, Well, I'm bringing a salad, and I want you to spray that stuff on you, and I want you to eat it in front of me. The guy [MNR] refused. I said, well, he [MNR] said if it's so safe then, you know what I mean? You put your money where your mouth is. So, he wouldn't eat it. So, he said, that's crazy, it's ludicrous talk he was saying.

The MNR has also questioned the knowledge and expertise of community members. One Elder discussed how they provided the MNR evidence of what spraying glyphosate is doing to the land through firsthand experience and the MNR's lack of belief in their knowledge:

> One place, we had one road that they sprayed up and we're trapping, and we never trapped it for four years because there's nothing in there. You go up there and there's no tracks and everything, so we just leave it alone until nature looks after itself again, and then four years later, you can go back in there and they (MNR) said, oh, there's no evidence there that the animals are leaving after you spray, I said, well, if you set a trap in there or you see the snow and there's no tracks in there for three or four years, there's evidence right there. Yeah, but we don't have any evidence, I said, well, maybe you guys should be on the land doing that, you know what I mean? And that's the problem with a lot of these studies and a lot of interviews that you do with First Nation people, but they

> don't have the physical evidence, even though if they're getting a story from one of us, they don't believe it.

One Elder discusses his experience as a commercial fisher and an interaction with an MNR employee regarding standard creel surveys and how the MNR employee did not trust his expertise in conducting a standard creel survey:

> The Ministry sometimes comes out in the lake and does a creel on our netting, and they count the fish coming out, and then they sample and stuff like that. And then they send a guy with a Skidoo, two guys with a Skidoo and everything. I said, why can't we do it ourselves? Well, you guys might screw, not screw up the numbers, but budge the numbers. I said, well, take a video, first twenty fish over there, when we sampled the twenty fish right there, then we always lift the whole net and you count the fish, how can we screw that up? He said, well, we want our own guy doing it, so we know the numbers are right. I said, well, I mean, we could say that there's two hundred fish and there's only one hundred fish in that, stuff like that.

There is also concern over greed and extractive practices on the land. One Elder stated, "The government doesn't care if they are making money off the land."

Another Elder went on to question when extractive industries and the dire situation with environmental contaminants will be enough:

> There's something, you know, like with the Ministry getting all these people coming in and doing things to the land like they want to come in and do a bunch of mining on this land and myself I'm right against it because they're just going to screw up more and more that they've screwed up already. Why do we want more? And that's what's going to happen? Once you, if we allow these mining people in here think what our land will look

like in 10 years (…) You guys decide what to tell the Ministry because I got two words for the ministry and they're not nice. Not nice, because they're allowing the water and our land to get destroyed you know, like we have cutting going on back here and everything else. Yes, the world's got to live, but at our expense? That's not good either.

Another Elder wants the government to think of folks in Northwestern Ontario regarding access to food:

Before we used to be able to go out and go down some old road there and look in the [not audible] now you can't even do that can't even find a damn duck in this [not audible]. The hunting here is … if you don't go way, way up North then hunting around here is shit, excuse my language, but it is. And if … I blame it on the government really the government has got to open their eyes and think about us people up here in Northwestern Ontario.

One Elder spoke to the blueberries, spraying, and the lack of communication by the government and forestry companies:

Well, I mean, you go there, and you look at them [blueberries], jeez, they look nice, but then you look around, all these birds, trees are dead here. Somebody sprayed in here, so we're gonna stay away from here, so when we go picking, we look for areas that are not sprayed or haven't been sprayed. If they're sprayed, say, maybe 20 years ago or something, well, it's probably okay, but, you know, I watched them spray up in my area there, I've seen them spray there [not audible] you just see them going over the helicopter there, and it's just a whole fog of it over there. Yeah, it's … it's something else. And like I said, I've been concerned about this for years, and I've been passing this information on to all the trappers, all the First Nations, and saying, you know, something has to be done

about this, at least people have to be aware of it, what's going on, you know? Because the MNR, as far as I'm concerned, and the Forest companies never advertised it. They said, you know, they put up these signs saying, area is going to be sprayed, caution, that's all. They didn't have no information on that thing, what it was, what it can do. There was nothing like that on there. … You have to basically, and the only reason I knew because I worked in the forestry sector and I took the name I got on the computer and Googled it to see what the heck and I thought, my god, this stuff is … is poison.

This same Elder spoke to spraying impacts on trapping and an encounter he had with the MNR and a moose he had hunted:

Well, what I've seen and what really first opened my eyes was when I noticed the trap ground, I thought, what happened to the squirrels? What happened to the martens? What happened to the rabbits? And that was the first thing that caught my attention. Something's wrong over here. What happened? And then the next thing I noticed, I personally got a moose myself and it was opening it up to dress it, and I thought, what's wrong with the liver on this? There's something wrong with the liver. The kidneys and the liver had these boils on them and cysts. So, I just said, nah, I'm not going to have this animal at all. So, I literally had to get it buried because I didn't want other animals to eat it either. So anyways, I took the liver, and I went to the MNR and MNR said, oh, no, no, no, there's nothing wrong with that. I said, wow, you eat it then. You eat the bloody thing then if it's okay. Slice it and fry it and eat it. I said, you can literally poke your finger through it where if you take a liver, you can't poke your finger through it. You know, it's kinda hard, spongy thing, but you can literally put your finger right through it. It's just like soft foam. Go right through it. Then when you cut it open, there's these things just

> like boils all through them and you poke them, there's like pus comes out of them and stuff, you know, and then you open up the lungs, you see the lungs, and I don't know if you've ever seen a picture of cancerous lungs. That's what you see. … Then you look at their tongues, you know, pull up their tongues and you see these ulcers on them. You know, and that's a very sick animal.

In summary, community members spoke about not being heard and often dismissed by government officials regarding their concerns around spraying and the potential impacts of glyphosate on their lands. When community members expressed their concerns to government officials about glyphosate, they did not feel they were taken seriously and spoke of being brushed aside. They also felt as though their knowledge and experience surrounding glyphosate were not acknowledged as a worthy contribution and were treated with disrespect.

4.3 Environmental Contaminants & Indigenous Knowledge

Community members shared their knowledge and teachings from the land and expressed concern over the changes they see from environmental contaminants and spraying. There is also concern about environmental contaminants (esp. glyphosate) impacts on traditional knowledges being passed on because of reduced access to the land for teaching. A couple of community members spoke of cycles and the cycle changes they see during the sharing circle. An Elder in the community expressed, "What I find is that the seasons are changing later, so all of our stuff are coming in later … is at a different time I mean look at the geese. Like they came in so late this year again and they left late. Like everything's changing with our season."

One community member spoke about how everything on the land goes in cycles:

> They go in a cycle, every 7 years. Everything is interconnected because everything smaller gets eaten by something bigger and we're like at the end of the food chain besides [not audible] and moose, which we eat so basically every time one of those species [disappears] that affects us because we eat most of that stuff. Every little piece that gets affected is ultimately going to affect us because we eat all of it.

One Elder spoke of having to go back to their traditional ways of living and planning for future events, stating:

> Well, the way the world is going now, we might have to go back to the old ways and catch our food and grow our own food, you know what I mean, cause all the chemicals are putting in our food and then we have a shorter growing season so we'd have to pick what we want or eat what's here, you know what I mean, so like, blueberries, and raspberries and stuff like that ... I mean, you gotta think further down the line if there is going to be a problem, you know what I mean, or if the way they're talking about more storms coming through and stuff … I mean, the roads, the weather conditions are getting warmer, but it's also bigger storms and stuff like that, so you gotta think ahead and have a generator station and stuff like that. I think, so same with your First Nation people, you know what I mean, we got to think that if we can't get out of this area because we gotta big lots of snowstorms … so you got to have a plan for some food in there. You got to have a plan for power; you got to have a plan for gas and stuff like that … So, planning ahead might be part of the food, you know what I mean? Same there with subsistence fishing would be a big [not audible] and if you want to go shoot a moose for food, like some of the First Nations.

This same Elder is a commercial fisher and has noticed changes in the distribution of lake species. He said:

> Lake Nipigon is a world-famous lake for speckled trout. The world record come out of the Nipigon River, which is just kind of part of Lake Nipigon, so now you troll along the shoreline thinking that you're going to catch a speckled trout, and you catch a four or five pound pickerel or walleye, whatever you call them, so, it's changing.

Another Elder also spoke of land cycles and the changes he is seeing that pertain to the spraying:

> Everybody's saying the same thing. They just think, well, what's happened? What's happened? Well, I know the rabbit, they go in cycles, you know, but I used to drive up north of Jellicoe there and you can drive down the road and you can count one hundred rabbits easy on the road. You don't see them anymore. You don't see them anymore. So same with the partridge, you know, I used to drive up to my camp. You didn't go around one corner, there's a flock there, there's another flock there, they're on the road. Now, if you see them, one or two. There's none of these big, huge families of them anymore. Everything's changing, you know and that's the only thing I can think that's causing. There's nothing else out there that's harming them. It's manmade. This manmade stuff that's killing them off, you know, and I'm kinda wondering if it's causing cancer in human beings by eating this stuff. I mean, if it's in the liver, it's throughout the whole animal. It's in the blood, you know, it's in the blood, so the liver is like a filtering system, so that's where it's all filtered in there and the animals, you know, get sick.

Community members expressed much concern over how environmental contaminants (esp. glyphosate) are potentially impacting the transfer of Indigenous Knowledge to the youth in the community. One community member said:

> Every time we lose a species we lose a lot. We lose opportunities for the future, for our future generations. There are less teachings, and the Youth are not harvesting as much. Residential schools, 60's scoop took this away, the teachings lost because grandparents were scared to teach their grandkids because they fear the white man and what could happen to them.

A few community members spoke of being forced from their traditional lands due to flooding from dams and contamination of the land due to industries, such as mining and logging. According to one Elder, flooding from the dams forced the community from their traditional territories, which impacts the flow of Traditional Knowledge between generations. One Elder said:

> Back in 1943, what was it, '43 or '44, 1944, when they made that dam here for hydro, when they blocked off the water, there is erosion. All the banks of that whole Lake Nipigon, the trees that came down, and the erosion all around the whole lake, you can see it where the erosions were. And all those trees that was floating after that came down, they all went into the lake. So they're all in the bottom because a lot of that stuff floated all over once the water was high. Because we were one of the bands that had to move away from Ombabika Bay because of the flood, that's why we're getting compensated today for that. … We got…we got forced out. My grandparents, my great-grandparents got forced out. They had to move away into the bush because of the water was getting too high where they were in Lake Nipigon, because all the Natives, back then, I'm talking

> about back in the '30s and the '20s before that even, they all lived in Lake Nipigon. That was a big community, that lake. The whole lake, from an Elder that told me a story about that, the whole lake was all Natives before they all got put into reserves. All these people that's got reserves now, they were scattered in that whole lake…They got moved to Gull Bay, White Sand, and us. Lake Nipigon got moved to Partridge Lake and Rocky Bay, [not audible] Point, McIntyre Bay, all these places I'm mentioning those people. Now there's nobody living in all of these places. See, Sandpoint? That just became a reserve a few years ago because there never was nothing there before. Just a cemetery. Native cemetery was right there beside the lake. That's how all our people are getting back their areas because of the cemeteries, our people lived here before. And there's markings, there's a cemetery, you can see it. There was one place there in Sandpoint, when the water came high, the graves, the graves came up. … It's been a long journey to talk about this stuff, like what you see and what you hear from back then to today.

There are also concerns about the impacts of environmental contaminants (esp. glyphosate) on the access and efficacy of traditional medicines. One community member spoke about the Elders, stating, "Elders say that medicines from along the railroad tracks, or where boats have been or things that have come into contact with fuel, human waste, other contaminants or toxins is less effective."

Another Elder spoke about glyphosate spraying and the impacts on Indigenous medicines, stating:

> It's very important because there's still a lot of our elders and other people that seek for medicines in the wild. There is still lots of people like that that rather go and get their own medicines. But if our medicines are getting ruined, where are we going to go get

> that? How're we gonna heal ourselves if we don't have that? It is medicines we're talking about like now, a lot of people are taking Native Medicine, especially Elders, they drink their labrador tea every day. There's even other people that drink Labrador tea every day, you know [omitted sensitive cultural information]. They'd rather have that than go to see a doctor, you know to get that medicine. So now if that's not available for our people no more, where is people going to get their medication, especially the ones that don't go and see a doctor. And same thing with our medicine people, like our medicine men, we have medicine men, medicine women. They're healing our people. Whoever wants to get healed, they go get stuff for them, fresh. But if you can't get anything fresh, well, it's going to happen. Yeah. And same thing with the leaves. A lot of people use certain leaves. But if you're going to be spraying all this stuff, whatever's being sprayed, where it's being dropped, it's ruining everything.

In summary, community members discussed how the seasons were changing and how life occurs in cycles. It is also important to many community members to relearn and engage in traditional ways of doing things. Community members worry that environmental contaminants (esp. glyphosate) harm their ability to share their knowledges with the youth in their community and that they will lose their traditional knowledges. They also worry that environmental contaminants, particularly glyphosate, harm the efficacy of their traditional medicines and access to their traditional foods by impacting species distribution.

4.4 Advocacy, Solutions, & Calls to Action

Advocacy, solutions, and calls to action were especially important themes throughout my conversations with community members. Community members discussed testing waterways,

animals, and the land for contaminants. Community members also discussed the desire to have a seat at the table. They expressed wanting to be heard by the government and have their experiences and knowledges respected and included. They also discuss wanting more open and transparent communication from the government about spraying and generally, when anything is done on the land. Community members also asked for leadership to empower its members more.

AZA community members expressed that testing animals, waterways, and the land for contaminants was a starting point. One Elder said, "We almost gotta take your moose to the Ministry and ask him to get it tested to see if we can eat it or not."

One Elder spoke about testing the waterways and fish:

> Well, I think we need more investigation done on this. What's under there, and what's around that lake? What's causing all this stuff that's happening? … All the bodies of water should be checked. Yeah, all over. Anywhere at all where there's water flowing, the water should be checked (…) I would think, you know, when something's found like that, I do believe it should be brought to town. Put it in a plastic bag somehow and try to handle it carefully to pick it up and put it in a bag somehow and take it to one of the universities here to check on it, what maybe they might find some kind of a other kind of sickness that's going out there we don't even know of.

AZA wants their voices heard and a seat at the table when it comes to the land. As one Elder in the community stated:

> Give us more voice when any Ministry, um, laws or whatever should be passed, and brought forward to the First Nations to overlook and see if that suits US [the community] not what suits them for this. It's money that's been taken over our health, our livelihood, our animals, our eating, our drinking, our, you know, it's … it's … we have no say

> anymore and I think we need to start having a voice and we need to be taken serious. That's what's got us is we got to be at those tables a little bit more and have better representation.

The community also wants more communication from the government when it comes to the government spraying or working on the land in any capacity. They want consultation. One Elder said, "I think that should be looked at because there's a lot of stuff like they're doing to our land, they're not actually telling us exactly what it is, and I think we should be informed a bit more so we're aware of these things."

Multiple community members expressed wanting less industry on the land and no more extractive practices. One Elder said:

> I went on a study for Trans Canada Pipeline when they were talking about putting gas through one of the, because they have three lines that run through this area, so I took some ladies out that think concerns of crossings that go into Lake Nipigon. So, he said, well, what's your idea? And I said, well, I'm negative against it. He goes, Why? I said, if one of these things, you're going to ruin not only the commercial fishing, you're going to ruin all the sport fishing, all the animals, everything else along the shoreline because you're not going to contaminate it because there's major rivers that they're going to be crossing, the Nipigon River, they're going to be not, well, Nipigon River flows south, but the Blackwater River and stuff like that and all the creeks that go along there and what if it breaks, then it contaminates the whole lake, so and then you're never going to be able to clean it up, so I was kind of against that project, it never went through, but you know what I mean?

Other community members expressed similar sentiments, especially as it pertained to spraying. One Elder said:

> They sprayed there so [not audible] the wildlife the wildlife here [not audible] spray it so we'll have nothing. No more. We got nothing as it is. Even the moose are hard to find. Take the liver and the heart out and they're full of white shit, you know, like when's it going to stop? We've been complaining about this for years what it's doing to the animals. Nobody does nothing … It's all going to be changing because of what they're going to be doing up in all these mines around the lakes, so it's not just the animals or anything it's Mother Nature and the biggest problem is human. Human is our biggest problem. It's not the water because the water is not [not audible] a human it's not the land, the land was done by the humans you can't blame anyone but it's us really if you think about we're our own worst enemy … and when's it gonna stop?

Other community members mentioned humans as the common denominator. One Elder said, "Man is just as bad as everything." Another echoed this same thing, "You know, I've always said, everything man creates out here it's harming the Earth. It's harming everything out here, you know and it's just the way it is, you know it's the world we live in today."

One Elder in the community elaborated on this discussion by saying more about spraying:

> Yeah, I don't think it has to be done like that, but that's the way it is, I guess, do you know what I mean, it's … If the MNR wants to spray to try to grow trees better, I guess there's no way of stopping it, I don't think. It would be good if you can stop it, but I don't think you can. And same thing for the blueberries. Like where we are up in Auden there, they cut it that whole area back on the west side of the river. And now they started spraying

> over there. And there's blueberries growing, they're real nice. Now you can't go pick. You just look at your blueberries because you don't want to touch them because of that spraying. And now, partridge will come by there and start eating them, it doesn't know. A bear will come there and start eating them. He doesn't know that spray's there. So, I think this is what's, some of that animal, what's happening to the animals, I think it's got something to do with that. What they're eating out there. … But I don't think it will ever change. I think it'll just keep going no matter what people do and say, because it doesn't seem to want to budge because we've been after this for a long time already, as far as I remember, when even I was working, they were talking about that already. Not the [not audible], but they're still doing it. So, I don't think they'll ever change. To me, anyway, that's the way I feel about it. But, like you say, there's ways we prevent it, I guess. … But I don't think it's not only the people that's going to stop that. I guess it's going to have to be the whole … idea has got to be changed from what people are coming out there.

Community members mentioned they want to see an end to the spraying and a ban on glyphosate. One Elder spoke to manual thinning as an alternative method to spraying that is not being considered, "To me if, this spraying business, it's … it shouldn't have to be done. I don't think you shouldn't have to spray. Because I did the tree thinning myself before." One Elder called for a ban on spraying and also brought forward manual thinning as an option, stating:

> I think as far as I'm concerned, as far as the spraying of Vision or any chemical like that to kill off vegetation, I think it has to be stopped, period. I mean they never did it before and trees grew. They had people out there employed to thin it out manually. You know, the only reason why industry is doing it this way now is because they're trying to save money.

Returning to the manual thinning of trees would also create jobs for folks. One Elder said, "That's what I was thinking about, instead of using a power saw and spray. And now that would give more guys work. More people to go to work to do that because it takes a man and one tool to do that."

One community member spoke about wanting to see better leadership from within the community by empowering those within the community, "It's the [community] leaders - they need to be out there. They [community leaders] need to be in power and empower the people [community members]."

One Elder spoke about concern for future generations and lack of action saying:

> When you think about kind of these things, cause myself, I never thought about stuff like this before when I was younger. I never, it didn't, I never … The one time I ever thought like this the way, I think now after I start seeing what I see because what about my grandchildren? What about all these young little kids running around today? They're going to see that. It's going to be very punishing for them to see. And they're going to say, or maybe they're going to say, well, what happened to our elders back then? How come they didn't stop this? You got to think about them, not just us all the time. You know what I mean? Why is it like that? You know what I mean? It's always like the industries, they say, oh, we're going to protect, we're going to protect. You don't protect whatever like you say. In the future, what about the kids?

In summary, community members want waterways, animals, and the land tested for environmental contaminants and glyphosate. They also want a seat at the table and to be listened to. They want to be able to express their concerns to the government and be heard, respected, and have their knowledges and experiences considered when looking for solutions to the issues they

face. They also want to end industrial and extractive industries on their lands without consultation or consideration of community needs and goals. They want more open and transparent lines of communication about spraying and when the government does anything to the land. They want an end to the spraying on their lands and a ban on glyphosate. They want their community leaders to guide and empower their people.

4.5 Conclusion

In conclusion, AZA community members expressed concerns about what they are seeing in their experiences working and living on the land with environmental contaminants, particularly glyphosate. Community members are seeing changes in the distribution of plants and animals, and irregularities in the plants and animals they are harvesting because of the spraying. Accessing their traditional foods has become more difficult due to the scarcity of plants and animals post-spray, and rising food costs due to this lack of access. Community members are entitled to clear and open communication by the government about what is being done to their lands and to have their voices and perspectives considered regarding their concerns around environmental contaminants and their potential impacts on their lands and well-being. Community members find it important to return to their traditional ways of doing things, including having ties to their lands and passing knowledge on to future generations. Community members need to have a seat at the table where they can express their concerns and share their knowledges and ways of knowing around glyphosate and any other environmental contaminant that impacts the lives of both themselves, the land, and their non-human kin.

Chapter 5: Discussion and Conclusion

This research aimed to work with Animbiigoo Zaagi'igan Anishinaabek (AZA) to explore their lived experiences living and working on the land concerning the impacts of environmental contaminants and what can be learned from different ways of knowing. The intention was to explore how different ways of knowing could support AZA in understanding environmental contaminants. It is hoped that with this information, AZA members will work together to decide what the next steps will be so that members are able to obtain the information they need to make informed decisions for their own health, their communities, and the land. This is important to collaboratively advocate for the health and well-being of all beings on the land and in the waters. In this chapter, I synthesize what I have learned from the communities with the literature, and I share my reflections. I also discuss next steps and potential avenues for future research.

5.1 Discussion

Considering different ways of knowing is beneficial because being open to new ways of doing things is integral to our survival. There was a noticeable difference when considering my literature review concerning the findings from discussions with community members. What community members were seeing and experiencing was different from what I was reading in articles and reports, and this came as no surprise to me because I expected differences. My findings, when compared to the literature, followed much of what is outlined in Figure 1 of this thesis (see University of Minnesota, Great Lakes TEK, Figure 1 in Chapter 1). In general, many of the studies and articles I read about glyphosate were findings based on experiments done in industry settings and laboratories. These are often experiments done in very controlled and contained environments. The perspectives from community members are experiential and were

gathered over time based on their experiences being on the land and harvesting from the land and water, and also through the sharing of stories between community members, not only within AZA, but with other First Nations in the region. My findings suggest that while there are differences, if we accept the value in different ways of knowing, we can understand that multiple truths and experiences can exist simultaneously. It is not that Western knowledge is correct and Indigenous knowledge is wrong, or vice versa, because both systems are answering the questions that they set out to answer. What we need to be asking is whether we are asking the right questions to begin with, and whether all voices are present and accounted for in these discussions in order to get a more fulsome picture of the issues at hand. We will all benefit from acknowledging these multiple truths as we move forward to find solutions to complex problems.

Combining multiple ways of knowing (e.g., employing the Two-Eyed Seeing approach) means that we are always (re)considering our assumptions and perspectives in order to find a better way to accomplish tasks (Bartlett et al., 2015). As Bartlett et al. (2015), Two-Eyed Seeing means to "emphasize developing shared abilities to work with our different epistemologies and ontologies respectfully, see with the strengths or the best in our different worldviews, find common ground in innovative and meaningful ways" (p. 280). The aim is to engage in new ways of seeing the world and enable new forms of inquiry and community participation. Part of the goal of this research was to find common ground and new, meaningful ways to engage. Part of why this study developed as a Community-Based Participatory Research (CBPR) project was to explore opportunities for finding common ground. Gathering together, our research team decided collectively how we wanted to do this research, with AZA owning this project and all the data herein. I brought the knowledge that I researched based on the Western literature, and they

brought their experiential knowledge and expertise, which we then combined through this research project.

Working with AZA, this came through in our discussions because what they were seeing and experiencing with environmental contaminants, particularly glyphosate, in their community differed from much of what is in the current literature. It was apparent while at the gathering and conducting interviews that community members have significant concerns about what is being done to the land and how that impacts the plants, animals, and people living on it (i.e., all relations). The hard part about this research is that while discussing the issues with the community, many members spoke to environmental contaminants in more general terms, not just specifically to glyphosate. Sometimes I had to redirect the conversation to glyphosate because that was the chemical they wanted to look at for this study. I tried to note this in my findings to distinguish when glyphosate was being spoken of specifically over environmental contaminants more generally. For instance, some members spoke about mercury in the waters and calcium used to suppress dust on the side of the roadways.

My research demonstrated similar concerns as the scholarly literature about the impact of environmental contaminants on the land as those of other communities (Baxter & Dunne, 2021; Campeau & Porter, 2022; Patterson et al., 2023). AZA community members spoke about the issues they are finding in animals and fish, that their organs and the meat are not what they used to be. For example, community members have found animals with discolored organs, specifically the liver, kidneys, and lungs. They have also found moose with boils, blisters, or spots on the meat and organs. In fish, they have found boils, blisters, open sores, worms, and even organs that are like "goo." This matches what other communities have stated in the literature about

deformities in animals and discolored organs that do not have the normal consistency, which has often been described as "goo" (Campeau & Porter, 2022; Patterson et al., 2023).

Community members also shared their concerns over how they see plants, medicines, food, and their cultural practices being impacted by glyphosate use. They see fewer plants and animals in the bush than before spraying occurred. There was much shared sentiment that they cannot find berries like they used to, and that things are not bouncing back soon after spraying. Community members also mentioned that places where there are, in fact, berries, they cannot pick because of the spraying. This point also speaks to the lack of access that community members spoke to in length during the sharing circle and interviews. Many community members spoke about how, after the spraying, there are fewer moose and fewer berries, and that animals are disappearing. The scholarly literature also discusses these phenomena, that after a spray, moose and other animals tend to avoid areas that have been sprayed because the things these animals need for survival are not abundant (Chiblow, 2019; Connor, 1992; Lamy & Finnegan, 2019; Lowitt et al., 2023). Community members also spoke to the loss of efficacy and access to their medicines, which has also been found by other communities in the literature (Chiblow, 2022; Patterson et al., 2023). This also translates to community members having to spend more time and money accessing traditional foods because now they must travel farther and farther from their lands to try and find fish and game. This presents other issues since there is no guarantee that moving farther from their land means they will catch anything, and for them, that is a big expense if they have nothing to bring home.

It also became apparent that the lived experiences of community members and the knowledges they hold are not being taken as seriously as those of Western science by government representatives. Many community members expressed that they do not feel heard by

the government and do not have a seat at the table when making decisions about the issues the community faces. In multiple interactions, community members had with government representatives, they expressed that they were not listened to and their lived experiences with hunting, gathering, and fishing were brushed aside, even when the government was presented with evidence by community members. Multiple community members had discussions with Ministry of Natural Resources (MNR) representatives about spraying and their concerns. However, they were waved aside and told things were safe, even when community members had evidence to suggest otherwise. Multiple MNR representatives told community members that glyphosate was safe to drink yet refused to oblige when community members challenged this by asking them to consume it themselves. Community members also discussed the lack of communication regarding spraying and the chemicals that they are using. One Elder, who worked in forestry, mentioned having to do his own research to learn more about the chemicals used because the government did not provide this information.

This also matches sentiments in Patterson et al. (2023), where the government ignored First Nations' concerns about environmental contaminants and their impacts on the land. There has also been a lack of communication about the processes and chemicals used and the potential impacts that could happen with improper use and exposure. As I have spoken about previously, the use of glyphosate and glyphosate-based herbicides (GBHs) is a contentious topic globally. There is still no clear consensus on what glyphosate levels are safe with many in the scientific community asking for the re-evaluation of the current glyphosate thresholds since much of the research presented on glyphosate over the last decade is outdated (Jefferies, 2022; Patterson, 2023; Peillex & Pelletier, 2020; Vandenberg et al., 2017). Again, it is important to frame this in the context of Patterson et al. (2023) and the impacts on the Great Lakes region because, as it

was stated before, many human and non-human kin, Indigenous and non-Indigenous, make the Great Lakes Basin their home (ECCC & USEPA, 2022). A combined population of 35,371,814 people in Canada and the U.S.A. depends on the Great Lakes for drinking water, food, recreation, and ceremony. In addition, this research adds an additional qualitative Indigenous voice to this existing research in support of the findings in Patterson et al. (2023) within the Great Lakes region.

AZA community members also spoke of being displaced from their original territory and the impacts colonialism has had on intergenerational knowledge transfer. One Elder spoke about all the loss – every time they lose a species, they lose opportunities for future generations. They have lost their teachings because of residential schools, the '60s scoop, and flooding from the dams that forced them from their homes. As Kerr et al. (2024) argue, "The impacts of settler colonialism have interrupted intergenerational knowledge around harvesting and preserving traditional foods and resulted in limited Indigenous control over the use of traditional territories for food provisioning" (p. 172).

AZA Community members spoke about the cyclical way of life and nature and how everything has a purpose, which is represented by the "First Nations Perspective on Health and Wellness" published by the First Nations Health Authority (n.d.). Humans exist at the centre, just as in nature, because they have a responsibility to care for themselves and all their relations to ensure the success of all future generations. Community members spoke about embracing their traditional ways and planning for future generations. A lot of the information gathered in Western science about pesticides is gained from lab experiments, which are a contained and controlled environment, unlike nature, which is not. Indigenous Knowledge systems look at the land from a wholistic perspective and consider how all the elements in an ecosystem work together because

everything in nature serves a purpose and benefits the overall system, which is different than the way that Western science typically views the world (Patterson et al., 2023; also see Figure 1 in Chapter 1, which encapsulates this nicely in a visual way). As discussed, the current scientific literature and research begin from an underlying assumption about the accuracy of the Western, colonial framework. Indigenous Knowledge systems are tied to place and do not look to control or manage nature, but rather to work for the benefit of all relations, emphasizing the interconnectedness of beings in the natural world (see Figure 1 in chapter 1). Indigenous Communities have a unique perspective because of how their culture influences their relationships with the land. This was evident throughout my discussions and interviews with AZA community members.

Mi'kmaq Elder Albert Marshall spoke about taking the best of all knowledge systems and combining them to create a new way of seeing – Two-Eyed Seeing (Marshall, Marshall, & Bartlett, 2015). It is "weaving Indigenous and mainstream knowledges" (Bartlett, Marshall, & Marshall, 2012, p. 331) in a co-learning process that will enable us to answer the challenges we as a society face. Though often other terms are used in the context of Two-Eyed Seeing, such as "braiding" (Zeyer & Aikenhead, 2025), "fusing" (Zeyer & Aikenhead, 2025) "combining", "integrating", "merging", "blending" knowledges is also often described as a "fusing", "integrating", or "braiding" of knowledges in the literature. However, these terms are not meant to replace or be a synonym for the term Two-Eyed Seeing (Roher et al., 2021). Bartlett, Marshall, Marshall, & Iwama (2015) were very clear in what Two-Eyed Seeing means and what it does not:

"Integrative" is not used in the sense of two knowledge systems merged into one. The

> latter is not our intent and, moreover, would hold open the door to knowledge domination and assimilation, an undesirable new form of hegemony. "Integrative" is not used in the sense of only taking bits and pieces from Indigenous knowledges and ways of knowing and then appending them to Western knowledges and approaches. Unfortunately, this easily results when timeframes are hurried and/or when co-learning has not been part of the process. In addition, we do not use "integrated." This past tense implies a finished product, whereas our co-learning journey is envisioned as ongoing (p. 284-285).

Having multiple ways of knowing is important because each serves its purpose and gives us a whole understanding of the issues we face as a society. Integrating Western sciences and Indigenous ways of knowing is not about devaluing or dismissing knowledge; rather, it is about decentering Western sciences as the be-all end-all of scientific inquiry (Stein et al., 2024). It uses the best of all knowledge systems to make better and informed decisions about the issues that communities face. In the case of this research, while I was also learning Indigenous Knowledges, practices, and protocols, it was also important to the community that I share with them my knowledges and what I bring to the table. This is a big part of why I reviewed the Western literature and presented it to all of the communities of the Understanding Our Food Systems (UOFS) project at their gathering in the Fall of 2023. Based on this shared knowledge, AZA members reached out and wanted to do further work together.

While there is value in integrating different ways of knowing, tensions exist around this. It is also important to note that the braiding of Indigenous and Western knowledge can be difficult in practice as it requires relationship and trust building between groups, and it will take time and effort to build trust and relationships with Indigenous People. These things do not happen overnight. For myself, I was privileged in that I was able to access existing relationships

with AZA through the Thunder Bay Health Unit and my advisor, Charles Levkoe, in doing this work, and that was because of the relationships they curated with the First Nations Communities in the UOFS project over many years. Many of these tensions lie in the fact that many settler academics, researchers, and scientists have un/learning that needs to be done around colonization and how that affects our methods and research (Kerr et al., 2024; Stein et al., 2024). It is like Kerr et al. (2024) describe, we need to move beyond "good intentions" and do the hard work of "working through tensions and feelings of discomfort," which are an integral part of un/learning, so we can shift power structures in meaningful ways (p. 173). Moving forward must include reflexivity and interrupting the "business as usual" that we tend to reproduce rather than having reciprocal learning, true collaboration, and relationship building (Stein et al., 2024). Western science and knowledge systems need to move away from what Stein et al. (2024) call "epistemic exceptionalism and toward epistemic humility" (p. 5). We need to acknowledge that Western science and knowledge systems have limitations and can benefit from other knowledge systems' strengths.

Stein et al. (2024) argue that those trained in Western sciences currently might not be able to see the possibilities of different ways of knowing and that many fields, depending on how deeply entrenched they are in their ingrained assumptions, may not be committed or interested in doing this work. I also think about that as I move forward with this work, but Stein et al. (2024) and Kerr et al. (2024) say, we cannot let this diminish the work that Western science needs to do moving forward, nor should it exclude anyone from accountability while doing this work. It might be uncertain and challenging work, but that does not mean we should stop moving forward in it. We must embrace the hard stuff and commit to this work long-term for all relations to

benefit from it. Combining different ways of knowing can benefit and enhance Indigenous food sovereignty and health.

There are more calls to action and discourse surrounding the fusion of Indigenous Knowledge and science within research and policy development (Bradford, 2024). This is especially important since there is a distrust within the current research and findings, notably in industry-based and governmental studies, because there is little transparency (Patterson et al., 2023; Wilson et al., 2018). A recent study by Patterson et al. (2023) demonstrates that, drawing on discussions through a knowledge-sharing workshop with First Nations from across the Robinson-Huron Treaty Area, this perception of a lack of transparency exists. In the study, a participant remarked that "they [industry] give answers agencies want to hear rather than the actual truth about the impacts of glyphosate spraying" (p. 10). This distrust is understandable when, as discussed previously, there is a lack of consensus between academics and the government and between governments and their regulatory bodies regarding safe levels of glyphosate. Many participants in the Patterson et al. (2023) study mentioned concerns that "government and industry prioritize economy over ecology when making decisions regarding forest management" (p. 10), which also resonates with what AZA Community members expressed during our time together.

Moving to advocacy, solutions, and calls to action, AZA community members expressed interest in seeing more animal and waterway testing as a starting point. The inclusion of Indigenous Knowledges and Indigenous participation has been increasing in community-led and community-based environmental monitoring in the past few years (Thompson et al., 2020). Indigenous-led and Indigenous community-based environmental monitoring is shown to empower Indigenous Peoples and other rights holders, in addition to delivering reliable and

legitimate knowledge that is able to inform local decision-making and governmental policies (Mercer et al., 2023; Reyes-García et al., 2022; Wilson et al., 2018). Honouring and utilizing multiple ways of knowing is beneficial because of the "complementary differences between Indigenous and scientific knowledge systems, which can add to collective understandings of the complex systems being monitored" (Thompson et al., 2020). This is a growing area that is not without challenges, and there are important things to consider when combining different ways of knowing and co-learning and co-creating. In community based monitoring, in many cases, the depth of research outcomes has been limited due to unequal power relationships between external parties and Indigenous community members (Mercer et al., 2023; Thompson et al., 2020; Wilson et al., 2018), as well as the contributions of Indigenous Peoples have often been limited to data collection and little else (Mercer et al., 2023; Thompson et al., 2020). We must honour each other and move in ways that show respect, reciprocity, and focus on community priorities (Mercer et al., 2023).

AZA community members want to a seat at the table and have their opinions considered when laws and regulations are being passed. The government also needs to be accountable and communicate more transparently and consistently with community members about their actions and processes. For example, community members want to know more about what they are doing to the land, what chemicals they are using, and their potential impacts. It should not be up to community members to do extensive research to understand these processes. Many community members would also like to see a stop to extractive industries on their land and an end to spraying. Community members want access to their lands and to practice their culture, passing their knowledges on to the next generations. It is, as Kerr et al. (2024) state, "To exercise food sovereignty, Indigenous Peoples must have access to land and resources to revitalize language

and cultural practices that were stolen or banned" (p. 173). Community members want better leadership from within and for community leaders to empower their members. One Elder mentioned that community leaders need to be out there with the people and empowering them.

5.2 Strengths, Limitations, Next Steps & Future Research

A major strength of this research is that it was a collaborative and community-based research project where I could talk to people directly, be with them in their spaces, and hear their stories and experiences. Through the relationships I built with Charles Levkoe, Kim McGibbon, the UOFS project, and AZA, I could access community members and knowledges I would not have been able to access had I attempted to do this work alone. Another strength is that I remained open to the knowledges and stories shared with me in this work. Going into this project, I had no expectations of the community, nor did I have a particular idea or issue I wanted to push. I knew that AZA had concerns about the impacts of glyphosate on their community, which they wanted to explore and give voice to, and I just wanted to hear their stories and experiences. I wanted AZA to have their voices heard and shared in the way that they wanted to express themselves. I believe that people should be listened to for who they are and be able to speak on their own behalf.

This project also had a few limitations, many of which could be addressed with the next steps and potential future avenues of research. First, only about half of the members in the sharing circle signed consent forms to participate in this study. This had implications for the findings since voices were missing from the conversation. There was also a lack of data about what kinds of communication AZA is looking for from the government, and guidance on how the government could communicate with the community in a better way. Also, due to my lack of

experience facilitating a sharing circle and one-on-one interviews, there were many times when the discussion focused more broadly on environmental contaminants rather than glyphosate specifically, which impacted the scope and specificity of the findings. I had to be thorough when reviewing the data and making my findings. I had to note when community members spoke specifically about glyphosate and spraying, or whether it was more general to environmental contaminants.

This project is the first part of an ongoing study. During my research, multiple AZA community members pointed me to other First Nations Communities in the region and leaders who should be brought into this discussion. Thus, there is potential to expand this work into other communities through the UOFS project to get their input on these same issues. This research also adds to existing debates on glyphosate's impacts on human and environmental health and well-being, within the context of First Nations communities. It could inform action and community-based monitoring opportunities between external stakeholders and Indigenous communities.

In addition, this research adds to the existing literature on using diverse ways of knowing when addressing complex issues, such as environmental contaminants' impacts on the health and well-being of First Nations across Canada. It could also contribute to ongoing Indigenous food sovereignty work in the community and through the UOFS project across the region. One way this project reaches others is through a presentation of my findings to the fourteen regional First Nations communities within the UOFS project at the UOFS gatherings. I also created a report to augment this presentation and support communities further. I plan to work with the research team and AZA to publish a scholarly article to bring this information into academic communities.

I presented this research at the annual 2025 Canadian Association for Food Studies (CAFS) held in Toronto, Ontario, from June 2-5, 2025, at George Brown College as part of the Federation for Humanities & Social Sciences Congress (running from May 30 to June 6, 2025). The theme of this year's conference was *Foundations, Evolutions, & Revolutions*, which fit the overall congress theme this year of *Reframing Togetherness* (CAFS, 2025).

In addition to my research presented here, a second part of this project with AZA is that the youth in their community are collecting video footage of different land-based harvesting activities. Through the UOFS project, the youth are working with a videographer to learn how to curate their footage into a series of documentary-style videos that they will overlay with testimonials and stories they have collected from interviews they have done with Elders and other Knowledge Keepers in their community. The video project will impact all facets of planetary health: humans, other animals, plants, watersheds, food systems, and the air.

Based on study limitations, a few areas could benefit from future research. Firstly, it would be beneficial to follow up with the community on this topic and see if more community members want to give their voice to this project. It would also be beneficial to hear from the community directly about what kinds of communication they want from the government and guidance for how the government can do better. It would be beneficial to look at environmental contaminants in partnership with AZA on a broader level, rather than specifying only one contaminant, because environmental contaminants are multi-faceted and work in the environment in different ways, both independently and when they combine together, creating newer, different compounds in nature. Also, building on the observations from community members of the abnormalities they are seeing on the meat and organs of animals, as well as their ask to have more testing done, this would be a great opportunity for AZA to partner with

scientific collaborators to pursue a grant to start testing of the waterways, as well as the plants and animals that the community is harvesting to see what could be there.

5.3 Concluding Thoughts

In conclusion, the purpose of this research project was to consider different ways of knowing to support AZA and other First Nations in understanding environmental contaminants so that members have better information to make informed decisions for the health of themselves, their communities, the land, and all other relations. While AZA has expressed many concerns similar to those of other First Nations on environmental contaminants and their impact on the land, they have also expressed solutions and calls to action. They want a seat at the table and for First Nations to have a voice on these issues that affect their communities. They want an end to the contamination of their lands and the impeding of their rights on their lands.

This research can add to existing debates on glyphosate's impacts on human and environmental health and well-being, especially within the context of First Nations communities, and inform action between communities since this work is also being done in other regions. It also has a goal of adding to the existing literature about using different ways of knowing when it comes to addressing complex issues, such as social and environmental health and well-being, and will contribute to ongoing Indigenous food sovereignty work in the community and across the region. This study also informs research on the impacts of glyphosate and GBHs in the Great Lakes region, home to a combined population of 35,371,814 people in Canada and the U.S.A. (ECCC & USEPA, 2022). This study adds Indigenous voices to the existing research within the Great Lakes region. Environmental contaminants impact all facets of planetary health: humans,

other animals, plants, watersheds, food systems, and the air. This research hopes to add to the wider public health and health sciences discourse on planetary health.

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Appendix A – Talking Circle Question Guide

Sharing/Talking Circle Schedule

Notes:

- Liz Lovell, MHSc student, and Kim McGibbon, RD, MScCH, Public Health Nutritionist, TBDHU, will co-facilitate this event with AZA .
- A schedule of times and a date to be determined with the community. The sharing circle will occur during an Elder and Youth gathering in July/August of 2024, which has yet to be determined.
- Sharing circle will last for approximately 90 minutes

Time	Activity	Details
10 minutes	Smudge	This will be organized with the community to follow their protocols. We will also consult if tobacco bundles would be appreciated and are something we can make and bring to the event.
10 minutes	Project overview	We will introduce ourselves and the project. In addition, we will create handouts with the project information available for members who would like to have this for their own records. "This project intends to build on previous work done in partnership with Understanding Our Food Systems, that began in 2018. An Indigenous Food Sovereignty Assessment (IFSA) was conducted in 2022 with TBDHU through this project. A key theme of land stewardship came from this assessment. More specifically, confusion and concern about spraying chemicals, like glyphosate, on your territories and what that does to the berries, animals, medicines, fish, the land, people, and sharing Traditional Knowledge with younger generations. Many of you have noted the impacts this has had on your community, with things such as an increase in illness and disease. The purpose of this sharing circle is to hear more about your concerns, needs, goals, and hopes in relation to these concerns."
10 minutes	Consent	Consent forms will be read aloud, and members can sign or verbally consent to participate. It will be emphasized that they can withdraw their participation at any time, and they only need to contribute what they are comfortable with. We will also get consent to videotape or record audio of the day's events and to take notes throughout.
15 minutes	Introduction	Each participant will introduce themselves and share and describe their photo.

40 minutes	Discussion	Question prompts to promote discussion: 1) What kinds of traditional foods do you hunt/gather/fish/grow? 2) What is the value of these foods to you? 3) How has accessing these foods changed over time? 4) What are your concerns about the spraying done in your territory? 5) What have you seen and/or experienced that have caused these concerns? 6) What do you think should happen to address these issues?
5 minutes	Closing	Thank everyone and share next steps.

Appendix B - Information Letter

Understanding the Impacts of Glyphosate Spraying on the Territory of the Animbiigoo Zaagi'igan Anishinaabek

Dear Potential Participant,

Thank you for your interest in this research project. Your time and help are truly appreciated. This sheet gives some basic information on the research, what you can expect, how the data will be handled and used in the future. If anything is unclear or you want more information, please feel free to ask any question you wish, our contact details are at the end of this document.

What is this research about?
This research project is an AZA community-led initiative, in collaboration with Thunder Bay District Health Unit and Lakehead University as part of the work done for Understanding Our Food Systems. In 2022, there was an Indigenous Food Sovereignty Assessment (IFSA) conducted through this project and land stewardship was a key theme. There was expressed confusion and concern about the spraying of glyphosate and what that does to the berries, animals, medicines, fish, the land, people, and sharing traditional knowledge with younger generations.

We want to know your experiences with the spraying of glyphosate and how that impacts individuals and the community. A sharing circle is being organized to hear more about your concerns, needs, goals, and hopes in relation to these concerns.

What is being requested of me?
You are being invited to participate in this research because of your ties and connections with the community. The sharing circle should last about 90 minutes. We would also ask you to bring a photograph or object of the land where you harvest and share a story about what it means to you. Your participation is completely voluntary; you may refuse to answer any questions or withdraw from the study at any time.

Some questions we are looking to discuss in the sharing circle include:

- What kinds of traditional foods do you hunt/gather/fish/grow?
- What is the value of these foods to you?
- How has accessing these foods changed over time?
- What are your concerns about the spraying done in your territory?
- What have you seen and/or experienced that have caused these concerns?
- What do you think should happen to address these issues?

Are there any benefits or risks I should be aware of?
While there are very few perceived risks from participating in this research, some questions may be perceived as sensitive, and you may not want certain information made available. Your participation is voluntary, and you are only being asked to offer information you feel comfortable sharing with us. Also, you will have the choice whether you want your name included in the study or not, but it will not be possible to remove your identity in the actual sharing circle since it is a group discussion.

How should I expect to be treated?
In participating in this research, you should feel that you and your contribution to this research, have been treated with respect. Participation is voluntary and all information offered will be treated in good faith. You have the option to have any information you present tied to your identity or it can remain completely confidential. You are welcome to refuse to participate, withdraw from the research at any time and refuse to answer any of the questions asked without any negative consequences for yourself or your organization. All questions about the research, its aims and outcomes will be answered openly and honestly. While the researchers have control over what we write, you are free to withdraw your information at any stage by contacting us and indicating your wish to do so.

This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team, please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.

What will happen to the data after it is collected?
In all cases, nothing you say will be attributed to you individually, unless you choose to have your words attributed to you and to be named in the study. Only the researchers and AZA leadership will have access to the sharing circle transcripts and identifiable materials (including audio recordings, hand-written notes, photographs, and consent form). Summarized results, key findings, and recommendations will be shared back with all participants along with the broader AZA community. All raw data, audio recordings, and typing up of interviews will be stored on password-protected computers and in locked filing cabinets for seven years and then destroyed. The final research results, including key findings and recommendations, will be shared back with the AZA community through presentations, plain language reports, visuals (e.g., infographics), a master's thesis, and video testimonials. We also plan to host a webinar to share results with others in Northwestern Ontario and beyond.

If you have further questions about these processes or feel uncomfortable with any aspect of them, please let us know as soon as possible.

Thank you again for your time and assistance,

Liz Lovell (they/them), Lakehead University
e. elovell@lakeheadu.ca

Kim McGibbon, Thunder Bay District Health Unit
t. 807-625-5956 e. kim.mcgibbon@tbdhu.com

Charles Levkoe, Lakehead University
t. 807-346-7954 e. clevkoe@lakeheadu.ca

Appendix C – Consent Form

Lakehead UNIVERSITY

Name of Participant _____
(please print)

- I have discussed the details of this research project and agree to participate in the research.
- I understand that the purpose of the research is to discuss the impacts of glyphosate on the health and wellbeing of myself and my community.
- I understand that my participation in this study will bring minimal risks or harm.
- I understand that my participation in this study is voluntary and that I may withdraw at any time for any reason without penalty.
- I understand that there is no obligation to answer any questions that I feel are invasive, offensive, or inappropriate.
- I understand that I will remain confidential in the research (i.e., not be named) unless indicated below).
- I understand I may ask questions of the researcher at any point during the research process.
- I understand that the information in the sharing circle will be video or voice recorded.
- I understand that the results of this study will be shared with members of UOFS, TBDHU, Lakehead University, and my community.
- I want to be identified by name in the research Yes No
- I agree to have this interview recorded (please circle one): Yes No
- Would you like to receive a copy of the research results (please circle one): Yes No

I am fully aware of the nature and extent of my participation in this project as stated above.

_____ _____
Participant's Signature Date

If you have any questions or concerns about this study, please contact Dr. Charles Z Levkoe (clevkoe@lakeheadu.ca; 807-346-7954). If you have questions about your rights as a research participant in general, please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.