First Nations and Adaptive Water Governance in Southern Ontario, Canada

by

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I certify that the above material describes work completed during my registration as doctoral student at the Wilfrid Laurier University.

I declare that this is a true copy of my dissertation, including any final revisions, as approved by my dissertation committee and the Graduate Studies office, and that this dissertation has not been submitted for a higher degree to any other University or Institution.

Abstract

Water quality and quantity are prominent concerns for First Nations across Canada. The federal government shares the responsibility with First Nations to ensure water resources on-reserves meet the needs of First Nations. Federal approaches have been predominantly technical, focused on addressing issues related to infrastructure, maintenance, training, and monitoring. This approach is important. However, water issues concerning First Nations go beyond technical issues and relate to inadequate participation in decision making, poorly defined roles and responsibilities, and approaches to managing water resources on-reserve that have not accounted for local context. These issues parallel historical nation-to-nation (i.e., First Nations and federal government) governance challenges in a broader range of social and economic development settings.

The purpose of this research was to examine the potential emergence of adaptive forms of water governance in three First Nations contexts in southern Ontario to ameliorate current limitations in practice. The key objectives that guided this research were to: (1) characterize and assess water management and water governance in the three case studies using the multi-barrier approach for drinking water safety; (2) identify and critically examine institutional attributes and conditions (i.e., capacity) that facilitate or constrain adaptive forms of water governance in each of the case study sites, with particular reference to opportunities for analytic deliberation, institutional variety, and linkages across scales; and (3) examine the multi-level institutional setting of the case studies for empirical evidence of adaptive water governance and to identify opportunities to foster it.

Three First Nation communities were the setting for this research: Six Nations of the Grand River, Oneida Nation of the Thames, and Mississaugas of the New Credit First Nation. The research involved actors both on-reserve and off-reserve including representatives from federal, provincial, and municipal governments, watershed organizations, non-government organizations, and citizen groups. Multiple qualitative methods were used to triangulate the findings (i.e., semi-structured interviews, archival data gathering, secondary date gathering, and direct observation). The research utilized the multi-barrier approach to safe drinking water to characterize and assess water management and water governance issues in the case studies. Drawing from this characterization and assessment, the research identified and critically examined institutional attributes and conditions that facilitate or constrain adaptive forms of water governance in the case studies utilizing an institutional lens. Finally, the research examined the multi-level institutional setting of the case studies for empirical evidence of adaptive water governance and identified opportunities to foster it and enhance water quality and quantity.

The findings shed light on community perspectives that are often absent in literature discussing the social and political contexts that define First Nations water rights and responsibilities in Canada, including experiences with colonialism and discrimination. Community perspectives have revealed divergent understandings of decision making authority and legitimacy, formal institutions for managing water on-reserve that are incompatible with cultural norms, and a lack of community engagement in water issues. Poor sharing of knowledge (both scientific and traditional) and unclear roles and responsibilities constrain First Nations from responding effectively to the water issues they confront. In response, this research identified governance opportunities to foster adaptive forms of water governance in First Nation contexts, including acknowledgment of underlying socio-political conditions, creating space within current formal arrangements

for alternative approaches to water management to be recognized and substantiated, and mediating divergent assumptions about rights and responsibilities among water managers.

The research offered several important contributions to theory, practice, and methodology in water governance. For example, this research contributed conceptually to an emerging literature on adaptive water governance, and in particular, how it resonated (or does not resonate) within First Nations contexts. It did this by drawing attention to the role current institutions (e.g., rules, legal frameworks and norms) may have in constraining or creating opportunity for adaptive forms of governance. The research also contributed conceptually to understanding what a multi-barrier approach means in the context of First Nations in Canada. The insights here are relevant in Ontario and Canada more broadly, where challenges implementing the Multiple Barrier Approach (MBA) in First Nation contexts have been voiced.

Empirically, this research reinforced the need to acknowledge and include First Nation approaches in water management practice. It did so by bringing to the forefront First Nation water management practices of three First Nation communities, particularly for protecting water resources on-reserve, and in terms of highlighting what is working and what is not. These insights provide guidance for advancing water policy and practice toward the meaningful involvement of First Nations in decision making, and a commitment to include the cultural practices required to foster more adaptive forms of governance.

Methodologically, the research made a contribution by utilizing two analytical frameworks. First, the research made a contribution through the use of the multi-barrier approach as a framework to characterize and assess water management and water governance in First Nations contexts. The adaptability of this framework may be useful for use in First Nation contexts as a way to identify key drinking water management and governance challenges. Second, the research extended Dietz et al.'s (2003) framework depicting institutional strategies for adaptive governance to examine and understand how these strategies may be operationalize and assessed in First Nations contexts. The extension of the framework may be helpful to explore constraints and opportunities to manage and govern resources in other marginalized communities.

This research presented five recommendations to enhance opportunities for more adaptive forms of water governance in First Nations in southern Ontario: (1) Give further attention to potential divisions between groups on-reserve and the implications for water governance, (2) build support for and maintain the relationships that enhance water governance but which often transcend legally defined mandates and/or jurisdictions, (3) foster a common understanding of the different 'legitimate voices' that must be incorporated in efforts to support adaptive water governance, (4) be open to First Nation approaches to managing water resources that may be based on cultural practices and norms, and (5) identify new opportunities to foster the financial stability needed for adaptive water governance. Collectively, the findings and recommendations from this research developed the concept of adaptive water governance and help to bridge the gap between concept and practice.

Dedication

For Sol, my joy and motivation.

Acknowledgements

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List of Abbreviations

AANDC	Aboriginal Affairs and Northern Development Canada
AFN	Assembly of First Nations
CIER	Centre for Indigenous Environment Resources
COO	Chiefs of Ontario
EC	Environment Canada
CCME	Canadian Council of Ministers of the Environment
FNWMS	First Nations Water Management Strategy
GNRA	Grand River Notification Agreement
GUDI	Groundwater under the influence of surface water
GWP	Global Water Partnership
HC	Health Canada
MBA	Multi-barrier Approach
NGO	Non-government Organization
NPRF	National Priority Ranking Framework
OCWA	Ontario Clean Water Agency
SDWFNA	Safe Drinking Water for First Nations Act (2013)
SPC	Source Protection Committee
UNWWAP	United Nations World Water Assessment Program
GVWSP	Grand Valley Water Supply Project

Chapter 1
Introduction

1.1 Problem Context

Why do First Nations continue to be confronted with water quality and quantity

issues in Canada? Access to safe drinking water is a prominent concern for First Nations[1] in

Canada (Christensen et al., 2010; Government of Canada, 2005). As of June 2016, 134

Drinking Water Advisories were in effect in 93 First Nation communities across Canada,

excluding British Columbia; some of these advisories are long-term and have been in place

for multiple years (Health Canada, 2016). Reports issued by government and non-

government organizations alike reflect the severity of water issues confronting First

Nations (water quality and quantity). For example, reports by the Office of the Auditor

General of Canada, Polaris Institute, Sierra Legal Defence Fund, Ecojustice, Assembly of First

Nations (AFN) and the Centre for Indigenous Environmental Resources (CIER) argue that

poor access to water on First Nation reserves is a pressing issue (AFN, 2011; CIER, 2009;

Christensen et al., 2010; Christensen, 2006; Government of Canada, 2005; Harden &

Levalliant, 2008).

Water quality and quantity issues are specifically acute on First Nation reserves.

Reserves are tracts of land set aside for First Nations in the Indian Act (1876). Boyd and

Phare (2010) identify the following three main reasons the deplorable situation regarding

safe water persists. First Nation governments often cannot afford to invest in new

infrastructure (e.g., treatment facilities and distribution systems) on reserve leading to an

ongoing water crisis (AFN, 2008; Christensen et al., 2006; Harden & Levalliant, 2008; Swain

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[1] First Nations refers to a group of Aboriginal Peoples recognized within the Canadian Constitution with unique histories, languages, cultural practices and spiritual beliefs (Government of Canada, 2011)

et al., 2006b). The federal government has jurisdiction over reserve affairs including

ensuring First Nations have adequate infrastructure to address water resource issues. The

degree to which First Nation governments can ensure adequate water resources on reserve

is often limited to working within the confines of the funding model from Aboriginal Affairs

and Northern Development Canada (AANDC). AANDC provides First Nations with up to

80% of costs associated with infrastructure; however, First Nations across Canada routinely

fall short of being able to raise the additional 20% due to a limited tax base and additional

revenue sources (Harden & Levalliant, 2008; Swain et al., 2006b)[2]. Second, reserves are a

regulatory 'black hole' as provincial regulations do not apply and the adequate legal

framework by the federal government is wanting (Boyd & Phare, 2010)   While water flows

across the boundaries of reserves legal requirements and approaches to water management

do not. (see Section 1.5 for more details about the limitations of using the reserve as a

boundary for this research). Finally, the absence of running water in First Nation

communities has not been historically prioritized by the federal government (Boyd & Phare,

2010).

In an effort to address issues of water quality and quantity the federal government

has implemented a number of strategies, plans, panels, and protocols[3] most of which are

directed at improving drinking water quality. For example, in 2002 the federal government

(i.e., AANDC) developed the First Nations Water Management Strategy (FNWMS) to address

gaps in water management (e.g., gaps in water monitoring, outdated infrastructure,

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[2] The current land tenure, particularly inadequate arrangement of property rights, on reserve is well recognized as a limitation in enabling economic development on First Nation reserves (Baxter & Trebilcock, 2009; Natcher et al., 2009).
[3] Under the Canadian Constitution Act, 1867, s.91(2.4) the federal government is responsible for First Nation affairs including issues related to water (AANDC, 2007; Phare, 2009). Provinces are primarily responsible for providing and implementing laws and regulations concerning water, and municipalities are responsible for water delivery for uses such as drinking, industry and agriculture (AANDC, 2007; Phare, 2009).

inadequate operations and maintenance, inadequate training for operators, poorly defined

roles and responsibilities, lack of awareness within the public, and poorly defining

standards, protocols and policies) (AANDC, 2007). By 2005, few improvements were

realized (Government of Canada, 2005), leading the federal government to develop the Plan

of Action for Drinking Water for First Nations (AANDC, 2009). The plan of action had

several important outcomes. First, it developed the Expert Panel on Drinking Water for First

Nations, a panel tasked with reviewing existing regulatory frameworks, collecting

suggestions from involved actors, and developing new regulatory options (AANDC, 2006).

Second, the Plan of Action for Drinking Water for First Nations developed the Protocol for

Safe Drinking Water for First Nations (AANDC, 2006). This protocol brought together all

applicable standards and requirements for drinking water systems utilizing the Multi-

Barrier Approach (MBA) to Safe Drinking Water[4] as a guide. Third, the Plan of Action also

initiated mandatory training for operators, specific remedial plans for high risk

communities, and regular progress reports. To complement the Plan of Action for Drinking

Water for First Nations, in 2008 the federal government implemented the First Nations

Water and Wastewater Action Plan (AANDC, 2009). The plan designated 300 million dollars

toward infrastructure development and upgrades, monitoring, operations, programs and

procedures. In sum, these strategies, plans, panels and protocols implemented by the

federal government have focused primarily on technical aspects of drinking water

challenges confronting First Nations.

Despite these efforts, ongoing challenges remain. Lack of federal regulation of

drinking water on First Nations reserves is an ongoing concern (Bakker & Cook, 2011;

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[4] The Multi-Barrier Approach to Safe Drinking Water is "an integrated system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health (Canadian Council of Ministers of the Environment 2002). The Multi-Barrier Approach will be discussed in detail in Section 1.3.1.

Christensen, 2006; Government of Canada, 2009) and has been cited as playing a role in the federal government's poor performance fulfilling its responsibility to ensure access to safe drinking water for First Nations (Christensen, 2006). The federal government has recognized this shortfall and work has begun to develop new legislation and regulations, (i.e., Safe Drinking water for First Nations Act, 2013). However, as of August 2016 regulations have yet to be developed leaving First Nations to remain within a regulatory gap for drinking water. One challenge that plagued the development of regulations is a lack of engagement with First Nations. In the Act's present form, Chiefs of Ontario, Andre Morriseau argued in a press release that it will offload onto First Nations the fiduciary responsibilities of the federal government to provide safe drinking water, putting increased pressures on already stressed resource capacities (financial, human, and infrastructural) (Morriseau, 2011). Further, the relationship between the federal government and First Nations Peoples has historically been one of dominance and subjugation that may facilitate or constrain how First Nations respond when confronted with water challenges (Walkem, 2007). Kahn et al. (2001) argue that legislation (e.g. the Indian Act [1876]) and civilization and assimilation policies have contributed to a loss or change in values, relationships, and responsibilities surrounding water held by First Nations. This argument by Kahn et al. (2001) illustrates the potential linkages between governmental institutions and the values, relationships and responsibilities held by First Nations, a relationship that may have a role in influencing how First Nations respond to water-related challenges. Institutions are defined in this research as human constructs that shape and are shaped by human behaviour and are often described as forms of rules that can be nested structurally, spatially, and temporally within cultural, social, economic, and political contexts (Hall & Taylor, 1996; Scott, 1995; Vatn, 2005).

These developments in the regulatory environment for drinking water for First Nations illustrate that the water challenges confronting First Nations include both technical and non-technical issues. The federal government has made some headway to solve technical issues through improved infrastructure, training regimes, monitoring, and funding for operations, programs and procedures, but more work needs to be done to understand how First Nations are to participate in the process, define roles and responsibilities, and be open to alternative strategies to manage water resources.

This line of thinking parallels the United Nations World Water Assessment Programme (UNWWAP, 2015) and Global Water Partnership's (GWP, 2000) acknowledgement of water challenges experienced globally as a crisis of governance, where social, economic and political factors intersect to determine how actors use and control water resources. Increasingly, the process of water governance involves government as well as other non-government actors (e.g., Non-government organizations [NGO], watershed organizations, citizens, and First Nations). Here water governance is referred to as the "range of political, organizational and administrative processes through which interests are articulated, input is absorbed, decisions are made and implemented, and decision makers are held accountable in the development and management of water resources and delivery of water services" (Nowlan & Bakker, 2007, 14). The involvement of diverse actors is conceptualised to improve accountability by incorporating multiple levels of decision making (local, regional, national), multiple values and information sets, and by drawing upon diverse knowledge sets to make decisions (Pahl-Wostl et al., 2008; Rogers & Hall, 2003; UNWWAP, 2003).

Increasing attention is being given to the importance of water governance arrangements that are flexible and adaptive to deal with complex multi-level challenges (Akamani & Wilson, 2011; de Loë & Plummer, 2010; Pahl-Wostl, 2008). However, adaptive

water governance is an emerging concept that warrants additional examination in diverse contexts, including in First Nations settings as is the focus of this dissertation. In the context of the water related challenges confronting First Nations as outlined above (i.e., the emergence of new legislation, issues of resource capacity, concerns about engagement, equity, and uncertainty), First Nation leaders and water researchers alike are calling for more collaborative and flexible arrangements among the actors involved in water governance (Christensen et al., 2010; Morriseau, 2011). In addition, there is increased recognition of the value of involving diverse knowledge sets, interests and values in adaptive decision making processes (Anishinabek Ontario Resource Management Council [AORMC], 2009; Kahn et al., 2001) to address the water related challenges confronting First Nations. Despite the rhetoric, however, the potential emergence of more adaptive forms of water governance in the context of First Nations in Canada requires further analysis, and additional consideration of how such forms of governance may complement existing arrangements.

1.2 Research Objectives

The purpose of this research was to examine the potential emergence of adaptive water governance in a First Nations context in southern Ontario. Three First Nation Communities are the setting for this research: Six Nations of the Grand River, Mississaugas of the New Credit First Nation, and Oneida Nation of the Thames (see Section 1.4 for more details about the research setting). Parts of this research also involved actors outside of these communities that include representatives from federal, provincial, and municipal governments, watershed organizations, NGOs, and citizen groups. The key objectives that guided this research were to:

1. characterize and assess water management and water governance in the three case studies using the multi-barrier approach for drinking water safety;

2. identify and critically examine institutional attributes and conditions (i.e., capacity) that facilitate or constrain adaptive forms of water governance in each of the case study sites, with particular reference to opportunities for analytic deliberation, institutional variety, and linkages across scales; and,

3. examine the multi-level institutional setting of the case studies for empirical evidence of adaptive water governance and to identify opportunities to foster it.

Each objective forms part of a sequential approach to examine the potential emergence of adaptive water governance in First Nations contexts in southern Ontario. The purpose of the first objective is to understand current approaches for managing and governing water resources on reserve with reference to the multi-barrier approach for drinking water safety. Exploring how First Nations participate in and define their role and responsibility for managing and governing water resources is essential for understanding the practices being undertaken within the communities.

Characterizing water management and governance on reserve using the multi-barrier approach for drinking water safety provides the foundation upon which the potential for adaptive water governance may be critically examined. The purpose of the second objective is to identify and probe the constraints and opportunities of First Nation's ability on-reserve to respond to water issues in relation to adaptive water governance.

Water management and governance takes place across and within multiple levels of society (e.g., national, provincial, regional, First Nation). In order to examine the potential emergence of water governance in First Nation contexts it's necessary to capture their multi-level nature in this assessment. The third objective therefore explores experiences

within and across levels at which water management and governance takes place to glean empirical evidence of the concept of adaptive water governance in First Nation water contexts. Each of these objectives, when compiled together help explore and examine the concept of adaptive water governance and its potential emergence in First Nation water contexts in southern Ontario.

This research followed a larger research project titled, First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance. The larger project's overall aim was to enhance source water governance in First Nation communities. Drawing on participatory methodologies, the larger research project involved a research team that was made up of three university partners (Brock University, University of Waterloo, and Wilfrid Laurier University) and three First Nation partners (Oneida Nation of the Thames, Six Nations of the Grand River, and Mississaugas of the New Credit First Nation). Each community was represented by a community research partner who played an active role in guiding the research. The project received ethics approval through each community-specific mechanism and from the Research Ethics Board at Brock University and Wilfrid Laurier University. The research described in this dissertation extends this larger research project by exploring adaptive forms of water governance in First Nations contexts. This research is a unique project with original contributions to knowledge.

This doctoral research was conducted in partnership with the Mississaugas of the New Credit First Nations, Six Nations of the Grand River, and Oneida Nation of the Thames First Nation. Formalized within an memorandum of understanding and through community ethics protocols, each community provided a research partner (water leader within their community) to work with me to drive inquiry, help guide the interpretation of findings, and

ensure research activities are conducted appropriately within their particular community context.

1.3 Literature Review

This section introduces the main bodies of scholarship used in this dissertation to provide scholarly context to understand and address the research problem and achieve the research objectives. The bodies of scholarship fall broadly within three sections: water governance and First Nations in Canada (Section 1.3.1), institutions (Section 1.3.2), and adaptive approaches to engage with water (Section 1.3.3). Section 1.3.1 outlines key scholarship related to water governance and First Nations in Canada. A critical review is provided for how water is governed in relation to First Nations in Canada highlighting gaps and opportunities in governance germane to the research problem and achieving the first objective. Section 1.3.2 highlights the role of institutions in fostering or constraining adaptive forms of water governance. Specifically, it highlights scholarship that examines historical institutions and their potential role in driving how adaptive forms of governance emerge in First Nations contexts. Section 1.3.3 establishes the relevance of adaptive governance scholarship as an approach to decision-making in situations of complexity and change.

1.3.1   Water governance and First Nations in Canada

Conventional water governance approaches founded in technocratic and regulatory solutions have been argued inadequate in assuring the sustainability of water resources (Gleick, 2003). Consequently, the process of water governance increasingly involves government as well as other non-government actors (e.g., NGOs, watershed organizations, citizens, First Nations). The involvement of diverse actors is conceptualized to improve accountability by incorporating multiple levels of decision making (local, regional, national),

multiple values and information sets, and by drawing upon diverse knowledge sets to make

decisions (Pahl-Wostl et al., 2008; Rogers & Hall, 2003; UNWWAP, 2003). This is the case

for water governance in Canada where the responsibility for water is spread across

municipal, provincial, federal, and First Nations boundaries (Kahn, 2001; McCullough et al.,

2012; Plummer et al., 2013).

The responsibility for water on First Nations reserves in Canada is shared between

the federal government and First Nations (AANDC, 2007; Swain et al., 2006b). Under the

Canadian Constitutions Act, 1982, s. 35(1) the federal government has a fiduciary

responsibility to ensure First Nations have access to adequate water resources. This

responsibility is implemented through federal Aboriginal Affairs and Northern

Development Canada (AANDC), Health Canada (HC) and Environment Canada (EC) through

funding, monitoring water resources, and development of enforcing regulations

respectively (Health Canada, 2015).

First Nations view their responsibility as rights-based. Indigenous rights in general

are confirmed by the Constitution Act 1982 section 35(1) recognizing Aboriginal rights,

Aboriginal Title, and treaty rights[5]. However, Indigenous rights in Canada are often defined

differently depending on the various interests and actors involved. On one hand, the

Supreme Court defines Aboriginal rights as the "rights that flow from Indigenous Peoples'

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[5]*Aboriginal rights*: With respect to water, Aboriginal rights, defined by Canada, refer to "rights of access and withdrawal only, but are considered to be authorized claims to use water and control decision-making about water management" (Government of Canada, 2010).
Aboriginal Title: "recognizes the relationship between Indigenous Peoples and their territorial homelands (a far broader area than that allotted to reserve lands). It is a communal interest, flowing from Indigenous Peoples' historic relationship with their territories (including waters) and reflects the fact that we have land tenure and resource management systems that have been in practice since time immemorial" (Walkem, 2006, 306).
Inherent rights: rights that "originate from the fact that their own existence, as nations, residing and governing throughout [Indigenous] territories" (Phare, 2009, 36).
Treaty rights: refer to inherent rights that have been recognized by a treaty as well as new rights that are granted by another government (Phare, 2009).

occupation of Canada before colonialization" and often include Aboriginal title (Phare, 2009). On the other hand, Indigenous peoples define their rights as inherent, stemming from their "own existence, as Nations", limited only by the Creator's laws (Phare, 2009). Canada considers Indigenous rights as valid only after they are acknowledged by the court system (Phare, 2009). This is in conflict with inherent rights that Indigenous peoples feel are greater and above the court system.

There are some strengths and weakness to how the legal interpretation of Indigenous rights to water in Canada are determined. Over the last 20 years, the Supreme Court of Canada, through multiple key court cases (e.g. Sparrow 1990, Sundown case 1999, Winters vs. United States[6]), has been successful at establishing legal precedents for Indigenous rights to water in Canada (Phare, 2009). This has strengthened Aboriginal Peoples[7] ability to exercise their (legal) rights to water. However, infringements on Indigenous rights to water have to be decided by the courts on a case-by-case, community-by-community basis (Walkem, 2006). The result is that even though Indigenous rights are affirmed in the constitution, lengthy and expensive disputes have been unavoidable. Furthermore, gaining rights does not always mean gaining access to water (de Loë & Plummer, 2010).

As exemplified above, navigating multi-jurisdictional roles and responsibilities is an ongoing challenge. This is particularly true when it comes to protecting water resources.

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[6] Winters vs. United States was a United States case that supported the existence of Indigenous water rights, in particular, the right to use water was included when reservation and treaty lands were created (Phare 2009). It hasn't been used in Canadian litigation, but likely played a role in the Pikani settlement negotiation regarding water rights from the Old Man River in southern Alberta, Canada (Phare, 2009). Phare (2009) describes six critical aspects of the case with direct relevance to Canada (see Phare, 2009 for more details).

[7]*Aboriginal Peoples* is a collective name that includes First Nations. The government of Canada defines the term as a "collective name for the original peoples of North America and their descendants. The Canadian constitution recognizes three groups of Aboriginal people: First Nations, Métis and Inuit. These are three distinct peoples with unique histories, languages, cultural practices and spiritual beliefs" (Government of Canada, 2011).

The multi-jurisdictional process of protecting water resources in Canada is a helpful lens to characterize and assess water management and governance (Objective 1) because it's highlights how actors, policy, and regulations interact across jurisdictions and levels of society (e.g., local to national). Across Canada, a multi-barrier approach (MBA) is being utilized to address water safety concerns (particularly around drinking water). The MBA consists of multiple requirements (i.e., barriers) to protect drinking water systems from present and potential water quality and quantity threats (Canadian Council of Ministers of the Environment [CCME], 2002). Commonly used barriers put in place to prevent water contamination are source water protection, protection of the distribution system, and drinking water treatment (CCME, 2002). Through the CCME an MBA is advocated to protecting drinking water as a broad mandate to facilitate policy development, standard setting, and support for provincial and municipal actions.

The federal government's efforts to develop and implement the MBA has confronted challenges with respect to defining roles and responsibilities. In the absence of any enforceable federal drinking water quality standards, the federal government most recently passed the Safe Drinking Water for First Nations Act (2013) to respond to water quality and quantity issues confronting First Nations. The Act is to develop enforceable regulations to ensure First Nations have access to safe, clean, and reliable drinking water; have effective wastewater treatment; and protect water from quality and quantity risks on-reserves (In 2016, regulations were still under development). Although many First Nation leaders agree with the need to have regulations on reserve, as demonstrated by their broad willingness to work with the federal government to develop legislation, many argue that their role to date is insufficient given their interests to have adequate water quality and quantity on reserve and their rights as self-determining nations (AFN, 2013). First Nations advocate for a role that provides decision making power to influence how water issues on reserve are

addressed, for example, how financial resources are distributed on reserve to address

drinking water quality issues (AFN, 2013).

Although water across Canada is generally a provincial responsibility, this is not the

case on federal lands such as military land or First Nation reserves. This means that the

province is not legally responsible for water resources on First Nations reserves. Boyd &

Phare (2010) thus characterize reservations as being in a 'regulatory black hole'. Across

Canada each province has established requirements to provide safe drinking water. The

multi-barrier approach has been particularly important in Ontario, following the tragedy in

Walkerton where seven people died and thousands became sick due to water

contamination. Commissioner O'Connor, in response, made recommendations to put in

place a multi-barrier approach to protect all citizens (including First Nations) from water

contamination (O'Connor, 2002). This raises important questions about defining the

provinces role and responsibility for protecting water resources.

The Government of Canada (2001) and Swain (2006b) argue that the province does

have a role in implementing its laws and regulations to protect water resources on reserve.

For example, provincial law may apply on reserve through general application if it does not

specifically relate to First Nation aspects of the land, nor infringe on the rights of First

Nations. However, it is not entirely clear if provincial laws and regulations for protecting

water resources fall under general application or if they infringe on the rights of First

Nations. Swain (2006b) articulates two examples illustrating how provincial laws and

regulations for protecting water resources may or may not apply to First Nations reserves,

> *On the one hand, an argument can be made that the water regulation*
> *pertains to public health in general and does not relate to being*
> *'Indian.' On the other hand, the courts have found that band council*
> *activities related to local government functions form an integral part*
> *of primary federal jurisdiction over 'Indians and lands reserved for the*
> *Indians'.*

Chiefs of Ontario in O'Connor (2002) argue that protecting water resources directly impacts

First Nations aspects of land through land management practices, and therefore, potentially

infringes on federal jurisdiction and the rights of First Nations.

Further, challenges implementing the MBA across Ontario (and Canada generally)

are exacerbated because First Nation reserves represent critical gaps in understanding of

how to protect water resources to benefit those on- and off-reserve (see O'Connor 2002).

These gaps jeopardize a comprehensive approach of the province to ensure water quality

and quantity for all (on- and off-reserve) (Patrick, 2011).

Walters et al. (2012) and Finn (2010) draw attention to the governance challenges

associated with implementing a multi-barrier approach in Canada, arguing that current

strategies (federal and provincial) do not address First Nations concerns related to gaps in

political leadership, participation in decision making, and fail to support local and

traditional knowledge[8], beliefs, and perspectives. Recognizing these gaps reinforces the

need for more work to develop the water governance process to address issues of concern,

particularly issues related to participation, knowledge and leadership. McGregor (2012)

argues that improving water governance lies within the practices and knowledge of

Indigenous peoples. First Nations perspectives on their responsibility to protect water (all

uses both human and ecological) are embedded in world views and relationships with

water that are in turn based on respect and reciprocating responsibility. As Walters et al.

(2012) and Finn (2010) point out, questions remain about how these play a role in the

governance process (e.g., particularly with respect to protecting water resources).

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[8] For this Dissertation, traditional knowledge is defined as "collective knowledge of traditions used by Indigenous groups to sustain and adapt themselves to their environment over time. This information is passed on from one generation to the next within the Indigenous group. Such traditional knowledge is unique to Indigenous communities and is rooted in the rich culture of its peoples. Traditional knowledge is passed to next generations in many ways such as through ceremonies, stories or teaching (AFN n.d.)

In a study that examines the extent to which municipalities develop new environmental policy in response to crisis in Ontario, Plummer et al. (2010) use these federal and provincial approaches to drinking water safety identified above, along with others, to synthesis five elements with criteria of the multi-barrier approach (i.e., protection of sensitive source areas, treatment, distribution, monitoring and responding to adverse conditions). This dissertation uses these elements and criteria to characterize and assess water management and water governance which is essential for understanding the practices being undertaken within the communities (see Section 1.2 for more details).

Protection of sensitive source areas refers to the protection of sensitive recharge and discharge zones and includes long term planning to ensure the sustainability of surface water and groundwater. Treatment refers to the treatment of water and contaminated sources to ensure waterways are healthy for human consumption. Distribution and storage systems include infrastructure for water distribution and storage and included water cycle and storage management that protects water resources from contamination. Monitoring and distribution includes the monitoring of surface and groundwater quality and quantity. Monitoring is critical to providing continued protection from water quality and quantity issues. Finally, responding to adverse conditions are requirements or responses put in place when water issues arise.

The MBA, and in particular the elements and criteria outlined by Plummer et al. (2010), are helpful as a framework to characterize and assess water management and governance because they provide a concise set of requirements that relate to policy guidelines, monitoring, infrastructure, diverse actors from a variety of levels and sectors. For more details on these key elements and concerns see Section 3.3. I use the criteria outlined by Plummer et al. (2010) as a framework to illuminate current approaches and practice for managing and governing water resources on reserve. A better understanding of

current approaches and how roles and responsibilities are defined on reserve is a critical starting point to examine adaptive water governance. For example, examining how sensitive source areas are protected on reserve may bring light to management practice that goes beyond policy or regulation and highlight alternative strategies for protecting sensitive areas (e.g., cultural values and norms). The framework is also used to identify opportunities to address water challenges and improve prospects for more effective water governance on First Nation reserves. Further discussion about the MBA as a framework is provided in Section 2.3.

1.3.2   Institutions

Institutions are human constructs that shape and are shaped by human behaviour and are often described as forms of rules that can be nested structurally, spatially, and temporally within cultural, social, economic, and political contexts (Hall & Taylor, 1996; Scott, 1995; Vatn, 2005). Institutions have often been dichotomized into being either formal or non-formal (informal) rules. Some have criticized this labeling arguing that non-formal rules embed formal rules and determine their role in society (i.e., important or unimportant) (see Cleaver, 2002). For the purpose of this research, making the distinction between formal and non-formal rules may be helpful. Formal rules are codified rules that are recognized within society and often constrain actor behaviour or define some requirement (e.g. legal rules, constitutions, laws) (Hodgson, 2006). Non-formal rules are the socially embedded rules of society. Non-formal rules tend to be more subjective and can be present and followed without the rule ever being explicitly defined (Hodgson, 2006). An example of this may include the potential norms surrounding water conservation. People who believe water should never be wasted may adhere to non-explicit rules about how water should be used. These norms influence their behaviour to conserves water. Formal

and non-formal institutions are not independent of each other but may interact. For example, the process of creating formal rules happens within cultural, social, economic, and political institutional contexts that can constrain, reproduce, and mold them through positive feedback. Likewise, formal rules can influence socially embedded non-formal rules creating new norms and conventions held by actors. As a result of this interaction and positive feedback, institutions (especially if they are socially embedded) can be very robust and difficult to change.

Institutions are an important concept for understanding the emergence of adaptive forms of governance within First Nation water contexts because of the role they have in enabling or constraining actors to respond when confronted with challenges (Cleaver, 2002; Scoones, 1998). Various overlapping perspectives on the role institutions and actors play in responding to social-ecological challenges (challenges associated with how humans interact with their environment, including those challenges associated with the use of resources and the implications for social and ecological systems) have been articulated through the diverse body of scholarship of New Institutionalism (i.e., rational choice, organizational/sociological, and historical)[9].

It is important to acknowledge the temporally-embedded nature of historical institutionalism and the role that institutions have in enabling or constraining actors to respond when confronted with challenges. From a historical perspective, institutions are path dependent. Path dependence refers to the notion that the present status and future direction of institutions cannot be divorced from their earlier course and past history (North, 1990). Whether formal or non-formal, past institutional arrangements make up a

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[9] See Greif (1998), Hall & Taylor (1996), Immergut (1998), March & Olsen (1989), Rutherford (1995) for a review of each perspective. These and other perspectives can be indistinguishable and overlapping (Saravanan, 2009).

historical context that can influence current and future institutions benefiting –some actors and prolonging power inequalities among other actors (Hall & Taylor, 1996). Institutions viewed in this way provide a context for action that leads to understanding why actors respond as they do to address confronting challenges (Immergut, 1998). Aiming to understand if adaptive forms of water governance are helpful (particularly, within First Nation contexts in southern Ontario), my attention must therefore be sensitive to the historic institutional setting and its potential role in enabling or constraining actors from responding when confronted with challenges.

1.3.3 Adaptive Approaches to Engage with the Environment and Water Resources

Effective governance of water resources is challenging because it involves interactions between diverse actors often with varying (often inequitable) levels of decision making power across levels, and continuously changing social, economic, political and environmental contexts. There are many approaches to environment and water governance, each with advantages and disadvantages. For example, top-down or centralized approaches may be successful at providing unified management direction and water standards; however, often fail to capture water contexts at lower levels and across multiple jurisdictions (Galaz et al., 2008; Pahl-Wostl et al., 2007). Further, top down approaches often fail to incorporate interactions between actors with inequitable decision making power, diversity of values and interests, and changing social economic and political conditions that are needed for learning and adapting to changing conditions (Akamani, 2016; Pahl-Wostl et al., 2007). Finding the appropriate approach depends, in part, on navigating the complexity associated with governing resources across levels with varying amounts of information, knowledge, resources, and decision making power (Cosens & Williams, 2013; Dietz et al., 2003).

Adaptive approaches to governing water resources offer potential opportunities to incorporate interactions between actors with inequitable decision making power, diversity of values and interests, address changing social economic and political conditions, and foster learning within water management. Scholarship broadly concerning adaptive approaches to environment and resource (including water) management and governance inform this research. These specifically include adaptive management, co-management, adaptive co-management and learning. Participatory and Indigenous approaches also incorporate important aspects of adaptation. The following sections describes the breadth of scholarship and its role in fostering adaptive approaches to resource governance.

Adaptive management

Adaptive management scholarship by Holling (1978), Pahl-Wostl (1995), and Lee (1999) is foundational in setting the stage for thinking about adaptive approaches to managing water resources within complex and uncertain contexts. Adaptive management is conceptualized on the premise that management approaches such as scientific management, which relies on predicting future conditions of an ecosystem and it's response to stressors (i.e., predict and control), is limited in its ability to respond and provide solutions under conditions of complexity and uncertainty . Successful management must be able to respond to unpredictable changes or adapt and change management practices based on learned experience and insight (Pahl-Wostl et al., 2007). Adaptive management is conceptualized with this need in mind, to "learn by doing" where experiments become the learning platform for policy (Chaffin et al., 2014; Gunderson, 1999; Lee, 2001; Walters, 1986; Walters, 1997, p. 4).

Adaptive management informs adaptive approaches by changing how resource managers think about solving environmental problems. Specifically, resource managers

cannot rely on predictive assumptions and instead must foster the capacity to alter their practices based on their learned experience (Pahl-Wostl et al., 2007). In this way, adaptive management integrates science and decision making through a process that fosters learning from experience to change and adapt policy.

Conceptualizing and implementing adaptive management practices to deal with uncertainty and complex contexts has clear limitations. For instance, adaptive management is critiqued for insufficiently considering the social contexts (Folke et al., 2005). Adaptive management approaches have also been recognized for not broadly incorporating multiple forms of knowledge (e.g., local, indigenous) and learning, especially at and across levels (Folke et al., 2005). Walters (1997) identifies this as a prominent challenge and articulates the need for management approaches to go beyond a single level. It is thus important to be cognizant of the social context and to realize opportunities for incorporation into the management process through the involvement of appropriate actors, not only to diversify value sets used in decision-making of particular resource related issues, but also to foster power sharing across actors and promote knowledge generation and learning (Folke et al., 2005; Walters, 1997).

Co-management

Co-management signals a move away from government being the sole authority in decision making. Although there are many forms of co-management, consistent within the literature is that responsibility and authority is often shared (in varying degrees) between government and communities. Co-management supports the participation of communities and resource users, local institutions, practices, and knowledge systems to manage, regulate and enforce resource management (Armitage et al., 2007). Incorporating local communities

and actors within decision making processes enhances learning and innovation (Armitage et al., 2007).

The co-management concept informs adaptive approaches by shifting how decision making authority influences resource management. Co-management arrangements recognize local knowledge along with 'expert' knowledge to inform decision making (Day & Cardinall, 1998). Including local knowledge has benefits such as increasing efficiency, while providing appropriate and equitable approaches for managing resources. The result is improved conflict resolution, data gathering, information sharing, allocation, protection and planning (Armitage et al., 2007).

Limitations of co-management have been identified within co-management scholarship. For example, critical questions about co-management have been raised in terms of terminological precision, efficiency, legitimacy and evaluation (Plummer & Armitage (2007). Consequently, co-management arrangements may have little impact on shifting away from centralized or top down government structures or addressing resource challenges at broader regional or national levels (Leach et al., 1999; Rusnak, 1997).

Adaptive co-management

Adaptive co-management is an approach that bridges the 'learn by doing' benefits of adaptive management and the collaborative strengths of co-management (Armitage et al., 2007). As such, much of the adaptive co-management literature focuses on key features that foster this integration, including the utilization of diverse knowledge systems, collaboration across and within levels, power sharing with regards to decision-making authority, and systematic learning (Armitage et al., 2008a; Olsson et al., 2004). In all of this, underpinning adaptive co-management is a response to the challenges of environmental and resource governance (Armitage et al., 2008a).

Considerably scholarly attention has been given to the relationship between adaptive co-management and governance (See Plummer et al., 2013). As Plummer et al., (2013) highlight in their systematic review, there is no consensus among scholars on the specific relationship between adaptive co-management and environmental governance. Plummer et al., (2013) contend that regardless of their complex relationship, scholarly work on adaptive co-management contributes insights to addressing key governance challenges, and more specifically insights toward addressing challenges that enable actors to respond within complex and uncertain circumstances (adaptive approaches). For example, adaptive co-management directs attention to the issue of legitimacy by involving diverse actors, sharing power among diverse actors with a variety of roles, interactions between actors by spanning across levels, and novel processes by which to integrate diverse knowledge sets can be incorporated into resource management.

Learning

Learning has a prominent role in enabling actors to respond within complex and uncertain resource contexts. Learning as well as knowledge features prominently in the adaptive management scholarship (Walters, 1998). Learning is central to adaptive management where policy and practice become experiments to observed and learn from to adapt new approaches accordingly to meet the needs of resource users and the environment (Lee, 2001; Walters, 1998). Learning is about refining understanding about the current state of the resource and its users. Learning also appears prominently in the adaptive co-management scholarship, with attention to the governance process as the as the social setting influencing who learns, how they learn, and when they learn (Armitage et al., 2008b).

Within the adaptive management and co-management scholarship, learning is conceptualized into single loop learning (involves identifying specific strategies to solve particular problems and improve management outcomes), double loop (involves reflecting on our assumptions to make decisions and take action), and triple loop learning (involves challenging the values and the formal and non-formal institutions that inform assumptions, building trust, and diversity among participating actors) (Argyris & Schon, 1978; Armitage, 2008b; Reed et al., 2010). Pahl-Wostl et al. (2007) articulates protocols and the management process is often developed together over time and therefore path dependent. Such pathways can be very difficult to change as they are imbedded within social and cultural norms. Triple loop learning is key to being able to question current norms for resource management and making changes if necessary. Resource management literature emphasizes social learning as essential for coping with uncertainty and change (Armitage et al., 2008b; Diduck et al., 2005; Folke et al., 2005; Pahl-Wostl et al., 2007). Armitage et al. (2008b) reminds us that in building capacity for learning requires a process that is inherently related to power, culture, institutions, worldviews, and values.

Participatory approaches to resource management

Participatory approaches to resource management are often involved adaptive aspects. Participation is a key component to addressing complex and uncertain resource problems (Folke et al., 2002; Stringer et al., 206). When invested actors from diverse backgrounds are enabled to participate in resource management, opportunity opens for actors to deepen there understanding of resource issues and foster knowledge co-production (Akamani, 2016; Stringer et al., 2006). Community actors may offer descriptions of and insight into social contexts that would otherwise not be incorporated into the decision-making process. The adaptive aspect of participatory approaches to resource

management comes from the multiple iterations of these interactive processes by which knowledge, values, world views, and perspective of actors are brought together to foster social learning. Further, the increased involvement of local actors may empower and improve overall legitimacy of the decision-making process (Stringer et al., 2006).

Critical analysis of participation as a normative feature reveals difficult questions about the role participation has in fostering adaptive approaches. For example, it remains unclear if participation always improves a system within which uncertainty and complexity exist. Stringer et al. (2006), Armitage et al. (2008b), and Diduck et al. (2004) articulate that the role of participation in fostering an adaptive approach needs to be imbedded in discussion and understanding of how should participation be carried out, who should participate, and with what role should they have.

Indigenous approaches to resource management

Indigenous approaches to resource management have been of growing interest to scholars since the 1980s, in part, because of their contribution to resource management (protected areas, conservation, resource use and ecological process) (Berkes et al., 2000). Part of the attraction or realization is that Indigenous peoples have been living off natural resources for many generations and have something to offer when it comes to sustainability (McGregor, 2005). Indigenous approaches cannot be generalized as every nation is unique with their own values, practices, and understanding of their environment. Nevertheless, Indigenous approaches are generally informed, at least in part, by traditional knowledge[10], a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and

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[10] As a non-indigenous (academic) concept, traditional knowledge is criticized for being an often over simplified view of Indigenous peoples knowledge, beliefs and values associated with the environment (See Nadasdy, 1999; McGregor, 2005). I use scholarship on traditional knowledge within this dissertation to help differentiate and explore adaptive approaches inherent within Indigenous approaches to resource management.

handed down through generations by cultural transmission, about the relationship of living

beings (including humans) with one another and with their environment" (Berkes et al.,

2000, p. 1252).

Traditional knowledge parallels attributes of adaptive management for addressing

complex and uncertain conditions related to resource management. In fact, Berkes et al.

(2000, p. 1260) identifies that adaptive management is a "rediscovery" of traditional

knowledge. For example, traditional knowledge deals with a changing environment (social

and ecological) by evolving over time as information and knowledge changes (Berkes et al.,

2000; Menzies, 2006). As time passes, information and knowledge that is relevant will be

maintained and transferred across generations and knowledge that is no longer relevant

due to a changing environment will be dropped (McGregor, 2005). This process provides

continuous feedback and adjusts to ensure resources continue to meet the needs of

Indigenous Peoples (McGregor, 2009). Traditional knowledge does not assume the

environment can be controlled or predicted (Berkes et al., 2000). Instead it assumes

unpredictability and uncertainty within natural systems.

Adaptive governance

Any approach must respond to particular contexts and situations which are often

complex and uncertain. Dietz et al. (2003) was one of the first to use the phrase 'adaptive

governance' to describe an approach for governing the use and protection of environmental

resources in a complex and uncertain world. The concept has been the focus of increasing

attention and empirical analysis, but at the same time it remains as much an idealized

concept as it does a clearly defined approach. Since its conception, the term adaptive

governance has been widely used to articulate an approach to achieve sustainability within

complex and uncertain conditions (Brunner & Steelman, 2005; Chaffin et al., 2014; Dietz et

al., 2003; Folke et al., 2005; Olsson et al., 2006). Indeed, Dietz et al. (2003) argued that in order to govern resources, strategies must be developed to overcome complexity and uncertainty. They presented three strategies to achieve adaptive governance, including meaningful participation and dialog across actors (analytic deliberation), a variety of institutions to govern resources (institutional variety), and nested institutions across and within levels of society (nesting). These strategies will be discussed in further detail below.

Adaptive management, co-management, adaptive co-management, learning and knowledge, and indigenous approaches scholarship offer broad insight into some of the main attributes associated with adaptive governance approach, and how those attributes have been tested within different empirical settings. Based on this scholarship, for example, adaptive governance should ideally reflect an ability to respond to undesirable circumstances within a multi-level system of human-environmental interactions, and in ways that account for both the social and ecological components of a system. This involves actors across multiple levels taking part in the decision making processes, ensuring decisions are made in light of the full complexity of a given problem, and recognizing diverse and potentially divergent interests when deciding on appropriate solutions (Olsson et al., 2007; Rijke et al., 2012). An important emphasis in this process is resolving conflict and negotiating trade-offs between actors and their interests (Brunner et al. 2002; Dietz et al., 1998; Leach et al., 1999; Nelson et al., 2008).

How adaptive governance emerges may also depend more specifically on the actors involved (social context). For example, Huitema et al. (2009) argues that adaptive forms of governance may depend on how readily actors are able to build trusting relationships (Huitema et al., 2009). This is particularly relevant, but not exclusive to, polycentric decision making. Polycentric decision making describes the multiple centres of decision making power that may overlap jurisdictions fostering a bridge between knowledge and

information across levels (Folke et al., 2005; Olsson et al., 2006; Huitema et al., 2009). Polycentric decision making has been argued to facilitate the flow of information and interactions across levels and increase redundancy and is facilitated through trusting relationships (Da Silveira & Richards 2013). Similarly, trust is key to the participation of actors in the governance process from multiple administrative levels with diverse interests and may depend on the degree actors are able to (or willing to) participate in the process (Folke et al. 2005).

The degree of participation is particularly relevant for understanding the emergence of adaptive forms of governance with respect to marginalized groups where underlying power dynamics may undermine an actor's decision making authority (Armitage, 2008a; Chaffin et al., 2014). Cosens and Williams (2012) add that critical to supporting adaptive forms of governance, particularly across multiple centres and jurisdictions is legitimacy of authority to make decisions and/or have voice to inform decisions. As noted by Huitema et al. (2009) and Koontz et al. (2006) underlying power dynamics can influence how legitimately actors participate in decision making and how their knowledge is used to make decisions. Contexts (e.g., social or political) may constrain some actors and facilitate other actors from being able to actualize forms of adaptive governance. In other words, institutions (both formal and non-formal) play an important role in understanding how adaptive governance may emerge in specific contexts.

Institutions can be hidden and their influence on actor behaviour may be difficult to measure. Dietz et al. (2003) argued that institutions are at the core of fostering governance that is adaptive, particularly through analytic deliberation, institutional variety, and nesting. Concisely capturing the broad governance attributes listed above, these three strategies (analytic deliberation, institutional variety, and nesting) remain relevant today for exploring the social-ecological components of resource governance (Akamani & Wilson,

2011; Dietz et al., 2003; Dietz & Stern, 1998; Gupta et al., 2010; Huitema et al., 2009; Huntjens et al., 2012). For example, Pittman et al. (2015) use them to analyze institutional adaptive capacity in costal-marine contexts to understand governance fit for climate change. Akamani and Wilson (2011) use the strategies as a framework for understanding the prospects of adaptive transboundary water resource governance. These recent studies illustrate the continued relevance of the strategies for understanding the governance of environmental resources particularly water resources.

To achieve the objectives two and three of this dissertation, strategies, analytic deliberation, institutional variety and nesting are utilized as an analytical framework in two distinct ways. The first way is to examine particular arrangements that facilitate or constrain water management in First Nations contexts (Objective 2, Chapter 4). The second way is to examine the multilevel institutional setting of the case studies to explore adaptive water governance and identify opportunities to foster it (Objective 3, Chapter 5). Each strategy is outlined below followed by a detailed description of how together they form a framework to achieve Objective two and three.

Analytic deliberation is the first strategy identified above and refers to the process of how actors interact with the goal to "define [what is] to be understood, to identify the values and outcomes of concern, to distinguish disagreements that must be addressed through compromise and tradeoff from those that might be resolved with better information, and to agree on appropriate ways to collect and interpret the needed information" (Dietz & Stern, 1998, p. 442). Dietz and Stern (1998) argue that analytic deliberation is appropriate for solving complex problems because it enables the perspectives and knowledge of all actors to contribute holistic understanding of the problem at various levels. With respect to water resources, analytic deliberation holds potential to inform my understanding of adaptive forms of water governance. Diverse

knowledge sets and values provide a holistic understanding of challenges and solutions surrounding water issues. In the context of First Nations, values and interests are often prevented from being incorporated into existing formalized water institutions because they are viewed as "anecdotal", "irrational", or "unsubstantiated" (Walkem, 2006, p. 310). Such a practice has "decontextualized" environmental decision making removing the spiritual, physical, and emotional connections and interconnections held as critical for First Nations to fulfill their own responsibilities toward water (McGregor 2005; McGregor & Whitaker, 2001; Ransom, 1997; Walkem, 2006). The strategy of analytic deliberation may be valuable in building trust and social capital between actors of divergent values and interests improving how involved actors respond to the complex challenges associated with water (Akamani & Wilson, 2011).

Institutional variety exemplifies the second strategy identified above with potential for making water governance more adaptive by employing multiple types of institutions for governing resources (Akamani & Wilson, 2011). The sustainability of human environmental interactions demands institutional diversity as a mechanism for generating new opportunity out of complex and uncertain circumstances (Berkes, 2007). Conventional governance forms often rely on regulatory institutional arrangements employed by a single actor (often government) to govern natural resources and has been criticized for creating problems of capacity mismatch and restricting local level institutions from being incorporated into the decision making process (Gleick, 2003; Holling & Meffe, 1996). With respect to First Nations and water, a good example of this is the Safe Drinking Water and First Nations Act (2013). The legislation outlines a schedule for defining federal drinking water regulations on First Nations reserves. This Act has been criticized by First Nations leaders for its role in offloading the federal government's responsibilities onto First Nations without addressing capacity issues to uphold such responsibilities (Barlow, 2016;

MacIntosh, 2013). The government-appointed Expert Panel on Safe Drinking Water for First Nations recommended a variety of institutions, such as customary (or natural) law[11], may provide options for improved drinking water for First Nations (AANDC, 2006). This example illustrates the relevance of institutional variety within First Nation contexts in Canada. The potential benefit of employing a variety of institutional arrangements is consistent with Gupta et al.'s (2010) framework providing opportunities to utilize local institutions, diverse actors (e.g., public, private, and citizen based arrangements) and their corresponding unique knowledge. In this way, institutional variety is a potential strategy to make governance more adaptive.

Finally, the third strategy identified above is nesting. The concept of nesting has potential to foster adaptive forms of water governance by addressing level-dependent challenges associated with complex human environmental interactions. Nesting refers to "a response that recognizes that the focus on a single level of scale is inadequate in dealing with complex social ecological systems" (Akamani & Wilson, 2011, p. 4). In particular, a key challenge is improving the fit[12] between institutions by which actors interact, negotiate, and make decisions and the spatial and temporal dimensions associated with human environmental interactions (Olsson et al., 2006; Young, 2002; Young, 2008). Single level governance regimes that utilize contemporary strategies (e.g., government regulation) are often inadequate to solve complex multi-level challenges (Folke et al., 2005). To address this, nesting has been conceptualized to highlight the important role of cross-level interactions in meeting the demands of governing complex human environmental

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[11] Customary law reflects stewardship and the importance of preserving surrounding waters and lands (AANDC, 2006)

[12] Institutional fit described by Young et al. (2002) refers to the "congruence or compatibility between ecosystems and institutional arrangements created to manage human activities affecting these systems" (p. 20). Similar to Galaz et al. (2008) this research extends this definition more broadly to the congruence between social-ecological systems and institutional arrangements.

interactions (Dietz et al., 2003). Nesting can occur through polycentric institutional

arrangements often with multiple centres of decision-making authority. Nesting has

potential to improve institutional fit and deal with complex challenges and is consistent

with Gupta et al.'s (2010) framework by improving interactions amongst actors,

participation, accountability, and redundancy (though often at the cost of efficiency)

(Akamani & Wilson 2011; Dietz et al., 2003; Low et al., 2003; Nowlan & Bakker, 2007; Pahl-

Wostl et al., 2009).

  The challenges associated with institutional fit are particularly acute in the context

of First Nations and water. Spatially, how the geographical or ecological dimensions of a

problem are defined (e.g., traditional territory, reserve, hunting ground) may need to

correspond to the jurisdiction(s) of the institutions that govern them. In Ontario, the

responsibility for water lies under the jurisdiction of the province; however, water issues

concerning First Nations lie under federal jurisdiction rendering any provincial regulations

out of jurisdiction on First Nation reserves (CIER, 2008). Institutional misfit, as described

here, has precipitated challenges related to regulatory gaps, financial capacity, and lack of

local authority in water decision making (Duncan & Bowden, 2009; Phare, 2009; Morriseau,

2011). Institutional nesting has potential to enhance water governance by improving

interactions between First Nations and other involved actors, facilitating participation and

fostering accountability.

  Temporally, institutions surrounding water governance in the context of First

Nations must also fit with the dynamics of human environmental interactions. While

institutions play a role in shaping how actors behave, behaviour also provides feedback and

shapes institutions. In this way, institutions can be very difficult to change. As a result,

institutions for water governance need to be flexible enough to enable timely response

under changing human environmental interactions. Institutional nesting has potential to

enhance the flexibility of water governance through supporting redundant functions.

Redundancy may improve the opportunities available for actors to respond when

confronted with challenges (Duit & Galaz, 2008; Low et al., 2003). For example, when one

institution fails (e.g., regulation fails to respond under changing environmental

circumstances like drought, flood) to enable actors to respond at the national level,

redundant institutions at other levels enable actors to respond and deal with confronted

challenges.

These three strategies may overlap or link with each other. For example, nesting is

linked to analytic deliberation through the level of scale at which problems are addressed.

Higher level institutional arrangements (e.g., government regulations) may be suitable for

addressing issues at broader spatial scales, but less suitable for addressing local level

challenges. For addressing issues at a local scale, local level institutional arrangements may

be more effective through the utilization of local skills, knowledge, values, and interests to

address problems. The values and interests incorporated into decision making from local

level participation reflect the interconnections between nesting and analytic deliberation.

Linkages to institutional variety are also found through the level of scale at which problems

are addressed.

Employing diverse types of institutions (e.g., state mechanisms, market-based

institutions, and community institutions) enhances how complex problems are addressed.

Institutions employed at varying levels (local to international), provide new opportunities

for actors (e.g., local actors) to participate in decision making process demonstrating

interconnections with nesting and analytic deliberation.

The bodies of scholarship I outlined above form the conceptual foundation for how I

framed this research. An institutional lens is employed in this research to investigate the

construct of adaptive water governance in relation to two important considerations for

First Nations and water. The first (Chapter 4) focuses on the community and investigates the enabling and constraining factors on the reserve regarding water, with a particular focus on the perceptions of community members. The second (Chapter 5) considers the situation of water in these communities from a broader multi-level context and encompasses the corresponding views of a broader range of actors (First Nation, provincial and national level actors). Each is outlined below. See Section 2.3 for more details about how the frameworks are used as conceptual starting points for this research.

The first way that the institutional strategies are used as an analytical framework is in Chapter 4 where I examine the particular institutional arrangements that facilitate or constrain water management in First Nations contexts (Objective 2, Chapter 4, Stage 2 outlined below). The institutional strategies are hypothesized to potentially help actors deal with and thrive within complex and uncertain social and environmental conditions. As an analytical framework, institutions that facilitate or constrain these strategies can be identified and examined to understand how they influence First Nations ability to respond to water quality and quantity issues.

Specifically, I concentrate on institutional arrangements that facilitate or constrain analytic deliberation, institutional variety, and nesting. For example, within the framework, analytical deliberation highlights meaningful participation in decision making as one key element to improving how actors respond under complex, uncertain conditions. An institution such as a regulation or policy may promote a particular actor's interest and ignore the interests of other actors (all potentially unbeknownst to the actors involved). If actors face water quality or quantity issues and decisions are not made with their interests in mind, they can be constrained in how they are able to respond and deal with the issues. As articulated in this example, because institutions can influence human-environment interactions in ways that may not be known to the actors involved, the analytical framework

helps guide this research toward which attributes may be important and should be examined to deal with water quality and quantity issues.

This framework is applied specifically at the First Nation community level (on-reserve) to understand how institutions facilitate or constrain water management. This means I examined analytical deliberation, institutional variety, and nesting from the perspective of First Nation community members. Although there are discussions about how institutions from other levels play a role in facilitating or constraining their response on reserve, I examined only those perspectives from First Nations community members.

I recognize that not all institutions will be visible to the researcher or captured by this framework. There may be ways in which institutions can influence human behaviour that this framework may not capture, including for example, institutions based particularly on perceptions of gender and equality. However, the Dietz et al (2003) framework is well-accepted and offers fertile ground for highlighting key institutional attributes that may constrain or facilitate First Nations from addressing water quality and quantity issues on reserve.

Adaptive governance is hypothesized to be one way to navigate complexity and change, and to complement previous approaches to water governance. As such, the second and distinct way the institutional strategies (Dietz et al. 2003; Akamani & Wilson, 2011) are used as a framework in this research is to explore the multilevel water governance context in which First Nations in southern Ontario are embedded for evidence of the concept (Objective 3, Chapter 5, Stage 3). Drawing on the previous example, analytic deliberation highlights meaningful participation in decision making as one attribute to foster adaptive governance. I examine First Nation participation in water management across levels (e.g., national, provincial, regional, and watershed) from the perspective of governments (national, provincial, regional), NGOs, conservation authorities, and First Nations, and use

the information learned as evidence for expression of the adaptive governance concept within this multi-level institutional setting.

The application of the framework in Chapter Five differs from how it is applied in Chapter Four because the focus is not to understand how institutions facilitate or constrain. Instead, the focus is on exploring experiences within and across levels at which water management and governance take place. Further, I apply this framework in Chapter Five not only including the perspectives of the First Nations, but also the perspectives of water managers across multiple levels of water governance (e.g., perspectives from governments, organizations, and citizens across national, provincial, regional, watershed levels levels). In contrast, the framework as it is used in Chapter Four is only applied across First Nations on reserve. More details about how the frameworks were applied can be found in Chapter Two, Section 2.2.

I recognize that the institutional strategies used in this framework (i.e., Objective 3) may not fully capture all aspects of adaptive governance that may be meaningful within a particular context. For example, the framework focuses on institutions around participation and multilevel interactions. Others (see Gupta et al. 2010, Pahl-Wostl et al., 2012) have used different strategies to examine adaptive governance such as learning, leadership, and equity which, although potentially overlapping with the framework used in this research, would present different aspects of how adaptive governance may be meaningful within a given context. I chose the institutional strategies used in this research because they are informed by more than two decades of conversation between governance scholars about how to improve governance approaches to deal with uncertainty and complexity and focus on institutions that are timely and relevant within First Nation water contexts (as described above).

Using the framework in these two distinct ways has a number of advantages. First, it affords an opportunity to focus on institutional aspects of water governance that may be too complex through one assessment. Multiple uses of the framework also support an incremental approach toward a better understanding of how the concept of adaptive governance may resonate within a multi-level context. For example, Chapter 4 examines from a community's perspective institutional arrangements that facilitate or constrain First Nations from responding to water issues. This complements the use in Chapter 5 by helping to understand how broader multilevel aspects play a role facilitating or constraining First Nations ability to respond to water issues and shedding deeper insights into the potential emergence of adaptive forms of water governance.

1.4 Empirical Setting

This research focuses on three specific First Nation communities: Six Nations of the Grand River, Mississaugas of the New Credit, and Oneida Nation of the Thames. Figure 1**Error! Reference source not found.** displays the location of each case study in southern Ontario. Each case study was deliberately selected because of its water quality and quantity issues (e.g., concerns regarding drinking water and sanitation) and related governance concerns (e.g., assertion of Aboriginal rights, degree of meaningful involvement, imbalanced roles and responsibilities). Further, the case study communities were selected because their experiences reflect other First Nations communities across southern Ontario with respect to water issues and arrangements for protecting water resources. For example, with respect to source water protection planning, New Credit source water is protected provincially under a Municipal Type Agreement, Six Nations has source water protection plan, and Oneida has no plan in place (AANDC, 2011). Across Ontario, one in three First Nations has some degree of source water protection planning in place. With respect to on-reserve

populations, the case study communities range from small (820 on-reserve members in New Credit), medium (2000 on-reserve members in Oneida), to large (13000 on-reserve members in Six Nations) when compared with First Nations across southern Ontario that range from 175-13000 on-reserve members (AANDC, 2011, 2012). The case study sites also share similar types of primary water sources as other communities in southern Ontario (i.e., Surface water, ground water, and ground water under the direct influence of surface water [GUDI]) (AANDC, 2011).

Figure 1 Case Study Communities in Southern Ontario
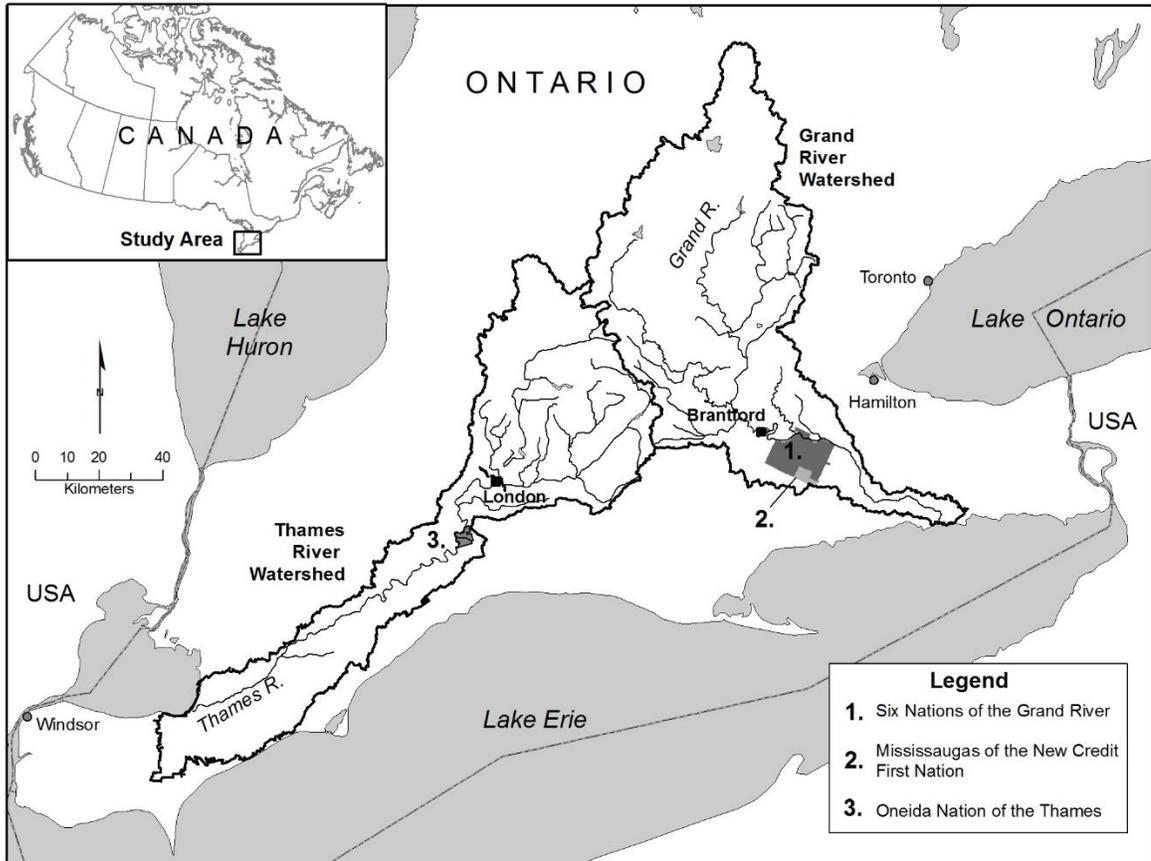
Water uses within the case study communities include water for drinking, industrial activities, agriculture, commercial uses and water used by the natural environment. This research predominantly focuses on water quality because drinking water quality is a prominent concern expressed within all three case study communities. Less emphasis on

water quantity in this research reflects that water quantity issues are in general less of a concern. However, concerns surrounding the capacity of drinking water treatment facilities are a water quantity issue that is discussed.

Six Nations of the Grand River First Nation is located south of Branford in southern Ontario and has an on-reserve population of approximately 13000 people (Six Nations, 2010). Six Nations receives water from two main sources: surface water from the Grand River which is treated on-reserve and distributed to some community members by pipe or water truck. Residential wells are also used to capture groundwater (Six Nations, 2007). Many residents also purchase bottled water for drinking. Six Nations continues to face pressures related to water quality and quantity. Prior to 2013, Six Nations water treatment plant was run at capacity which limited the availability of treated water to residents and increased the vulnerability of drinking water to contamination (Burnett, 2005). In 2013, a new water treatment facility was opened to serve the community; however, access is still limited to homes on the community pipeline (approx. 14%) and those homeowners that pay to receive water hauled by truck (approx. 20%) (AANDC, 2011). Some resident use residential wells, but they are often in poor condition and subject to contamination (Burnett, 2005). Other pressures related to contamination stem from waste disposal facilities, septic systems, and agricultural sources (Six Nations, 2007).

Water governance in Six Nations involves actors at multiple levels (e.g., federal, provincial, local) both on- and off-reserve[13]. This is demonstrated by Six Nation's role in the provincially-led Source Water Protection initiative. Arrangements such as the Grand River Notification Agreement (GRNA) are another example of where Six Nations among other

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[13] Preliminary information about institutional arrangements within the case studies was drawn from insights from the First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance project (see Section 1.2 for more details about the project).

actors are involved in making decision about the watershed. This agreement involves federal, provincial, municipal governments, First Nations and the Grand River Conservation Authority and informs Six Nations about upstream initiatives or activities that would impact the supply of safe drinking water. Within Six Nations, arrangements for responding to water related emergences (i.e., emergency plan) also involve multiple actors including public works department, health department, and Chief and Council.

Mississaugas of the New Credit First Nation is also located south of Brantford, Ontario and borders the west side of Six Nations. It has an on-reserve population of approximately 880 people (AANDC, 2010). New Credit receives surface water piped from Lake Erie. The water is treated off reserve by the municipality of Haldimand County and distributed to some community members by pipe or water truck. A small proportion of community members receive water captured from deteriorated wells. Some residents purchase bottled water for drinking. New Credit continues to face water-related pressures. For example, New Credit faces contamination of both groundwater and surface water on reserve from sources on and off-reserve (e.g., agricultural activities, dumping, septic systems, and industrial activities such as the Tom Howe Landfill and a nearby gypsum plant). New Credit is involved with multiple institutional arrangements related to water governance, specifically source water protection. For example, New Credit sits on the source protection committee of the provincial source water protection initiative. As a result of water treatment taking place off reserve, New Credit is a partner in the Grand Valley Water Supply Project (GVWSP). As a partner, New Credit has institutional linkages with the surrounding communities, specifically Nanticoke where water treatment takes place. New Credit also sits on the provincially led source protection committee which is responsible to overseeing source water protection planning in the region.

Oneida Nation of the Thames is located south-west of London, Ontario and has an on reserve population of approximately 2000 people (AANDC, 2010). Oneida receives water primarily from an aquifer fed by the Thames River. Water is treated on reserve and distributed to all residents. Many residents purchase bottled water for drinking. Oneida's location near the controversial Green Lane Landfill has raised concerns about groundwater contamination. Oneida has further concerns related to the contamination of the Thames River by the South Side Sewage Treatment Plant. Additionally, a general lack of trust in the quality of water provided by the treatment plant has been identified (Cave, 2012). Similar to Six Nations and New Credit, Oneida sits on the provincially led source protection committee. However, its water intake is not designated a protection zone within the provincially led source water protection initiative. Multiple actors are involved in governing water within Oneida, for example, Oneida's emergency response to water issues (typically as a result of contamination) involves the federal government, Chief and Council, and the Public Works and Health Department.

1.5 Study Limitations and Delimitations

All research is subject to limitations. This section acknowledges the limitations associated with this research. The boundaries placed on the study are also presented.

This research involved working with First Nations Peoples and aspects of their culture that may be difficult for the researcher (a non-First Nation person) to fully understand. The limitation of cross-cultural research is well recognized (Pickering, 2008; Van de Vijver et al., 1997). In this research, cultural aspects of water and the formal and non-formal rules established within the community may be difficult to interpret and assess. To address this limitation, the research was conducted in collaboration with the case study community partners (see Section 1.2). The partners (leaders within their community)

played an integral role in translating aspects of community culture, perspectives, and protocols. Communication with partners was often on a monthly basis throughout the scoping, data collection, analysis, and reporting periods of the research (approximately 2010-2014). The research also conformed to and upheld the Tri-Council Policy Statements: Research Involving the First Nations, Inuit and Métis Peoples of Canada (Government of Canada, 2011), as well as, case study community ethics protocols and procedures. In addition, efforts were made to communicate findings back to the community. Core findings were presented at community events (e.g., community picnic, fall fair) in the form of a booth where the researcher and community partner engaged with community members about the research, its findings. Community members had opportunity to reflect on the findings and provide any feedback (See Appendix D – Community report back materials for details).

Another limitation of this research was the process of selecting participants[14] within the case studies both on- and off-reserve. As mentioned above, the research was conducted in partnership with the case study communities. Community leaders were involved to identify potential on-reserve participants that were members of the community and knowledgeable about water. However, it is possible that in some situations the participants identified could have been biased to the social connections of the partners involved and the political environment of the community, a process that may have led to the avoidance of a potential participant unknown to the researcher. As a result, if different partners were involved in the research, different interviewees with different perspectives may have been chosen to inform the findings, leading to potentially varying outcomes. This research is dependent on community partners to work within the social and political context of the

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[14] Within this dissertation the term participant and key-informant are used interchangeable. Key informants are participants in research that hold social positions which give them proprietary knowledge about people, process or happenings and therefore are valuable for informing research (Payne and Payne 2004).

case study communities. Community partners' role in selecting participants is part of this process, and therefore, avoiding social or political biases of the research partners was unavoidable. The researcher made efforts to identify additional potential interviewees based on advice from participants through snowball sampling techniques, but in some cases the decision to involve (or not involve) some individuals was made by the partner.

The process of selecting participants within the case study sites off-reserve was also a limitation of this research. Water issues, particularly those that concern Aboriginal Peoples and the federal government in Canada are controversial. When individuals representing multiple levels of governments and organizations off-reserve were contacted by the researcher, some government agencies (particularly, AANDC and HC) refused to allow some representatives to participate in the research. This may have resulted in a narrowing of information and perspectives available for analysis. To address this issue, snowball sampling and participant networks were used to identify and request other potential participants off-reserve to fill any gaps of information or perspectives. The process was partially successful. In some instances off-reserve participants willingly used their social networks and relationships to contact other potential participants that were otherwise inaccessible. This built trust between the researcher and the potential participant and often led to better access to other participants within the organization. Looking forward, it would be helpful when identifying potential participants to utilize snowball sampling to a greater degree to overcome situations where individuals are inaccessible. Additionally, the networks and relationships of participants should not be underestimated and more attention to their role in connecting the researcher with other potential participants would ensure a broader spectrum of information and perspectives.

This research draws its findings from three case studies. The generalizability of the findings to First Nations across Canada may be limited. Each of the case studies have unique

histories, languages, cultural practices and spiritual beliefs. As such, the findings may be difficult to generalize depending on water situation, political environment, or culture in the community at which they are applied. However, the case studies are similarly embedded within provincial and federal contexts as other First Nations in Ontario and Canada. Off-reserve participants often spoke broadly about water issues that concern First Nations across Canada. This broader perspective shared by interviewees improves the generalizability of the findings to other First Nations across Canada.

This research is framed broadly through an adaptive governance lens. Although this research could have been framed within multiple other lenses with varied and valued outcomes, i.e., traditional knowledge, adaptive management, adaptive co-management, and learning (see Section 1.3.3), I choose adaptive governance as my lens for two primary reasons. First, uncertainty and complexity is an important characteristic of water management and governance. For instance, the natural fluctuation in water resources are exacerbated and made more unpredictable by changes in our environment, such as those from intense land uses such as agriculture and industrial activities or from changes associated with climate change. Beyond ecological uncertainty, communities (First Nation and non-First Nation) have social and political uncertainty. Human behaviour, economics, and politics all play a role in the uncertainty surrounding the management and governance of water resources. A prominent water challenge confronting all communities (First Nation and non-First Nation) is learning how to manage water resources within these uncertain and complex systems.

Adaptive governance concept brings together a broad suite of suitable scholarship (traditional knowledge, adaptive management, adaptive co-management, and learning) advantageous to understanding and exploring resource management within uncertain and complex conditions, particularly, First Nations and water contexts. Further, the concept has

had little attention in the context of water and First Nations communities in Canada. The result of it being both a concept that incorporates a full suite of scholarship to address uncertainty and complexity in resource management, and a relatively unexplored concept in First Nations context, makes adaptive governance promising for uncovering new insights and lessons toward addressing water issues confronting First Nations.

Second, adaptive governance (e.g., focus on participation, institutions, and multilevel contexts) overlaps many of the concerns First Nations have regarding water resources i.e., issues related to meaningful participation, authority to make decisions, legislative and regulatory gaps, poorly defined roles and responsibilities, knowledge gaps, multi-level nature, and the diversity of values and interests. For example, participation in resource management is a key challenge confronting First Nations. Current resource management processes are often criticised for inadequately involving First Nations as a stakeholder, much like industry or a municipality would be involved (von der Porten et al. 2013). Examining these and other First Nations issues with an adaptive governance lens has great potential to be fruitful for developing strategies to address them.

I used the First Nation reserve as a boundary for this research. Reserves are tracts of land set aside by the Indian Act (1876) for First Nations in Canada. They are criticized for facilitating a paternalistic relationship with the federal government. A relationship that marginalizes those that live there economically, socially, and politically, and thus, has the potential to create a state of dependency (Alfred, 2009). Further, First Nation water management and water governance extend beyond the artificial boundaries of the reserve both physically, as water flows across and through the reserve from neighbouring communities, but also from an institutional perspective with respect to federal and provincial regulations and legislation (see Section 1.3.1). The intent of this research is not to perpetuate the status-quo relationship between the federal government and First Nations

by bounding First Nation water management and governance to the reserve boundary. Similarly, the intent is not to entertain the notion that water management on-reserve is disconnected or separate from surrounding local, regional and national contexts.

First Nation reserves have unique water, social, political, and economic contexts that are important to explore and understand for water management. From an off-reserve perspective, reserves are "black boxes" when it comes to understanding water management (Boyd & Phare, 2010). Little is known about water management on reserves, e.g., what does it look like, what works, and what does not work. Most scholarly discussion about water management concerning First Nations is discussed from the perspective of off-reserve institutions (primarily regulations and legislation) (Patrick et al. 2011; Walters et al. 2012). This leaves a considerable gap in understanding water management on-reserves.

As discussed in Section 1.3.1, Ontario is implementing source water protection across the province for all of its citizens, including First Nations (O'Connor, 2002). Gaps in understanding water management on-reserve will make it difficult to build a management process that works both on- and off-reserve. However, the intent of using the reserve as a boundary for this research is to focus on what works or what does not work within the unique social, political, economic, and ecological contexts of the reserve, an element that off-reserve practitioners and scholars know little about.

1.6 Organization of dissertation

This dissertation is organized into six chapters. Chapter 1 introduces the research outlining the problem context and research objectives. This is followed by a three sub-sections outlining water governance and First Nations, the conceptual foundations of institutions, and adaptive water governance. Chapter 1 also outlines the empirical setting of the case studies.

Chapter 2 provides an overview the methodology and research framework of this dissertation. This includes a description of the data collection methods and analysis process. Chapters three, four, and five are three stand-alone manuscripts that correspond respectively to the research objectives presented above.

Chapter 3 presents the manuscript, "Examining First Nations' approach to protecting water resources to safe drinking water in southern Ontario, Canada". This manuscript uses a multi-barrier approach to examine issues and opportunities with water resource protection in the case study communities. The findings highlight the relevance of attitudes toward water and authority, cultural practices, current legislative and regulative arrangements, and quality of relationships for improving water management and governance.

Chapter 4 presents the manuscript, "Addressing water quality and quantity issues in three southern Ontario First Nation communities: An institutional approach to examine constraints and opportunities". This manuscript utilizes an institutional lens to examine the constraints and opportunities to address water quality and quantity issues on-reserve in the case study communities. It highlights institutional constraints that limit First Nations' ability to respond to water issues (i.e., diverging conceptions of decision making authority and legitimacy, lack of community engagement in water issues, incompatible formal institutions for managing water on-reserve, and an imbalanced distribution of knowledge, responsibility and decision making authority). Opportunities lie in fostering on-reserve relationships that encourage dialog, trust building, openness, and participation (especially among youth).

Chapter 5 presents the manuscript, "Moving from concept to practice: Examining adaptive water governance in the multi-level context of First Nation in southern Ontario, Canada". This manuscript examines the multi-level institutional setting of three First Nation

communities in southern Ontario, Canada for evidence of adaptive water governance and to identify opportunities to foster it. It highlights underlying issues (i.e., colonialism and deeply rooted perceptions of legitimacy and decision making authority) that can limit core requirements of adaptive water governance, (i.e., participation and voice of actors in decision making, use of diverse approaches to manage water resources, and equitable distribution of decision making power and authority). This chapter advances the conceptual and practical foundations of adaptive water governance by offering empirical insights on actionable starting points for water actors to build adaptive forms of governance in multi-level contexts that involve Indigenous Peoples. Chapter 6 concludes the dissertation by summarizing the overarching findings and contributions, outlining recommendations for water actors, and research limitations.

Chapter 2
Methodology and Research Framework

2.1 Overview

This research is positioned in a constructivist research paradigm. Constructivist perspectives move away from the existence of singular realities (as held in post-positivist paradigms) toward the existence of plural realities that are constructed in the minds of individuals (Ponterotto, 2005). Such realities can be uncovered through researcher-participant interaction. Through this interaction, the researcher and participant co-construct understandings about the phenomena of interest (Ponterotto, 2005). The goal is to understand the "lived experience" from the perspective of those that live it (known or unknown to the participant). Dilthey (1977) articulates that such experiences are embedded within a historical reality. To understand human behaviour (e.g., why various decisions or choices are made) the meanings that participants ascribed to particular behaviour or action is important. For example, in order to understand the decisions and choices surrounding adaptive water governance, it is necessary to uncover meanings that shape them (e.g., perceptions of historical events, existing relationships on- and off-reserve).

A case study methodology, as outlined by Yin (2009), is suitable within a constructivist perspective due to its capacity for "clarifying descriptions and sophisticated interpretations" about particular places, events, and people by those individuals that are most knowledgeable about a particular situation (Stake, 1995, p. 102). A case study is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; [where] the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1998, p. 23). This research focuses on

three specific case studies to examine adaptive water governance in First Nation contexts (see Section 1.3.3). Each case consists of a First Nation reserve in southern Ontario. There are several advantages to utilizing multiple cases over a single case study. First, multiple case studies produce evidence that is more compelling and robust then what can be gained from a single case (Yin, 1998). Second, multiple case studies produce outcomes for each specific case study, but also provide opportunity for cross-case conclusions (Yin, 1998). Cross-case conclusions can contribute to new understandings within the particular contexts of each case, across cases, and external to each case. As described, three First Nation case studies were selected within southern Ontario. The cases were selected in part because of their unique water issues and contexts in southern Ontario (See Section 1.4). Insights from these case studies contribute to cross-case conclusions about First Nations in southern Ontario, and potentially First Nations across Canada more broadly.

The case study is ideal for exploring a specific contemporary issue that is embedded in political, social, cultural, and economic contexts (Stake, 1995). Investigators can uncover specific problems, conflicts, and complexities surrounding a given issue in specific contexts through case study investigations (Stake, 1995). This is particularly important for exploring adaptive water governance in First Nations contexts. The challenges surrounding water governance happen within social, political, cultural, and economic contexts. As such, exploring water governance challenges through a case study has the potential to uncover lived experience that may play a role in the emergence of adaptive water governance (e.g., trust, historical institutions, past environmental conditions) in the First Nation context. Case studies can utilize quantitative, qualitative and mixed methods approaches (Yin, 1998). This research primarily utilizes qualitative research methods to collect data. This can be advantageous when investigating phenomenon where direct measurement is not possible. The process of triangulation, which utilizes multiple methods to corroborate evidence about

a theme or perspective was important to meaningfully bring together the outcomes from each method (Creswell, 2003; Lewis-Beck et al., 2004; Stake, 1995). The process of how themes were identified and triangulated is explained in further detail below (see Data Analysis in Section 2.4.5).

2.2 A partnership-based and co-designed methodological approach

Research practices continue in many instances to colonize Indigenous peoples worldwide (Smith, 1999). Researchers and research initiatives often frame problems, distribute benefits, and perpetuate assumptions about the interests of Indigenous peoples that may support – intentionally or unintentionally - historical and unequal relations of power (Ritchie et al., 2013; Smith, 1999). Methods and approaches that help to decolonize research is thus critical when working with Indigenous peoples, and an issue that is acknowledged in the several guidelines for research involving Indigenous Peoples in Canada (e.g., Canadian Institute of Health Research [CIHR] et al., 2014). Decolonization of research brings into focus a critical perspective on the underlying assumptions, motivations, and values that inform research practices (Smith, 1999), and seeks to ensure research is respectful, ethical, and useful from Indigenous perspectives. A core principle is that research involving Indigenous peoples should be lead by or co-developed to produce locally relevant knowledge, and in ways that support the interests of Indigenous people (Berkes, 2009; Davidson-Hunt & O'Flaherty, 2007; Maclean & Cullen, 2009).

As noted above, this doctoral research was conducted in partnership with the Mississaugas of the New Credit First Nations, Six Nations of the Grand River, and Oneida Nation of the Thames First Nation. The research partnership was formalized within a memorandum of understanding and a community ethics protocol. Each community identified a research partner (i.e., a water leader within their community) to work with me

to frame the inquiry, help guide the interpretation of findings, and ensure research activities were conducted appropriately within their particular community context. The relationship between the community partners and myself was guided by a collaboratively developed living ethics protocol established at the onset of the project. At each stage of the research, the living ethics protocol was revisited to ensure no changes were necessary and that its aims and intent remained in place. Funding was shared with the community research partners to support their role in the research.

Through the roles set out by the living ethics protocol, each partnering community was directly involved in steering the research and implementing relevant research activities. I worked with the community partners on a regular basis throughout the research process (e.g., from developing a research proposal to knowledge mobilization) to collectively decide on the direction of research inquiry, and to reflect on the appropriate methods to undertake research activities within their respective communities. For example, the community research partners played an important role in directing the research in a manner that ensured we specifically examine institutional constraints on-reserve. Community research partners felt that this was an important topic that needed more attention within water management and governance, and was an important influence in terms of the structure of this dissertation (i.e., the particular emphasis in chapters four and five).

In addition to the living ethics principles guiding the collaborative relationship, this research is also guided by the ethics requirements established by the Aboriginal Advisory Circle and Brock University and through the Office of Research Services at Wilfrid Laurier University. Further, this research has been reviewed and approved by Chief and Council in each partnering community. Through these protocols and approvals, this research adheres to the First Nation principles of Ownership, Control, Access, and Possession (OCAP®). The

OCAP principles are a set of standards that establish how First Nations data should be collected, protected and used or shared (FNIGC, 2014). The use of the OCAP principles was requested by a research participant. The participant played a role in its development in 1998 during the meeting of the National Steering Committee (NSC)[15] of the First Nations and Inuit Regional Longitudinal Health Survey. Below is a brief description of how the OCAP principles were incorporated within this research.

Ownership: The First Nation communities involved in this research have ownership over their community's cultural knowledge, data, and information. To exercise ownership, the communities, via the community research partner, have control over how that information is used and shared. For example, throughout the research, community partners reviewed all materials collected to ensure that no sensitive cultural knowledge, data, and information was inadvertently shared outside of the community. All materials are to be held in stewardship by myself and will be destroyed after three years, or one year after the last publication.

Control: As a partnership, the case study communities were explicitly involved in driving the research direction and implementing its actions. This took place through meetings and workshops at each stage of the research. Community partners were involved in framing how research activities were undertaken, including for example, the process to conduct interviews, select participants, provide incentives for participants, transcribe interviews, and general planning.

Access: Each community partner has access to all of the information and data collected throughout the research. Community materials in the form of presentations, posters, and demonstrations were collectively developed and disseminated through the

[15] In 2010, the NSC became First Nations Information Governance Centre (FNIGC) an incorporated non-profit under the mandate of the Assembly of First Nations Chiefs in Assembly.

community partner to ensure materials are received by community members according to community protocols.

Possession: All of the materials that were collected have been provided back to the community. For example, interview transcripts were handed over to the community partner as they were completed. In addition, all secondary data collected both on- and off-reserve was also provided to the community in the form of a database to be available for future use by the community.

2.3 Research Framework

In this section, I summarize my overall research framework (see Figure 2). This integrative research framework includes the elements and processes associated with my work (e.g., units of analysis, the phases of my research approach), as well as reference to the underlying concepts and theories (as distilled from section 1.3) that frame my inquiry into water management and governance in First Nations settings. For example, to examine the potential emergence of adaptive water governance and First Nations contexts in southern Ontario, I used two primary conceptual frameworks to address the research objectives (see Section 1.2). Each framework provides an important lens through which empirical evidence can interpreted.

The first core conceptual framework used in this research was the multi-barrier approach (MBA) to drinking water safety (see Plummer et al. 2010). Application of this conceptual framework was particularly relevant when addressing my first research objective. I used the MBA as a framework to characterize water management and governance on-reserve, and to provide the foundation upon which the potential for adaptive water governance may be critically examined (objective one). The MBA was chosen for two primary reasons. First, the MBA elements and criteria outlined by Plummer

et al. (2010) are a concise set of requirements relating to policy guidelines, monitoring, infrastructure, and the roles of diverse water actors at multiple levels. As such, these criteria were helpful for highlighting key components of water management and governance on-reserve. Second, First Nation reserves currently represent gaps in knowledge when considering a multi-barrier approach in Ontario more generally, and in our ongoing efforts to comprehensively protect water resources in the province. Section 1.3.1 further describes the MBA and the elements of that approach used as a framework in this research (see Chapter three for the full analysis).

To address the second objective, I utilized a conceptual framework that emphasizes the notion of 'institutional adaptive capacity' (Dietz et al. 2003; Gupta et al. 2010). This framework draws particular attention to three key dimensions that can be used to examine how existing institutional arrangements may facilitate or constrain water management in First Nations contexts: 1) analytic deliberation; 2) institutional variety; and 3) nesting. Specifically, I chose to apply the framework articulated by Dietz et al. (2003) for two primary reasons. First, institutions are the means through which governance takes place, and the identification of institutional constraints and opportunities using this framework can help to critically reflect on the implications for the development of more adaptive forms of water governance (see Section 1.2). Second, the three key features or strategies of the institutional adaptive capacity framework noted above serve as a concise entrée into governance in a way that reflects the social-ecological connectivity of the water systems of interest in this research (see Akamani & Wilson, 2011; Dietz et al., 2003; Dietz & Stern, 1998; Gupta et al., 2010; Huitema et al., 2009; Huntjens et al., 2012). The key elements of this framework, how and why it was used, and its limitations are described in more detail in Section 1.3.3.

The third objective of this research (see Figure 2) was addressed using the same

three strategies articulated above (analytic deliberation, institutional variety, and nesting)

to explore the First Nations in a multilevel governance context. Using the same framework

to examine First Nations water management and governance in a multilevel context allowed

for consistency in my approach to examine both the specific on-reserve constraints and

opportunities (objective two) and this broader socio-political an institutional context (e.g.,

national, provincial, regional, watershed, and reserve levels) (objective three). However, the

manner in which I applied the framework to address objectives two and three differs in

some key ways. Notably, and with regard to objective 3 and as previously indicated, I

applied the analysis across multiple levels (e.g., national, provincial, regional, watershed,

and reserve) and by drawing in particular on the perspective of governments, NGOs,

conservation authorities, and First Nations. This enabled me to give particular attention to

the structure and function of cross level/actor relationships and cross level/institutions.

This research was conducted in three stages. Each stage corresponds to a research

objective and chapter of this dissertation, Objectives 1, 2, and 3 in Chapter 3, 4, and 5

respectively. All inform the overarching purpose of examining the potential emergence of

adaptive water governance in First Nations context in southern Ontario. Section 1.2

describes how each objective is used to achieve the overall research purpose.

Figure 2 illustrates the research framework that guided the process. It sets forth and

displays the relationships among the objectives, case studies and methods. The three case

studies identified above form the context for each stage. The first stage characterized and

assessed water management and water governance in each case study community using the

multi-barrier approach for drinking water safety (Objective 1, Chapter 3). In Stage 2

institutional attributes and conditions that facilitate or constrain adaptive water

governance in the case study communities were identified and critically examined,

particularly how institutions facilitate or constrain analytic deliberation, institutional variety, and nesting (Objective 2, Chapter 4). Analytic deliberation, institutional variety, and nesting are discussed in more detail in Section 1.3.3. In Stage 3, multi-level institutional setting of the case studies is examined for empirical evidence of adaptive water governance and opportunities to foster it are identified (Objective 3, Chapter 5).

Figure 2 Research Framework

	Purpose of this research is to examine the potential emergence of adaptive water governance in a First Nations context in southern Ontario.	

Stage 1 (Objective 1)
Assess water management and governance

- Multi-barrier approach

Case Studies

- Six Nations of the Grand River First Nation

- Oneida of the Thames First Nation

- Mississaugas of the New Credit First Nation

Stage 2 (Objective 2)
Constraints and opportunities to protect water resources from community perspectives
- Analytic deliberation
- Institutional variety
- Nesting

Methods

- Direct observation

- Archival data gathering

- Secondary data gathering

- Semi-structured interviews

Stage 3 (Objective 3)
Examine the multi-level institutional setting and identify opportunities to foster
- Analytic deliberation
- Institutional variety
- Nesting

Outcomes for Adaptive Water Governance

- Opportunities
- Limitations/constraints

The arrow between each stage in Figure 2 indicates that each stage informs the next. The dotted arrow linking Stage 1 with Stage 3 conveys that the characterization and assessment of water management and water governance also informed Stage 3 for examining the multi-level institutional setting and identification of opportunities to foster adaptive water governance. All three stages informed the outcomes for enhancing water governance in the case study communities. The dotted line feeding back from research outcomes for adaptive governance illustrates the potential learning opportunities within and across the case study communities. Learning opportunities were possible through a workshop[16] about water attended by community members from each case study, presentations made to Elected Chief and Council about the research outcomes[17], and materials developed to capture research outcomes (documents, articles, community engagement booths, and flyers[18]). Multiple data collection methods (i.e., archival records, secondary data, semi-structured interviews, focus groups, and direct observation) were used to collect data. The following sections below provide more details about each stage of the research and how data were collected.

Stage 1

To understand the potential emergence of adaptive water governance in First Nation contexts it is necessary to characterize and assess water management and water

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[16] A workshop was facilitated by Paul General, Manager of the Six Nations EcoCentre and I for members of Six Nations, Oneida, and New Credit to attend. The purpose was to explore water issues within each community and share challenges and opportunities for water management on-reserve. Within the workshop preliminary outcomes of this research was shared with attendees. The workshop provided opportunities to reflect on these outcomes, build connections within and across the case study communities, and communicate water issues and strategies to overcome them.
[17] Throughout the proposal writing, ethical clearance process, data collection, analysis and presentation of results, the Elected Chief and Council received presentations from the principal research and/or research partners providing opportunities to learn about the research outcomes.
[18] Multiple times information was provided back to community members at community events and meetings (see Appendix D – Community report back materials for more details on this process and material).

governance (Objective 1; see Section 1.2 for and explanation of why this is essential to achieving the objectives of this research). To characterize and assess water management and governance within First Nation contexts, Stage 1 focuses attention on water management and governance arrangements surrounding the protection of water resources in the case studies outlined above. More specifically water management and governance arrangements are characterized and assessed based on current arrangements for protecting drinking water on reserve.

The five elements synthesised by Plummer et al. (2010) from federal and provincial approaches to drinking water safety were used as the basis for semi-structured interview questions (see Section 3.3 for more details). Semi-structured interviews were conducted with members of all three case study communities. This stage only included the views, experiences, and perspective from community members who live and/or work on reserve and does not include participants who live and work off-reserve. In total, 31 individuals were interviewed with roles that include council members, Elders, treatment plant operators, and health representatives. Some individuals represented more than one role in the community, for example, some members of Traditional Council were also Elders. Archival and secondary information

> **Stage 1 Participant Summary**
> A total of 31 individual members from the case study communities were interviewed.
> - Oneida: 10 individuals
> - New Credit: 11 individuals
> - Six Nations: 10 individuals

was also collected and used to triangulate interview data to achieve the first objective (See Section 2.4 for more details about data collection and analysis).

Stage 2

Stage 2 complements Stage 1 by examining the institutional attributes and conditions that facilitate or constrain adaptive water governance in First Nations contexts

(Objective 2; see Section 1.2 for an explanation of why this is essential to achieving the objectives of this research). In particular, Stage 2 utilized an institutional approach to examine how three First Nations communities are facilitated or constrained to address water quality and quantity issues on-reserve. It can be difficult to measure how institutions influence human behaviour because they can be hidden or unknown. Therefore, to operationalize institutions as an approach to examine on-reserve constraints and opportunities to address water quality and quantity issues, three strategies, highlighted within resource management literature to reduce constraints and improve how actors respond to challenges, were employed as an analytical framework (See Section 1.3.3 and 4.3 for more details). They include: analytic deliberation, institutional variety, and nesting (Akamani & Wilson 2011; Dietz et al., 2003; Dietz & Stern, 1998; Gupta et al., 2010; Huitema et al., 2009; Huntjens et al., 2012).

Key characteristics associated with each strategy were assessed through semi-structured interviews. Semi-structured interviews captured the experiences and perspectives of members who live and/or work within the case study communities. This stage did not include the perspectives of off-reserve participants. When possible participants chosen to participate in Stage 1

Stage Participant Summary
A total of 26 individual members from the case study communities were interviewed.
• Oneida: 8 individuals
• New Credit: 10 individuals
• Six Nations: 8 individuals

were again selected to participate in Stage 2. In total 26 individual members with diverse roles (i.e., council members, Elders, treatment plant operators, and health representatives) in the case study communities were interviewed. Similar to Stage 1, some of those interviewed represent more than one role. In these cases, a single on-reserve interview may have been used to inform insights about more than one role in the community (e.g., elder and councillor). In addition to interviews, archival and secondary information, and

observations were also collected to triangulate interview data and achieve the second

objective. See Section 2.4 for more details about data collection and analysis.

Stage 3

Stage 3 complements Stages 1 and 2 by examining the multi-level institutional

setting of the case studies for empirical evidence of adaptive water governance and to

identify opportunities to foster it (Objective 3; see Section 1.2 for and explanation of why

this is essential to achieving the objectives of this research). Within the case studies the

jurisdictional responsibilities for water crosses multiple levels and therefore an

examination of adaptive water governance must include this multilevel investigation. To

examine adaptive governance in this multi-
level context an analytical framework identical
to Stage 2 (i.e., analytic deliberation,
institutional variety, nesting) is employed;
however, instead of being used to examine on-
reserve constraints and opportunities to
address water quality and quantity issues, the
framework is used to empirically test how
meaningful the concept of adaptive water
governance is in a multi-level First Nation
water context.

> **Stage 3 Participant Summary**
> A total of 27 individual members
> from the case study communities
> were interviewed
> - Oneida: 8 individuals
> - New Credit: 10 individuals
> - Six Nations: 8 individuals
> A total of 31 individual off-reserve
> participants were interviewed
> - Federal government: 5
>   individuals
> - Provincial government: 5
>   individuals
> - Municipal government: 8
>   individuals
> - Conservation Authority: 5
>   individuals
> - Provincial level organization:
>   5 individuals
> - National level organization: 3
>   individuals

In order to examine adaptive forms of

governance within the southern Ontario First Nation multi-level context, semi-structure

interviews were used as part of its data collection methods. A total of 58 interviews were

used for this stage and can be divided into two groups. The first group is comprised of the

same interviews conducted in Stage 2 (27 individuals from the case study communities).

These interviews used in Stage 2 were reanalyzed to achieve Objective 3. The second group

of interviews included an additional 31 interviews of individuals that represent off-reserve

perspectives from governments and organizations (see Section 2.3 for more details).

2.4 Data Collection and Analysis

Multiple methods (semi-structured interviews, archival data gathering, secondary

data gathering, and direct observation) were used to identify and triangulate themes that

related to the research objectives. This section describes each method detailing its

significance for achieving the research objectives. This is followed by a discussion about the

process that was used to analyse the data collected.

2.4.1   Semi-structured Interviews

Interviews are used to understand what the researcher cannot observe, such as,

feelings, thoughts, intentions, perceptions, and significance and meanings of historic events

(Patton, 2002). Qualitative interviewing assumes that the perspectives of others are

meaningful. Aligning with the constructivist research paradigm, interviews allow

researchers to articulate constructed realities held by individuals. Interviewing allows the

researcher to describe and uncover the interpretations of participants, people that are most

knowledgeable about a topic and case.

Institutions are human constructs and therefore their interpretation depends on an

individual's life experiences. Interviews provide an important method to access how

institutions are interpreted by individuals and the role they play in the emergence of

adaptive water governance. Specifically, interviews were used in three ways to meet the

research objectives. First interviews were used to characterize and assess water

management and water governance (Objective 1). Second, interviews were used to examine

institutional attributes and conditions that facilitate or constrain adaptive forms of governance (Objective 2). Third, interviews were used as a source of information to examine the multi-level institutional setting for empirical evidence of adaptive water governance and to identify opportunities to foster it (Objective 3).

A semi-structured interview method was used because the systematic approach allowed individual perspectives and experiences to emerge from multiple case studies (Patton, 2002). Semi-structured interviews were conducted in each of the three stages of this research that are presented above. Figure 3 illustrates broadly which stage involved specific interview sources (i.e., participants that are members of the case study First Nations vs. participants that represent off-reserve governments and organizations at multiple levels). Figure 3 is followed by further explanation and details regarding each stage of the research.

Figure 3 Research stages/objectives and interview sources. The interviews source from the First Nations case studies was the same for both Stage 2 and Stage 3.
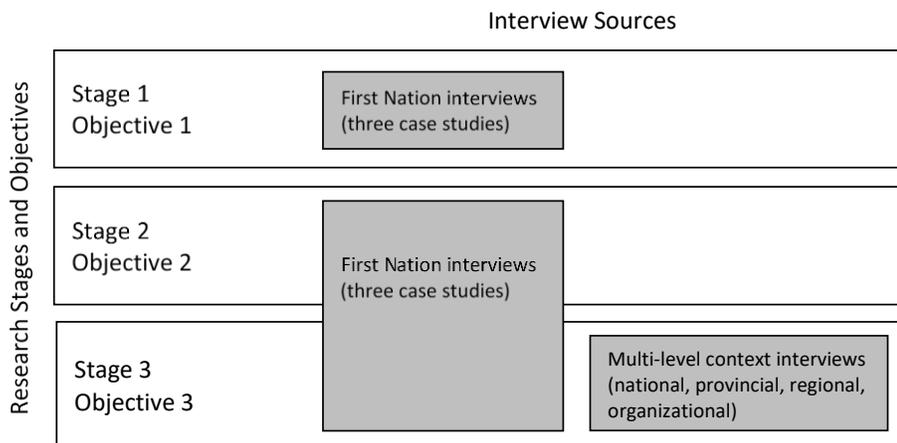
Stage 1: interviews were conducted with key informants who were (1) members of the partnering First Nation communities and (2) were working in or involved with water management on-reserve. Participants included council members, elders, treatment plant operators, health representatives etc. Table 1 summarizes the number of people

interviewed across the case studies for Stage 1. Semi-structured interviews followed a protocol that focused discussion related to the multi-barrier approach through open-ended questioning (Bernard, 2000; the interview protocol used in Stage 1 can be found in Appendix B – Interview question guide).

Table 1 Summary of Key informant interviews for Stage 1

Data sources (approx. dates conducted or accessed)	Case study (# number of individuals interviewed)		
	Oneida Nation of the Thames	Mississauga of the New Credit	Six Nations of the Grand River
Key informant interviews (2012-2013)	• Elected Council (4), Traditional Council (3), Health (1), Technical specialist (4), Elder (3) (10 individuals total)	• Elected Council (4), Health (2), Technical Specialist (2), Elder (2), other (2) (11 individuals total)	• Elected Council (4), Technical specialist (3), Elder (2), other (1) (10 individuals total)

Interviewees were selected based on knowledge and experiences surrounding water in the context of First Nations. Participants were selected or recruited based on guidance provided by the research partner and included technical operators, chief and council, health representatives, elders, and other community members that have a role in water management. Additionally, each community participant was asked to identify additional potential participants that were members of the partnering First Nation community and works or is involved in water management on reserve (i.e. snow ball sampling).

Stage 2: similar to Stage 1, entailed interviews with key informants who were 1) members of the partnering First Nation communities and 2) were working in or involved with water management on reserve. A summary of the key informants that participated in Stage 2 of this research is displayed in Table 2. Stage 2 interviews followed an interview protocol (different from Stage 1) to focus discussion around constraints and opportunities for managing water resources through open-ended questioning. The interview protocol used in Stage 2 can be found in Appendix B – Interview questions guide.

Table 2 Summary of Key informant interviews for Stage 2

Data sources (approx. dates conducted or accessed)	Case study (# number of individuals interviewed)		
	Oneida Nation of the Thames	**Mississauga of the New Credit**	**Six Nations of the Grand River**
Key informant interviews (2012-2013)	• Elected Council (2), Traditional Council (1), Health (1), Technical specialist (2), Elder (2) (8 individuals total)	• Elected Council (4), Health (2), Technical Specialist (2), Elder (2) (10 individuals total)	• Elected Council (2), Technical specialist (3), Elder (2), other (1) (8 individuals total)

Similar to Stage 1, interviewees were selected based on knowledge and experiences surrounding water in the context of First Nations. When possible, the same participants were selected in Stage 1 were again selected in Stage 2. In some case this was not possible because people were unavailable or no longer in a position related to water management. In these cases, additional participants were selected and interviewed. As in Stage 1, interviewees in Stage 2 were selected or recruited based on guidance provided by the research partner based on their role in the community related to water management. Each community participant was also asked to identify additional potential participants based on their role in water management within the community.

A total 58 interviews were carried out for Stage 3. The same set of interviews that was used in Stage 2 (on-reserve) was used in Stage 3 in combination with a set of interviews (off-reserve). This third set of interviews included off-reserve participants that work in or involved with water management off-reserve. Off-reserve participants included individuals working for governments (e.g., municipal, provincial, and federal), organizations (e.g., Conservation Authority), or individual members of a citizen group etc. Stage 3 is the only stage that includes off-reserve participants. Table 3 summarizes the key informants that participated in Stage 3 of this research. The interview protocol used in Stage 3 for both on-reserve and off-reserve interviews can be found in Appendix B – Interview questions guide.

Table 3 Summary of key informant interviews

| Data sources | Case study (# of individuals interviewed)[19] | | |
	Oneida (ON)	New Credit (NC)	Six Nations (SN)
First Nation[20]	•Elders(2), Health(1), Elected Council (2), Technical Specialist (2), Traditional Council (1) (8 individuals total)	•Elders (2), Health (2), Elected Council (4), Technical Specialist (2) (10 individuals total)	•Elders(2), Technical Specialist (3), Elected Council (2), Other(1) (8 individuals total)
Federal Government	•Health Canada (HC) (1) •Environment Canada (EC) (1) •Aboriginal Affairs and Northern Development Canada (AANDC) (1) (3 individuals total)		
	•Regional Health Canada (1) (1 individual total)	•Regional Health Canada (1) (1 individual total)	
Provincial Government	•Ministry of the Environment (MOE) (1) •Ministry of Natural Resources (MNR) (2) (3 individuals total)		
	•Regional Ministry of the Environment (MOE)(1) (1 individual total)	•Regional Ministry of the Environment (MOE) (1) •(1 individual total)	
Municipal Government	•City of London (LN) (1) •Middlesex County (MC)(2) (3 individuals total)	•Haldimand County (HD)(1) •Waterloo Region (WR)(1) •City of Brantford (BF)(2) •Brant County (BC)(1) (5 individuals total)	
Conservation Authorities	•Upper Thames Valley Conservation Authority (UTVCA) (1) •Lower Thames River Conservation Authority (LTRCA) (2) (3 individuals total)	•Grand River Conservation Authority (GRCA) (2) (1 individual total)	
Organizations	•Association of Iroquois and Allied Indians (AIAI) (2) (2 individuals total)		
	•Assembly of First Nations (AFN) (1) (1 individual total)		
	•Chiefs of Ontario (COO) (1) (1 individual total)		
	•Ontario First Nations Technical Services Corp. (OFNTSC)(1) (1 individual total)		
	•Ontario Clean Water Agency (OCWA)(1) (1 individual total)		
	•Centre of Indigenous Environmental Resources (CIER)(1) (1 individual total)		
	•Canadian Environmental Law Association (CELA)(1) (1 individual total)		

(Row labels down the left side: Key Informant Interview Sources)

[19] In total, 58 interviews were used for Stage 3. In this table an individual is counted once and categorized according to their most prominent role determined by community partners, the participant and researcher.
[20] Interviews with First Nations are the same interviews as those conducted for Stage 2 (see Figure 3).

Off-reserve key informants were selected based on their affiliated organization's role in water and water management related to the partnering First Nation communities. Additionally, key informants were selected through recommendations provided by the community partners and interviewees (snowball sampling) based on their role in water management related to First Nations in southern Ontario. Individuals were contacted and verbally invited to participate in the interview. Some off-reserve interviewees held positions that were relevant for more than one of the case studies. (e.g., the Grand River Conservation Authority as a watershed organization is relevant to both Six Nations and New Credit). In these cases, a single off-reserve interview may have been used to inform insights about more than one case study.

All interviews were recorded with a digital recorder and subsequently transcribed by the researcher. After interviews were transcribed, they were imported into QSR Nvivo 10 for analysis. Each participant was provided with the opportunity to review their transcribed interview and perform a member check to confirm accuracy and make any subtractions or additions if necessary.

Key informants volunteered to participate in the interview based on their interest in, and their perception of, the importance of, the research topic. Individuals who participated on behalf of their organization did so during office hours. For these reasons, incentives were not provided for participation in this research (except for circumstances stated below). However, community partners expressed that providing incentive was appropriate and required when conducting interviews within their respective communities. In these circumstances compensation was provided for each participant valued at $50 per interview as suggested as an appropriate amount by the community partners.

2.4.2 Archival Data Gathering

Archival data gathering involves locating, evaluating and systematically interpreting and analyzing data sources found in archives (Corti, 2004). Archival sources (e.g., organization records, personal collections), contain information about historical events, historical relationships, and historical processes (e.g., development of ideas or protocols). Interpretations of historical events, relationships, and processes depicted in archival data are constructions developed through the experiences of the individuals or groups that constructed them (Yin, 1989). The constructivist research paradigm aligns with archival data gathering by recognizing the role of an individual's experiences in the interpretation of historical events, relationships, and processes.

For this research, archival data gathering complemented the other data collection methods by providing historical information about water management and water governance in the case studies and surrounding multilevel actors (Objective 1 and 3). Archival data gathering was also important for examining institutions drawing linkages between historical events and actor relationships with First Nations water related challenges (Objective 2).

Archival data collected included minutes from council meetings (publicly available) (142 documents) and Source Protection Committee meeting minutes (95 documents). The data were identified through online searches and downloaded. Once downloaded, documents were imported into QSR Nvivo 10. Here data were searched using the text query functions (e.g., water, watershed, river, stream, lake, groundwater, contaminate). Information that was relevant to the objectives of this research was analyzed (See Section 2.4.5). All archival data were organized in a spreadsheet and provided back to the community in electronic and/or paper form through the community partner.

2.4.3 Secondary Data Gathering

Secondary data are any data that has already been collected by someone else and available for the researcher to inspect and re-analyse (Glass, 1976). Secondary data contains important information about a particular case study or associated issue. For example, secondary data can provide general background information about a case or issue, as well as, current and historical values and perspectives held by individuals, organizations, and interest groups. In this way secondary data fits within the constructivist paradigm recognizing multiple interpretations of life experiences held by people and reflected in the materials they produce. Furthermore, secondary data can illuminate new insights into the research questions and add new knowledge about the specific contexts under investigation (McArt & McDougal, 1985; Patton, 2002). Sources of secondary data included, but were not limited to, published statistical information, published and unpublished reports, memorandums, maps, newspapers, and newsletters (Jackson, 1995).

Secondary data were important for this research because they hold valuable background information for characterizing and assessing water management and governance arrangements (Objective 1). Secondary data were also used to identify and examine institutional attributes and conditions that facilitate or constrain adaptive forms of governance and helped uncover historical relationships and linkages with how First Nations responded when confronted with challenges (Objective 2). Secondary data provided context specific information that was helpful for examining the multi-level institutional setting of the case studies (Objective 3).

To identify and retrieve secondary data, searches were conducted on internet webpages (government websites, Elected Chief and Council Website, Organizational Websites) based on input from community members or other data sources. Examples of words used to search came from the interviews (e.g., water, treatment, contamination,

distribution, groundwater, and advisory). Once downloaded or retrieved, documents were imported into QSR NVivo 10 for analysis. Further details about analysis are presented in the data analysis Section 2.4.5. All secondary data collected was organized in a database and provided back to the community in electronic and/or paper form through the community partner.

2.4.4   Direct Observation

Direct observation provides additional information related to the case study community about relevant behaviours and environmental conditions (Yin, 1989). Observations were helpful in understanding the role that institutions have in facilitating or constraining each respective community from addressing water related issues and was necessary for formulating strategies and tools to enhance water governance (Objective 1, 2 and 3). Observations were both casual and formal. Casual observations were valuable for providing additional information about the research topic (e.g., context). Casual observations took place during research activities or other water related events within the communities (e.g., interviews, workshops, meetings). Casual observations were recorded in a notebook as field notes and compared with other data collected through other methods looking for similar patterns or ideas. Formal observation is important when the researcher seeks to observe specific phenomenon related to the research topic (Yin, 1989). In some situations formal observation was appropriate for this research, for example, when participating in workshops where observations from more than one person were required at once. In such a situation, an observation protocol was utilized for recognizing and recording observations (the observation protocol can be found in Appendix C – Research observation guide). Both the protocol and observation notebooks were imported into QSR NVivo for analysis (see Section 2.4.5 for more details about analysis).

2.4.5 Data analysis

The collected data were analysed using qualitative methods (further details about how the methods were applied can be found in Chapters 3, 4, and 5). After data were collected as described above, data from interviews, archival and secondary data sources and direct observations were imported into QSR NVivo 10™ qualitative analysis software. Once imported, the data were organized based on type, such as the type of document (e.g., meeting minutes, report), interviewee (e.g., First Nation, Non-First Nation) and observation notes. Detailed analysis of the data began with coding the transcribed interviews. Coding is the process of organizing data into themes and then assigning meaning to each theme (Creswell 2003; Marshall & Rossman, 2010). A theme is a pattern of observations that exist across the data collected (Creswell, 2003; Guest, 2012; Lewis-Beck et al., 2004; Stake, 1995). Themes were arrived at through qualitative content analysis of the data using deductive and inductive coding approaches as outlined by Graneheim and Lundman (2004), Crabtree and Miller (1999), Boyatzes (1998), and Fereday and Muir-Cochrane (2008). Deductive coding is a process where predetermined categories (in this research related to the multi-barrier approach [Objective 1] and strategies for adaptive water governance [Objective 2 and 3]) were used to group themes.

The relative importance of a theme was evaluated based on patterns across and between data sources. Patterns were evaluated and weighted based on the reoccurrence of specific themes across the data sources. Specifically, the occurrence of a theme several times throughout the data sources was given more weight in the analysis than a theme that occurred only few times, with the exception of themes surfacing from participants with proprietary knowledge (i.e., treatment facility operator) on a subject or context. In these cases, themes from participants with proprietary knowledge were emphasized. A participant with proprietary knowledge is a participant that has a unique role within the

community and has understandings related to water that other members may not have the opportunity to experience. For example, a single participant such as a treatment facility operator may provide information contributing to a theme that only someone working and involved in the day-to-day operations of the water treatment facility may know. This process of evaluating and weighting theme importance aligns with the qualitative methods approach of Miles et al. (2014), Ryan & Bernard (2003), and Saldana (2010). The overall weighting of themes was crosschecked with respective community partners throughout the data collection, analysis, and reporting period of this research.

From these groupings, categories were analyzed inductively to examine their relationship with water management and water governance (Objective 1); institutions, constraints and opportunities (Objective 2); and the multi-level institutional setting (Objective 3). To aid in visualizing case specific interconnections between themes identified through the coding process, mind mapping software (Docear 1.0.0 beta 1 build 31™) was used to map out the linkages. An example of a mind map is provided in Figure 4A. It illustrates a portion of the mind map used in Chapter 4 and depicts the deductively coded sub-category of 'Diversity of values included in decision making', the theme of responsibility was identified in the New Credit case study and linked to aspects of institutions, constraints and opportunities through the codes. Initials at the end of a node indicate the interview participant(s) who discussed the theme. The mind map was a helpful tool for organizing and visually representing the themes specific to each case study. A similar mind map and process was developed for Chapter 4 and 5. Specific to Chapter 5, interviews with off-reserve actors were included in the data analysis. In this case, themes and codes were organized around off-reserve actors in addition to the case study communities (see highlighted area in Figure 4B).

Figure 4 Example of code and theme mind-maps

A

B
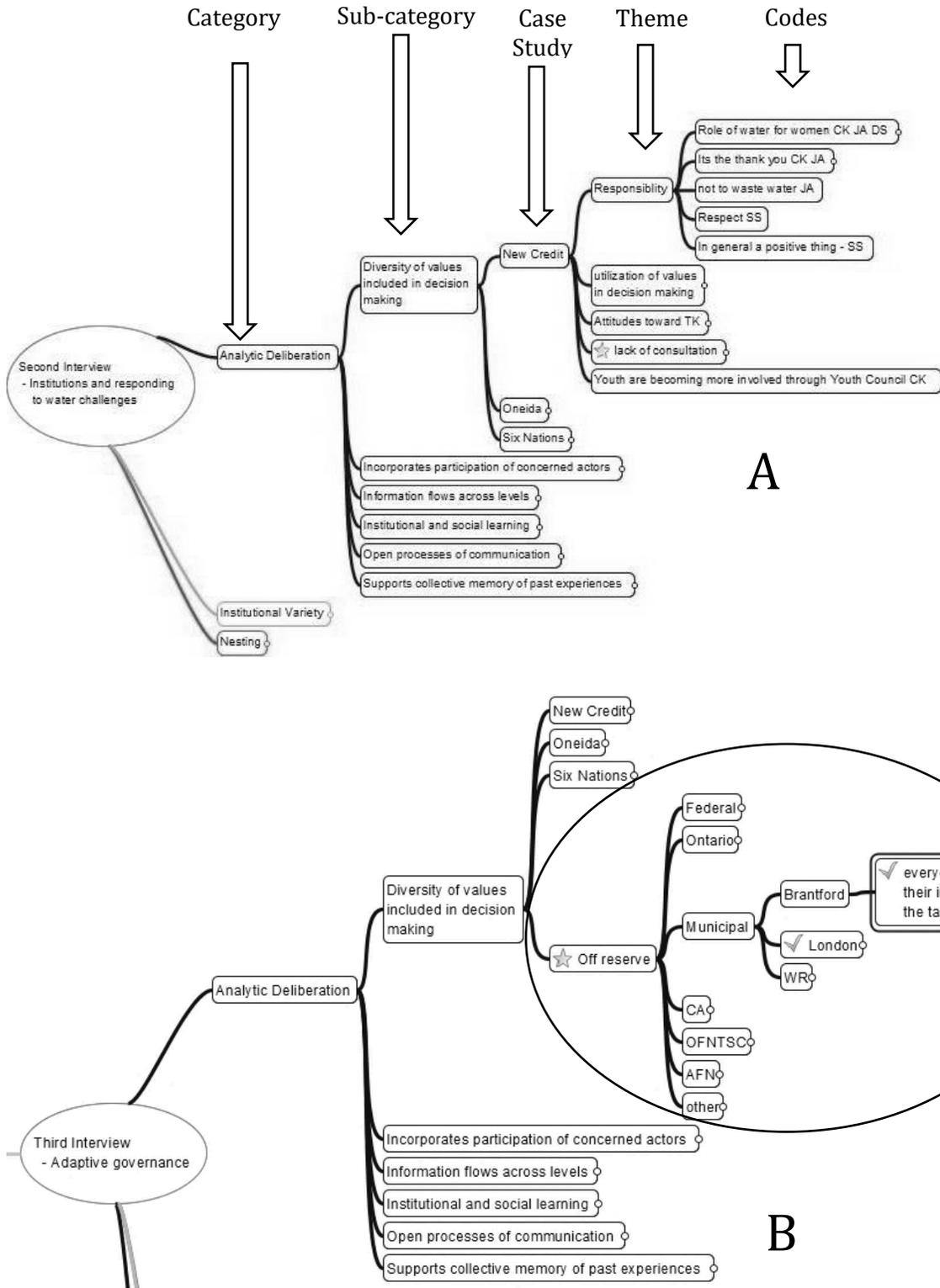
Once each category was inductively coded and interconnected relationships identified, a case study database was constructed following the methods of Yin (2009). A database is a table that contains a collection of data (codes and quotes) that corresponds to the themes identified in the analysis process. Along with these collections personal notes that build on the connections made during the analysis process were added. The database was used to find interconnections and relationships across the case studies for each objective. Organized in a similar way to the mind maps depicted above, the database was used to develop and organize case specific summaries of the themes identified under each sub-category. Next, all the summaries of the sub-categories pertaining to a specific category (e.g., in Figure 4A, analytic deliberation, institutional variety, and nesting) were subsequently summarized. The result was a case specific summary (including off-reserve actors in Chapter 5) for each category. Drawing from these case specific summaries, a final cross-case summary was added to the database depicting interconnections and linkages across the case studies (and off-reserve actors in Chapter 5). It is these summaries that cross-case insights within this research were based. The analysis process was conducted sequentially from Chapter 3 to 5. As such, using Dietz et al.'s (2003) framework across Chapter 4 and 5 was advantageous because it allowed for insights from Chapter 4 to be carried over to Chapter 5. A database of this nature was also helpful for ensuring reliability and maintaining a chain of evidence. The results and conclusions were drawn from the information stored in the database.

2.4.6 Data presentation

The data sources and analysis inform the findings presented in this research. The findings are communicated using exemplary quotations from the key informant interviews to illustrate the prominent themes. Prominent themes presented in this dissertation were

identified and weighted based on their reoccurrence across data sources, from proprietary knowledge from key informants, and input provided by respective community partners (see Section 2.4.5). Quotations from the key informant interviews were chosen to communicate the findings in this dissertation because they highlight the rich context of water management and the experience of participants both on- and off-reserve.

2.5 Conclusion

In this chapter the methodology and research framework was presented. The research employed a multiple case study methodology. The three case studies are Six Nations of the Grand River, Oneida Nation of the Thames, and Mississaugas of the New Credit First Nation. Multiple methods (semi-structured interviews, archival data gathering, secondary data gathering, and direct observation) were used to identify themes related to the research objectives. Qualitative content analysis using deductive and inductive coding approaches were used to identify themes and examine their relationship with water management and water governance, institutions, constraints and opportunities, and the multi-level institutional setting. The following chapters three, four and five are standalone papers that either have been published in peer-reviewed academic journals (i.e., Chapter 3) or are being prepared for publication (i.e., Chapters 4 and 5). As a whole, each paper meets the objectives of this dissertation. Each paper also makes individual contributions to knowledge.

Chapter 3
Examining First Nations' Approach to Protecting Water Resources Using a Multi-Barrier Approach to Safe Drinking Water in Southern Ontario, Canada

3.1 Chapter overview

This paper uses a multi-barrier approach (MBA) to examine issues and opportunities with water resource protection in three First Nations communities in Southern Ontario (Mississauga of the New Credit First Nation, Oneida Nation of the Thames, and Six Nations of the Grand River). The MBA is a comprehensive approach that the province of Ontario, Canada has taken to address drinking water safety. Examining the issues and opportunities with water resource protection on-reserve is critical because reserves represent a critical gap in Ontario's comprehensive approach. For example, water quality and quantity may be protected off-reserve, but are vulnerable on-reserve. As a result, issues and opportunities on-reserve have potential to influence on-reserve, as well as off-reserve contexts.

The cross case analysis highlights the relevance of attitudes toward water and authority, cultural practices, current legislative and regulative arrangements, and quality of relationships for improving water management and governance. Employing a perspective that captures cultural, social, economic, and political contexts may enhance the ability to address persistent water challenges experienced by First Nations.

3.2 Introduction

Across Canada a MBA is being utilized to address concerns about water safety. After the crisis in Walkerton, Ontario, where seven people died due to treatment mismanagement and source water contamination, Justice O'Connor recommended the provincial

government amend legislation to employ an MBA to safe drinking water for all citizens of Ontario, including First Nations. Recognizing the severity of water issues confronting First Nations, O'Connor argued that despite the constitutionally enshrined federal responsibilities for water on First Nations reserves, provincial legislation should enable First Nations to join in the watershed planning process, specifically in planning and implementing source water protection (one of the multiple barriers protecting Ontario's drinking water). The province responded by developing the Clean Water Act (2006) to improve the protection and safety of water in Ontario (Ontario Ministry of the Environment [OMOE], 2004); nevertheless, water issues continue to be a prominent concern for First Nations.

First Nations confront many issues related to water quality and access. As of July 2016, 132 Drinking Water Advisories were in effect in 92 First Nation communities across Canada, excluding British Columbia, some of which are long-term and have been in place for multiple years (Health Canada, 2016). Reports issued by governments and non-government organizations alike reflect the severity of water issues confronting First Nations and also indicate that inadequate access to water is a paramount concern (e.g., access to safe drinking water; AFN, 2011; Christensen, 2006; CIER, 2009; Christensen et al., 2010; Government of Canada, 2005; Harden & Levalliant, 2008). Inadequate access is often an issue of equity. For example, lack of meaningful engagement limits how the values and interests of First Nations Peoples are incorporated into water management. Meaningful engagement is central to asserting the inherent rights of First Nations to use and control water resources (Kahn et al., 2001; Safe Drinking Water Act [SDWF], 2009). Why these water issues persist across First Nations communities vary depending on social, political, cultural, and environmental contexts (Basdeo & Bharadwaj, 2013; Borrows, 1997).

Policy makers and researchers have recognized the value of an MBA to address water concerns and challenges confronting First Nations, and its application within reserve contexts. However, debate continues over how provincial legislation applies on First Nations reserves (O'Connor, 2002). For example, provincial law may apply on reserves through general application if it does not specifically relate to First Nations aspects of the land and infringe on the rights of First Nations. If it does, provincial law may apply by virtue of the Indian Act, s. 88 (1985) (Government of Canada, 2001; Swain et al. 2006b). However, the Chiefs of Ontario, in O'Connor (2002) and Swain et al. (2006a; 2006b), argue that protecting water through land management practice potentially infringes upon federal jurisdiction and the rights of First Nations, thus affecting the ability to self-govern. Further, in Ontario source water protection legislation focuses strictly on municipal water supplies leaving First Nations non-municipal or community systems (e.g., residential wells, streams, cisterns) largely unprotected. In examining the implications of these arrangements, Walters et al. (2012) compared the capacity of First Nations and non-First Nations communities in Ontario to implement an MBA. They identify that implementing a MBA within the current water management and governance regime remains a challenge for First Nations. They argue that current federal and provincial strategies (predominantly financial and technical investments) needed to implement the MBA do not address existing gaps in political leadership and participation in decision making. Walters et al.'s (2012) study aligns with Finn's (2010) commentary that current conceptualizations of the MBA fail to meet the needs of First Nations. Finn's (2010) study evaluated how an MBA, according to the Council of Ministers of the Environment (CCME, 2002), was applied in northern Ontario First Nations communities. He found that current conceptualizations of an MBA (i.e., CCME) employ predominantly technical strategies to protect water resources, and fail to support

local and traditional knowledge, beliefs, and perspectives within the current water management and governance regime.

As these studies highlight, current approaches to implement and conceptualize multiple barriers to protecting water resources focus on financial and technical aspects that are unable to address the full extent of challenges confronting First Nations. Questions remain over how to improve strategies that support local and traditional knowledge, participation, and leadership. Authors such as McGregor (2012) argue that answers can be found through the practice and knowledge of Indigenous Peoples. First Nations' perspectives on their responsibility to protect water are embedded in their world views and relationships with water that are in turn based on respect and reciprocating responsibility (Kahn et al., 2001; McGregor & Whitaker, 2001; Ransom, 1995). These attitudes and values are informed by the Natural Laws that are carried forward through oral traditions and spiritual beliefs and underpin First Nations responsibility to protect water resources (McGregor & Whitaker, 2001; Walkem, 2006). The protection of water resources on-reserve may be informed by both the current water management regime and local or traditional approaches. Improving understanding of this intersection of current practices for protecting water resources on-reserve will shed light on helpful strategies that go beyond financial and technical investments to meet the needs of First Nations.

This paper explores current approaches to protecting water resources in three First Nations case study communities. Two main objectives guide this research: (1) to examine how the MBA is expressed in three First Nations case study communities highlighting prominent challenges for protecting water resources on-reserve; and (2) to identify opportunities to address water challenges and improve prospects for more effective water governance on First Nations reserves.

3.3 MBA and Context

The MBA is an integrated system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risk to public health (CCME, 2002). Commonly used barriers put in place to prevent water contamination are source water protection, protection of the distribution system, and drinking water treatment (CCME, 2002). In Canada, a MBA to protecting drinking water has been advocated through the CCME as a broad mandate to facilitate policy development, standard setting, and support for provincial and municipal actions.

Plummer et al. (2010) synthesize the MBA into five key elements, namely protection of sensitive source areas, treatment, distribution, monitoring, and responding to adverse conditions to examine the extent to which municipalities develop new environmental policy in response to crisis in Ontario (See Table 4). It should be noted that in First Nations contexts, protecting water resources may extend beyond drinking water to other uses such as medicinal and ecological. This paper uses these five elements along with corresponding key concerns (also outlined in Table 4) as a framework to examine how the MBA is expressed in each case study community. The five element framework had been successfully utilized to investigate water policy in Ontario, and specifically to investigate how new policies and processes interact when introduced into pre-existing policy arenas (Plummer et al., 2010). In a similar way, this research uses the elements as a guide to collect and synthesize prominent challenges for protecting water resources confronting First Nations in Ontario.

Table 4 Key elements and concerns of the MBA to protect drinking water

Elements	Description	Key Concerns
Protecting of sensitive source areas	• Protection of sensitive recharge and discharge areas to assure the quality and the quantity of water availability in its broadest sense to fulfill the needs of society and ecosystems. Long-term planning for sustainable water availability of instream flows, surface water, and groundwater requires the establishment of policy relationship between land use planning and water protection. This is an essential principle designed to protect and/or enhance water resources from potentially harmful development within the initial area of water supply (Brandes et al., 2005, p. 57; de Loë et al., 2005, p. 135; Ivey et al., 2006, p. 193; OMOE, 2004, p. 8)	• Delineation of sensitive areas • Initiatives focused on ground and surface water protection • Protection of sensitive lands (relating to agricultural, commercial, industrial and other land uses and activities) • Protection of water from impacts of historic, existing, and future land use
Treatment	• Treatment of water to ensure the health of the resource for human consumption as well as treatment for potentially hazardous substances that may result in water contamination and the reclamation of water through recycling. Multiple treatment mechanisms are desirable (Brandes et al., 2005, p. 13, 84; OMOE, 2004, p. 8)	• Identification of contaminant sources from industrial, commercial, agricultural and other activities • Availability of options before discharge is permitted such as on-site recycling, • product reuse, and treatment to remove or reduce hazards • The use of biological, chemical and physical treatment of water to lower the risk of contamination • Sufficient funding to operate and maintain facilities
Distribution and storage systems	• Covers the components of water cycling through the storage and distribution system. The water distribution network is a key aspect of protection; it is also the most expensive component of a water supply system and is continuously subject to environmental and operational stresses, which cause deterioration. The water storage component refers to both built and natural storage approaches. This broad barrier encompasses water cycle and storage management that prevents the intrusion of contaminants (Brandes et al., 2005, p. 70; Kleiner et al., 2001, p. 15; OMOE, 2004, p. 8; Pollution Probe, 2001, p. 4)	• Safety, reliability, quality, and efficiency of water supply • Improvement of water supply systems • Management of the water cycle and storage throughout the distribution system • Programs for management of existing and abandoned private wells (public and private)
Monitoring and distribution, surface and groundwater	• Monitoring of surface and groundwater quality and quantity involves detection of contaminants that exist in concentrations beyond acceptable limits and return systems to normal operation. Monitoring is an essential process that provides continued protection and management (de Loë et al., 2005, p. 132; OMOE, 2004, p. 8)	• Inspection, monitoring and enforcement for existing private wells and septic systems • Monitoring of source water and ground water withdrawals and quality • Policy commitment to continuous improvement through implementation based on assessment, monitoring, evaluation, reporting and follow-up modifications

Responding to adverse conditions	• Responses to adverse conditions are in place for all elements of the MBA. This element is designed to help prevent adverse health impacts and further water degradation by responding to adverse conditions that may cause any barrier(s) to fail (de Loë et al., 2005, p. 134; OMOE, 2004, p. 8).	• Policy addressing procedures for emergency response to spills and other threats • Identification of significant risks that have a potential to create adverse impacts; prescribed actions to mitigate the risks

Adapted from (Plummer et al., 2010)

3.4 Methodology

A multiple case study methodology as outlined by Yin (2009) is utilized to explore specific contemporary issues like those surrounding water and its protection through the lived experiences in the study studies. A cross case comparison is conducted between three First Nations case studies in Southern Ontario (i.e., Six Nations of the Grand River, Oneida Nation of the Thames, and Mississaugas of the New Credit First Nation; see Figure 5 for their location in Southern Ontario). Deliberately selected, each community characterizes diverse water arrangements (e.g., drinking and sanitary water infrastructure, current pressures on source waters within each reserve, and process for responding to drinking water issues). Building on previously conducted research (see Plummer et al. 2013), this study is part of a collaborative partnership with three First Nation communities, Mississaugas of the New Credit First Nations (New Credit), Oneida Nations of the Thames (Oneida), and Six Nations of the Grand River (Six Nations). Figure 5 summarizes for each case study the key arrangements including source water and sanitary services, infrastructure, responsibilities and financing. The following case study descriptions draw from previous works by Cave et al. (2013), Plummer et al. (2013), and Smith (2009).

Figure 5 Case Study Communities in Southern Ontario
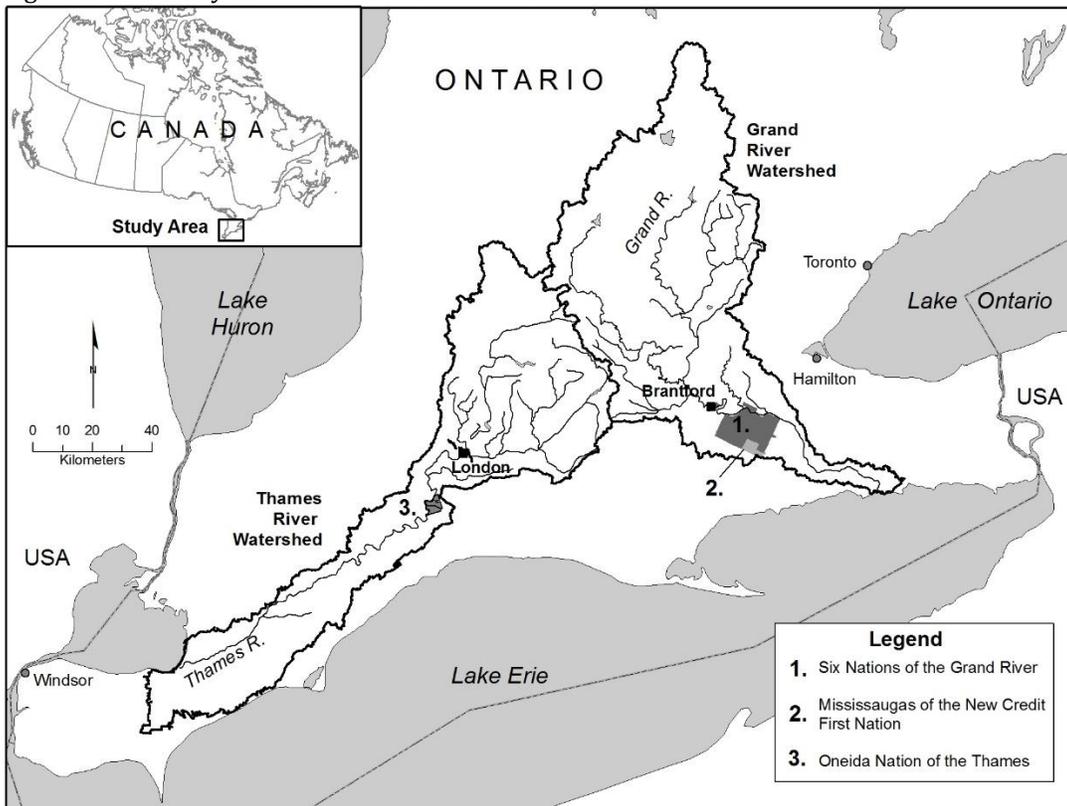
3.4.1 Six Nations of the Grand River

Six Nations of the Grand River is located south of the City of Brantford (downstream) with an on-reserve population of approximately 13000 people (Six Nations of the Grand River [SNOTGR], 2010). Six Nations receives water from two main sources within the Grand River watershed: surface water from the Grand River which is treated on-reserve at a new treatment plant facility (opened in November 2013 after data were collected for this research) and distributed to some community members by pipe or water truck, and residential wells used to capture groundwater (SNOTGR, 2010). Additionally, many residents purchase bottled water. Current pressures on water include source water contamination (via poor residential wells, disposal facilities, septic systems, and agricultural sources; Burnett, 2005; SNOTGR, 2007).

3.4.2 Mississaugas of the New Credit First Nation

Mississaugas of the New Credit First Nation is also located south of Brantford and borders the west side of Six Nations. It has an on-reserve population of approximately 820 people (Mississauga of the New Credit [MOTNC], 2008). New Credit receives surface water piped from nearby Lake Erie. The water is treated off reserve at the Nanticoke treatment facility and distributed to some community members by pipeline or water truck. A small proportion of community members receive water captured from deteriorated wells (MOTNC, 2008). Some residents purchase bottled water for drinking (MOTNC, 2008). New Credit continues to face water-related pressures from contamination of both groundwater and surface water from agricultural activities, dumping, septic systems, and industrial activities (i.e., the Tom Howe Landfill and a nearby gypsum plant). The landfill is located adjacent to New Credit and threatens residential well water quality within the community. The landfill is the 22nd largest in Ontario (by footprint, 26.4 ha) and was scheduled to close in October 2015 (Ontario, 2015).

3.4.3 Oneida Nation of the Thames

Oneida Nation of the Thames is located southwest of London (downstream) and has an on reserve population of approximately 2000 people (AANDC, 2010). Oneida receives water primarily from an aquifer fed by the Thames River. Water is treated on reserve and distributed to all residents. Many residents purchase bottled water for drinking. Oneida has concerns over water contamination from the Green Lane Landfill located adjacent to the community. The landfill is the eighth largest (by footprint, 71.2 ha) in Ontario (Ontario, 2015). Upstream sewage treatment facilities as well as general river water quantity issues are also a concern. Additionally, Cave et al. (2013) identify issues associated with mistrust in leadership and the quality of water provided by the drinking water treatment facility.

Table 5 Summary of drinking water and sanitary services for each case study

Case study community	Source water and Sanitary disposal	Access to water and sanitary services	Key water and sanitation infrastructure	Responsibility for maintaining and operating infrastructure	Primary source of financing
Mississauga of the New Credit[a]	• Surface water from Lake Erie	• 226 total residential, public, commercial and industrial units within the community • 141 residential units access communal system • 20 (approx.) public / commercial units access communal system	• Drinking water treatment facility operated off reserve	• Owned by City of Nanticoke, operated by Ontario Clean Water Agency (OCWA)	• City of Nanticoke
			• On reserve water pipeline (from treatment facility)	• Maintained and operated by New Credit	• AANDC New Credit*
	• Groundwater	• 70 residential units access wells or cisterns for drinking water (filled with surface water from Lake Erie)	• Residential wells (detraining and under maintained)	• Residential home owner	• Residential home owner
	• Sanitary disposal to Boston Creek	• 69 residential units access communal sanitation • 13 commercial/ industrial units have access to sanitation • 144 residential and commercial units access septic pumping services	• Single cell lagoon for water treatment and sand filter	• Maintained and operated by New Credit	• AANDC
Oneida Nation of the Thames[b]	• Groundwater Under the Influence of Surface Water (GUDI)	• 459 total residential units, total units of commercial and industrial is unavailable • 459 residential units access communal water service	• Treatment plant facility • Water tower and pipe line	• Maintained and operated by Oneida	• AANDC
	• Groundwater	• 5-6 residential units access residential wells*	• Residential wells and cisterns (degrading and under maintained)*	• Residential homeowner	• Residential home owner
	• Sanitary discharged to small creek	• 9 residential units access communal sanitation system • 439 residential units use septic tanks • 11 residential units access other services	• Sequencing batch reactor wastewater treatment system (as of 2001 not functioning) (Southern First Nation Secretariat [SFNS], 2001)	• Maintained and operated by Oneida	• AANDC
Six Nations of the Grand River[c]	• Surface water from the Grand River	• Total of 2808 residential units, total units of commercial and industrial is unavailable • 415 residential units have access to surface water • 99 commercial units have access to surface water	• Treatment Plant facility at capacity (New plant expected to be completed by end of 2013) • Truck fill station • Water tower • Pipeline	• maintained and operated by Six Nations	• AANDC
		• 315 residential units are not connected to running water services in 2010 (Wong, 2010)			
		• 2200 residential, commercial and public units access truck fill station (Pecoskie, 2010)	• Residential cisterns	• Residential homeowner	• Residential home owner
	• Groundwater	• Unreported how many residential and commercial units access residential wells	• Residential wells (detraining and under maintained)	• Residential homeowner	• Residential home owner

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• Sanitary discharged to the Grand River	• 304 residential units access communal system • 99 commercial units access communal system • 2058 residential and commercial units access septic services	• 5 cell sewage Lagoons for water treatment • Peat land Treatment System	• Maintained and operated by Six Nations	• AANDC
	• 312 residential units have no sewage system			

* information from interviews
[a] (MOTNC, 2008; [b]SFNS, 2001; [c]SNOTGR, 2010)
Note: it is possible that residential, public, commercial and industrial units may access more than one water source

3.4.4 Methods

Multiple methods were used to explore the water challenges confronting the three case study communities according to the MBA, including archival data gathering, secondary data gathering, semi-structured interviews, and direct observation. Multiple methods were used to identify and evaluate themes or perspectives based on a combination of triangulation between data sources, the reoccurrence of themes across data sources, the occurrence of themes from key informants with proprietary knowledge, and input provided by respective community partners (see Section 2.4.5) (Creswell, 2003; Lewis-Beck et al., 2004; Stake, 1995). Data collection was conducted between 2010 and 2014. A summary of data sources is presented in Table 6. Primary data sources included 31 semi-structured interviews (approx. 10 within each case study) conducted face to face with community members in locations convenient to each participant (e.g., home, coffee shop, office). An interview guide was developed based on the key elements described in Table 4 to capture the water related challenges confronting First Nations (see Appendix B – Interview question guide).

Table 6 Data Sources

Data sources (approx. dates conducted or accessed)	Case study (# number of individuals interviewed)		
	Oneida Nation of the Thames	Mississauga of the New Credit	Six Nations of the Grand River
Key informant interviews (2012-2013)	• Elected Council (4), Traditional Council (3), Health (1), Technical specialist (4), Elder (3) (10 individuals total)	• Elected Council (4), Health (2), Technical Specialist (2), Elder (2), other (2) (11 individuals total)	• Elected Council (4), Technical specialist (3), Elder (2), other (1) (10 individuals total)
Secondary and Archival data (2012-2014)	• Websites (e.g., AANDC, Oneida, Stats Canada, Health Canada, Conservation Authority), Community documents (e.g., engineering reports, emergency response plan), Government reports (e.g., assessments, inquiries, source protection committee meeting minutes)	• Websites (e.g., AANDC, Oneida, Stats Canada, Health Canada, Conservation Authority), Community documents (e.g., engineering reports, emergency response plan, Chief and Council meeting minutes, Comprehensive Community Plan), Government reports (e.g., assessments, inquiries, source protection committee meeting minutes) Historical texts (e.g., Smith, 1987)	• Websites (e.g., AANDC, Oneida, Stats Canada, Health Canada, Conservation Authority), Community documents (e.g., engineering reports, emergency response plan, Chief and Council meeting minutes, Community Plan), Government reports (e.g., assessments, inquiries, source protection committee meeting minutes), Historical texts (e.g., Johnson, 1881)
Direct observation (2009-2014)	• Research notes	• Research notes	• Research notes

Note: Some individuals represented more than one role e.g., Elder and Traditional Council. In this table an individual is counted once and categorized according to their most prominent role determined by community partners, the participant and researcher.

Interviews were conducted between 2012 and 2013 with key informants who are (1) members of the partnering First Nation communities, and (2) work in areas related to or are knowledgeable about water. Participants included council members, elders, treatment plant operators, and health representatives. Participants were selected based on their knowledge and experiences surrounding water and recruited based on guidance provided with the assistance of the community partner and snow ball sampling. Participants were between the approximate ages of 30 and 75. Interviews were conducted by two researchers. Training and pilot interviews were conducted with both interviewers to assure congruency throughout the interview process.

Each interview was transcribed and provided to the participants for member checks. I analyzed the data using a qualitative content analysis approach (Graneheim & Lundman, 2004) which incorporated both deductive and inductive approaches to coding as outlined by Crabtree and Miller (1999), Boyatzis (1998), and Fereday and Muir-Cochrane (2008). The analysis process started with deductive coding utilizing the MBA elements (see Table 4) as categories, where information related to water challenges was organized according to these pre-determined categories. Inductive coding was then used to uncover themes related to water challenges and opportunities. The qualitative research software QSR NVivo 10™ was used to organize data categories and identify themes.

Archival and secondary data sources included council meeting minutes (publicly available; 142 documents), source protection committee meeting minutes (95 documents), personal documents provided by community partners, websites, reports, community documents, and historical texts. Archival and secondary data sources were selected based on the recommendation of research partners and participants, and through online searches based on relevance to the research.

Secondary and archival data sources were searched using text query functions in QSR NVivo 10™ (e.g., water, watershed, treatment, river, stream, lake, groundwater, well, contaminate, monitoring, landfill, gallery). Search terms were selected based on key ideas and topics uncovered through research activities. The search results were then deductively coded according to MBA elements (see Table 4) and used to triangulate with other data sources.

Direct observation was also an important method for data collection. Over the time period from 2010 to 2014 the authors worked within the communities on water related projects (see Cave et al. 2013; Plummer et al. 2013). Observations from these experiences

and while conducting research activities and attending workshops were recorded in a journal. The information gained through observations (e.g., behaviour, environmental conditions) provided additional insights into water challenges and their evolution over time and was used in conjunction with other data sources to triangulate findings (Yin, 2009). Information collected was organized using QSR NVivo 10™.

Ethical clearance to conduct this research was provided through Brock University's Research Ethics Board and Wilfrid Laurier University's Research Ethics Board, as well as through the Elected Chief and Council in each case study community. Interested potential participants were verbally read an invitation to participate outlining the purpose of the study, its voluntary nature, benefits for their community, and the terms for which information will be used.

3.5 Results

The following section reports key findings illustrating the most prominent themes that emerged from coding the multiple data sources. The findings are communicated utilizing quotations from the key informant interviews that were identified within the analysis process to illustrate the prominent themes. The findings are organized by the main MBA themes (see Table 4). A summary of findings is provided at the end of Section 3.5 in Table 7. Key insights that emerge across the three case studies are discussed in the subsequent section, concluding with specific implications for water management and governance.

3.5.1 Mississaugas of the New Credit First Nation

Protection of Sensitive Areas

Within New Credit sensitive areas are delineated in the comprehensive community report and include forested areas, creeks, and populated areas (MOTNC, 2008). However, their delineation does not necessarily facilitate their protection. The fact that there are few formal community mechanisms (zoning bylaws) to intervene in land uses impacting water has resulted in inadequate protection of sensitive areas, an issue that is exacerbated by attitudes toward authority and the appropriate involvement of the Elected Chief and Council. The majority of participants identified that conflicting attitudes toward authority can derail the process to administer bylaws and increase potential risks to water contamination. As one participant described, "We have lots of band members that don't like the zoning bylaw because it controls you and what you do… The only mechanism that we have… and everybody hates zoning bylaws" (Interviewee 9). The participant goes on to provide an example, "Like we have a trucking company that's right on the water way and he doesn't give a shit'… 'Well there are zoning bylaws and there are certain distances that you have to be away from there. And well he just totally disrespected it" (Interviewee 9). This example illustrates the extent to which attitudes held within the community toward formal First Nations regulatory mechanisms underpin the inability to enforce bylaws to protect sensitive areas.

Formal bylaws are not the only mechanism for protecting sensitive areas within New Credit. Approximately two thirds of participants stated that strong cultural arrangements contribute to protecting sensitive areas that are vulnerable to land use activities. Expressing a holistic view of the environment that is strongly interconnected by the waters held within, some participants cited an area called the "Grove" as a sensitive area

where water is being protected from certain land uses through cultural practice. The Grove is a forested area that has been used for cultural and ceremonial purposes for many years (e.g., powwow gatherings). They reflected that protecting the forest is synonymous with protecting the water (Interviewees 9, 7). Intense use of the area resulted in soil compaction and a noticeable degradation of the forest and water within. Drawing from holistic cultural themes of cyclic renewal, and the responsibility toward caring for the environment, community leaders protected the site's ecology (including water) from further degradation until it could recover. One participant described their thinking behind the process as,

> *I thought we should leave and host the powwow somewhere else for a couple of years until [the Grove] rejuvenates, which is like a traditional concept. You spent its abilities, move on, let it rejuvenate, as we go around we come back to it. Giving it time to get its strength back (Interviewee 9).*

The protection of this sensitive area has been successful through the use of traditional values and cultural arrangements to change land use and behaviour.

Treatment

Similar to the protection of sensitive areas, New Credit lacks the ability to enforce First Nations bylaws related to water treatment. Drawing from the MBA elements (see Table 4) practices that encourage on-site treatment are beneficial for preventing contamination within the natural environment. Some participants identified that although on-reserve industry and agriculture are subject to community bylaws for discharging waste into streams, there are no enforceable regulations to assure that potential contaminants are treated before entering the environment. Concern over a lack of enforceable regulations related to treatment was common among respondents. For example, one participant explained that unless you can enforce regulations they aren't very helpful (Interviewee 12).

Improvements to water treatment have contributed to building trust in the safety of water within New Credit amongst its members. When compared with private well water systems, communally treated water has had fewer issues (e.g., boil water advisories), contributing to a culture of trust in the current treatment system operated by Halidmand County (Interviewee 2). Further demonstrating this trust, the majority of community members willingly decommission their old wells when given the option to connect to new extensions of the treated water pipeline (Interviewee 2). Improvements to water treatment have played an important role in gaining community member trust in the quality of drinking water on-reserve.

Distribution and storage

The federal government provides funding for First Nations to support the maintenance and operation of water infrastructure (up to 80%; Simeone, 2010); however, inadequate funding to provide safe drinking water and delivery of services on-reserve continues to constrain New Credit. For example, a lack of funding for pipelines restricts New Credit's ability to supply treated drinking water to all its members. As articulated by a participant,

> *when we started the water system on New Credit we would love to be able to give everybody water at the end, but because of the money, funding [shortfall], [power] was being unbalanced, right away, stuff that we need, stuff that we want, [we] cannot always get it. (Interviewee 3)*

In order to keep up with maintenance and upgrades, the Elected Chief and Council are forced to pull funds from other services, creating funding shortfalls in other areas, a response that one participant describes as "steal[ing] from Peter to pay Paul" (Interviewee 7). Although sourcing temporary funding from land claim settlements while the federal

funds are secured is an effective way to reduce financial pressures, federal funding continues to be insufficient for meeting the needs of the community (Interviewee 1).

Similar to protecting sensitive areas and treating industrial, commercial and agricultural sources of contamination, there are few enforceable mechanisms on-reserve to regulate infrastructure. In lieu of federal regulations, New Credit utilizes provincial regulations as a guide for developing infrastructure such as wells, cisterns, and septic systems. A system guided by provincial regulations without a mandate or formal mechanism on reserve to enforce them is identified as a perpetual challenge because there is little recourse if infrastructure development fails to meet the standards. As articulated by one participant,

> *What happens is, [developers] do the best they can [to adhere to the provincial regulations as guidelines], but usually it's not up to snuff. There is no way to monitor that or regulate that once there's a problem. So it continues. (Interviewee 1)*

Using the provincial regulations as a guide to develop infrastructure within New Credit is important in the place of federal regulations; however, the inability to enforce these rules on-reserve continues to promote an infrastructure system that fails, at least in part, to meet preferred standards.

Monitoring

The New Credit Elected Chief and Council are committed to monitoring drinking water resources on reserve; however, challenges remain in monitoring private water systems. New Credit's commitment is demonstrated by regular monitoring of the communal distribution system at provincial drinking water standards (Interviewee 1, 2). Private water systems are supported by the community health department and Health Canada, but the responsibility for ensuring private systems are monitored ultimately lies

with the homeowner. Attitudes and perceptions about private water sources and the appropriate level of involvement of the Elected Chief and Council in water management (i.e., monitoring) can result in the unwillingness of some community members to allow health representatives on their property to monitor water resources. As one participant described, "A lot of people are saying that [the Health Department is] not coming out [on my property], it's my property and it's my water! So they feel very strongly about their water sources" (Interviewee 10). Further, if homeowners do request monitoring of a private system, recommendations provided by the Health Department and Health Canada are not mandated or enforced, making it even more difficult to assure the safety of private water systems on reserve.

Monitoring of natural water ways (particularly surface water) continues to be a challenge for New Credit. The two small creeks that flow through New Credit are not currently monitored, largely because the task has not been included in anyone's job description at the band office (Interviewee 1). However, monitoring is particularly critical for the Boston Creek into which wastewater effluent is discharged twice a year, and because there are ongoing concerns about water quality (MOTNC, 2008). Further, one participant articulated that effective monitoring of natural waterways on reserve hinges on the ability to enforce provincial standards. As this individual noted about the effectiveness of standards, "who the heck is following [standards] and holding that up, and saying, 'Oh I have to do this because this book says I have to', I don't think that happens" (Interviewee 1).

Response to adverse conditions

Protocols and procedures for responding to emergencies exist within New Credit (Department of Public Works and Health); however, challenges remain in ensuring that protocols are followed. New Credit's emergency protocols clearly outline the roles and

responsibilities, actions, and procedures the community implements under emergency situations related to water (i.e., environmental spills, accidents, and boil water advisories). For example, the process for issuing boil water advisories is well established, and includes details on how residents are notified when an advisory is put in place (i.e., radio broadcasts, hand-delivered fliers, and newspaper advertisements). However, participants expressed that communication must be improved to assure they are notified in a timely manner when adverse conditions arise off-reserve. One participant described a recent spill occurring at the Tom Howe Landfill site in Haldimand County adjacent to New Credit where the protocol was not followed:

> *We just had a spill in January over at the Tom Howe [landfill], I think everybody was notified of that but [us], you know [you] can't notify your band members until you're notified. …The Town of Haldimand didn't follow the right protocol… we didn't find out till three days, two days later. (Interviewee 7)*

Assuring emergency protocols are followed is an important ongoing concern for New Credit.

3.5.2   Oneida Nation of the Thames

Protection of sensitive areas

Protecting sensitive areas is a challenge in Oneida. As in the case in New Credit, attitudes over who has the authority to make decisions about water are a part of this challenge. In lieu of federal First Nations drinking water legislation (prior to June 2013), ensuring safe drinking water with community bylaws has been a challenge. Participants said that different views about who has the authority to make decisions about water weakens land use control and increases the risk of on and off-reserve water contamination. One participant compared this lack of control to locating a dangerous fuel storage tank next to a nursery: "Never mind [adhering to federal regulations], oh, [they placed a fuel storage

tank] next to a nursery, the Band Council had no authority over land use planning. So I

don't think, like, there's not land use planning to promote safe drinking water" (Interviewee

24).

Current funding arrangements are insufficient for programs outside the scope of

water treatment (e.g., protection of sensitive areas), potentially increasing the risk of

contamination to water quality. Due to financial constraints, priority is given to the

immediate needs of maintaining and operating the water treatment facility rather than to

proactive approaches such as protecting sensitive areas (e.g., protect creeks and rivers from

land use activities that impact water quality). As one participant describes, "Well, we don't

have a lot of funds to, you know, do a lot of stuff in [protecting sensitive areas]. We have

enough basically to run our water treatment program" (Interviewee 27). With the drinking

water treatment plant already operating at capacity (Interviewee 30), protecting sensitive

areas may be less of a priority as Oneida works to addresses upcoming water availability

challenges.

The responsibility to protect water is embedded in Oneida's culture; however,

Oneida has faced challenges maintaining a strong sense of responsibility with each

generation. One participant reflected on the relationship as a "kinship", but lamented that

"it's certainly not as strong as it should be" (Interviewee 25). The same participant went on

to describe that the responsibility to protect water is part of a circle that connects

everything including the decisions made about water. A loss of responsibility to protect

water breaks the circle and the way that decisions are informed.

Treatment

A lack of information about surrounding land uses and the potential impacts they

have on water quality exacerbates Oneida's inability to reduce the risk of drinking water

contamination. Some participants expressed how Oneida's Elected Chief and Council have little understanding of the potential risks related to land use activities adjacent to the reserve:

> *the [water treatment facility] that is still in the makings [is a big unknown, also] …all the flood plain all around the Thames River is land that is agriculture, we don't know what kind of fertilizers they use and if it affects the groundwater? (Interviewee 22)*

Questions remain over how off-reserve land uses such as landfills and general water quality impact water treatment on-reserve. Further, one participant discussed these concerns as follows:

> *[members] had concerns about I think the water quality, the background water quality of the Thames River itself. Issues related whether or not Greenlane landfill plumes can reach into water bed, you know, [the] waters, they're downward gradient from Greenlane? Is it enough to, you know, cause some impact on like Oneida's local sources of water? (Interviewee 24)*

Improving information about potential contamination risks is important to participants, but Oneida faces challenges in its ability to treat water resources without further understanding the potential impacts of neighboring land uses.

Perceptions of water contamination, source water quality, and operator capacity also influence community trust in Oneida's ability to ensure the quality of treated drinking water. Historically characterized as poorly managed with regular mechanical failures, Oneida's drinking water system is perceived by residents to be vulnerable to contamination. For example, its close proximity to the Greenlane landfill and location downstream of the City of London fuel questions and community mistrust about the quality of treated water on reserve. As a result, many community members rely on bottled water for drinking and medicinal uses instead of community treated water (Interviewee 27). One participant describes an aspect of mistrust:

> *You know and since [contaminants] can possibly get into our system since it's, it's a groundwater under the influence [of surface water] system (GUDI), then that's very concerning to us even though we do have our water treatment. ...nobody likes to be taking water... when they're just downstream from sewage outputs and stuff like that. ... people always have their doubts about whether or not Greenlane has any effect on our water supply especially considering we're slightly downhill from Greenlane and, you know, you can't tell water what to do. (Interviewee 27).*

Oneida's Elected Chief and Council's commitment to use provincial standards as a guide to treat water resources does not ensure its full compliance. For example, according to participants at the time of writing, treatment facilities did not meet provincial standards. One participant describes the situation as follows:

> *We are undergoing another upgrade pretty soon. We have just had a water study that has been completed and been reviewed by the higher ups... Our system will have to change because we don't meet the [provincial] regulation systems right now. (Interviewee 22)*

Distribution and storage

In Oneida, the mistrust of community members about the quality and safety of drinking water resources on reserve is related to past mechanical failures in the water distribution line, water advisories, and perceptions of treatment plant operators. For example, one participant described the work environment for operating the community water system as "broken" and untrustworthy. They went further and called for operators to show more "commitment" toward protecting water resources to regain the trust of the community back (Interviewee 23).

Monitoring

Despite the Elected Chief and Council's emphasis on regular monitoring of drinking water at the source and throughout the distribution system, Oneida continues to be unable to monitor drinking water to fully meet the needs of its members. The interviews revealed

that monitoring is primarily controlled by Health Canada through the federal drinking water guidelines. Participants identified that Oneida is unable to serve its members, because it, in part, lacks decision making power over how funding should be used to monitor water on reserve. As one participant articulated,

> *[Oneida doesn't] have the local control that they should have because Health Canada ...controls the budget for the monitoring... I think a lot of those controls that the First Nations should have, they don't have. It's with some bureaucrat somewhere else. (Interviewee 24)*

Oneida's inability to make monitoring decisions and serve its members appropriately is a challenge.

Response to adverse conditions

Oneida has formal emergency response protocols; however, numerous challenges were identified in communicating the risk of adverse conditions when incidents occurred beyond reserve boundaries. Many participants attribute these challenges to having few formal arrangements which adjacent jurisdictions, such as the upstream City of London, can use to inform Oneida about adverse conditions (e.g., an overflow event of the storm sewer system). When asked about receiving notification of adverse conditions arising upstream in the City of London so Oneida can implement precautions a participant stated, "No, no we don't actually [get notified] even though we should be" (Interviewee 27). Currently, Oneida relies on personal relationships to communicate storm sewer overflow events.

3.5.3   Six Nations of the Grand River

Protection of sensitive areas

There are several key sensitive areas identified in Six Nations including forested areas, creeks, river and wetlands. Six Nations continues to confront challenges protecting these sensitive areas because of (1) lack of land and water-use control, because community

bylaws do not have jurisdiction on lands where individuals hold certifications of possession (some members refer to these lands as "private" but they remain under ownership of the Canadian Crown) and (2) attitudes toward who has the authority to make decisions about water. Within Six Nations there are few formal arrangements (e.g., regulations and zoning bylaws) to control land and water use on reserve. A wide range of participants agree that there is a need for more controls. For example, one respondent articulated how,

> *if we only had [the rules found off-reserve] we'd have some form of structure... Council themselves don't have any guidelines, they can put a dump in the swamp, they can!... the land is private and there's no bylaws and you'll see yards full of old cars sitting on blocks upside down, uh god knows where the battery acid is gone, antifreeze leaking, oil leaking, and it's everywhere you know and nobody gets it. (Interviewee 12)*

Part of the challenge expressed by participants is that Council can do little to enforce existing rules on lands with certificates of possession because of negative attitudes towards any efforts to control land and water use through community bylaws. As noted by one participant, "There really isn't anything anybody can do because as, as a council, we don't have the right to tell somebody else what they can and cannot do on their own property" (Interviewee 17).

Despite a limited use of bylaws to control land and water use on reserve, some participants identified the existence of Six Nations traditional knowledge and worldviews about water that can be used to support the protection (in terms of both quality and quantity) of water resources. As expressed by one participant, "We don't need no regulations to let us know that we're here to protect the land... I said we don't need any because of your upbringing... you look after the land and the land in turn will look after you" (Interviewee 12). Similarly, other participants expressed how traditional knowledge motivates members to protect water from contamination and to conserve its use:

"traditional knowledge is the preservation of water [quality] for the next seven generations" and "[it's part of] conservation and making sure you don't harm the water supply" (Interviewees 17 and 14, respectively).

Six Nations are also actively pursuing collaborative arrangements with off reserve organizations to better protect sensitive areas. Stemming from a historical need to collaborate in response to serious flooding in the early 1900s, Six Nations now routinely works with several key off-reserve organizations to manage water resources, For example, Six Nations has collaborated with the Grand River Conservation Authority (GRCA) and the Ontario government (e.g., Ministry of Environment) to implement aspects of the MBA through the Clean Water Act (2006). Although challenges remain in controlling land use off-reserve, within what Six Nations considers its traditional territory, participation in off reserve programs such as the Ontario source water protection program has improved Six Nations' ability to protect water resources. For example, by volunteering to participate in Ontario's source water protection program, Six Nations can advance collaboration with the GRCA to share information about water contamination. As one participant described, this relationship is built on respect:

> I think [communication is good]. It's a good system. They monitor [the river], they do a good job and we have people [in our community that] keep in touch with the GRCA. They have respect for our community members. Our community members have respect for them. Our community members bring the information back to us, that's the important part. (Interviewee 13)

One participant notes that the long-standing established relationships have been "supportive" for watershed planning and contribute to improving the protection of water resources (Interviewee 14).

Treatment

Decision making about water issues and community planning processes within Six Nations more generally can be stalled due to internal tensions between groups (e.g., Chief and Councils, citizen groups). Internal tensions are caused in part by divergent beliefs, attitudes, and values over appropriate authority and control in the community planning process and have been a feature of Six Nations political context for some time (Interviewee 21 and 35). Illustrating this tension one participant described communications from the Elected Chief and Council as follows: "As soon as [some members] see it's the [Elected Chief and Council] letterhead, they throw it in the garbage. I wish they would leave the religion out of it" (Interviewee 16). The same participant noted,

> *I think it's more of a long-standing thing... some people say the Confederacy is the ruling party of Six Nations. And then we have the elected [Council] as the recognized government. We're fighting among ourselves instead of going ahead'... '[the community is] polarized and so dysfunctional. (Interviewee 16)*

These tensions have direct implications for water treatment. For example, during the planning process for the new water treatment facility, groups within the community (i.e., citizen groups) expressed opposition to the Elected Chief and Council's decision making authority. More specifically, they felt the treatment facility didn't address the problem of water contamination from upstream communities and wanted to be consulted on decisions related to the plant (Pecoskie, 2013). Tensions eventually resulted in protests and barricades in 2012 and temporarily stalled the construction of the facility.

Financial arrangements also constrain water treatment within Six Nations. Participants identified that funding arrangements with the federal government, i.e., Aboriginal Affairs and Northern Development Canada (AANDC), often constrain development because they fail to provide sufficient funds in appropriate time frames

leading to temporary solutions that do not fully meet the needs of the community (see

section below). For example, as one participant explained, Six Nations is unable to get

enough funding from AANDC to fully address water treatment concerns (at the time of data

collection running at capacity) and, as a result, cheaper temporary solutions with limited

lifespans are used (Interviewee 17). These constraints have led to delays in the

development of water treatment on reserve. Articulating how funding constrains drinking

water treatment facilities on-reserve, one participant expressed,

> *Indian Affairs has to pay for our water, 20 million dollars, they can't afford it so they gave us five [million], you know what I mean, so if right out of the gate you know you're going to get a third rate system, well how can you be enthusiastic about that you know? Could we ever have a system that would provide clean water to all of our community? (Interviewee 13)*

Distribution and storage

Current funding arrangements with the federal government are generally felt by

several respondents in Six Nations to restrict the development and maintenance of the

distribution and storage systems. Most respondents noted that federal funding

arrangements do not provide sufficient funds, and this leads to temporary solutions that do

not fully meet the needs of the community. For example, there has been insufficient

financial support for infrastructure improvements (i.e., expanded pipeline) to supply all

community members with water from the new treatment facility. Describing the likelihood

of AANDC supplying funding for the whole community to have access to clean drinking

water, one participant stated, "No, they wouldn't provide that [only enough for a temporary

solution]… Just, just little parts here and little parts there" (Interviewee 13). Reflecting on

the daily struggle to source enough money to develop and maintain infrastructure, one

participant explains that "we're fighting daily… on money for this, money for that. …we're

just not getting enough money from Indian Affairs" (Interviewee 17). To address funding

constraints Six Nations is seeking support from other sources (i.e., gaming revenues) to fund water services (Pecoskie, 2013).

The safety, reliability, and quality of water supply are important in the distribution and storage systems. Several participants identified that many community members do not trust the source water quality because of a history of contamination. As one participant described, there is "some past history with water quality with the [treatment] plants and the river itself and, over above that, overriding this whole thing is a mistrust in the water quality in the Grand River" (Interviewee 14). Participants report that it is a continuous challenge to rebuild that trust in the water system. Steps have been taken to include community engagement opportunities to educate the community on water issues.

Monitoring

Six Nations monitors water resources throughout the reserve. For example, Six Nations conducts regular monitoring of water quality both at its community treatment facility intake and throughout the distribution system, and in accordance with provincial standards. Six Nations also supports groundwater monitoring programs (e.g., Well Aware). However, efforts to monitor were identified as undermined by some members, because they question the Councils ability to effectively monitor water quality. For example, one participant expressed that a lack of transparency when monitoring known sources of contamination (e.g., industrial, agricultural) contributes to a lack of trust in the accuracy of monitoring and overall quality of water resources on reserve (Interviewee 20).

Response to adverse conditions

In addition to formal procedures on reserve for responding to emergences, a collaborative approach between Six Nations and off-reserve organizations has improved

community response to adverse conditions. For example, some participants identified that

well developed relationships enable organizations like the GRCA to share information about

adverse conditions such as flooding. As one participate explains:

> *Well, I think the GRCA has always been a good partner. I know [our members] here have a good relationship with them… I know they [will] contact us in the event of the river is going to flood. They notify the council and the council notifies the community that, "hey, be careful the Grand River is going to rise 25 feet this afternoon" or whatever, you know. (Interviewee 17)*

This sharing of information to improve response under adverse conditions is

complementary to more formalized arrangements such as the Grand River Notification

Agreement Protocol (GRNAP) (AANDC, 2000; AANDC, 2005).

Table 7 Summary of findings

MBA Principle	New Credit	Oneida	Six Nations
Protection of sensitive areas	• Few mechanisms to control land use on and off reserve • Attitudes toward authority and the appropriate involvement of Elected Chief and Council can derail the process to administer bylaws and may increase the potential risk of contamination • Application of cultural practices to protect natural areas	• Attitudes toward planning initiatives and authority may increase the risk of on and off-reserve water contamination • Attitudes and cultural upbringing that reinforce values for protecting natural areas are declining • Belief that funding is inadequate for protecting sensitive areas	• Few formal mechanisms to control land use on reserve lands with certificates of possession • Attitudes on reserve contribute to a perceived inappropriateness of regulations to control land and water use • Belief that traditional knowledge and world view are important to support the protection of water • Collaboration between organizations and groups is important for protecting sensitive areas off reserve
Treatment	• General trust in the drinking water provided by off reserve treatment facilities • Bylaws not effective in controlling potential contamination sources • Cultural meaning exist in water related to treatment	• Perceptions about water contamination and management contribute to a lack of trust in water operators and quality of water treatment • A lack of information about land uses and their potential impacts on water quality is a challenge for water treatment and reducing the risk of drinking water contamination. • Using provincial standards as guidelines may not be adequate to ensure compliance of current treatment system	• Tensions between groups often deriving from historic and colonialist contexts (both on and off reserve) have resulted in decision making delay • Belief that funding is inadequate for developing and maintaining water treatment facilities resulting in temporary solutions that do not fully meet the needs of community • Cultural meaning exist in water related to treatment
Distribution and Storage	• Belief that funding is inadequate for maintenance and development of water infrastructure • Few formal mechanisms exist to regulate infrastructure and achieve sought after provincial standards	• Perceived lack of trust in the quality and safety of water resources due to previous mechanical failures	• Belief that funding is inadequate to maintain and develop infrastructure potentially resulting in infrastructure not meeting the needs of community • Perceived lack of trust in the quality of water due to previous issues with contamination
Monitoring	• Council committed to monitoring both source and distributed water • Homeowner are responsible for private water systems, recommendations not mandated or enforced. Monitoring of private	• Council committed to monitoring both source and distributed water • Belief that Oneida is unable to serve members due to a lack of control over funding for monitoring	• Council committed to monitoring both source and distributed water • Indication of a lack of trust in monitoring effectiveness and the quality of drinking water resources

	systems often dependent on attitudes toward authority • Enforcing rules related to monitoring natural waterways is challenging.		
Respond to adverse conditions	• Formal procedures exit for responding to emergencies on reserve • Emergency (notification) protocols not always followed	• Formal procedures for responding to emergencies on reserve exist • No formal arrangement exist to receive emergency notification from surrounding municipalities (i.e., London, ON) • Oneida depends on personal connections for communicating upstream storm water overflows	• Collaboration between surrounding municipalities improves community response to emergencies

3.6 Cross-Case Analysis and Discussion

The Cross-case analysis of findings conveys challenges and opportunities for *protecting sensitive areas*. Independent of the delineation of sensitive areas as seen in New Credit, some community member attitudes toward authority and the Elected Chief and Council's role in implementing and enforcing potential or existing bylaws (e.g., zoning) limit the ability of communities to protect water resources in each of the cases. These attitudes, at least in part, contribute to an inability to protect and control land and water uses on reserve. Attitudes of this nature are challenging for the Elected Chief and Council to reconcile. The degree to which they can protect water resources is often limited to working within the confines of the funding model from AANDC. This is illustrated in Oneida where financial constraints force attention toward priorities such as maintaining and operating water treatment facilities and away from proactive initiatives that protect water resources. Attitudes that create tensions within (and across) First Nations communities are recognized by some (i.e., Cave et al. 2013; Tait 2007); however, few have explored their implications for water management and governance.

Despite the role of attitudes toward authority and the decision making power to control land and water use, all communities expressed a deep connection with water and its association with protecting water resources. Experiences in New Credit highlight the significance of their holistic view of the environment and cultural practices that support the protection of water from certain land uses, such as described in the "Grove". Indigenous Natural Laws are recognized as "fundamental" to understanding the nature of water (McGregor & Whitaker, 2001; Walkem, 2006, 310). Others recognize that Natural Laws are critical in overcoming the effects of colonialization through the fulfillment of their responsibility for water (Ransom, 2001 in McGregor & Whitaker, 2001) and that Natural Law should "retake [its] rightful place in all political and social institutions" (Alfred, 2005, p. 13). However, what this means in practice is still to be determined. New Credit's success in protecting sensitive areas and the waters within the Grove illustrates the strength of certain cultural arrangements (respect, responsibility to protect water resources) to inform decision making and to communicate the implications of changing land use within the Grove. The ability to influence special land uses (powwow gathering, ceremony) and general attitudes against land use controls (e.g., land use bylaws and zoning) provide an example of the role and strength of cultural arrangements in protecting water resources.

Inadequate funding to deliver water services on reserve is well documented (AFN, 2008; Christensen et al., 2006; Harden & Levalliant, 2008; Swain et al. 2006b), and the situation in Oneida provides an example of how financial constraints may limit the protection of sensitive areas especially when water availability for drinking is a concern. In contrast, experience from Six Nations may be instructive. Here, active participation in planning processes across reserve boundaries (i.e., with adjacent municipalities) has enabled long standing working relationships with organizations (e.g., GRCA) and

governments (e.g., Ontario) and contributed to a sharing of resources to help overcome financial constraints.

The importance of *treatment* to ensure access to safe water resources was recognized in each of the cases; however, challenges remain with regard to lack of control over treatment processes, enforcement and decision making. Within New Credit, the Elected Chief and Council lack meaningful authority to enforce bylaws that ensure adequate treatment before potential contaminants are discharged to the environment. Information gaps about potential sources of contamination located both on and off-reserve challenge Oneida's ability to make decision about water treatment. In Six Nations, divergent views within the community over authority and control also create barriers to improving water treatment.

Past experiences influence the degree of trust in the safety and quality of source and treated drinking water on-reserve. Underpinned by past water issues and the currently perceived state of vulnerability to contamination, attitudes towards the water treatment in Oneida influence the Elected Chief and Council's ability to deliver safe drinking water. In comparison, the few mechanical failures experienced in New Credit have encouraged a sense of trust in the treatment of drinking water resources. This observed difference supports Dupont et al.'s (2014) findings that illustrate a link between perceptions of water quality and past mechanical failures and perceived water contamination and illustrates the continued relevance of perceived water issues and their impact on Elected Chief and Council ability to deliver safe drinking water to its members.

Each case study site has a *distribution and storage* system to supply water to at least a portion of its members. Present funding arrangements continue to constrain the maintenance and expansion of distribution systems within each community. Core to this

constraint is the ability of Elected Chief and Councils to secure financial resources. AANDC provides First Nations with up to 80% of costs associated with infrastructure; however, First Nations across Canada routinely fall short of being able to meet the needed 20% due to a limited tax base and limited ways of raising additional revenue (Harden & Levalliant, 2008; Swain et al., 2006b). Despite significant investments by the federal government into First Nations drinking water systems, McCullough and Farahbakhsh (2012) argue that until the policy and processes reflect the needs of First Nations (i.e., need to control financial resources), it will be challenging to improve deteriorating water infrastructure. This is demonstrated in Six Nations where financial constraints exacerbated delays in building a new water treatment facility. Similar experiences are found in New Credit. New Credit and Six Nations are actively seeking alternative arrangements to meet the financial needs of infrastructure expansion.

The Elected Chief and Council within each community support and implement the Ontario Drinking Water Standards as guidelines for *monitor*ing drinking water; however, this research has highlighted unique challenges in each case study. In New Credit, negative attitudes towards health representatives and the Elected Chief and Council are a hurdle to assuring safe drinking water for some community members (i.e., private systems). Further, the effectiveness of monitoring natural waterways is hinged on the authority of the Elected Chief and Council to enforce and implement protective rules on reserve. Oneida lacks the ability to control funding related to monitoring, thus making it difficult to ensure that testing meets the needs of the community. This was not raised as a prominent issue within New Credit or Six Nations. McCullough and Farahbakhsh (2012) identify that this challenge stems from the federal government's "one-size-fits-all" format for First Nations water policy, a format that does not account for diversity among First Nations. Within Six Nations,

concerns over the trustworthiness of the monitoring process bring to light additional challenges for meeting the needs of the community.

Participants from each community reinforced the importance of strong protocols and processes for *responding appropriately under adverse conditions*. Within New Credit, findings reflect that notification protocols for adverse events off reserve need to be improved and followed. In the absence of formal protocols, Oneida continues to rely primarily on personal relationships to receive information about sewage treatment plant overflows. Historical relationships with watershed organizations, municipalities, etc. such as those discussed above in relation to Six Nations continue to be effective in ensuring information flows across the watershed through programs such as Ontario Source Water Protection and the GRNA program. Actors (including Six Nations) within the Grand River Watershed, which is historically susceptible to flooding, have developed relationships working to improve flooding issues (Plummer et al., 2005). Over time, the process of working together to improve the watershed has facilitated access to resources (e.g., financial, human), communication of concerns and interests, mutual learning, and legitimacy of concerns and interests held by First Nations.

3.7 Conclusion

This paper has explored current approaches and practices for protecting water resources in three First Nation communities (Mississauga of the New Credit First Nations, Oneida Nation of the Thames, and Six Nations of the Grand River) using the MBA to illuminate issues and opportunities for improvement.

Addressing the water challenges confronting the case study communities require technical approaches (regulations, standards, technological improvements) as well as broader approaches that reflect cultural practices, social norms, attitudes, and relationships

(Basdeo & Bharadwai, 2013). The analysis of how the MBA and its elements are expressed in the case study communities illuminates two prominent issues constraining First Nations' ability to protect water resources. First, attitudes toward water, water operators, and authorities are often a barrier to protecting water resources within the case study communities. A better understanding of the role that attitudes of community members play in water management and water governance is needed to improve water resources on First Nations reserves. Second, perceived limitations of financial resources are identified to constrain water management. Opportunities for improving funding may be found in sharing resources (human, information) across reserve boundaries and exploring alternative sources. The analysis also illuminates two opportunities to improve the MBA in how it supports the needs of First Nations. First, to protect water resources, solutions that express the needs and diversity of First Nations across Canada are critical. This research demonstrates that a holistic view of the environment and cultural activities (i.e., those associated with protecting the "Grove" in New Credit) offer unique opportunities for informing decisions and protecting water resources on-reserve. However, these cultural practices are often context or First Nations-specific. As a result, opportunities across First Nation communities in Canada may vary. Second, strategies to overcome information gaps, poor relationships, and the lack of meaningful participation in decision making are needed. Opportunities to build relationships and share information and resources may be facilitated through collaborative partnerships (Lebel & Reed, 2010). These challenges and opportunities have specific implications for water management and governance. A summary of these implications, organized by the MBA elements, is provided in Table 8.

Table 8 Implications for water management and governance

MBA Principle	Implications for water management and governance
Protection of sensitive areas	• Perceptions held by community member towards authority and the arrangements that support them should be acknowledged when planning protected areas.
	• Collaborative partnerships between First Nation and non-First Nation groups may be helpful to mediate funding short falls by drawing on each other's resources.
	• Cultural practices may complement formal rules for protecting sensitive areas, specifically, to inform decision making and communicate the implications of land use change.
Treatment	• Attention towards building a sense of authority within communities to enforce bylaws may be helpful for ensuring adequate water treatment
	• Efforts to build relationships between on and off-reserve groups offer opportunities to share resources and information about potential sources of contamination
	• Tensions across groups within the community create constraints for developing and maintaining infrastructure. Building common understanding about roles and authority may help reduce constraints.
	• Trust in the safety of water resources and capacity of water operators may be nurtured by demonstrating accountability and openness to how issues (contamination, mechanical failures) are being addressed.
Distribution and storage	• Limited financial resources are perceived to constrain the development and distribution of clean water. Opportunities for utilizing alternative funding sources (treaty funds) should be explored.
Monitoring	• Diversity amongst First Nation communities should be acknowledged in policy. Approaches that are flexible and enable direct participation in decision making may help reconcile one-size-fits-all policy.
	• Approaches toward building trust through community engagement and practice that is open and accountable may be helpful for improving monitoring.
Response to adverse conditions	• Notification of adverse conditions off reserve remains a challenge for some communities. Clarification of notification protocols with off reserve actors (e.g., industrial, municipal) should be undertaken.
	• The flow of information about contamination risk and financial and human resources across reserve boundaries may be improved by facilitating collaborative partnerships with off-reserve actors.
	• Formal protocols between actors (municipalities, industry, and province) should be established for responding to potential adverse conditions.

This research provides a step towards understanding and developing approaches that support the needs of First Nations to address water concerns on-reserve. However, embedded social, cultural, economic, and political contexts may be a challenge for applying new approaches. Historical and colonial legacies have the potential to reproduce attitudes and norms that constrain First Nations' ability to apply new approaches for addressing

water concerns. More work is needed to appreciate the complex challenges confronting First Nations and provide direction for building more effective water management and governance in Canada.

More broadly, exploring how water is protected on reserve using the MBA provides insights into advancing water policy and governance. This is especially relevant in the context of the newly passed Safe Drinking Water and First Nations Act (2013). After this became law in 2013 the federal government began working with First Nations to develop "enforceable regulations" to ensure safe access to drinking water and sanitation. The findings demonstrate the need to meaningfully include the perspectives and interests of First Nations to enhance the development and implementation of legislation and regulations. Arrangements that support cultural practice and multi-level collaborative relationships were found to support First Nations' ability to protect water resources, yet such analysis and discussion have so far been given little attention in research. These research outcomes suggest that advancements in water policy and governance require meaningful First Nations involvement in decision making and commitment to include cultural practice. Further research is needed focused on understanding how factors such as perceptions, culture, historical legacies, and relationships enable or constrain water governance processes that respond to water concerns confronting First Nations.

Chapter 4
Addressing water quality and quantity issues in three southern Ontario First Nation communities: An institutional approach to examine constraints and opportunities

4.1 Chapter Overview

First Nation community perspectives are often absent from research that explores the social-political dimensions (e.g., water rights and responsibilities, colonialism and discrimination) that constrain water management on-reserve. Considering that each nation is distinct with unique cultures, institutions, and environmental conditions, highlighting First Nation community perspectives can shed light on the breadth of constraints and opportunities First Nations face when dealing with water issues. Current institutional arrangements are examined in this paper to understand how they constrain and facilitate opportunities to address water quality and quantity issues on-reserve in three First Nation communities. The results are presented from the perspective of on-reserve participants (perspectives and insights of participants off-reserve are not included - see Chapter 5). Multiple methods used in this research include semi-structured interviews, archival and secondary data gathering, and direct observation. Informed by multiple data sources (30 on-reserve key informant interviews, 142 archival and secondary data sources, and observations), the research highlights institutional constraints (i.e., diverging conceptions of decision making authority and legitimacy, lack of community engagement in water issues, incompatible formal institutions for managing water on-reserve, and a disproportionate distribution of knowledge, responsibility and decision making authority) that limit First Nations' ability to respond to water issues. Opportunities lie in fostering on-reserve

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relationships that encourage dialog, trust building, openness, and participation (especially among youth).

4.2 Introduction

Many First Nation communities experience poor water quality conditions arising from deteriorating infrastructure to treat and transport water resources (AANDC, 2011), or from industrial contamination making natural water ways unusable (e.g., drinking, fishing, medicinal uses) (AANDC, 2011; Mascarenhas, 2007). Similarly, water quantity issues (whether too little or too much) arise from fluctuations in source water availability, treatment facilities operating at over their capacity (AANDC, 2011), or flooding due to inadequate planning and infrastructure (AANDC, 2014).

Scholarship that examines First Nations water issues emphasizes how underlying contexts such as colonialism and discrimination constrain First Nations in their ability to address water-related issues. For example, Borrows (1997), LaBouncane-Benson et al. (2012) and White et al. (2012), among others, consider water-related issues as symptoms of a broader failure to acknowledge and accommodate socio-political contexts. They articulate that current management practices, those typically employed to address technical aspects of water quality and quantity (e.g., infrastructure, training, standards), fail to substantially improve water issues on reserves, because they perpetuate colonial legacies that erode the function of lands and water in Indigenous lives. These losses are reinforced and self-perpetuating, and reduce human capital and experience to deal with complex environmental issues related to water. Similarly, Mascarenhas (2007, 2012) and White et al. (2012) discuss how environmental discrimination exists and exacerbates disparities in health, environmental condition, and wellbeing further depleting resources for addressing

water quality and quantity issues. Further, von der Porten et al. (2013a) argue that conceptual gaps between Indigenous governance and contemporary water governance regimes limit how First Nations' values and interests inform decision making. They argue that First Nations can't ensure their needs are met through meaningfully participation in decision making without establishing a nation-to-nation relationship between First Nations and Canada. The value of the scholarship identified above is the national or regional (e.g., provincial, watershed) focus when addressing persistent water issues on First Nation reserves (see Chapter 5 for a multi-level perspective). However, constraints that may exist at the local level are not always fully considered in this literature, and is the primary emphasis in this chapter.

A detailed community perspective is needed to understand primary issues (e.g., those related to rights and responsibilities for decision making) constraining water management in First Nations on-reserve in southern Ontario. The perspectives of people that share an indigenous culture and live within the collective social, political and water context arise from their experiences living on-reserve and inform how water-related issues are understood and managed. Gaining an improved understanding of community perspectives can better inform how inter-group relations, conflict, and other tensions contribute to constraining how First Nations respond to water-related issues. For example, Cave et al. (2013) explore First Nation community perspectives through an institutional lens and identify that water management is underpinned by processes such as relationships and perceptions that operate within a First Nation community. In addition, research utilizing a community perspective offers further opportunity to expand on First Nation water scholarship and practice by identifying opportunities on-reserve that enable First Nations to overcome constraints and respond to water-related issues. McGregor (2012) and

Lavalley (2006) articulate that traditional arrangements based on respect and the responsibility to protect water resources is critical for water management on-reserve. Gaining an improved understanding of community perspectives can better inform how traditional arrangements can be utilized alongside current water management practice.

This paper examines current institutional arrangements related to water and how they facilitate or constrain three First Nation communities to address water quality and quantity issues on reserve. The focus is on community perspectives on water quality and quantity within the community context of First Nation reserves.

4.3 Institutions for water management

Institutions are useful for understanding and addressing human environmental problems due to their linkages with human behaviour (Acheson, 2006; Ostrom, 1990). Institutions are human constructs described as rules that shape and are shaped by human behavior and are nested structurally, spatially, and temporally within cultural, social, economic, and political contexts (Hall & Taylor, 1996; Scott, 1995; Vatn, 2005). The intersection between institutions and human behaviour is articulated in the overlapping body of scholarship of new institutionalism (Greif, 1998; Hall & Taylor, 1996; Immergut, 1998; March & Olsen, 1989; Rutherford, 1995). From this scholarship, institutions influence behaviour through formal laws, rules, and regulations and through socially embedded norms where past arrangements and experiences can influence current and future institutions benefiting some actors and prolonging power inequalities among other actors (Hall & Taylor, 1996; North, 1990). Whether formal (e.g., legal rules, constitutions, laws) or non-formal (e.g., cultural norms), institutional arrangements facilitate or constrain how actors interact, negotiate, and make decisions about water (Olsson et al., 2006). This

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conceptualization of institutions is especially relevant in First Nation contexts where embedded historical and colonial legacies have potential to constrain actors by reproducing behaviours and norms that benefit some and prolong power inequalities in others (Nadasdy, 2007; Natcher et al., 2005).

To examine how institutions facilitate or constrain First Nations' ability to respond to water quality and quantity issues, I draw from the environmental governance literature. Environmental governance scholars argue that human ability to respond to resource management issues is in part constrained by the complexity and uncertainty associated with human environmental interactions (Biermann et al. 2009, Lemos & Agrawal 2006). Scholars agree that an approach must enable actors to not only deal with but respond and thrive within complex, uncertain conditions (Walker et al. 2004, Folke et al 2002). Conceptualized through the lens of resilience thinking, scholars have articulated the important role institutions have in enabling actors to manage complexity and uncertainty (Himley 2008). There is no clear consensus on the best institutional strategies to manage resources within a particular context. However, three strategies have been highlighted as important and are of relevance to this analysis: (1) analytic deliberation; (2) institutional variety; and (3) nesting of institutions (Akamani & Wilson, 2011; Dietz et al., 2003; Dietz & Stern, 1998; Gupta et al., 2010; Huitema et al., 2009; Huntjens et al., 2012).

This paper uses these three strategies as an analytical framework to examine how institutions influence First Nations ability to respond to water quality and quantity issues, with a specific focus on reserve. Specifically, these strategies as outlined in the literature (see Dietz et al. 2003; Akamani & Wilson, 2011) are used as a basis to assess specific experiences with water governance in three First Nations communities in southern Ontario. This framework may not address all dimensions of the institutional arrangements needed

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to facilitate water governance in First Nations contexts. However, these strategies do have the potential to highlight the institutional attributes that can facilitate or constrain First Nations in addressing water quality and quantity issues on reserve.

Analytic deliberation refers to the process of how actors interact with the goal to "define [what is] to be understood, to identify the values and outcomes of concern, to distinguish disagreements that must be addressed through compromise and trade-offs from those that might be resolved with better information, and to agree on appropriate ways to collect and interpret the needed information" (Dietz & Stern, 1998, p. 442). Analytic deliberation holds potential to uncover institutional arrangements that facilitate or constrain meaningful participation and legitimate voice in decision making.

Institutional variety is the second strategy to enable actors to respond to environmental resource challenges and refers to the benefits received when multiple types of institutions are employed to govern resources (Akamani & Wilson, 2011; Dietz et al., 2003). Complex and dynamic problems such as those related to water are less likely to be addressed with a single institution (e.g., rule, regulation). Institutional variety has potential to bring to the forefront alternative institutional arrangements (potentially those associated with traditional practice and culture) alongside conventional arrangements (e.g., legislation, regulations).

Nesting is the third strategy based on the premise that there is no single scale to address complex challenges. Rather, a multi-scale approach, often occurring through multiple centres of decision making, is more effective at addressing complex challenges. Nesting illuminates how institutions facilitate or constrain interactions amongst actors, accountability, and the flow of knowledge and information across and within levels (local, regional, and national). These concerns have been articulated through the concept of

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institutional fit described by Young (2002), Cash et al. (2006), and Vatn et al. (2012). Nesting is achieved by improving institutional fit within environmental, social, political, cultural contexts (Vatn, 2012; Young, 2002). Nesting has potential to highlight, from an on-reserve perspective, the multi-level dimensions of institutions (see Chapter 5 for more on this) and how they facilitate or constrain interactions amongst actors, accountability, and the flow of knowledge and information across levels. A description of each strategy and corresponding institutional characteristics are summarized in Table 9.

Table 9 Institutional strategies and characteristics

Strategy	Description	Institutional characteristics
Analytic Deliberation	The process of how actors interact with the goal to "define [what is] to be understood, to identify the values and outcomes of concern, to distinguish disagreements that must be addressed through compromise and tradeoff from those that might be resolved with better information, and to agree on appropriate ways to collect and interpret the needed information" (Dietz & Stern, 1998, p. 442). Analytic deliberation enables the perspectives and knowledge of all actors to contribute holistic understanding of the problem at various levels (Dietz & Stern, 1998).	• Diversity of values included in decision making process • Open processes of communication • Incorporates the participation of concerned actors • Information flows across levels • Institutional and social learning • Supports collective memory of past experiences
Institutional Variety	Institutional variety emphasizes employing multiple types of institutions for governing water resources (Akamani & Wilson, 2011). The sustainability of social-ecological systems demands institutional variety as a mechanism for generating new opportunity out of complex and uncertain circumstances (Berkes, 2007). Conventional governance forms often relying on regulatory institutional arrangements employed by a single actor (often government) to govern natural resources has been criticized for creating problems of capacity mismatch and restricting local level institutions from being incorporated into the decision making process.	• Employment of different types of institutions or systems of rules for governing resources • Involves local level participation
Nesting	Nesting recognizes the importance of addressing complex social and ecological challenges from within and across multiple levels of scale (vertical or horizontal) (Akamani & Wilson, 2011; Dietz et al., 2003; Huitema et al., 2009; Low et al., 2003). Nesting has been utilized through polycentric institutional arrangements often with multiple centres of decisions making authority to improve institutional fit and deal with complex challenges by improving interactions amongst actors, participation, accountability, and redundancy (though often at the cost of efficiency) (Akamani & Wilson, 2011; Dietz, Ostrom, & Stern, 2003; Low et al., 2003; Nowlan & Bakker, 2007; Pahl-Wostl et al., 2009).	• Multiple centres of decision making authority • Redundancy in function

4.4 Methodology

To examine how institutions facilitate or constrain First Nations' ability to address water quality and quantity issues, a multiple case study methodology as outlined by Yin (2009) is used. Three specific First Nation communities make up the case studies (i.e., Six Nations of the Grand River [Six Nations], Oneida Nation of the Thames [Oneida], and Mississaugas of the New Credit First Nation [New Credit]; see Figure 6). Each case study

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was selected for its distinct water quality and quantity issues and institutions (both formal and non-formal) related to water (e.g., community bylaws, diverse cultural context, beliefs and perceptions). Building on previously conducted research (see Plummer et al. 2013; Cave et al. 2013), this study examines, across the three case studies, how institutions facilitate or constrain First Nations in addressing water quality and quantity issues on-reserve. Following a short case study description, Table 10 summarizes the key water issues, source water, sanitary services, and responsibilities within each case study.

Figure 6 Case Study Communities in Southern Ontario

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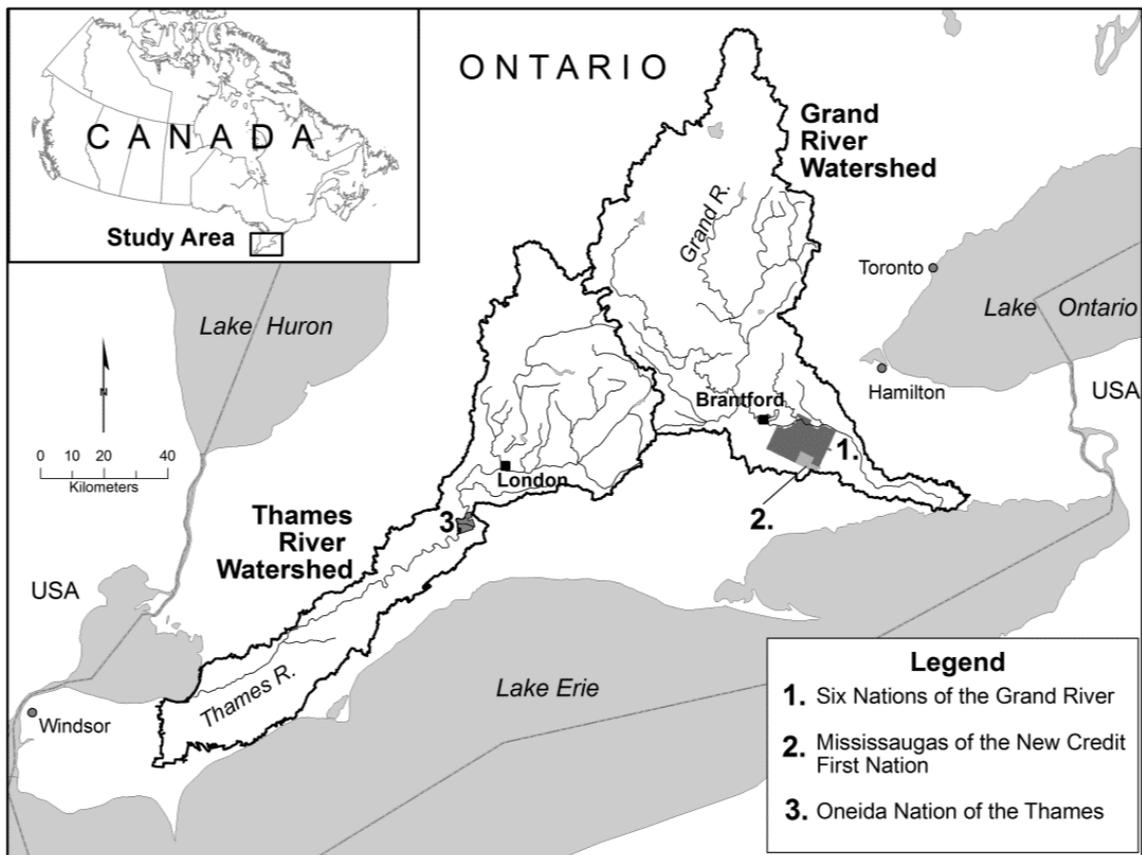
4.4.1 Case Studies

Mississaugas of the New Credit First Nation is located within the Grand River watershed south of the City of Brantford, Ontario. The on-reserve population is approximately 820 people (MOTNC, 2008). The community receives water from a variety of sources that include, Lake Erie treated off reserve at the Nanticoke treatment facility, groundwater through wells, and purchased through bottled water (MOTNC, 2008). New Credit experiences water quality and quantity issues related to groundwater contamination (Burnett, 2005; SNOTGR, 2007), aging infrastructure, and financial constraints. Across the reserve there are few regulative arrangements to control land use and protect water resources (See Chapter 3).

Oneida Nation of the Thames is located within the Thames River watershed downstream of the City of London, Ontario. Oneida has an on-reserve population of approximately 2000 residents receiving water primarily from the Thames River aquifer (AANDC, 2010). Water is treated on reserve; however, many residents purchase bottle water for drinking. Green Lane landfill and upstream sewage treatment facilities generate concerns regarding the quality of surface and groundwater resources. Many residents mistrust the quality of treated water on reserve (Cave et al., 2013).

Six Nations of the Grand River is also within the Grand River watershed downstream from the City of Brantford, Ontario and adjacent to New Credit. Six Nations has an on-reserve population of approximately 13000 people (SNOTGR, 2010). Source water is received from the Grand River treated on reserve as well as from groundwater through residential wells. Additionally, many residents purchase bottled water. Six Nations is concerned about water contamination of both surface and groundwater. At the time of data collection the treatment plant was operating at full capacity limiting the availability of

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treated water. A new water treatment facility has been opened in November 2013, but

access is limited to homes on the community pipeline (approx. 14%) and those home

owners that pay to receive water hauled by truck (approx. 20%; AANDC ,2011). As a result,

approximately 66% of residents receive water from other sources such as a well or bottled

water (AANDC, 2011).

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Table 10 Summary of case study communities

Case study community	Source water and Sanitary disposal	Key water and sanitation infrastructure	Responsibility for maintaining and operating infrastructure	Identified water challenges
New Credit	Surface water from Lake Erie	Drinking water treatment facility operated off reserve	Owned by City of Nanticoke, operated by Ontario Clean Water Agency (OCWA)	- Lack of formal arrangements - Inadequate funding arrangements - Contaminated groundwater - Geology not good for wells - Regulatory gap - Lack of infrastructure (via poor residential wells, disposal facilities, septic systems, and agricultural sources) (Burnett, 2005; Six Nations, 2007)
		On reserve water pipeline (from treatment facility)	Maintained and operated by New Credit	
	Groundwater	Residential wells (deteriorating and under maintained)	Residential home owner	
	Sanitary disposal to Boston Creek	Single cell lagoon for water treatment and sand filter	Maintained and operated by New Credit	
Oneida	Groundwater Under the Influence of Surface Water (GUDI)	Treatment plant facility (running at full capacity)	Maintained and operated by Oneida	- Trust issues in the water and water operators - inadequate funding - Plant running at capacity - Pollution of point and non-point sources
		Water tower and pipe line		
	Groundwater	Residential wells and cisterns (deteriorating and under maintained)*	Residential home owner	
	Sanitary discharged to small creek	Sequencing batch reactor wastewater treatment system (as of 2001 not functioning) (SFNS, 2001)	Maintained and operated by Oneida	
Six Nations	Surface water from the Grand River	New treatment plant facility (Completed in Nov 2013)	maintained and operated by Six Nations	- Trust issues in water - lack of formal arrangements - tensions regarding authority to make decisions - Treatment plant at capacity (at time of data collection) - Groundwater contamination - Geology not good for wells - Surface water contamination (via poor residential wells, disposal facilities, septic systems, and agricultural sources) (Burnett, 2005; Six Nations, 2007). - lack of infrastructure
		- Truck fill station - Water tower - Pipeline		
		- private cisterns	Residential home owner	
	Groundwater	Residential wells (deteriorating and under maintained)	Residential home owner	
	Sanitary discharged to the Grand River	- 5 cell sewage Lagoons for water treatment - Peatland Treatment System	maintained and operated by Six Nations	

* Information from interviews

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Each case study is embedded within a broader institutional context that defines the roles and responsibilities for water management in Canada. The responsibility for addressing water issues on reserve is shared between the Canadian federal government and First Nations. The Canadian Constitution Act, 1982, s. 35(1) defines the federal government's fiduciary responsibility to ensure First Nations have access to adequate water resources and is implemented primarily through funding (Aboriginal Affairs and Northern Development Canada [AANDC]), monitoring (Health Canada [HC]), and developing and enforcing regulations (Environment Canada [EC]). The Federal government's approach to address (drinking) water quality and quantity issues has been predominantly technical and advanced through numerous federal strategies, plans, panels, and protocols (AANDC, 2006, 2007, 2009; Swain et al., 2006). The Safe Drinking water for First Nations Act (SDWFNA), 2013 is the latest attempt to develop standards for drinking water and wastewater on reserves. First Nations' are responsible for developing, operating, and maintaining infrastructure (Simeone, 2010). In addition, Indigenous Peoples express their responsibility to protect water resources (AFN, 2014; McGregor, 2012). This responsibility is informed by the Natural Laws carried forward through oral traditions (McGregor & Whitaker, 2001; Walkem, 2006). Under the Constitution Act 1982, First Nations defend their inherent rights to fulfill this responsibility (Phare, 2009).

4.4.2 Methods

Multiple methods (semi structured interviews, archival data gathering, secondary data gathering, and direct observation) were used to identify and triangulate themes that related to the role institutions have in facilitating or constraining First Nations' ability to address water quality and quantity issues experienced on-reserve. Themes consist of patterns observed across the data collected from each source (Creswell, 2003; Lewis-Beck

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et al., 2004; Stake, 1995 Guest 2012). Themes were arrived at through qualitative content analysis of the data utilizing deductive and inductive coding approaches as outlined by Graneheim and Lundman (2004), Crabtree and Miller (1999), Boyatzis (1998), and Fereday and Muir-Cochrane (2008). The relative importance of a theme was evaluated and weighted based on the reoccurrence of themes across data sources, themes that arose from key informants with proprietary knowledge, and input provided by respective community partners (see Section 2.4.5).

Primary data sources included 26 key informant semi-structured interviews (Oneida 8, New Credit 10, and Six Nations 8). See Table 11 for a summary of key informant interviews. Interviews were conducted in person in locations convenient to the participant (e.g., home, coffee shop, office). I conducted each interview using an interview guide (see Appendix B – Interview question guide) based on the institutional strategies described in Table 9. Key informants included individuals that were members of the partnering case study community, knowledgeable about water and recruited based on guidance from community partners and snowball sampling. Typical participants included council members, elders, treatment plant operators, and health representatives. A pilot interview was conducted within each community assuring the nature of questions was appropriate and respectful within the respective communities.

Table 11 Summary of key informant interviews

Data sources (approx. dates conducted or accessed)	Case study (# number of individuals interviewed)		
	Oneida Nation of the Thames	**Mississauga of the New Credit**	**Six Nations of the Grand River**
Key informant interviews (2012-2013)	• Elected Council (2), Traditional Council (1), Health (1), Technical specialist (2), Elder (2) (8 individuals total)	• Elected Council (4), Health (2), Technical Specialist (2), Elder (2) (10 individuals total)	• Elected Council (2), Technical specialist (3), Elder (2), other (1) (8 individuals total)

I transcribed each interview and provided them back to the participants for member checks. Using the qualitative research software QSR NVivo 10™, I conducted data analysis using a qualitative content analysis approach (Graneheim & Lundman, 2004), incorporating both deductive and inductive approaches to coding as outlined by Crabtree and Miller (1999), Boyatzis (1998), and Fereday and Muir-Cochrane (2008). Using the institutional strategies outlined in Table 9 as predetermined categories, deductive coding was used to organize information. Inductive coding was then used to uncover themes related to institutions that facilitate or constrain each First Nation community from addressing water quality and quantity issues.

Archival and secondary data sources were collected and included minutes from council meetings (142 publicly available documents) and source protection committee meeting minutes (95 documents), personal documents provide by community partners, websites, reports, community documents and historical texts. Archival and secondary data were selected based on recommendations of the research partner and through online searches based on relevance to the research.

Organized using QSR NVivo 10™, each archival and secondary data source was searched using the text query functions (e.g., water, watershed, river, stream, lake, groundwater, contaminate). Information related to the case study communities' ability to address water quality and quantity issues was deductively coded according to the institutional strategies identified in Table 9 and used in conjunction with other data sources to triangulate results.

Direct observation was carried out over a four-year period where I worked within the communities on water related projects. Observations from working within the community and attending activities and workshops were recorded in a journal. Journal

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entries were used to triangulate research findings, organized in QSR NVivo 10™, and deductively coded according to the institutional strategies identified in Table 9.

This research was given ethical clearance through both Brock University and Wilfrid Laurier's Research Ethics Boards, as well as through the case study communities' respective Elected Chief and Councils' ethical clearance protocols. Each participant received a verbal invitation that included the purpose of the study, its voluntary nature, the benefits for their community, and the terms for which information would be used.

4.5 Results

The following results reflect the cross-case themes drawn from the data sources and coding outlined above. The themes presented were identified and weighted based on their reoccurrence across data sources, their occurrence from key informants with proprietary knowledge, and input provided by respective community partners (see Section 2.4.5). My focus here is on the role of institutions in facilitating or constraining First Nations' ability to address water quality and quantity on-reserve. The quotations presented in this paper exemplify the themes identified in the analysis process. The results from the case studies are organized by institutional strategies defined in Table 9 (analytic deliberation, institutional variety, and nesting). A summary of results organized by these strategies is presented at the end of this section.

4.5.1 Analytic Deliberation

Analytic deliberation provides insight into the manner in which institutions facilitate or constrain First Nations' capacity to respond to water issues on reserve, and draws attention to the interactions between actors to overcome disagreements and address identified problems (Dietz et al., 2003; Dietz & Stern, 1998) (See Table 9). Folke et al.

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(2005) explored these types of interactions and expressed the potential role they have bringing together diverse knowledge to inform the values and interests that are used to define problems and to seek solutions. Therefore, institutional arrangements that embody analytic deliberation have potential to improve how complex problems like those associated with water are addressed.

All communities expressed that water management should be informed by both western and traditional knowledge; however, many participants from all three case studies articulated that traditional knowledge is being eroded, diminishing how First Nation values are incorporated into the water management process. Traditional knowledge is defined in this research as knowledge held by First Nations that is specific to place, usually transmitted orally, and rooted in the experience of multiple generations (AFN, n.d.). Participants expressed traditional knowledge as a holistic understanding that informs water management through associated values (e.g., responsibility to conserve, respect, and protect), practice (e.g., hunting, fishing, medicine), and spirituality (e.g., relationship, traditional ceremony). For example, traditional knowledge expressed through values associated with water conservation influence how community members reduce water use on reserves. Participants from Six Nations reported that few community members were reported to participate in water use activities such as lawn watering because the traditional understanding of the value of water and its connection to all living things implies that it should not be wasted on watering lawns (Interviewee 14, Six Nations). Another participant from Oneida expressed that some members still fish in the Thames River and that through these activities water quality within the river needs to be protected for the fish (Interviewee 31, Oneida). However, despite the critical role traditional knowledge plays in water management on reserve, many participants describe how changes within their communities

over time embed institutions (formal and non-formal) that influence how traditional knowledge is transferred and utilized. One participant from Oneida described how norms associated with colonialism influence traditional knowledge,

> *…our experience as a First Nation or Indigenous People [is not transferred from elders and council] through colonization. Language loss, residential schools, you know community breakdown and family breakdown, loss of language a change of practice…us changing to agriculture and gathering and stuff like that. …Like, there has been a lot of change [that] our community has gone through…. (Interviewee 6, Oneida)*

A loss of traditional knowledge has implications for the ability to inform water management, particularly through the values it embodies. As one participant explained, "[traditional knowledge is used] in a very limited way [now], I would say that no, not enough, a lot of it is now more limited to cultural practice, ceremonies, and those types of things" (Interviewee 27, Oneida). Further, one participant from Six Nations explained that acknowledging traditional practices (e.g., hunting, fishing, medicine) and spirituality (e.g., ceremonies) isn't sufficient in itself to address water quality arguing that the values that traditional knowledge inform must be engaged in decision making in order to create change and address water quality issues,

> *So sometimes we get too easily satisfied by just hearing it acknowledged rather than to do the hard work to say, okay take that thought, take that value, take that belief and now let's see us play it out. Otherwise, then, the water department would be burning tobacco regularly to build its relationship to, to water. …it's the seed that's been planted, it's starting to grow but if it doesn't get enough water it's not going to take off. So we're at that point of trying to decide, are we really going to engage [our values], or are we going to say, 'oh they're building another [water treatment] plant so everything will be okay'. Our people are so easily lulled into that, that's my fear 'cause there's no guarantee what they're building over there [a new water treatment facility] will give you healthy water out of the tap. (Interviewee 20, Six Nations)*

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Most participants from each case study community recognized the importance of engaging community members and facilitating communication surrounding drinking water quality issues on reserve; however, despite this recognition, community engagement continues to be a challenge. Participants from all communities described the community engagement process as difficult. For example, in New Credit it was described as "the hardest part about doing anything within the community" (Interviewee 8, New Credit). In Oneida, participants reflected that a lack of engagement makes it difficult for Council to remain accountable to its members. As one participant described,

> *I don't think [the public consultation process is] good enough right now. I mean just general communication on a lot of matters with our community is difficult. We don't get very good turnouts at our community meetings"… "you're still looking at probably 800 to 1000 people that should be attending these things. (Interviewee 28, Oneida)*

Difficulties engaging the community may be linked to institutions (norms about water within the community) that perpetuate mistrust in the water system. This was particularly expressed by participants from Six Nations and Oneida. When members feel uninformed about the quality of drinking water, operators can be perceived to be unaccountable for water treatment instilling mistrust in the operation and quality of water delivered to their taps. As one participant from Oneida articulated,

> *…you question [the quality of water] just because you don't get those regular reports, if that water treatment plant was out front and had better reporting for the public and said, 'this is what we do, this is our day to day operations, we are following this chart, and last time we had anything' if they had an incident report or said, 'we had 10 complaints and this is how we responded to them to address it' and if they did those things, I think it would go a long ways to improve confidence. (Interviewee 24, Oneida)*

Engaging the youth, particularity through youth councils, was recognized by multiple participants in New Credit and Six Nations as vital to improving community engagement

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and communication across generations (Interviewee 5, New Credit; Interviewee 23, Six Nations).

The process of defining water quality and quantity issues, utilizing diverse value sets, and addressing disagreements across groups within communities can be a challenge. Participants identified multiple instances in which various groups (e.g., Elected Chief and Council, Confederacy Council, other citizen groups) within the respective communities are not in agreement on how to mediate and address water quality and quantity issues (e.g., build new water treatment facilities, decommission groundwater wells). These conflicts result in a "polarized", "dysfunctional" environment where you are "just stuck in the mud" stalling processes for moving forward on an issues (Interviewee 12, 23, Six Nations).

Institutions (i.e., norms) that perpetuate these conflicts arise around the use of different knowledge sets (traditional, western) and their role in informing decision making. Some participants recognize that despite these conflicts, there is a compatibility between western and traditional knowledge and suggest that traditional knowledge informs the appropriateness of potential solutions, for example, Interviewee 12 from Six Nations explained "there is a compatibility with the (traditional) value system [and western science], where the technology is used to get something done, ... [and] you can get guidance as to the appropriateness of a solution from traditional values (i.e., respect for water)". Participants from all case studies reflect that, in order to reduce conflict on reserve and move forward to address water issues, efforts to reconcile differences amongst traditional and scientific knowledge sets are needed. Some participants from each community case study articulate that reducing conflict can be achieved by increasing the dialog between conflicting groups on reserve (Elected Chief and Council, Confederacy Council, citizen groups). Articulating the benefits of dialog, particularly sharing information across groups,

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one participant from Oneida recalled a past experience where dialog was effective at reducing conflict about installing a waterline for the community, "[the] waterline was an issue, traditional council didn't like [it] because of [the] assumed source (the Thames River), once information flowed about [the] actual source (groundwater under the influence of surface water), the pipeline was no longer an issue" (Participant 33, Oneida).

4.5.2   Institutional Variety

No single institution is (or should be) expected to address complex environmental resource challenges (see Table 9) (Akamani & Wilson, 2011; Dietz et al., 2003). Instead, scholars agree that utilizing multiple institutions provides a diversity of approaches more aligned with complex environmental resource challenges (Berkes, 2007; Folke, 2007). Therefore, an exploration of variety of both formal (constitution, legislation, regulations, by-laws) and non-formal (beliefs, values and cultural norms) institutions may shed light on how institutions contribute to how First Nations address water issues.

Participants from all three case study communities identified numerous formal institutions for managing water resources that are viewed as important and needed within the community to address water issues. Formal arrangements include federal guidelines (e.g., water quality), provincial regulations (e.g., water quality standards), community bylaws (e.g., zoning, land use, user fees), and Band Council Resolutions (BRCs) (e.g., delineated sensitive areas). However, many participants identified formal on-reserve arrangements such as zoning bylaws that regulate land uses impacting water quality are ineffective because they are not enforceable by Elected Chief and Council on private lands. Reflecting on beliefs about zoning, one participant from Six Nations described why it is difficult to protect water resource through land use control, "...because it's private [land]

and 'you can't tell me what to do', [Zoning] doesn't exist around here... people go nuts when

you mention zoning" (Interviewee 12, Six Nations). Another participant from Six Nations

went as far as to call it "lawless" (Interviewee 21, Six Nations). In addition, the fact that

provincial regulations (e.g., Ontario Wells Regulation, Ontario Drinking Water Standards)

are unenforceable on reserve limit their effectiveness to protect water resources. For

example, the case study communities try to utilize provincial well regulations (Safe

Drinking Water Act, 2002) as guidelines for well installations on-reserve. One participant

from New Credit explained the challenges enforcing the regulations when wells are

installed incorrectly,

> *...we are going to install this well, we'll use the provincial guidelines or*
> *regulations as a guideline. What happens is [contractors] do the best*
> *they can, but usually it's not up to snuff (provincial standards). There is*
> *no way to monitor that or regulate that once there's a problem. So*
> *[infrastructure not meeting provincial standards] continues [to be*
> *built within the community]. (Interviewee 1, New Credit)*

In addition, formal institutions (by-laws) related to regulating user fees for

community treated water are not accepted by some members in the case study

communities because they feel the sale of water conflicts with understandings of water's

importance and sacredness. As expressed by one participant from Six Nations,

> *I guess [paying for water] may be more of a barrier ...as far as*
> *management goes, a lot of people say that water is there provided for*
> *us by the Creator, so it should be free and I agree with that, but it's*
> *polluted so you know it has to be clean, you have to pay for that*
> *service. That will be the part that is hard to get across to people about,*
> *'why am I paying for water' ...here [on reserve] it's just a new thing*
> *actually, people are still trying to get their heads around it. 'What next,*
> *[are] we going to have to pay for the air?' (Interviewee 14, Six Nations)*

Non-formal institutions that are informed by traditional knowledge (e.g., cultural

norms) are perceived as both helpful and unhelpful for managing water resources on-

reserve. On one hand, many participants from all three case study communities reflected on

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their beliefs about water that embody a connectedness to water through Creation that informs a deep respect for water and a responsibility to protect it. Some participants from New Credit and Six Nations recognized these beliefs to be complementary to formal institutions (regulations, by-laws), because they provide direction and motivation to improve water resources. As one participant explained, "it isn't enough to have a by-law or regulation, people have to feel that it's important to do it and understand what is right" (Interviewee 1, New Credit).

An example of cultural norms informed by traditional knowledge forming the basis for a formal decision making and planning processes is evident in New Credit. The traditional knowledge that informs their holistic view of the environment and its interconnection with water and values of respect and responsibility are incorporated into their comprehensive community plan (Interviewee 1, New Credit). This holistic planning led to a formal Band Council Resolution[21] and successful management of water resources through the protection of sensitive areas in New Credit. Beliefs in the connectedness of and responsibility to protect water have been used to manage a sensitive forested area on reserve known as the Grove. Important for ceremonial and community uses (e.g., gatherings and traditional ceremonies), the area was being degraded through soil compaction and overuse. Beliefs on-reserve underpinned the responsibility to protect it allowing the area, including waters within, to recover and rejuvenate from previous land uses. As Interviewee 9 (New Credit) described,

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[21] A written decision made by a band council. The decision is made during a council meeting and must have the support of the majority of council members (Ontario Ministry of Aboriginal Affairs [OMAA], 2015). One participant defined it as "our highest order of the Indian band under the Indian Act" (Interviewee 9, New Credit).

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I call it we were loving it to death. We all wanted to be there, cause just being amongst the trees is such a special thing, I thought we should leave and host the pow wow [gathering] somewhere else for a couple of years until this rejuvenates, which is like a traditional concept. You spent its abilities, move on, let it rejuvenated, as we go around we come back to it, giving it time to get its strength back.

On the other hand, some participants from Six Nations and Oneida articulated cultural norms informed by traditional knowledge may not always be effective for managing water resources, because they are not always compatible with current water issues such as water treatment and agricultural runoff. One Participant from Six Nations explained that managing the treatment of water resources was seen as "primarily scientific" to protect the health of community members (interviewee 15, Six Nations) and at least at the water treatment level [we don't] incorporate traditional knowledge. Similarly, one participant discussed the Great Law, the founding constitution of Haudenosaunee society, as "good in its time" and argues, "the Great Law doesn't tell me how to farm, [the] Great Law doesn't tell me how to cope with reality" (Interviewee 12, Six Nations). They go on to identified that mixing traditional and western values and beliefs can derail discussion and decision making processes, for example,

...some of the traditional people say we work the Great Law. I respect a Great Law... ...it is at the basis for a lot of things, but people use it for their advantage. The reserve is a small community everybody knows everybody, a lot of history, and resentments go up. Right away you're telling me how to live and you did this, this, this, this, everybody digging in their heels. (Interviewee 12, Six Nations)

These examples illustrate institutional variety within the case study communities; however, speaks to the possibility that traditional knowledge can lead or influence formal instructional process (e.g., New Credit and the Grove). Additionally, participants reflect that traditional knowledge need not influence all parts of water management (i.e., water treatment and farming).

4.5.3 Nesting

Nesting in this context reflects the limitation of institutions operating at one level (e.g., local, regional, national) to fully address multi-level problems, such as those associated with water (Akamani & Wilson, 2011). Management arrangements that foster polycentric institutions (multiple centres of decision making) and interactions within and across levels are reported to improve the fit between institutions and complex problems; Olsson et al., 2006; Young, 2002; Young, 2008). This has potential to enhance how actors respond to complex problems by improving interactions amongst actors, accountability, and redundancy (Akamani & Wilson, 2011; Dietz et al., 2003; Low et al., 2003; Nowlan & Bakker, 2007; Pahl-Wostl et al., 2009). Therefore, an examination of nesting has potential to shed light on how institutions facilitate or constrain First Nations ability address water issues on-reserve.

Many participants from all three case study communities recognized that federal level institutions like those that determine funding for water development, maintenance, and upgrading on reserve (e.g., National Priority Ranking Framework [NPRF]; AANDC, 2013) constrain their community's ability to address water quality and quantity issues. Participants expressed that without institutions that support First Nation control of funding, communities are forced to take what funding the federal government offers, despite it not being enough to develop, maintain, and upgrade water systems on-reserve. For example, one participant from New Credit expressed, "So [projects] either go forward or they don't go at all. ...a function sort of like, dangle money in front of you and then expect you to jump on it. But you know, it's not enough [money]" (Interviewee 4, New Credit). Some participants in all three communities expressed that controlling funding on reserves is analogous to controlling their community. For example, one participant from Six Nations

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explained, "The federal government [does not] provide adequate funding they simply provide funding, but it's not enough, they are using it as leverage to control us" (Interviewee 21, Six Nations). Participants from each case study community identified that institutions, such as the NPRF that determines how funding is distributed to address water issues on-reserve, have steered First Nations to develop in directions that are unsustainable over time given the available resources (human, information, or financial). For example, Interviewee 24 (Oneida) described how water issues have been addressed in Oneida,

> *...so it's like the First Nations they get led down the path that it's better to upgrade to a water treatment system, then find that you don't have the resources to operate that, ...so it's a situation where I think that the First Nation has gone along for the ride, ...we didn't know what all goes along with it... we were led down this path. The groundwater is contaminated, we can't [use] that now, so now we [use our current system]. Now we don't have the governance powers to go along with operating [our treatment plant].*

These examples illustrate how federal level institutions like the NPRF can constrain the case study communities by restricting their decision making control of how to use resources to better meet their needs. Participants from all three case studies expressed that there is a need for funding institutions that bridge decision making control across First Nation and Federal levels (Interview 1, New Credit; 24, Oneida; 15, Six Nations).

Participants from Six Nations and New Credit identified that institutions that empower federal level decision making, such as NPRF, require knowledge about water quality and quantity issues experienced within First Nation communities. This is because federal or provincial decision making can be disconnected from knowledge and information on-reserve diminishing the effectiveness of programs or initiatives implemented to improve water resources. One participant from New Credit discusses this disconnection referring to the process used to develop the federal guidelines for source water protection,

...all [that the federal government] did was hire a consultant, [using] the provincial draft at the time, [the consultants] basically substituted First Nations with municipalities, 'this is it for First Nations, Aboriginals, gimme my money'. That's pretty well all they did and we said, 'that's not going to work'. [First Nations are] not like the municipality, different structure and so we identified all the flaws in this. So they're trying to make a decision for the local level at a higher level. It isn't going to work. (Interviewee 1, New Credit)

In addition to institutions acting across levels, nesting also highlights the importance of multiple centres of decision making and the interactions between groups within specific levels for addressing complex problems. Within the boundaries of the reserve, decisions about water are primarily made by Elected Chief and Council and its departments (e.g., Health, Public Works). However, as seen in Six Nations there may be groups (e.g., Confederacy Councils, citizen groups) within the community that question the authority of Elected Chief and council to make decisions. These groups were not found to be legitimized by Elected Chief and Council and are often cut out of the decision making process. One participant described the power struggle,

It's off-balance, because you got your Elected Council controlling things making good decisions and then you have these other people claiming to represent one group or another and are constantly trying to undo whatever the council is trying to do. So the council has the power and these folks don't have the power... Yes, they want some of the power. (Interviewee 21, Six Nations)

This results in tension, protest, and stalled process. The same participant went on to describe recent protests related to legitimacy and the authority to make decisions,

Yes, take our new water [treatment] plant, the elected council has been working at this for something, like 12 to 14 years, and they finally got enough money together from all the different players to start building a new water plant and Friday three different factions, the confederacies, the Indian activists, and local activists, they got together and they wanted to put a padlock on the front door. That was this Friday. They shut the water treatment plant down, because they said we didn't consult them. (Interviewee 21, Six Nations)

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These examples illustrate how perceived decision making authority creates tensions and barriers to developing water resources on reserve. Table 12 provides a summary of results organized by strategy.

Table 12 Summary of Results

	New Credit	Oneida	Six Nations
Analytic Deliberation	• Traditional practice improves decisions making, but not represented within federal regulations related to water. • Community engagement both facilitates and constrains analytic deliberation • Youth council engages youth while providing a pathway for knowledge transfer • No mechanism for transferring knowledge and information.	• Traditional teachings are important for decision making; however, many members do not know teachings and therefore are limited in using them in decision making. • Diverging interests and views over water issues can limit decision making, flow of information and knowledge transfer. • Openness is key to improving attitudes toward water. Challenges associated with community engagement and lack of available information about water treatment exist	• Traditional practice has a strong role in managing and governing water resources; however, enhancing the connection people have with water will improve decision making. • Defining water issues, identifying the diverse value sets and addressing disagreements across groups is a challenge in Six Nations. • Decisions are more often based on western science, but potential for traditional knowledge lies with improving compatibility of decisions across the community. • Lack of engagement of community issues in water.
Institutional Variety	• Perception of authority on reserve lands diminishes the ability of formal and non-formal institutions effectiveness- lack of community engagement • Strong cultural arrangements are being used to protect sensitive areas, conserve water resources and generally form a value base for making decisions about water.	• Traditional system is critical for governing community, but few members are aware of cultural practice related to water. • Viewed as important, formal arrangement for governing water do not exist within Oneida.	• Traditional systems for governing water exist and critical for governing and managing water on Six Nations reserve; however, such arrangements can be difficult to implement as well as used to derail other processes. • Attitudes toward water and its sacredness conflict with arrangements that provide economic incentives • Recognize the importance of formal arrangements to manage and govern water; however, Chief and Council are limited by in land-use planning and community buy in.
Nesting	• Institutional arrangements that govern decision making across levels create an uneven playing field and create the sense of powerlessness • Role of governments (federal or provincial) in regulating water resources is important, but is ineffective because decision making at these levels lack knowledge and understanding about New Credit and what is suitable on reserve.	• Institutional arrangements create an uneven playing field and a sense of powerlessness and are exacerbated by perceptions that the federal government is off loading responsibility to ensure safe drinking water.	• Institutional arrangements across federal and reserve levels are disconnected from knowledge within Six Nations. This disconnection often results in downloading responsibility on to Six Nations. • Within Six Nations, multiple centres of authority and leadership do not align with each other resulting in legitimacy and accountability being undercut by the other. This stall the process to improve water resources on reserve.

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4.6 Discussion

Three institutional strategies have been used in this research to identify what facilitates or constrains First Nations in southern Ontario from addressing the water issues they confront: analytic deliberation, institutional variety and nesting (see Akamani & Wilson, 2011; Dietz et al., 2003; Dietz & Stern, 1998; Gupta et al., 2010; Huitema et al., 2009; Huntjens et al., 2012). Here, I discuss the broader implications from the results with a particular focus on experiences on-reserve (see Chapter 5 for an analysis of issues in a multi-level context).

The importance of traditional knowledge in environmental decision making coincides with the literature. Authors such as Berkes et al. (2000), Ellis (2005), and Watson et al. (2003) argue that traditional knowledge is important for addressing complex social-ecological problems such as those associated with water. Despite this importance, many participants from all three case study communities feel that the use of traditional knowledge about water and practice in decision making has been reduced over time, diminishing how First Nation needs are met through decision making. In the current institutional setting (e.g., Indian Act [1876], federal legislation, provincial regulations) participants from all three case studies feel First Nations' traditional knowledge is often absent and viewed as "anecdotal" or "unsubstantiated" (Alfred, 2005; Borrows, 1997; McGregor & Whitaker, 2001; McGregor, 2005; Walkem, 2006, p. 310). This has in part led to circumstances that allow water issues to perpetuate. For example, McGregor (2012) indicated that current water quality issues on-reserve continue, in part, because contemporary approaches to address them (largely technical in nature) do not fully support the values of First Nations. In the context of the case study communities specifically, the responsibility and respect for water resources to ensure the conservation and protection of

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water quality and quantity. Institutions that acknowledge colonial legacies and foster

traditional knowledge and the values it informs present an opportunity to broaden how

problems are defined and solutions identified that better meet the needs of First Nations.

Beliefs associated with decision making authority and legitimacy can create tension

and constrain how communities are able to address water quality and quantity issues on

reserve. Tension experienced between multiple groups on reserve, such as those expressed

by participants in Six Nations, can be a barrier to the flow of information, the participation

of concerned actors, open communication, and the inclusion of diverse values in decision

making. Tensions between groups can be rooted in historical events that perpetuate conflict

and mistrust. Authors such as Dietz and Stern (1998), Gupta et al. (2010), and Dietz et al.

(2003) recognize value conflicts and mistrust as paramount challenges to resolving complex

environmental problems. They argued that efforts to facilitate open examination, debate,

and accommodation between groups can increase trust, understanding, and legitimacy, thus

improving how communities respond to complex water challenges.

Participants expressed that community engagement is an ongoing challenge and

constrains how the respective communities are able to address water quality and quantity

issues. On one hand, Elected Chief and Councils have difficulties informing members about

water issues because those community members are not engaged when water issues arise.

On the other hand, community members are unwilling to engage in water issues, because

they lack trust in both the management and quality of water on-reserve. This self-

reinforcing situation parallels findings by Plummer et al. (2013) and Cave et al. (2013), who

identified lack of community engagement in First Nation contexts as a contributor to water

vulnerability. Dietz and Stern (1998) discussed the merits of engaging local actors in

decision making citing its benefits for improving opportunities for new insights into

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decision making, and trust building. Encouraging on-reserve community engagement (e.g., by being open about water treatment operations) offers to restore trust in both water sources and management. As multiple participants recognized in Six Nations and New Credit, opportunities lie in engaging youth within the community as a starting point to begin this process, and for example, supporting a youth council to engage in community decision making.

Formal institutional arrangements (e.g., legislation, regulations, zoning, by-laws) are important for managing water on-reserve; however, participants articulated that they are largely ineffective because there is an incompatibility with beliefs and values held on-reserve. For example, zoning and land use regulations important for protecting water resources were found to be unenforceable due to prevalent community beliefs that Elected Chief and Council does not have the authority to enforce them. This parallels insights from Chapter 3, where formal institutions, particularly those associated with community source water protection, are limited in their effectiveness due to beliefs that Elected Chief and Council do not have the authority to control land use on private lands. Similarly, formal arrangements that may have potential to improve water conservation off-reserve, such as those that introduce user fees and economic incentives, are also described as potentially ineffective because paying for water goes against deeply rooted cultural values that water is not something that can be sold. Care must be taken to ensure formal arrangements, whether they are federal, provincial or community initiated, are compatible with local beliefs about authority to enforce them and the local cultural values associated with water. Achieving this compatibility is paramount, especially as the federal government begins rolling out regulations for the newly passed Safe Drinking Water for First Nations Act (2013). Criticisms by Assembly of First Nations (2013) and the Chiefs of Ontario (2013) about the

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Act have been raised regarding implementation challenges arguing they do not meet the needs of First Nations, particularly those associated with enforcement. Successful implementation of the act will involve attention to improving its compatibility within First Nation communities achieved through meaningful participation in the development of new regulations.

Cultural norms are also important institutions for managing water; however, challenges remain in identifying specific arrangements that enable First Nations to address water quality and quantity issues on reserve. McGregor (2012) and Lavalley (2006) recognized that water management that supports traditional arrangements (e.g., respect, responsibility to protect)[22] enables communities to address water issues because it promotes self-governance aligning with the unique needs of each community. Cave et al. (2013) recognize that cultural norms contribute to water management through behaviour that supports water conservation and protection. Similarly, Longboat (2013) recognizes the role of traditional knowledge in water management and recommends that strategies be developed for how traditional arrangements may support water management. The findings from Six Nations and Oneida indicate that cultural norms for water management (e.g., conservation norms) may not in themselves be enough to enable communities to address water quality and quantity issues on-reserve. Perceptions of the inappropriateness or incompatibility between the cultural arrangements and current water issues instill a widening gap between traditional and western practice. Examples like the Grove in New Credit can be instructive as to what opportunities cultural norms afford toward building

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[22] All three case study communities reflected on their beliefs about water that embody a connectedness to water through Creation that informs a deep respect for water and a responsibility to protect it. An example of this is water conservation. Respect for water translates into water conservation and protecting its water quality on reserve.

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compatibility within water management. New Credit's traditional holistic views of the environment and values associated with respect were instrumental in defining the problem and provided motivation for restricting land use activities that were impacting water resources.

Nesting provides insights into the multi-level nature of water resource management within the three case study communities. The results indicate that the perceived imbalance in the distribution of responsibility, decision making authority, knowledge, and information across levels constrains First Nations from addressing water quality and quantity issues on-reserve. Although the responsibility for water on reserve is shared by the federal government and First Nations, perceptions of insufficient funding provided by the federal government on reserve make it difficult for First Nations to fulfill their responsibility. These findings coincide with the views of the Chiefs of Ontario who reject current federal approaches (i.e., SDWFNA) toward protecting drinking water because, in part, they fail to provide sufficient funding to implement and create an unequal distribution of responsibility, decision making, and financial means (Chiefs of Ontario [COO], 2013). Similarly, gaps in knowledge and information are perceived to exist at the federal level and constrain on-reserve efforts to address water quality and quantity issues. Federal efforts (e.g., Multi-barrier approach to safe drinking water) to improve the water on reserve were viewed as ineffective because they are not developed with community context in mind (e.g., social, political, environmental, cultural) and therefore are difficult to implement (see Chapter 3 and Finn, 2010).

Without control of decision making and the knowledge and information used to inform it, many participants felt they had no control over the types of solutions put forward by the federal government to address water issues and were 'led down the path' toward a

system that is unsustainable. Alfred (2005) and Borrows (1997) expressed that decision making control is paramount to facilitating First Nations' ability to address water issues and is connected to their right to self-govern as a nation. Similarly, von der Porten et al. (2013) argued that only after the nation-to-nation relationship between First Nations and Canada is restored can solutions truly address the needs of First Nations. Improving how institutions are nested across levels may provide some opportunities for First Nations to gain more decision making control to ensure their needs are met. Akamani and Wilson (2011) argued that achieving the right balance of authority at each level (local to national) improves participation and facilitates knowledge and information transfer. Achieving the right balance is notably linked to the concept of fit (Young, 2002; Vatn, et al. 2012), where institutions acting at one level fail to 'fit' the economic, social, political, and cultural needs at another level. Restoring a nation-to-nation relationship between First Nations and Canada by acknowledging First Nations right to make decisions pertinent to their communities is an opportunity to improve how institutions like those associated with funding fit within local environmental, social, political, and cultural contexts. Engaging in relationships that empower First Nations' right to make their own community specific decisions about funding bridges the gap experienced between the knowledge used to inform and authority to make decisions.

Nesting also provides insights into the constraints and opportunities to address water quality and quantity issues at the reserve level. Decision making across council departments has generally been found to enable the case study communities to identify water issues. However, experiences from Six Nations illustrate that the Elected Chief and Councils were not always identified as the legitimate decision maker. Divergent perceptions of responsibility and authority have led to a dysfunctional form of polycentrism. Lebel et al.

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(2006) articulated that interactions within a level (such as the community level) can improve communication and the balance of decision making power. Works by Imperial (1999), McGinnis (2000), Galaz (2008), and Da Silveira and Richards (2013) contend that multiple centres of authority are functional within a governance system when they facilitate knowledge transfer and information sharing critical for responding to complex problems. From the experiences in the case study communities (especially Six Nations), multiple centres of authority and legitimacy was shown to limit communication across groups creating a barrier to the transfer of knowledge and information. This constrained decision making by stalling the process to address water issues, particularly those related to water treatment. Opportunities lie in fostering relationships between the identified centres of authority. Building trust and facilitating communication between groups may improve how knowledge and information is transferred between groups on-reserve.

4.7 Conclusion

This paper explored how institutions facilitate or constrain First Nations' ability to respond to water quality and quantity issues on-reserve in three cases in Southern Ontario. Perspectives gained from the three cases provide important insights into the breadth of constraints and opportunities confronting First Nations on-reserve as they respond to water quality and quantity issues. Constraints that limit First Nations ability to respond include divergent understandings of decision making authority and legitimacy on-reserve among the range of actors, lack of community engagement in addressing water issues, the presence of formal institutions for managing water on reserve that may be incompatible with local norms of decision making, and lack of agreement on reserve about the role of traditional knowledge in water management, who is responsible for water and who has

authority to make water related decisions. Opportunities to enable First Nations to respond to water quality and quantity issues include fostering on-reserve relationships that encourage dialog, trust building, openness, and participation. The view of community perspectives toward water issues presented here contributes to ongoing research focused on the social and political contexts of water governance, and highlights specific ways in which they constrain First Nations on-reserve.

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Chapter 5
Moving from concept to practice: Examining adaptive water governance in the multi-level context of First Nations in southern Ontario, Canada

5.1 Chapter Overview

Adaptive governance is an approach to manage diverse human-environmental interactions characterized by complexity and uncertainty. However, there are relatively few empirical examples of efforts to operationalize adaptive water governance in a multi-level institutional setting. Further research is needed to assess if and how the concept resonates[23] (or is meaningful) in efforts to deal with water resource quality and quantity issues. A multi-case study approach in three First Nation communities in southern Ontario, Canada (Mississauga of the New Credit First Nation, Oneida Nation of the Thames, and Six Nations of the Grand River) provides the context for this analysis. In these contexts, evidence of regulatory gaps, fragmented responsibilities, and limitations placed on Indigenous rights to water decision making in Canada offer fertile ground for an empirical examination of adaptive water governance. The focus of this research is on the multilevel context incorporating the perspectives of actors from both on- and off- reserves (Chapter 4 focuses specifically on institutional constraints and opportunities from an on-reserve perspective). Primary data sources include 58 semi-structured interviews, 142 archival and secondary data sources, and direct observations. The research highlights underlying constraints stemming from multiple levels of water governance (i.e., colonialism and deeply rooted perceptions of legitimacy and decision making power among federal, provincial and

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[23] For example, does the concept contribute practically to deal with water resource quality and quantity within the multi-level case study contexts?

First Nations actors, including those situated on reserve) that can limit core requirements of adaptive forms of water governance, namely: participation and voice of actors in decision making, use of diverse approaches to manage water resources, and equitable distribution of actual decision making power and authority with reference to specific water quality and quantity issues. In addition to advancing the concept of water governance through empirical investigation of a multi-level institutional setting, insights are gleaned for how adaptive forms of governance may be fostered in contexts that involve Indigenous peoples. Key insights include acknowledging underlying power dynamics, creating space for rationalizing and substantiating alternative approaches to governing resources, and mediating divergent assumptions about rights and responsibilities among off-reserves actors and First Nations with regard to water quality and quantity.

5.2 Introduction

The concept of adaptive water governance is an approach growing in popularity amongst environmental governance scholars to address uncertainty and complexity in resource systems (e.g., water); however, current research lacks empirical examples of its application in real world resource decision making contexts, including those related to water (Brunner & Steelman, 2005; Dietz, Ostrom, & Stern, 2003; Folke et al., 2005; Olsson et al., 2006). Without additional empirical analysis, there is a risk of widening the gap between the conceptual appeal of adaptive water governance and its actual contributions to practice. Accordingly, this research examines the multi-level First Nation water context in southern Ontario, Canada by using the concept of adaptive governance. Two main objectives guide this research: 1) to probe the context of First Nations in southern Ontario for empirical evidence of adaptive water governance; and 2) to generate critical insights into this multi-level institutional setting and opportunities to foster adaptive water governance.

Water is a prominent issue for First Nations across Canada where many communities experience water quality and quantity concerns due to contamination (AANDC, 2011; Christensen, 2006), constraints on accessing and managing water resources (Mascarenhas, 2012), deteriorating and over extended infrastructure, and operational challenges (AANDC, 2011). Further challenges (e.g., assertion of Aboriginal rights to access and control water resources; see Christensen et al., 2010; Phare, 2009), lack of meaningful involvement of First Nations in the decision making process (Alfred, 2005; Borrows, 1997), and lack of clear roles and responsibilities (Standing Senate Committee on Aboriginal Peoples [SSCAP], 2007) cement the importance of fostering novel approaches to govern water resources. Adaptive forms of water governance have potential to address the complex, uncertain issues that exist within First Nation water contexts. Therefore, this research sets out to empirically assess how meaningful the concept is in First Nation water contexts influenced by multiple jurisdictional levels of decision making, including federal, provincial and on reserve actors (see Chapter 4 for an assessment of key issues with a specific focus on reserve only).

5.3 Adaptive Water Governance

Effective governance of water resources is difficult because it involves interactions between diverse actors often with inequitable decision making power across levels, and continuously changing social, economic, political and environmental contexts. Water governance is referred to here as the "range of political, organizational and administrative processes through which interests are articulated, input is absorbed, decisions are made and implemented, and decision makers are held accountable in the development and management of water resources and delivery of water services" (Nowlan & Bakker, 2007, p. 14). Conventional water governance approaches largely based on centralized decision

making, and technocratic and regulatory solutions, are likely inadequate to ensure the sustainability of water resources (Gleick, 2003). Consequently, a shift in thinking by some scholars toward making water governance more adaptive has taken place to potentially address the complex and uncertain circumstances associated with water resources (Dietz et al., 2003; Huitema et al., 2009; Lulofs & Bressers, 2010).

Adaptive governance is an emerging concept that requires empirical testing and application. However, it has received increasing attention among governance scholars and water practitioners (Chaffin et al. 2014, Akamani & Wilson 2011) given its potential contribution when managing diverse human-environment interactions and dealing with complex, multi-level resource problems (Brunner & Steelman, 2005; Chaffin et al. 2014; Dietz, Ostrom, & Stern, 2003; Folke et al., 2005; Olsson et al., 2006). In particular, attention has focused on several interrelated governance attributes hypothesized to be helpful for navigating complex and uncertain contexts. For example, Rijke et al. (2012) and Olsson et al. (2007) recognize that an effective resource governance system must reflect the multi-level nature of environmental problems and social interactions. This implies that both central governments and local communities have a role in addressing complex problems. Tackling complex problems from multiple levels must also involve actors that hold a range of interests and world views, thus emphasising the importance of resolving conflict and negotiating trade-offs (Dietz et al. 1998; Nelson et al 2008). Polycentric decision making may be helpful in this respect for bridging knowledge and information across levels (Folke et al., 2005; Olsson et al., 2006, Huitema et al., 2009).

Legitimacy is identified as having a pivotal role in fostering adaptive water governance (Biermann & Gupta, 2011; Cosens & Williams, 2012; Gearey et al., 2006; Kallis et al., 2009). Legitimacy describes relationships between actors and institutions in which

authority to make decisions is delegated in a way that most or all actors deem appropriate (Gearey et al., 2006). Cosens and Williams (2012) discuss forms of legitimacy in the context of adaptive water governance as having the authority to make decisions or having the voice and knowledge to inform decisions. With regard to adaptive forms of water governance an important question is "legitimacy in the eyes of whom?" (Biermann et al. 2011, p. 1858). Huitima et al. (2009), Olsson et al. (2004), and Armitage et al. (2008a) direct attention toward the underlying power dynamics inherent within resource management as critical to considering this issue. Huitema et al. (2009) and Koontz et al. (2015) further show that power dynamics play an important role in how actors legitimately participate in water governance both in terms of knowledge and authority.

The attributes of governance expressed above are increasingly well-studied in water governance contexts (Akamani et al., 2011; Cosens & Williams, 2012; Huitema et al., 2009; Pahl-Wostl et al., 2007; Pahl-Wostl et al., 2012). Decisions about water often span multiple jurisdictional levels and involve a diverse range of actors and institutions, each with specific roles for dealing with particular water issues (e.g., regulatory role at national levels, implementation role at local levels) (Gupta et al., 2013; Pahl-Wostl et al., 2008).

Attention to these potential attributes (i.e., multi-level, diversity among actors, polycentric decision making, and legitimacy) for navigating complex and uncertain circumstances may be important for fostering adaptive forms of water governance (Chaffin et al., 2014; Nelson et al., 2007). However, more research is needed to understand how they manifest in real life multi-level contexts. For example, questions remain about how does society decide who participates in the process, what their role is (e.g., decision maker or observer), and who benefits from imposed solutions (Pahl-Wostl, et al., 2007). Armitage (2008a) and Chaffin et al. (2014) draw attention towards the function of power and

authority in determining roles, and this is especially relevant with respect to marginalized groups. Similarly, Chaffin et al. (2014) and Pahl-Wostl et al. (2009) call for better understanding of the process that determines whose interests, values, and world views are used to define desired outcomes, distribution of resources, or relationships. This involves a critique of water governance and its broader social, economic, political, and cultural landscapes in mind (Pahl-Wostl et al., 2012).

The attributes outlined above offer a broad view of adaptive governance. Used as an entrée, my aim here is to examine the multi-level institutional setting of the case studies for empirical evidence of adaptive water governance and to identify opportunities to foster it. As noted previously, adaptive governance is still emerging and there is scope for further empirical analysis drawing on the underlying concepts that have been developed in the literature. In this regard, I use Dietz et al.'s (2003) strategies of adaptive governance and examine if and how they resonate with (or are helpful for) fostering adaptive forms of water governance in multi-level First Nation water contexts (see Table 13 for a summary of Dietz et al.'s [2003] strategies and corresponding attributes for adaptive water governance). I use Dietz et al.'s (2003) strategies because it represents the broad view of attributes presented above in a concise and distilled framework. These strategies are described below and include analytic deliberation, institutional variety, and nesting. Dietz et al. (2003) was one of the first to describe adaptive governance as an approach to address the complex and uncertain circumstances confronted in environmental management. These strategies remain relevant today as scholars continue to use them to explore social-ecological components of resource governance (See for example Akamini & Wilson 2011; Pittman et al. 2015). The following paragraphs describe each strategy and highlight their relevance for

exploring the appropriateness and resonance of adaptive water governance in multi-level

First Nations water contexts.

Table 13 Institutional Strategies and corresponding attributes for building adaptive water governance

Strategy	Description	Attributes
Analytic Deliberation	• The process of how actors interact with the goal to "define [what is] to be understood, to identify the values and outcomes of concern, to distinguish disagreements that must be addressed through compromise and trade-off from those that might be resolved with better information, and to agree on appropriate ways to collect and interpret the needed information" (Dietz & Stern 1998, p. 442)	• Diversity of values included in decision making process • Open processes of communication • Incorporates the participation of concerned actors • Information flows across levels • Institutional and social learning • Supports collective memory of past experiences
Institutional Variety	• The employment of multiple types of institutions for governing resources (Akamani & Wilson, 2011)	• Employment of different types of institutions or systems of rules for governing resources • Involves local level participation
Nesting	• A response that recognizes that the focus on a single level of scale is inadequate in dealing with complex social ecological systems (Akamani & Wilson, 2011)	• Multiple centres of decision making authority • Redundancy in function

Adapted from Chapter 4

Analytic deliberation is identified by Dietz and Stern (1998) as necessary to solve

complex problems associated with social-ecological systems because it enables the

perspectives and knowledge of all actors to contribute holistic understandings of a given

problem. As a process, analytic deliberation encourages actors to overcome disagreements

through compromise and negotiation of trade-offs. With respect to water resources,

distinguishing diverse knowledge sets and values associated with water and coming to

terms with differences among actors provides opportunities to consider the breadth of

challenges and potential solutions.

The use of analytic deliberation as part of a framework to assess how adaptive water governance resonates within First Nation water contexts is helpful as it focuses attention on multi-level interactions and power dynamics that exist between actors that influence participation in decision-making. Indigenous scholars argue that First Nation values and interests are often viewed as "anecdotal", "irrational", and "unsubstantiated", resulting in environmental decision-making that does not meet the needs of First Nations (Walkem, 2006, p. 310; McGregor 2005; McGregor & Whitaker, 2001; Ransom, 1997). Used as part of a framework in this research, analytic deliberation has potential to uncover these and other interactions that are important if adaptive water governance as a potential approach resonates within these contexts.

Institutional variety refers to the use of multiple types of institutions (e.g., formal rules and regulations and non-formal norms and rules) to govern resources (Akamani & Wilson, 2011). The sustainability of social-ecological systems benefits from institutional diversity as a mechanism to generate new opportunities in complex and uncertain circumstances (Berkes, 2007). Conventional governance approaches often rely on regulatory arrangements to govern natural resources and this approach has been criticized for being unable to address complex problems (Holling & Meffe, 1996; Kooiman, 1993). Arrangements that support institutional variety have potential to align institutions associated with traditional practice and culture (e.g., Indigenous Natural Laws that embody human respect and responsibility to protect the natural world) with western institutions (e.g., government regulations and legislation).

The use of institutional variety as part of a framework to assess how adaptive water governance resonates within First Nation contexts is helpful for examining the suite of institutions across multiple levels – federal, provincial and on-reserve – currently used for

governing water resources. Current regulatory institutional arrangements have been criticized for omitting First Nation institutions such as customary (or natural) laws, thus creating mismatches and restricting local level actors from being meaningfully incorporated into the decision-making process (Gleick, 2003; Holling & Meffe, 1996). Institutional variety provides a lens to examine how meaningful current institutional arrangements are in fostering adaptive forms of water governance.

Finally, the concept of institutional nesting has the potential to facilitate more adaptive water governance by addressing level-dependent challenges (e.g., local, regional, national) associated with complex social-ecological systems. Here, nesting refers to "a response that recognizes that the focus on a single level of scale is inadequate in dealing with complex social ecological systems" (Akamani & Wilson, 2011, p. 4). In particular, a key challenge is achieving the right level at which decisions about water are made to address problems (Olsson et al., 2006; Young, 2002, 2008). Institutions that are applied at a single level with limited nesting of institutions (e.g., rights, rules) are often inadequate to solve complex multi-level challenges associated with social-ecological systems (Folke et al., 2005). Nesting has potential to improve jurisdictional challenges as expressed through polycentric institutional arrangements which often involve multiple centres of decision-making authority in an effort to improve interactions amongst actors, levels of participation, accountability, and some redundancy (though often at the cost of efficiency) (Akamani & Wilson, 2011; Dietz et al., 2003; Low et al., 2003; Nowlan & Bakker, 2007; Pahl-Wostl et al., 2009). As part of a framework to assess how adaptive water governance may resonate within First Nation water contexts, nesting helps highlight the multi-level interactions that are being considered in this empirical investigation of a multi-level institutional setting (e.g., federal and provincial governments, on-reserve).

5.4 First Nations and Water Governance in Canada

The legal responsibility to address water issues on First Nation reserves in Canada is shared between the federal government and First Nations (AANDC, 2007; Swain et al., 2006b). The federal government is responsible for ensuring the accessibility of water resources on reserve primarily through funding (Aboriginal Affairs and Northern Development Canada [AANDC]), monitoring (Health Canada [HC]), and regulating and enforcing existing standards (Environment Canada [EC]) (Health Canada, 2014). Current approaches to address water concerns on reserve have primarily taken the form of multiple protocols, expert panels, recommendations, and guidelines (AANDC, 2006, 2007, 2009; Swain et al., 2006a). Through these arrangements hundreds of millions of dollars have been spent to upgrade and maintain infrastructure, train operators, and develop programs for improving access to water resources on reserve. The recently passed Safe Drinking Water for First Nations Act (SDWFNA) (2013) is the latest attempt to develop standards for drinking water and wastewater on reserve. Associated regulations are currently in the process of being developed.

First Nations view their responsibility for water as rights based. Indigenous people's (which includes First Nations') rights in general are confirmed by the Constitution Act 1982 section 35(1) (Boyd, 2011). In contrast, Canada sees Indigenous rights as valid only after they are acknowledged by the court system (Phare, 2009). This is in conflict with inherent rights that Indigenous Peoples feel are greater and above the court system. Indigenous Peoples define their rights as inherent and stem from their own existence, as nations, limited only by the Creator's Natural Laws (Phare, 2009). Denzin and Smith (2008) define Natural Laws as traditional institutions that embody an Indigenous way of thinking about the relationship between humans and the natural world. Carried forward through oral

traditions given to people by the Creator (Walkem 2006), Natural Law embodies the understanding that all things are related and part of a cycle that connects everything to each other. Humans have an assumed role of spiritual guardian to protect the natural environment. Core to this role is the concept of respect. Denzin and Smith (2008) link respect to being able to form and maintain good relations (human or with the natural world) that are necessary for finding ways to work together without coercion or need to enforce.

First Nations Peoples in Canada are not a homogenous group. Nonetheless, water often shares an important component in the cultural and spiritual landscape of Canada's First Nations (Kahn et al., 2001). Indigenous authors describe Indigenous Peoples' relationship with water as one full of respect clearly evident in the Thanksgiving Address, an important Haudenosaunee ceremonial greeting and creation stories (Haudenosaunee Environmental Task Force [HETF], 1995; McGregor & Whitaker, 2001). Respect for water is a cornerstone of all life, as is the reciprocating responsibility that the relationship between First Nations and water embodies (Kahn et al., 2001). Water is not only essential for subsistence of all life, but also has a role in linking all aspects of life together (McGregor & Whitaker, 2001). Water degradation influences all aspects of life and threatens the cultural survival of First Nations Peoples (Kahn et al., 2001).

Water issues on First Nation reserves have been linked to a number of water governance concerns. For example, concerns regarding the assertion of Aboriginal rights to access and control water resources (Christensen et al., 2010; Phare, 2009) and the degree of meaningful involvement of First Nations in the decision making process (Alfred, 2005; Borrows, 1997). Further, current approaches by the federal government to address water issues are subject to gaps in knowledge and information (Kahn et al., 2001; McGregor,

2012), promote disproportionate roles and responsibilities between the involved actors (Standing Senate Committee on Aboriginal Peoples [SSCAP], 2007), and advance a one-size-fits-all approach to water management (McCullough & Farahbakhsh, 2012). These concerns reflect the multi-level and complex nature of water issues, and reflect the need for novel approaches to address them.

5.5 Methodology

A multiple case study approach was used to examine the emergence of adaptive forms of water governance in First Nation contexts in southern Ontario (Stake, 1995; Yin, 2008). Case study methodology is suitable due to its capacity for "clarifying descriptions and sophisticated interpretations" about particular places, events, and people by those individuals that are most knowledgeable about a particular situation (Stake, 1995, p. 102). The primary unit of analysis is three First Nation communities in southern Ontario with particular attention to the multi-level institutional context that includes off-reserve actors (e.g., government, watershed organizations, NGOs) that play a role in water management. This unit of analysis was selected because of the ongoing water issues and related multi-level governance concerns (e.g., assertion of Aboriginal rights, degree of meaningful involvement, imbalanced roles and responsibilities) that may be instructive for empirically exploring the concept of adaptive water governance (AANDC, 2011; Swain et al., 2006b). The three specific First Nation communities are Mississaugas of the New Credit, Oneida Nation of the Thames, and Six Nations of the Grand River. Cases were selected for their distinct water contexts, issues and arrangements with off-reserve actors. For instance, when compared with other First Nations in southern Ontario the case studies chosen have on-reserve populations that range from small (820 in New Credit) to large (13000 in Six Nations), water systems classified as high risk, have a variety of source waters, and have

varying levels of engagement within the Ontario source water protection initiative (AANDC, 2011). See Table 14 for a summary of water characteristics for the case studies and other southern Ontario First Nations. **Error! Reference source not found.**Figure 7 displays each case study in southern Ontario. The following case descriptions summarize prominent case specific contexts related to water.

Table 14 Summary of Characteristics for the Case Studies and Southern Ontario First Nations

Case studies	On-reserve population (approx.)	Water Risk	Primary Source Water	Have a source water protection plan
New Credit	820	High	• Surface (MTA[1]) from Lake Erie • Groundwater	MTA - N/A
Oneida	2000	High	• Groundwater under the influence of surface water (GUDI; Thames River)	No
Six Nations	13000	High	• Surface water from Grand River • Groundwater	Yes
Southern Ontario First Nations (9 in total)[24]	175-13000	8 out of 9 high or medium risk	• 33% have MTA • 33% source water from GUDI system • 33% source surface water • Ground water no information found	Approx. 1 in 3 across Ontario

Source (AANDC, 2011, 2012) [1]Municipal Type Agreement

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[24] Southern Ontario First Nations include Caldwell First Nation, Walpole Island First Nation, Moravian of the Thames First Nation, Chippewas of Kettle & Stony Point First Nation, Munsee-Delaware First Nation, Chippewas of the Thames First Nation, Oneida Nation of the Thames, Mississaugas of the New Credit First Nations, Six Nations of the Grand River. These range in populations size from 175 to 13,000.

Figure 7 Case Study Communities in Southern Ontario
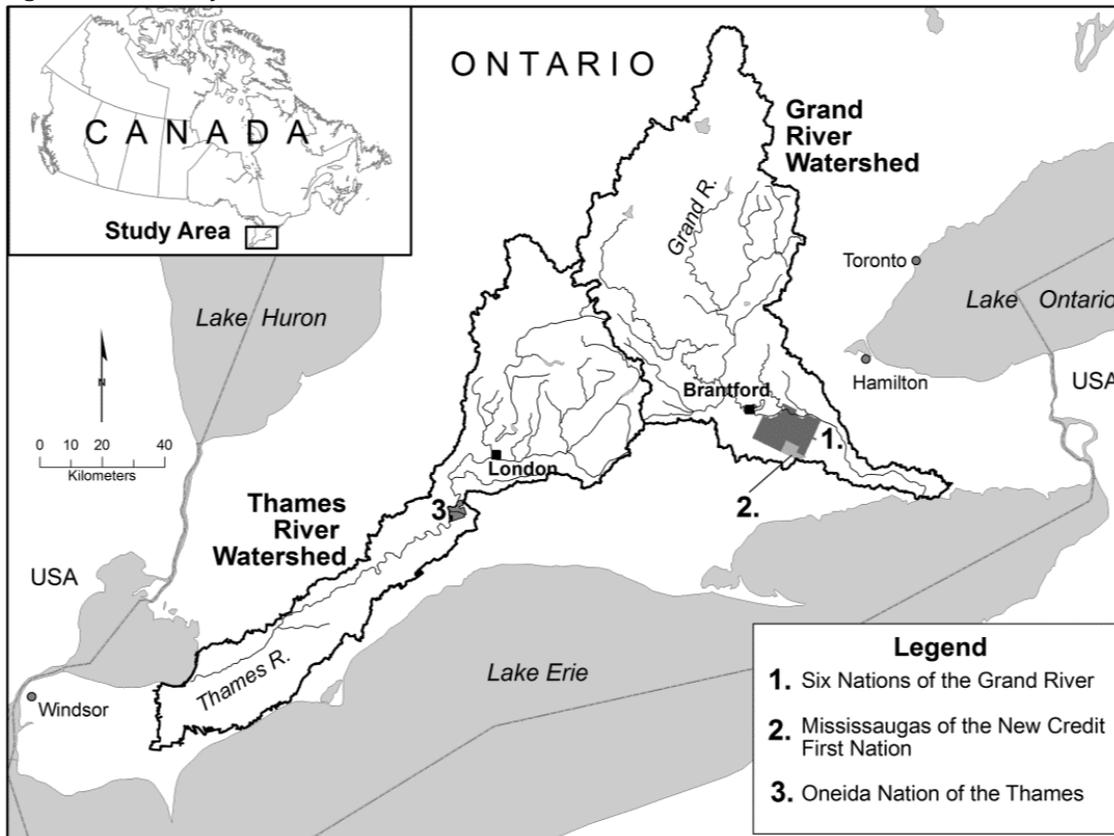
5.5.1   Case studies

Mississaugas of the New Credit First Nation (New Credit) is located 20 km south of the City of Brantford, Ontario within the Grand River watershed. New Credit has an on-reserve population of approximately 820 people (MOTNC, 2008). In addition to federal support in funding, health, and regulatory requirements (AANDC, HC, EC), New Credit has built relationships at the provincial and municipal levels. For example, New Credit sits on the Grand Valley Area Water Project, a partnership with five municipalities and First Nations to examine the long-term feasibility of the Nanticoke Water Treatment plant for supplying water to New Credit and other municipalities. Additional Municipal Type Agreements (MTA) have been made with surrounding municipalities concerning potable water and land use (e.g., Halidmand County and Tom Howe Landfill). New Credit is not

formally enrolled into the provincial source water protection program, but sits on the Lake Erie Source Protection Committee (SPC).

Oneida Nation of the Thames (Oneida) is 23 km south of the City of London, Ontario and within the Thames River watershed. Oneida's population on-reserve is approximately 2000 residents receiving water primarily from the Thames River aquifer (AANDC, 2010). Oneida participates in watershed based planning initiative within the Thames River watershed (Standish et al., 2010). Although not formally enrolled in the provincial source water protection program, Oneida sits on the SPC Liaison Committee which works with participating First Nations to communicate between Thames-Sydenham and Region SPC and respective communities. The liaison committee was formed to accommodate eight First Nations in the region represented by three seats on the Thames-Sydenham and Region SPC.

Six Nations of the Grand River (Six Nations) is approximately 14 km from the City of Brantford and is located next to New Credit within the Grand River watershed. There are approximately 13000 people living on-reserve (SNOTGR, 2010). Residents receive water primarily from the Grand River treated on reserve. Six Nations is formally enrolled in the provincial source water protection program and sits on the Lake Erie SPC. Their participation ensures a role in watershed planning, monitoring and emergency notification; however, Six Nations maintains independence to implement and enforce provincial regulations. Six Nations is also involved in select programs and initiatives at the municipal level including the Grand Valley Area Water Project, Grand River Water Management (Watershed based plan with 13 other municipalities, conservation authorities, counties, province and federal agencies), and Grand River Notification Protocol (an agreement with surrounding municipalities laying out notification protocols for issues related to land and water use changes and emergencies).

5.5.2 Data collection and analysis

Multiple methods (semi-structured interviews, archival data gathering, secondary data gathering, and direct observation) were used to gather data and triangulate themes that relate to the Dietz's et al. (2003) adaptive governance strategies. Themes consist of patterns observed across the data collected (Creswell, 2003; Guest, 2012; Lewis-Beck et al., 2004; Stake, 1995). Interviews were conducted with key informants from First Nations, the federal, provincial, and municipal governments, conservation authorities, and organizations. In contrast, key informant interviews in Chapter 4 included only those participants from First Nations. A summary of data sources is presented in Table 15.

Table 15 Data Sources

Data sources		Case study (# of individuals interviewed)		
		Oneida Nation of the Thames (ON)	Mississaugas of the New Credit (NC)	Six Nations of the Grand River (SN)
Key Informant Interview Sources	First Nation	• Elders(2), Health(1), Elected Council (2), Technical Specialist (2), Traditional Council (1)	• Elders (2), Health (2), Elected Council (4), Technical Specialist (2)	• Elders(2), Technical Specialist (3), Elected Council (2), Other(1)
	Federal Government	• Health Canada (HC) (1) • Environment Canada (EC) (1) • Aboriginal Affairs and Northern Development Canada (AANDC) (1)		
		• Regional Health Canada (1)	• Regional Health Canada (1)	
	Provincial Government	• Ministry of the Environment (MOE) (1) • Ministry of Natural Resources (MNR) (2)		
		• Regional Ministry of the Environment (MOE)(1)	• Regional Ministry of the Environment (MOE) (1)	
	Municipal Government	• City of London (LN) (1) • Middlesex County (MC)(2)	• Haldimand County (HD)(1) • Waterloo Region (WR)(1) • City of Brantford (BF)(2) • Brant County (BC)(1)	
	Conservation Authorities	• Upper Thames Valley Conservation Authority (UTVCA) (1) • Lower Thames River Conservation Authority (LTRCA) (2)	• Grand River Conservation Authority (GRCA) (2)	
	Organizations	• Association of Iroquois and Allied Indians (AIAI) (2)		
		• Assembly of First Nations (AFN) (1)		
		• Chiefs of Ontario (COO) (1)		
		• Ontario First Nations Technical Services Corp. (OFNTSC)(1)		
		• Ontario Clean Water Agency (OCWA)(1)		
		• Centre of Indigenous Environmental Resources (CIER)(1)		
		• Canadian Environmental Law Association (CELA)(1)		
Secondary and Archival		• 237 documents		
Direct Observation		• Research notes		

Primary data sources included 58 key informant semi-structured interviews.

Participants included 27 key informants identified as members of the partnering case study

communities and were knowledgeable about water. Participants were recruited based on guidance from the community partners and through snowball sampling. Participants included council members, Elders, infrastructure operators, and health representatives. An additional 31 key informants were interviewed representing multiple levels of governments and organizations off-reserve. Off-reserve participants were selected based on information collected through secondary sources and interviews with case study community members and through snowball sampling. Typically, off-reserve participants held roles equivalent to director, manager, First Nation liaison, and officer.

Interviews were conducted in person in locations convenient to the participant (e.g., home, coffee shop, office). I conducted each interview, both on and off-reserve, using an interview guide based on the strategies described in Table 13. A pilot interview was conducted prior to on-reserve interviews to ensure the nature of questions was appropriate and respectful.

I transcribed the audio recordings from each interview and distributed them back to participants for member checking. I conducted data analysis using a qualitative content analysis approach (Graneheim & Lundman, 2004), incorporating both deductive and inductive approaches to coding as outlined by Crabtree and Miller (1999), Boyatzis (1998), and Fereday and Muir-Cochrane (2008). Deductive coding was performed to organize information using the institutional strategies outlined in Table 13 as predetermined categories. From this, themes related to multi-level institutions and the roles they play in fostering adaptive water governance were identified through inductive coding.

Archival and secondary data sources that were collected included minutes from council meetings (publicly available; 142 documents) and SPC meeting minutes (95 documents), personal documents provide by community partners, websites, reports,

community documents and historical texts. Archival and secondary data selected for review was identified based on recommendations by the research partner and through online searches based on relevance to the research.

Information gathered from archival and secondary data sources was searched using the text query functions (e.g., water, watershed, river, stream, lake, groundwater, contaminate) within QSR NVivo 10™. Information that was relevant to the multi-level interactions between actors (First Nation and non-First Nation) was deductively coded according to the institutional strategies identified in Table 13 and used together with other data sources to triangulate results.

Direct observation took place over a five-year period at which time the authors worked on water related projects and attending activities and workshops within the case study communities. Observations were recorded in a journal and deductively coded using QSR NVivo 10™ according to the institutional strategies for adaptive water governance outlined in Table 13. Codes were combined with other data sources to triangulate results.

Ethical clearance for this research was provided by Research Ethics Boards at both Brock University and Wilfrid Laurier University, as well as through the case study communities' respective Elected Chief and Councils ethical clearance protocols. Each participant received either a verbal or written invitation that included the purpose of the study, its voluntary nature, its benefits, and the terms for which information would be used.

5.6 Results

The following sections outline the key results that emerged from the data sources and coding (see methodology Section 5.5) in accordance with the Dietz et al. (2003) framework. Adaptive water governance strategies were identified and empirical evidence for each was assessed based on a combination of triangulation of patterns between data

sources, number of occurrences that participants discussed a theme, and prevalence of a theme across case studies. Each theme is illustrated in the results through exemplifying quotations. The source of each quotation is identified by the interviewee number (e.g., Interviewee 12) and an abbreviation (e.g., SN) outlined in the Data Sources Table 15. The results are organized by the strategies - analytic deliberation, institutional variety, and nesting - and summarized in Section 5.6.4.

5.6.1 Analytic Deliberation

Analytical deliberation is used here to frame and identify governance attributes (i.e., multi-level, diversity among actors, polycentric decision making, and legitimacy) and to assess their contribution to fostering adaptive forms of governance in the case study communities. In particular, analytic deliberation reflects how actors interact to identify and resolve water issues and overcome disagreements (Dietz et al., 2003; Dietz & Stern, 1998). Institutional arrangements that enable actors to address issues through compromise and trade-offs have potential to bring to the forefront alternative approaches to address complex water issues.

Both on and off-reserve participants acknowledged the importance of having concerned actors participate in decision making to inform how water issues are identified and addressed; however, there are differences in how participants perceived meaningful participation. Many participants from each First Nation case study community commonly expressed that when water concerns arise, First Nations rarely are involved in legitimate participation or said another way, rarely have the authority or power to make decisions or meaningfully have the voice to inform decisions. They expressed that meaningful participation is more than having a single seat at a table with multiple stakeholders and should include opportunities to have voice to influence decision making. For example, one

participant from Six Nations discussed how having only a limited number of seats at the

table, such as on SPCs, isn't sufficient to impact decision making,

> *…we don't get our oar in the water, we don't get our issues, our concerns legitimately into the process and so we're left with the out-flow. We don't have a sufficient voice upstream of the process. It concerns me that that we aren't treated seriously. (Interviewee 12, SN)*

First Nations across each community expressed that they feel as though they are often an

"afterthought", "ignored", a "low priority", and "last on the list" when it comes to receiving

attention from governments to address water issues (Interviewee 11, ON; 5, 10, NC; 9, SN).

Illustrating First Nations' frustration with being ignored, one participant explains that

sometimes protest is the only way to get noticed and the only means to ensuring their voice

is heard,

> *…we feel [protest] is the only way that we can get our voice heard, because we're screaming out here…, but a lot of the time, that message gets lost and [off-reserve actors] are just saying, 'oh, they're just the Indians over there trying to raise trouble over this water and, and they want money so we better give them some money and maybe that'll make them go away' kind of thing. (Interviewee 11, ON)*

These examples reflect the case study First Nations' perspective that they lack the power

and legitimacy necessary to influence decision making to address water issues and

overcome disagreements in their respective communities.

Echoing First Nations views, select participants representing off-reserve

organizations (including federal, provincial, and municipal governments, organizations)

recognized that First Nations have limited decision making power. For example, off-reserve

participants (AIAI, MOE) articulated that First Nations have limited opportunities to

participate in water decision making either through adequate consultation (i.e., through the

development of the First Nations Safe Drinking Water Act, 2013), or through adequate

representation (i.e., insufficient seats on multi-stakeholder committees to accommodate

First Nation communities; Interviewee 18, AIAI; 3, 1, MOE). Off-reserve participants

attributed First Nations limited participation in decisions making to two prominent drivers.

First, First Nations have limited resources (e.g., financial, human) to participate adequately.

For example, a representative from MOE articulated that

> *…it's a capacity issue on the First Nation side. Despite the fact that they want to be at the table as equals in developing policy making decisions about the environment they don't have the capacity there. …they don't have sustained funding to retain to build their capacity …it's hit and miss whether they will have the capacity to be at the table as equals. (Interviewee 3,MOE)*

Second, most off-reserve participants expressed that there is no process to engage First

Nations in decision making. For example, a representative from the City of London

expressed,

> *…my colleagues in the engineering department were rebuilding a bridge, they have to go through a class environmental assessment process and they're frustrated by the provincial ministry who oversees the process, because [they say] 'you really should consult First Nations'. We have no idea how to do that …it's kind of a round peg in a square hole. (Interviewee 21, LN)*

Three off-reserve participants at the provincial, municipal, and watershed levels

expressed that First Nations' participation and voice in decision making is meaningful and is

part of everyday practice. These participants expressed the view that the values and goals

held by actors (including First Nations) is often shared, making it possible to collaborate. A

participant from the province of Ontario reflected on how common values and goals

promote the participation of First Nations and the incorporation of values and interests into

water decision making,

> *…we have our resource base, we're talking in this case water, and we have a common interest in healthy water, because we all need to drink, we all need to cook and to eat, and we need to have healthy fisheries. Then, we (MOE and First Nations) actually can talk a lot better. (Interviewee 3, MOE)*

Similarly, a participant from the City of London explains the role of First Nations within the development of a local water management plan,

> *…the door's wide open, saying if eight First Nations would like to come to our steering committee… were not going to turn anybody away, were hoping [First Nations will] have the ability to input and influence discussions about how do we engage best and funnel input into the steering committee. (Interviewee 21 LN)*

These examples illustrate that actors perceive an opportunity to engage First Nations providing them with opportunity to express their voice and influence decisions about water. However, this is not necessarily realized in practice, nor is there any agreement on why engagement is not happening.

Off-reserve efforts to include First Nations' on advisory committees, forums, initiatives, and projects are acknowledged by First Nations as an important step to improving their voice in water decision making. However, these localized roles (participation in committees, projects etc.) remain inadequate for ensuring the values and interests are meaningfully represented in water decision making. Many participants recognized that meaningful representation means to recognize First Nations' rights as distinct self-governing nations, for example, a COO representative expressed,

> *I think everyone is at the table, except for First Nations voice still is not being heard. There seems to be a real separation when it comes to policy. It is driven from the province or the feds, that's it. That encompassing the voice of First Nations as treaty rights holders, it's not there, as nations, it's not there yet. (Interviewee 6, COO)*

Multiple participants representing the province, municipality and conservation authority expressed that improving the opportunity for meaningful participation in decision making is a long process and largely driven by individual champions (Interviewee 3, MOE; 25, LTRCA; 21, LN). Individual champions are people who stand out as leaders in advocating and supporting a cause. Participants from both on- and off-reserve expressed that one of the

key roles champions have in fostering participation in decision making is building and maintaining relationships.

5.6.2 Institutional Variety

Institutional variety is the second dimension of the analytical framework and refers to the application of multiple types of institutions for governing resources (Akamani & Wilson, 2011). The use of diverse institutions offers opportunity to generate new approaches to complex and uncertain challenges.

Participants from both on and off-reserve recognized a variety of formal institutions that govern water resources in southern Ontario. Such arrangements identified included legal and constitutional (e.g., First Nation rights to water, federal and provincial responsibility to govern water), federal (e.g., standards and guidelines), provincial (e.g., regulations), and community arrangements (e.g., by-laws, Band Council Resolutions [BRC]). Institutional arrangements on-reserve are unique to other southern Ontario jurisdictions. First Nations are federal entities and often are not subject to provincial regulations as municipalities are. Federal regulations for water on reserve are reported to have gaps, particularly for drinking water (Simeone, 2010). As such, formal institutions for governing water on-reserve may vary greatly across reserves with varying outcomes. See Table 16 for examples of these arrangements and the role they play in water management.

Table 16 Prominent formal institutional arrangements for managing water

Level of administration	Institutional arrangements	Example	Key role in managing water resources
International	• Declarations	• United Nations (UN) declaration of indigenous rights	• Declares indigenous rights to maintain and strengthen spiritual relationship with water and uphold responsibilities to future generations
	• Resolutions	• UN Resolution 64/296	• Recognizes the human right to water and sanitation
First Nations	• Band council	• Water treatment	• Highest order of law on-reserve

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	resolutions	agreements with off-reserve municipalities	
	• Bylaws	• Water conservation by-laws	• Guide water management practice on-reserve
Federal	• Constitution	• Constitution Act, 1982, s. 35(1)	• Acknowledges Aboriginal rights, Aboriginal Title, and treaty rights
		• Canadian Constitution Act, 1867, s.91(2.4)	• Defines relationships between the federal government, province, and First Nations
	• Court hearings	• Court cases such as Sparrow 1990, Sundown case 1999, Winters vs. United States (1908)	• Successfully establishing legal precedence for Indigenous right to water resources in Canada
	• Legislation, • regulation, and policy • guidelines	• First Nations Drinking Water Act (FNDWA)(2013)*	• Drinking water regulations for water on First Nation reserves,
		• Canadian Water Act (1985)	• Set guidelines for water quality on First Nation reserves
		• Guidelines for Canadian Drinking Water Quality (2012)	• Federal drinking water quality standards
		• Wastewater Systems Effluent Regulations (2012)	• Federal wastewater effluent standards
Provincial	• Legislation, • Regulations	• Safe Drinking Water Act (2002)	• Regulates drinking water systems and drinking water testing to protect human health
		• Ontario Water Resources Act (1990)	• Governs water quality and quantity in the province
		• Clean Water Act (2006)	• Helps protect drinking water with a multi-barrier approach
		• Conservation Authority Act (1990)	• Empowers Conservation Authorities to undertake conservation, restoration, and development and management of water resources

* Regulations still in development

In addition to these formal (largely western) arrangements, participants from each First Nation case study and some organizations (e.g., AFN, COO) expressed that traditional perspectives governed by traditional institutions (e.g., Natural Laws) are fundamental to sustainably govern water resources. Natural Laws were expressed by two of the case study communities (i.e. New Credit and Oneida) and the COO as central to managing water resources, because they embody a worldview that reinforces a deep respect and

responsibility for protecting water resources (Interviewee 8, NC; 27, ON; 6, COO). A participant from COO reflected on the differences between traditional and western views of water management,

> *…for western culture it's about the bottom line and it's about, 'let's write down how much you [are] allowed to pollute, you [are] allowed to pollute this much and you won't get fined', where in the traditional perspective it's all about responsibility, it's all about respect… completely two different ways of knowing. (Interviewee 6, COO)*

Some participants from each case study community described traditional institutions as Indigenous rules that guide people's interactions with water. They identified that core values of respect and the responsibility to protect water resources inform people's actions toward appropriate water management practice. For example, traditional institutions inform sentiments that one should only take from nature what is required and avoid unnecessary impacts to the environment.

Participants (multiple from NC, SN, ON, and one from COO, AFN) reflected that it is necessary to utilize both western (e.g., government regulations, laws) and traditional institutions (e.g., Natural Law that embodies human respect and responsibility to protect the natural world) to promote sustainable management of water resources. Using both (western and traditional approaches) ensures that mechanisms for managing water are appropriate for First Nations. This sentiment is exemplified by the AFN participant,

> *There's no need to reinvent the wheel doing science …there's a lot of good science going on, but then also build [traditional] mechanisms or requirements into [the science] so it would be more acceptable to First Nations knowing that their traditions are being respected in the development of the regulations. (Interviewee 4, AFN)*

Another on-reserve (Oneida) participant similarly articulated,

> *I think it would be very helpful to have that traditional value system incorporated into the [western system], because it forces more culturally appropriate discussions… if you had a traditional system of governance that incorporates the values… ,[our] responsibly to look*

after the health of the people, their well-being, that would be more holistic. (Interviewee 24, ON)

Some off-reserve participants also reflected that traditional institution are important for opening the door to new (more appropriate) approaches to managing water on reserve. For example, an MOE participant articulated, "it might be better to [utilize traditional institutions] so that [First Nations] can incorporate their own values (related to respect and responsibility) rather than being confined by provincial legislation which is very rules focused, rather than culturally focused" (Interviewee 1, MOE). Water declarations by the AFN (2014), COO (2008), and UN (2008) are highlighted as starting points to guide the development of First Nation institutions for managing water (Interviewee 4, AFN; 6, COO; 18 AIAI; 3, MOE). The declarations outline First Nation and Aboriginal People's relationship with water, water conditions, and First Nations rights to water and self-determination.

Despite the fundamental role of traditional institutions in water management, the results indicate how they can be/are used to inform existing institutional arrangements is limited at best. For example, off-reserve organizations (AANDC, municipalities, and counties) are open to the use of traditional institutions; however, they reported that traditional institutions are primarily utilized at the local First Nation level and therefore cannot inform current water management arrangements at other levels. For example, referring to traditional institutions, the participant from AANDC explained,

[Traditional institutions are important], but they are not necessarily the ones that we're dealing with. We're dealing with supporting the communities from a public health aspect, to be able to provide clean and safe drinking water. There are broader [traditional] aspects, absolutely, to water and it's important that First Nations be able to incorporate those [traditional institutions] within their own operations and practices, but really what we are focused on ...the need to be able to have safe drinking water in your home, in your school, in your community center, in your band office, and trying to work with

> *First Nations… it is more the practical side of it. (Interviewee 8, AANDC)*

Similarly, an MOE participant explained the challenges informing source water protection regulations with traditional perspectives, in part, results because there is no concrete strategy to do this. It is up to the community to facilitate:

> *I'm not sure that traditional [institutions have] been incorporated in any sort of fashion into source protection …I'm not sure if it was ever given full consideration …it is really dependent on the committees their involvement in the process… the government tries to say we are open to it, 'we will incorporate it if we can, but I don't know that there is really a strategy do that in any sort of comprehensive way. (Interviewee 1 MOE)*

5.6.3 Nesting

Nesting is the final part of the analytical framework. Nesting refers to the idea that each level (i.e., national, provincial, First Nations, local) employs many actors, roles, and responsibilities and that any one institution acting at a single level isn't sufficient to deal with the complex social-ecological challenges associated with water (Akamani & Wilson, 2011). Nesting has potential to enhance interactions amongst actors, accountability, and redundancy through attributes such as multiple centres of decision making that link actors across levels reducing mismatch between institutions and complex problems (Akamani & Wilson, 2011; Dietz et al., 2003; Low et al., 2003; Nowlan & Bakker, 2007; Pahl-Wostl et al., 2009).

Within the context of the federal government's legal responsibilities and the constitutional and inherent rights of First Nations, results indicate that decision making authority to manage water resources across levels (i.e., federal, First Nation) is disputed. On one hand, First Nations, and organizations (e.g., AFN, COO) articulated that the federal government has primary decision making power and control over how resources are distributed and downloads responsibility and liability on to First Nations. One participant

from AFN expressed, First Nations limited role in deciding how funding is distributed can make implementation of regulations difficult,

> *[The federal government] is downloading their liability and responsibilities onto First Nations within this bill (FNDWA, 2013) without the accompanying resources. …we don't have a problem with regulations we need [regulations], but we have to have the accompanying resources to go with them …we need that financial support… this is the huge concern. (Interviewee 4, AFN)*

Many First Nation participants from all three case studies and CA participants also explained that decisions about funding are predominantly made at the federal level and continue to create an uneven playing field for managing water resources. For example, as on-reserve participants referring to the federal government expressed, "they give you the money, they try to tell you what to do" (Interviewee 7, NC), "they are using funding as leverage to control us" (Interviewee 21, SN), "whoever has the money is steering the boat" (Interviewee 14, SN) and "she who has the money has the power" (Interviewee 9, NC). Federal control over financial resources reduces First Nations' abilities to fulfill their responsibilities locally (e.g., operations, maintenance, emergency response) and some question the impact this has on their community. For example, one participant from New Credit expressed frustration with funding arrangements and an uncertain future for their community,

> *First Nations have needs. First Nations are over here running the country and the federal government is over there with the pot of money …if the federal government is not really going to give First Nations any money, what's going to happen? (Interviewee 9, NC)*

Similarly, some participants pointed out that federal level decision making (particularly funding distribution) and local knowledge and information about water issues at the community level are detached. For instance, one participant explained how source

water protection planning was developed at the federal level without knowledge and

information from the First Nation level,

> *...all the [federal government] did was hire a consultant to basically substitute First Nations with municipalities... that's pretty well all they did and we said 'that's not going to work'. [A First Nation] is not like the municipality, different structure. So they're trying to make a decision for the local level at a higher level, it isn't going to work. They just looked at the provincial process. They never really listen to us what we want. (Interviewee 1, NC)*

On the other hand, although the AANDC participant recognized ongoing debates

over the right level of decision making power, responsibility, and resources distribution,

AANDC interprets their role as predominantly to provide funding and not to dictate how

federal dollars are spent on reserve. For example, a participant from AANDC articulated,

> *...our role is actually more as a funding provider so we have rules around what we will and will not fund and we provide funding to First Nations in order that they can deliver services on reserve to the communities... Depending on who you talk to there are different views on how this works out. Our position is that we are the funding provider and that the First Nation is the owner and operator of the water treatment and delivery system on reserve, it's not necessarily fully accepted by everyone, but that is the department's position on this. (Interviewee 9, AANDC)*

The participant continues,

> *...we're not responsible for how the funding is used [by the First Nation]. The First Nation gets the money and is responsible for how it is used and they are accountable to us, we are accountable to Parliament and to Canadians*

Participants from AANDC, EC, and CA, articulated that controlling decision making around

the use of funding creates unwanted liabilities and is therefore not part of AANDCs

mandate. As an example, the AANDC representative reflected on an incident that led to

litigation because the department stepped out of its funding role,

> *We need to stay within our boundaries, lawyers get really upset when we render ourselves liable for actions having taken on responsibility outside of [funding]. (Interviewee 9, AANDC)*

Despite the legal responsibility and constitutional and inherent rights that outline the shared responsibilities of the federal government and First Nations to manage water resources, participants representing other governments (i.e., province, municipalities) and organizations (i.e., conservation authorities) not within legal jurisdiction recognized the importance of working with First Nations and making decisions at the local level. Reflecting the need to go beyond the legal responsibilities of the federal government to ensure adequate water resources on First Nations reserves, a county representative articulated that water management works better at the "hands-on level", it is "where the rubber hits the road". The participant articulated further the challenges when decisions are not made at the local level, "[decision makers at higher levels] don't understand what's needed to actually make change right down at [a local] level" (Interviewee 11, BC).

Some examples were identified where First Nations are involved in decision making forums at the local level (e.g., municipalities, NGOs and CAs) to address water issues (e.g., source water protection committees, watershed planning committees, advisory committees). Nevertheless, these local decision making forums are heavily dependent on the voluntary participation of each group (e.g., municipalities, CAs, First Nations). Participants from the conservation authorities and a municipality reflected that federal legal jurisdiction over water issues concerning First Nations can be a barrier for setting up local decision making forums. For example, a participant from UTVCA explained the tension between the need to fund partnerships with First Nations and federal jurisdiction to provide funding,

> *...there is a gap in the funding, to recognize that [building partnerships with First Nations is a necessity... 'why are you [partnering with First Nations] the federal government has a responsibility to talk to first nations', I don't think anybody has identified that the federal government is not [coordinating these partnerships]...there's no*

First Nations may also feel reluctant to participate in provincial or local initiatives (e.g.,

provincial source water protect initiative, watershed planning etc.), because provincial,

municipal, and watershed organizations have no legal jurisdiction to impose any

regulations or strategies on them. Exemplifying this, a federal health officer described, "a

big part of [why First Nations have not become involved in provincial source water

protection]... was their reluctance to [have] the province or anybody else have the authority

to tell them anything" (Interviewee 22, HC).

5.6.4 Summary of Results

Table 17 summarizes the results that emerged from the data sources in accordance

with Dietz et al.'s (2003) framework. The summary of results in Table 17 build onto the

results of Chapter 4, which express the institutional constraints and opportunities from an

on-reserve perspective, toward greater expression of adaptive water governance influenced

by multiple actors (federal, provincial, municipal, and on-reserve) and jurisdictional levels

of decision making.

Table 17 Summary of Results

Institutional Strategy	Prominent themes identified
Analytic Deliberation	• Perspectives both on and off-reserve reflect that First Nations had limited opportunity to meaningful participate in water decision making reducing First Nations voice to influence water management. • Limited opportunities to meaningfully participate in decision making forums is attributed to insufficient resources (human, financial) and little formalized process for First Nations to engage. • Perceptions exist off-reserve that meaningful participation of First Nations in decision making is part of everyday practice • First Nations inclusion into water management process as a stakeholder misaligns with their rights as a distinct nation • Individuals are influential for fostering meaningful relationships where First Nations have voice in water decision making • Timeframes that accommodate relationship and capacity building are critical for improving the opportunity for First Nations to participate in decision making forums

Institutional Variety	• In addition to existing western institutional arrangements, First Nation institutions (i.e., Natural Laws) are a fundamental component of water governance
	• Current utilization of First Nation institutions to inform water management is limited.
	• No process exists to utilize First Nations institutions to inform decision making
	• Water declarations by AFN, COO and UN are starting point, to guide the development of a process to utilize First Nation institutions in water management
Nesting	• The level at which decision making power, responsibility (or liability), and resources are distributed constrains water resource management on-reserve. Current distribution cultivates an uneven playing field between First Nations and the federal government, and a disconnection between knowledge and decision making.
	• Local level decision making is recognized as important for water management. This entails building local relationships outside of the legal responsibilities of the federal government

5.7 Discussion

Results from the investigation provides empirical evidence of adaptive water governance in First Nations context. This section builds upon this evidence by highlighting insights afforded by the novel use of the analytical framework in a multi-level institutional setting. Opportunities to enhance aspects of adaptive water governance in the multi-level setting of First Nations and water in southern Ontario (see Chapter 4 for an analysis that focuses primarily on-reserve) are correspondingly discussed.

The first insight is in the characterization of multi-level interactions and decision making power dynamics that exist between actors that influence participation in decision making. The concept of legitimacy is a helpful for exploring analytical deliberation, namely, for understanding how First Nations lack of meaningful voice and participation in decision making. McGregor (2012) articulates that the water crisis experienced by First Nations can only be solved if Indigenous voices[25] are meaningfully expressed in decision processes, maintaining their relationship with water and responsibility to protect it. However, the case

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[25] Indigenous voice refers to expressed interests and values of Indigenous Peoples

studies show that what legitimate voice 'looks like' when managing water resources is in fact quite diverse across communities, levels of government, and organization off-reserve. On one hand, some representatives from CAs, municipalities, and governments described how First Nations' participation and legitimate voice in decision making was part of everyday practice through their participation in committees and other multi-stakeholder forums. On the other hand, First Nations and organizations like AFN and COO described how First Nations have little legitimate voice in water decision making off-reserve, articulating that a seat at a multi-stakeholder table is important, but does not necessarily recognize First Nations voice as distinct self-governing nations with First Nations' rights (a necessary element expressed by a COO representative).

Indigenous voice and legitimacy is discussed by Alfred (2005), Turner (2006), and von der Porten et al. (2013), each of whom recognized how deep-seated colonial legacies perpetuate the assumption that First Nations are stakeholders (similar to industry, municipalities, or citizens) rather than being recognized as constitutionally affirmed self-governing nations. Without recognition of First Nations as distinct self-governing nations, their participation and contribution (values, knowledge, information) toward informing decision making is often administered as 'anecdotal' or 'tokenism' (Alfred, 2005; Borrows, 1997; Haplin, 2009; McGregor & Whitaker, 2001; McGregor, 2005; and Walkem, 2006, p. 310). As a result, the views and interests of First Nations in addressing water issues may be ignored, an experience consistent with the findings of this research.

The results of this research suggest that the starting point to foster adaptive forms of water governance in the multi-level context of the case studies is to legitimize the voices for all actors involved, and this hinges on acknowledging underlying socio-political contexts (e.g., acknowledge First Nations as self-governing nations vs. a stakeholder in the decision

making process) that may be limiting the legitimacy of First Nation participation and voice in decision making. Building capacity by establishing common understanding of what legitimate participation and voice embodies within the water decision making process is essential. This includes ensuring there is an established and agreed upon process to engage meaningfully with First Nations. Ensuring First Nations are not an 'afterthought', must involve their participation from the very beginning of any decision making process. Results highlight that individual champions (both on and off reserve) may be helpful for establishing an environment that legitimizes First Nations voice and fosters meaningful participation in decision making.

A second insight into adaptive water governance in the multi-level setting of First Nations water contexts is in depicting the lack of diverse water management approaches utilized to address water issues on reserve. Many governance scholars such as Akamani and Wilson (2011) and Dietz et al. (2003) agree that a single institution often isn't enough to address complex dynamic problems. Employing a variety of approaches such as those identified in the case studies above (i.e., western and traditional) is identified by governance scholars as critical for solving complex problems and contributing to adaptive water governance. For example, Gupta et al. (2013) and Huitema et al. (2009) discuss that adaptive governance relies on interaction between broader acting institutions often administered by governments, and local institutions that are informed by fine-grained information and knowledge.

The results here highlight that western approaches (e.g., regulations such as the Ontario Drinking Water Quality Standards under the Safe Drinking Water Act [2002]) currently play a central role in managing water resources in southern Ontario. In contrast, alternative or traditional approaches that exist primarily at the local level are not

incorporated into water management at other levels (e.g., federal, provincial). For example, Natural Laws[26] have been identified by research participants in each of the case study sites to be particularly important for water management through its expression of First Nations' worldviews that embody respect and responsibility to protect water resource and the understanding that all things are related and part of a cycle that connects everything to each other. These perspectives open doors to core values such as respect and responsibility and opportunities for more culturally appropriate approaches to managing water resources on reserve. The current utilization of First Nation institutions such as Natural Laws is limited, specifically the disconnection of water management from First Nations' way of thinking and a lack of understanding of the role, importance and implementation of Indigenous water management approaches. For example, participants identified that current provincial drinking water quality standards that determine acceptable levels of pollution entering the watercourse do not reflect the Natural Laws of respect and protection of those water ways.

Research findings correspond with Indigenous authors who similarly articulate Natural Laws as "fundamental" to understanding the nature of water (McGregor & Whitaker, 2001; Walkem, 2006, p. 310) and critical for overcoming the effects of colonialization through the fulfillment of their responsibility for water (Ransom, 2001 in McGregor & Whitaker, 2001). Further, Indigenous authors agree that broad use of traditional institutions such as Natural Law are still largely theoretical and often not incorporated into existing environmental arrangements (including water) (Kahn et al.,

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[26] Natural Laws are traditional institutions that embody an Indigenous way of thinking about the relationship between humans and the natural world (Denzin & Smith, 2008). Although the nature of Natural Laws may change from community to community, the case study communities identify that it is part of Natural Law to protect water quality and quantity through water conservation.

2001; McGregor & Whitaker, 2001)[27]. This is reflected in current legislation and regulatory development in Canada. Most recently, the First Nations Drinking Water Act (FNDWA) (2013) which outlines federal drinking water standards and development process for First Nations (see Table 4) has been criticized by First Nation organizations (e.g., COO) for not utilizing traditional institutions (Atleo, 2011; COO, 2011; Thornton, 2012). Despite prior recommendations of the government's appointed Expert Panel on Safe Drinking Water for First Nations to utilize Natural Law to guide the Act's development, the federal government (AANDC) cited uncertainty and time commitment as reasons to ignore them (Swain et al., 2006a). At present, there exist few concrete strategies and timelines to utilize traditional institutions at other levels (federal or local) to address water concerns. Traditional approaches to water are often difficult to articulate making it difficult to utilize alongside formal processes.

The results of this research suggest that in order to foster adaptive water governance within multi-level contexts, opportunities must be created within the current formal institutional environment for traditional approaches to be recognized and substantiated as legitimate. This is needed not just on reserve, but at multiple levels of decision making, including at federal levels. First Nations identify guiding documents such as the AFN Nation Water Declaration, COO Water Declaration, and the UN Declaration on the Rights of Indigenous Peoples as a basis to develop strategies that include First Nation institutions within current water management arrangements (AFN, 2014; COO, 2008; UN, 2008). For traditional approaches to be recognized and substantiated, the results highlight

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[27] Traditional institutions such as Natural Law could be incorporated into existing environmental arrangements through the attitudes and values that they inform, specifically, First Nations perspectives on their duty to protect water and their relationship with water that is based on respect and reciprocating responsibility (Kahn et al., 2001; McGregor & Whitaker, 2001; Ransom, 1995).

the need for First Nations to be a part of the process to understand and define what institutions (First Nation or otherwise) are appropriate within current water management settings, as well as to define how they are to be utilized and in what timeframe.

The third insight from this examination of adaptive water governance in a multi-level First Nation water context is the function of multiple centres of decision making, operationalized through the meaningful distribution of decision making power and clarification of inter-jurisdictional relationships. To address complex problems the adaptive water governance literature advocates employing multiple centres of decision making to bridge knowledge and information across levels, provide redundancy in decision making authority, and create opportunities for actors to connect (da Silveira & Richards, 2013; Galaz et al., 2008; Imperial, 1999; McGinnis, 2000; Olsson et al., 2006; Young, 2002, 2008). Further, Koontz et al. (2015) and Cosens and Williams (2012) illustrate that decision making that overlaps jurisdictions (e.g., local, regional, national governments) fosters the transfer of knowledge, information and resources to other levels where needed. Watershed organizations are examples of this and have been advocated for their role in improving how local actors interact within the watershed (Mitchell, 2005).

Gupta et al. (2013), Koontz et al. (2015), and Huitema et al. (2009) agree that multiple centres of decision making is not a panacea, and that more understanding about how it is operationalized to achieve adaptive governance is needed. For example, Gupta et al. (2013) acknowledge that gaps remain in understanding the role of power distribution and relationships to make multi-centred decision making more effective.

The case studies examined here illustrate how multiple centres of decision making can in fact create disparities in decision making power across levels (even if only perceived). This influences the effectiveness of water managers' ability to address complex

problems by creating conflict and by reducing the transfer of resources, knowledge, and

information. For instance, most participants recognized the federal government's fiduciary

responsibility to ensure First Nations have adequate water resources; however, some

participants voiced critiques similar to Kahn et al. (2001) and argued that the fiduciary

responsibility to provide adequate water resources on-reserve has been used to 'download'

liability onto band councils while maintaining water decision making power (particularly

through controlling the distribution of financial resources). Many participants (e.g., First

Nations and organizations) felt strongly that this is in conflict with First Nations inherent

rights to make decisions as distinct self-governing nations, and at the root of many of the

water challenges confronting First Nations (Phare, 2009; Walkem, 2006).

The First Nation's experience of decision making power inequities is instructive. In

the context of First Nations, decision making power must align with the constitutional and

inherent rights by recognising First Nations as distinct self-governing nations. This parallels

von der Porten et al. (2013) who articulate that the ability to address governance concerns,

such as finding agreement on the appropriate level of authority to make decisions about

water resources, depends on reconciling assumptions of First Nations as stakeholders

rather than distinct nations able to participate in nation-to-nation decision making. This is

particularly relevant for many First Nations who are calling for increased control of

financial resources to address water resource concerns on-reserve.

Similar to the distribution of decision making power, the case studies illustrate how

inter-jurisdictional relationships influence the operationalization of multiple centres of

decision making, and ultimately highlight lessons for fostering adaptive forms of

governance. Specifically, the case studies illustrate that hierarchical jurisdictional

arrangements, such as the constitutionally-defined relationship First Nations have with the

federal government, continue to be a barrier to distributive forms of decision making and power sharing. Such relationships limit opportunities for local interactions and/or collaboration. For example, the federal government's fiduciary responsibility over First Nations affairs implies a limited legal obligation for Ontario, watershed organizations, and municipalities to work with First Nations. This is a profound challenge when seeking to develop multi-level and distributed decision making processes. Similarly, First Nations may be reluctant to participate outside of federal initiatives (i.e., provincial, municipal, CAs initiatives) because of their legal relationship with the federal government. These examples illustrate that institutions governing legal jurisdiction and relationships (i.e., Constitution Act 1867) can reduce opportunities to build the necessary cross-scale relationships and partnerships to effectively manage water resources.

The results of this research suggest the need to find ways to nest local decision making (e.g., municipal, watershed levels) within broader jurisdictional contexts (i.e., constitutional and inherent rights) to foster relationships (individual or organizational) across the boundaries of legal jurisdiction. In the context of the case studies, reconciling First Nations role as self-governing nations is critical, but building relationships at across levels is also needed.

Drawing on the synthesis of results, Figure 8 outlines the key opportunities to foster adaptive forms of water governance in First Nation communities. Specifically, Figure 8 depicts governance opportunities (outer ring) that support analytic deliberation, institutional variety and nesting (inner ring).

Figure 8 Governance opportunities to build adaptive forms of water governance in contexts that involve southern Ontatrio First Nations.
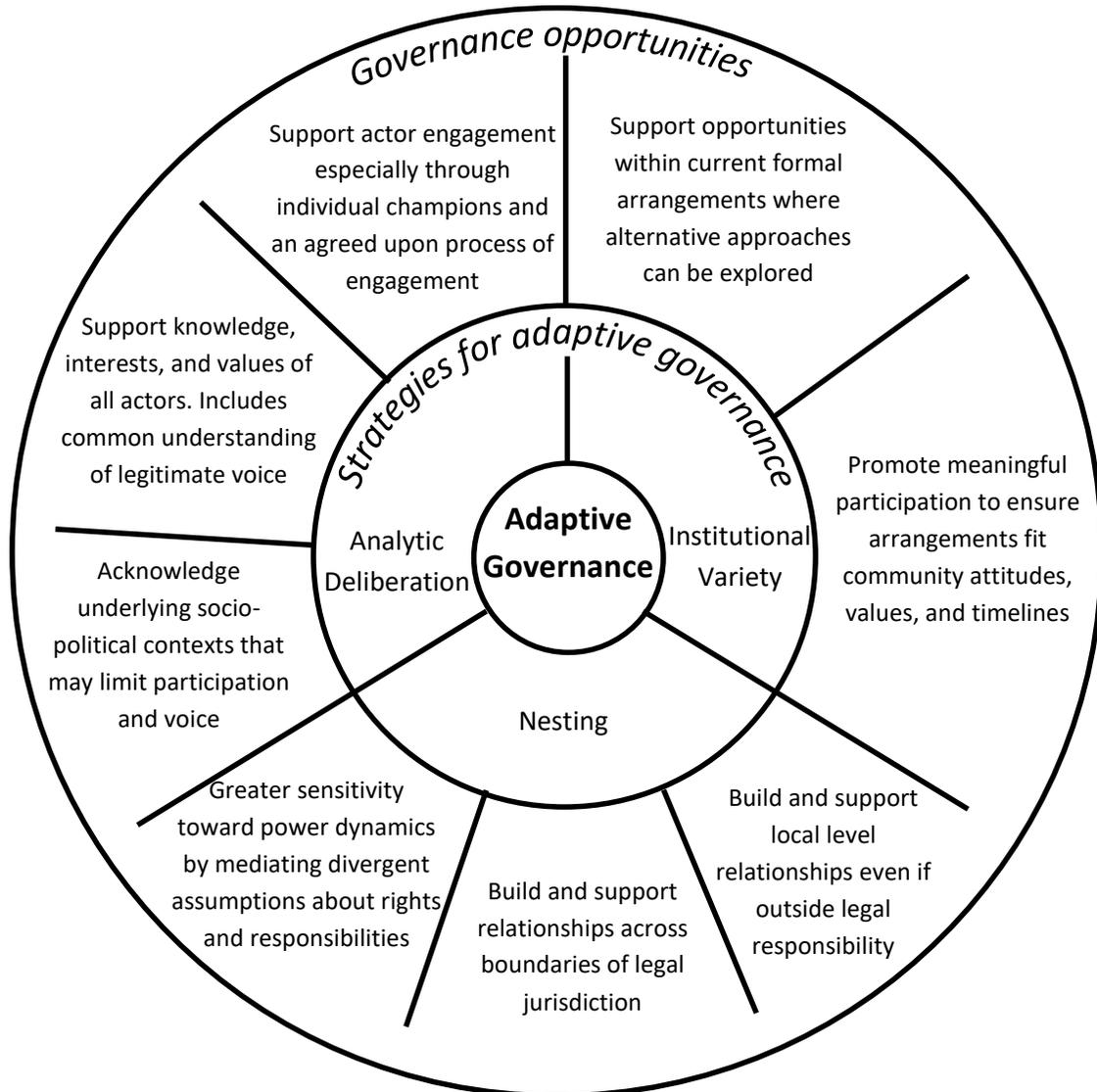
Informed by empirical examples, Figure 8 provides guidance on opportunities that move governance towards more adaptive forms within the multi-level Indigenous case study contexts. The specific challenges associated with adaptive water governance are identified, including challenges associated with participation (Huitema et al., 2009), power distribution (Chaffin et al., 2014), multi-level jurisdictions (Gupta et al., 2013). Key opportunities driving adaptive forms of governance are to support champions to take the lead in building relationships, build capacity and process to participate, acknowledge and

address inequitable decision making power dynamics, establish similar values across actors, and facilitate meaningful First Nations involvement from the very beginning of any decision making process.

5.8 Conclusion

Adaptive water governance is one of many potential governance approaches. Although the concept is still evolving, it has received increased attention for its potential to deal with complex and uncertain circumstances (Dietz et al., 2003; Huitema et al., 2009; Lulofs & Bressers, 2010). This research examines the concept of adaptive water governance in three empirical cases of First Nations in southern Ontario, and with a particular focus on the multi-level context in which decisions about water are made. The critical analysis illuminates some of the underlying factors that limit participation and First Nations voice in decision making, acceptance and use of alternative approaches to manage water resources across levels, and equitable distribution of decision making power and legitimacy across levels. As such, opportunities exist to foster adaptive forms of governance in this specific context. These opportunities may be fostered by acknowledging underlying socio-political contexts (e.g., including recognition of unequal relations of power), creating space within current formal arrangements for water management for alternative approaches to be recognized and tested, and mediating diverse assumptions about rights and responsibilities among water managers. Understanding the value of and operationalizing adaptive water governance is a challenge in the multi-level settings assessed in this research. However, this study adds insight into available opportunities to deal with complex problems such as water issues confronting First Nations in Canada.

Chapter 6
Conclusion

This research advances the conceptual and practical foundations of adaptive water governance through an examination of First Nations contexts in Ontario, Canada. Following a review of the purpose and objectives, this chapter synthesises the specific contributions from the individual chapters (i.e., Chapters 3, 4 and 5) and provides a discussion on the broader academic contributions of the research. The chapter ends with recommendations and a brief discussion about future research opportunities and study limitations.

6.1 Purpose and Objectives

The purpose of this research was to examine the potential emergence of adaptive water governance in a First Nations context in southern Ontario. Three First Nation communities were the primary setting for this research: Six Nations of the Grand River, Mississaugas of the New Credit First Nation, and Oneida Nation of the Thames (see Section 1.4). However, this research also involved actors outside of these communities that included representatives from federal, provincial, and municipal governments, watershed organizations, NGOs, and citizen groups. There were three key objectives that guided this research. Each objective contributed to an overall assessment of the potential emergence of adaptive water governance in First Nation contexts in southern Ontario. The first objective was to characterize and assess water management and water governance in the three case studies using the multi-barrier approach for drinking water safety. Specifically, the aim was to better understand the 'black box' of water management on reserves, assess current approaches for managing and governing water on-reserve, and in doing so, to assess what practices are already being undertaken (e.g., protection of sensitive areas, treatment, distribution and storage) that may facilitate or constrain a general shift toward more

adaptive water governance on- and off-reserve. The second objective, therefore, was to identify and critically examine institutional attributes and conditions (i.e., capacity) that facilitate or constrain a transition toward more adaptive forms of water governance within each of the case studies specifically, and with particular reference to opportunities for deliberation, institutional variety, and linkages across scales. The particular focus at this stage of the research was on conditions and experiences within each of the cases with regard to water quantity and quality (i.e., to emphasize experiences).

The third objective of the research aimed to build on this 'on-reserve' perspective and to consider the multi-level institutional setting in which the case studies are set in terms of empirical evidence of adaptive water governance, as well as to gain insights into how it may be fostered. The decision to consider this multi-level context for water management and governance (i.e., emphasizing insights *off-reserve*) independently from on-reserve situations was intentional. In doing so, I was able to pay particular attention to the broader institutional and socio-political contexts (i.e., provincial and national) in which on-reserve water management and governance experiences are embedded. There are clear tensions and differences in these two contexts, and each required an independent assessment. How these two situations in tandem manifest to influence opportunities for adaptive governance of water resources is reflected in the summary of findings I offer below.

6.2 Major Findings

The multi-barrier approach is being utilized across Canada to address water quality and quantity concerns. The MBA is cited as an important approach for addressing water concerns on First Nation reserves (O'Connor, 2002). Walters et al. (2012) identify that implementing the MBA within the current water management and governance regime

remains a challenge for First Nations. Gaps in knowledge about water management on reserves are critical for Ontario to implement the MBA as a comprehensive approach to addressing water quality and quantity concerns. For example, Finn (2010) identifies that the use of the MBA in Ontario fails to support local and traditional knowledge, beliefs, and perspectives of First Nations. Using key elements and criteria of the multi-barrier approach as outlined by Plummer et al. (2010) (see Section 3.3), Chapter 3 explores current management and governance approaches to protecting water resources on First Nations reserves. This is done by examining how the MBA is expressed in three First Nations communities (Oneida Nation of the Thames, Six Nations of the Grand River and Mississaugas of the New Credit) highlighting prominent challenges for protecting water resources. The MBA was valuable for addressing water concerns and challenges confronting First Nations on-reserve. As a comprehensive approach for ensuring safe drinking water, the MBA provides important perspectives on multiple aspects of water management and governance (e.g., policy and guidelines, monitoring, infrastructure, diverse actors from a variety of levels and sectors). As a first step to understand the potential emergence of adaptive water governance in First Nation contexts, this perspective provides an opportunity to characterize and assess water management and governance on-reserve and illuminate issues and opportunities for improvement.

The results from Chapter 3 illuminate two prominent findings regarding water management and governance on First Nations reserves, and particularly in relation to protecting water resources. First, attitudes and beliefs held on-reserves toward water, water operators, and water authorities can constrain the protection of water resources. Attitudes toward perceived authority to make decisions about water were found to derail decision making processes and enforcement where rules were put in place to protect sensitive areas and monitor water resources. These attitudes, in part, contribute to the

inability to protect and control water resources on-reserve. Second, perceived limitations of financial resources were identified to constrain water management within the case study communities. Participants from all case study communities expressed this finding as a constraint to protecting water resources. In cases like Six Nations and New Credit, water actors have found opportunities to improve funding through resource sharing (human, information) across reserve boundaries and through alternative income sources (e.g., gaming revenues, land claims).

The use of the MBA in this research to examine water management and governance on-reserve illuminates two improvement opportunities. The first opportunity is found within the use and acceptance of First Nations approaches to protecting water resources that includes a holistic view of the environment and cultural practice (i.e., those associated with protecting the 'Grove' in New Credit). The second opportunity is to continue to foster relationships on- and off-reserve. Building relationships offers opportunities to share information and resources, overcome information gaps, and foster meaningful participation in decision making. Together these findings from Chapter 3 suggest that advances in water policy and governance require attention toward on-reserve attitudes related to perceived authority to make decisions about water, meaningful First Nations involvement in decision-making (i.e., financial), and commitment to include cultural practice. Chapter 3 raises important questions about the role that attitudes and beliefs have in constraining how First Nations are able to protect water resources on-reserve, and illustrates how social, cultural, economic, and political contexts may be a challenge when seeking to apply new approaches to address water concerns on-reserve.

Using 'institutions' (e.g., rules, norms) as a lens, and guided by an analytical framework (detailed in Section 4.3), Chapter 4 focuses on the community perspectives on-reserve as related to the emergence of more adaptive forms of governance to address water

quality and quantity issues. Prominent constraints that limit how First Nations are able to respond to water issues include the prevalence of divergent understandings of decision making authority or legitimacy when it comes to making decisions about water on-reserve, formal institutions for managing water on-reserve that may be incompatible with local or on-reserve practices, a lack of community engagement in water issues, limited sharing of different forms of knowledge and understanding about water challenges and solutions, and unclear roles and responsibilities with regard to water decision making. The research also identified that opportunities to enable First Nations to respond to water quality and quantity issues involve fostering on-reserve relationships that encourage dialog, trust building, openness, and participation. The findings from Chapter 4 shine a light on community perspectives on-reserve that are often absent in literature discussing the social and political contexts of water management and governance in First Nations settings in Canada. As such, Chapter 4 offers unique insights on the breadth of on-reserve challenges and opportunities confronting First Nations in order to address water quality and quantity issues.

Chapter 3 and 4 both provide on-reserve insights into the practice of managing and governing water resources and confronting constraints and opportunities, albeit using different approaches to assessment. These chapters provide a better understanding of the First Nation community experience and its influence on water management and governance on-reserve. Building on Chapters 3 and 4, Chapter 5 explores the multi-level dimensions of water governance and how a potential shift toward more adaptive forms of water governance may resonate within First Nation contexts. Using the institutional strategies for adaptive governance as an analytical framework and as outlined in Chapter 4 (see also Section 5.3), the research uncovered empirical evidence of governance concerns on-reserve and also in its multi-level context. Insights from this multi-level analysis were distinct and

emphasized the underlying socio-political contexts that influence a potential shift toward more adaptive forms of water governance in First Nations settings, the need to create space for alternative and culturally-relevant approaches to water management and governance, and the importance of mediating diverse assumptions about rights and responsibilities among water managers.

The concept of adaptive water governance highlights interactions between water management approaches across levels (national to local). This resonates within the First Nations case studies because there is a stated expectation that local and/or traditional approaches be incorporated into water management at other levels. Currently, the First Nation case studies articulate a disconnection of water management (across levels) from the First Nations' way of thinking about and improving water resources on reserve.

Adaptive water governance also resonates with First Nations contexts by highlighting the importance of multiple centres of authority operationalized through meaningful distribution of power and clarification of inter-jurisdictional relationships. Current disparities in decision making power and hierarchical jurisdictions both influence the effectiveness of water managers' ability to address water issues, as well as the transfer of resources, knowledge, and information, and are a barrier to distributive forms of decision making power. The concept of adaptive water governance highlights the need to nest local decision making within broader jurisdictional contexts to foster relationships across levels. These empirical insights are helpful for understanding what adaptive governance may look like within Indigenous contexts in Canada.

6.3 Contributions

This research responds to the need to explore novel approaches to address water quality and quantity issues confronting First Nations in southern Ontario, and Canada more

generally. The federal government's approach to water issues (quality and quantity) on-reserve has predominantly focused on technical solutions, but has yet to fully address issues related to participation, clearly defining roles and responsibilities, and involvement of alternative strategies to manage water resources. Despite some headway on addressing technical issues such as improved infrastructure, training regimes, monitoring and funding, more work is needed to address governance concerns more broadly. This research has focused on this latter challenge.

Globally, there is increased attention on fostering more collaborative and adaptive forms of water governance for complex multi-level settings (Brunner & Steelman, 2005; Chaffin et al., 2014; Dietz et al., 2003; Folke et al., 2005; Olsson et al., 2006). However, further assessment is needed to determine if this emerging concept can complement existing approaches, and in particular, enhance multi-level governance conditions in the context of First Nations in Canada. Accordingly, this dissertation provides conceptual, empirical, and methodological contributions with regards to this challenge. Each of these contributions is outlined below.

This research contributes to ongoing academic inquiry into the conceptual understanding of adaptive water governance (Akamani & Wilson, 2011; Cosens & Williams et al., 2012; Huitema et al., 2009; Olsson et al., 2006; Huitema et al., 2012), and in particular, how the concept resonates within the research case study contexts. Adaptive water governance is an emerging concept and requires further research to determine its suitability in supporting water management in First Nations context in southern Ontario. This research expands upon existing adaptive water governance literature (e.g., see Akamani & Wilson, 2011; Huitema et al., 2009; and Pahl-Wostl et al., 2012) that identify broad attributes (e.g., polycentric decision making, involving actors and institutions within and across multiple levels) of adaptive forms of water governance. This research extends

these findings based on three detailed case studies and identifies how underlying institutional contexts that exist within and across levels (i.e., beliefs associated with decision making authority, colonialism, and discrimination) undermine the potential for adaptive forms of water governance. In the context of marginalized groups such as First Nations, attention toward underlying institutions that may constrain, but may also contribute opportunities to foster adaptive forms of water governance, is critical.

Further, this research makes a contribution to the conceptual development of the MBA in the context of First Nations in Canada. After Justice O'Connor made recommendations to put in place a multi-barrier approach to protect all citizens, questions about defining the provinces role and responsibility for protecting water resources have been raised (Government of Canada, 2001; O'Connor, 2002; Swain, 2006b). This research builds on works by Walters et al. (2012) and Finn (2010) that draw attention to governance challenges associated with implementation of an MBA within First Nation contexts in Canada, including those related to political leadership, participation and supporting local and traditional knowledge, beliefs and perspectives. The findings illuminate that a holistic view of the environment and cultural activities (e.g., those associated with protecting "the grove" in New Credit) offer unique opportunities to inform decisions and protecting water resources on-reserve.

This research makes a contribution by reinforcing the need to acknowledge and include First Nation practices in water management. Currently, knowledge gaps exit in understanding water management from on-reserves perspectives (see Chapter 4 specifically). Understanding water management on-reserve is critical for a comprehensive approach to protect water quality and quantity across Ontario. For example, current management approaches to implement the MBA to protect water resources fail to address the full extent of First Nation needs. Some analysts have recognized this gap and called for

the inclusion of First Nation traditional knowledge and practice into water management

(Finn, 2010; Walters et al., 2012). Managing water resources without acknowledging and

including First Nations approaches has shown to be ineffective or inappropriate when

managing water resources on-reserve. Challenges remain in identifying specific First Nation

arrangements or management examples that have promise for improving water

management. Shining a light on First Nations approaches to water management provides a

unique opportunity to examine what practices are working and what practices are not

working on-reserve. This research empirically examines First Nation water management

approaches in three First Nation communities, and particularly with reference to protecting

water resources on-reserve. The outcomes of this research provide guidance for advancing

water policy and practice in ways that include meaningful involvement of First Nations in

decision making, and commitment to include cultural practices that may be required to

foster adaptive forms of governance.

Further, this research contributes empirical understanding of what factors facilitate

or constrain First Nations' ability to address water quality and quantity issues on-reserve.

Water issues confronting First Nations have a technical component (e.g., infrastructure,

source water quality) (AANDC, 2011). However, scholarship that advances understanding

about water issues on First Nation reserves in Canada show that issues go far beyond

technical challenges and report that First Nations are constrained by social and political

contexts that result in poorly defined water rights, unclear responsibilities and a

perpetuation of colonialism and discrimination as drivers of water issues on-reserve

(Borrows, 1997; LaBouncane-Benson et al., 2012; Mascarenhas, 2007, 2012; White et al.,

2012). Absent from scholarship focused on First Nations and water is the experience and

perspectives of First Nations living on-reserve. Without recognizing the constraints and

opportunities of First Nations on-reserve, water managers off-reserve run the risk of

misunderstanding the full suite of challenges that confront First Nations along with a full suite of solutions capable of addressing them. This research reinforces the need to recognize and confront underlying social-political contexts that may constrain First Nations from responding to water resources. This research draws attention to the constraints (e.g., divergent understanding of decision making authority, community engagement) and opportunities (e.g., strong on-reserve relationships) on-reserve that may be otherwise hidden or unknown off-reserve. The research provides feedback from the reserve experience about current regulatory regimes and how they intersect with communities. This adds value to the water governance literature focused on First Nations by contributing a more complete view of the constraints First Nations confront when managing water resources, while offering practical opportunities to improve and support First Nations ability to respond to water issues. Without addressing the full suite of constraints confronting First Nations, opportunities to achieve adaptive water governance is limited.

Methodologically, this research makes a contribution by utilizing Plummer et al.'s (2010) key elements of the MBA to characterize and assess water management and water governance in First Nations contexts. The MBA is an important system for protecting drinking water and is being employed across Canada. This makes the research very relevant in First Nation contexts because: (1) the MBA is part of the federal governments approach to protecting water resources on-reserve, (2) provinces like Ontario are currently examining how to protect First Nations source water using the MBA, and (3) similar to water management on-reserve, the MBA is embedded within multiple levels of jurisdiction. The research demonstrates the effectiveness of the MBA as a framework to understand water management in First Nation contexts through its adaptability to capture not only water management and water governance issues associated with drinking water protection,

but also other uses and understandings of water (e.g., cultural, ceremonial, ecological) that are paramount within First Nations contexts.

Finally, this research makes an empirical contribution by using Dietz et al.'s (2003) framework depicting institutional strategies for adaptive governance to examine and understand institutional constraints and opportunities for water management in First Nation communities. Applied at different levels - on-reserve (see Chapter 4) and in a multi-level context (see Chapter 5), the framework was demonstrated to be particularly helpful for understanding how institutions influence human behaviour and provides a means to operationalize and qualitatively assess the ability of First Nations to respond to water quality and quantity issues. This framework holds promise for understanding institutional constraints and opportunities in other marginalized communities to manage and govern resources. The framework does this, in part, by expanding the strategies that foster adaptive governance. Specifically, this includes a better accounting of the underlying socio-political contexts that may limit participation and voice, greater sensitivity toward power dynamics by mediating divergent assumptions about rights and responsibilities, and supporting alternative approaches within current formal arrangements.

6.4 Recommendations for Water Practice

This research has examined the potential emergence of adaptive water governance in First Nations context in southern Ontario, drawing specifically from insights of water actors on-reserve (Chapter 3 and 4), as well as insights gained by undertaking a multi-level assessment (Chapter 5). In the following section, I present five recommendations for water practice. Some of these recommendations are directed at the reserve level, while others are directed off-reserve.

Give greater attention to potential differences between groups on-reserve

The case studies examined in this research illustrate that multiple groups within each First Nation community have varying understandings, values and perspectives on water management (i.e. there is not one Indigenous voice, but Indigenous voices). Conflict between groups created challenges for water management in numerous ways. Beliefs about who has the authority to make water management decisions contributed to challenges enforcing rules to protect water resources (see Sections 3.6 and 4.6), was a barrier to communication and the flow of information (see Section 4.5.1 and 4.6), and influenced community members' willingness to participate in initiatives driven by a group or individual (see Section 4.6 and 5.7). These challenges make it difficult to monitor water resources, implement land use planning, and/or water management (see Section 3.5). The research identified that strong beliefs and perspectives that divide groups are driven by historical experiences. For example, past water issues continue to influence some members' perception of water quality and the individuals that operate water facilities (see Section 3.6). This research suggests that the potential emergence of adaptive water governance on-reserve depends on some agreement or common understanding about the on-reserve authority to make decisions on water issues. The research highlights that a common understanding is rooted in addressing historical issues through communication and openness about decisions and trust building (see Sections 3.6 and 4.6). This is an ongoing and long-term process that can begin immediately with understanding the key conflicts between groups.

Support and maintain relationships beyond legally defined jurisdictions

The legally defined responsibility for water resources on-reserve is shared between the federal government and First Nations under the Canadian Constitution Act, 1982, s.

35(1). This relationship has a number of challenges. For example, the research identified that information is difficult to transfer from one level to another (i.e., First Nation, federal government; see Section 5.7), decisions can be hierarchical and informed by a single actor's interests and values (see Section 5.7), approaches by the federal government tend to be one-size-fits-all, and often not appropriate in specific situations found within the case studies (see Section 3.6). The research acknowledges the role other actors, such as the province of Ontario, municipalities, and watershed organizations have in water management. The research also illustrates that when relationships were strong, involved actors benefited by better transmission of information (see Section 5.7), opportunity to share resources (see Section 3.7), and legitimate First Nation input into decision making (see Section 5.7). These relationships between actors that go beyond legally defined jurisdictions are valuable for water management, and it is suggested that for adaptive water governance to emerge, opportunity to foster these relationships be undertaken. Building and maintaining relationships is an ongoing process and requires collaboration and trust building. Existing arrangements between Six Nations and the Grand River Conservation Authority that have been developed to undertake source water protection illustrate the potential for strong relationships beyond legally defined jurisdiction.

Foster a common understanding of legitimate voice

Indigenous voice in water decision making is central to the water crisis experienced by First Nations because it maintains First Nations' relationship with water and responsibility to protect it (McGregor 2012). The case studies illustrate contrasting views between CAs, municipalities, governments and First Nations (including within First Nation communities) about what legitimate voice looks like (see Section 5.6, 4.5). Without a common understanding of what legitimate voice is water managers run the risk of ignoring

the values, knowledge and information of First Nations for informing decision making. This research suggests that the emergence of adaptive forms of governance may depend on fostering a common understanding of legitimacy starting with acknowledging underlying socio-political contexts that may be creating conflict. This involves ensuring that First Nations are not an 'afterthought' and involve their participation from the very beginning of any decision making process. The results highlight that individuals acting as champions to bridge gaps in understanding about legitimate voice are already making a difference (see Section 5.6.1).

Be open to First Nation approaches to managing water resources

Formal arrangements (e.g., legislation, regulations, zoning, by-laws) are important for managing water resources on-reserve; however, the case studies illustrate that these can be ineffective for managing water in some cases because they are incompatible with cultural norms on-reserve (see Section 4.5.2 and 5.6.2). Some cultural norms were identified to be important for managing water because they can improve the compatibility of water management arrangements (See Section 5.6.2). The results of this research illustrate that perceptions of the inappropriateness or incompatibility between the cultural arrangements and current water issues instills a widening gap between traditional and western practice (see Section 4.6). This research suggests water managers both on- and off-reserve may find it helpful to support First Nation approaches for managing water resources. This may mean at times stepping away from formalized regulatory approaches toward approaches that utilize cultural norms and values. Experiences in New Credit where cultural norms that are embodied by traditional holistic views of the environment and values associated with respect were instrumental in defining what the issues were and providing motivation for restricting land uses that impact water.

Support new opportunities for financial stability

The case studies highlight that communities continue to experience funding challenges for water management. The federal government is responsible for funding 80% of operations and upgrading costs associated with water and wastewater treatment. This is helpful and necessary but, the results of this research indicate that even with this support, the funding regime is restrictive and controlling (See Sections 3.5, 4.5.3, and 5.6.3). Specific challenges include shortfalls of financial support for and lack of control of the expansion, distribution, monitoring, and operation of water systems. The federal government has a responsibility to provide funding for water management on reserve; however, seeking opportunity for First Nations to secure alternative arrangements to meet the financial needs on-reserve may be advantageous. For example, water actors from Six Nations and New Credit have found opportunities to increase revenue flow to develop and control water management on-reserve through alternative income sources (e.g., gaming revenues, land claims).

References

Aboriginal Affairs and Northern Development Canada. (2000). *Background to the Grand*

    River notification agreement. Ottawa, Canada: AANDC. Retrieved March 2013 from

    http://www.ubcm.ca/assets/library/Policy~Topics/First~Nations~Relations/First

    ~Nations~Relations~Archive/Agreements

Aboriginal Affairs and Northern Development Canada. (2005). *Grand River notification*

    agreement Renewal. Ottawa, Canada: AANDC. Retrieved March 2013

    http://www.ubcm.ca/assets/library/Policy~Topics/First~Nations~Relations/First

    ~Nations~Relations~Archive/Agreements

Aboriginal Affairs and Northern Development Canada. (2006). *Protocol for safe drinking*

    water in First Nations communities. Gatineau, Canada: AANDC. Retrieved from

    http://www.aadnc-aandc.gc.ca/enr/wtr/pubs/sdw/sdw-eng.pdf

Aboriginal Affairs and Northern Development Canada. (2007). *Summative evaluation of the*

    First Nations water management strategy. Ottawa, Canada: AANDC. Retrieved from

    http://www.ainc-inac.gc.ca/ai/arp/aev/pubs/ev/efnw08/efnw08-eng.asp

Aboriginal Affairs and Northern Development Canada. (2009). *First Nations water and*

    wastewater action plan (Progress Report), Ottawa, Canada: AANDC. Retrieved from

    https://www.aadnc-aandc.gc.ca/eng/1313426171775/1313426357946

Aboriginal Affairs and Northern Development Canada. (2010). *Detailed Tables - Registered*

    Indian population by sex and type of residence by group, responsibility centre and

    region 2010 - region 4. Ontario, Canada: AANDC. Retrieved Oct 2011 from

    http://ainc-inac.gc.ca/eng/1309371330667

Aboriginal Affairs and Northern Development Canada. (2011). *National assessment of First*

    Nations water and wastewater systems. Ottawa, Canada: AANDC. Retrieved from

    https://www.aadnc-aandc.gc.ca/eng/1313426883501/1313426958782

Aboriginal Affairs and Northern Development Canada. (2012). *Registered Indian population by sex and residence 2012*. Ottawa, Canada: AANDC. Retrieved November 2012 from https://www.aadnc-aandc.gc.ca/eng/1373985023065/1373985196078

Aboriginal Affairs and Northern Development Canada. (2013). *National First Nations infrastructure investment plan*. Ottawa, Canada: AANDC. Retrieved from http://publications.gc.ca/collections/collection_2014/aadnc-aandc/R1-36-2013-eng.pdf

Aboriginal Affairs and Northern Development Canada. (2014). *2014 Flooding in First Nation communities*. Ottawa, Canada. Retrieved December 22, 2014, from https://www.aadnc-aandc.gc.ca/eng/1397740805675/1397741020537

Acheson, J. M. (2006). Institutional Failure in Resource Management. *Annual Review of Anthropology*, *35*(1), 117–134.

Akamani, K., & Wilson, P. I. (2011). Toward the adaptive governance of transboundary water resources. *Conservation Letters*, *4*(6), 409-416.

Akamani, K. (2016). Adaptive water governance: Integrating the human dimensions into water resource governance. *Journal of Contemporary Water Research & Education*, *158*(1), 2–18.

Alfred, G. R. 2005. *Wasase: Indigenous pathways of action and freedom*. Peterborough, Canada: Broadview.

Anishinabek Ontario Resource Management Council. (2009). *Anishinabek traditional knowledge & water policy report (water policy report)*. North Bay, Canada: Anishinabek Ontario Resource management Council.

Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Boston, MA: Addison-Wesley.

Armitage, D. (2005). Adaptive capacity and community-based natural resource

management. *Environmental Management*, *35*(6), 703–715.

Armitage, D., Berkes, F., & Doubleday, N. (Eds.). (2007). *Adaptive co-management*

collaboration, learning, and multi-level governance. Vancouver, Canada: U British

Columbia P.

Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., . . .

Wollenberg, E. K. (2008a). Adaptive co-management for social-ecological

complexity. *Frontiers in Ecology and the Environment*, *7*(2), 95–102.

Armitage, D., Agnew, M., & Plummer, R. (2008b). Adaptive co-management and the paradox

of learning. *Global Environmental Change-Human and Policy Dimensions*, *18*(1), 86–

98.

Assembly of First Nations. 2008. *Climate change and water: Impacts and adaptations for*

First Nations communities. Ottawa, Canada: AFN. Retrieved August 2011 from

http://www.afn.ca/uploads/files/env/08-03-

27_climate_change_and_water_research_paper_final.pdf

Assembly of First Nations. 2011. *AFN marks world water day on March 22: Safe drinking*

water remains a major concern for First Nation communities. Ottawa, Canada: AFN.

Retrieved July 2011, from http://www.afn.ca/index.php/en/news-media/latest-

news/afn-marks-world-water-day-on-march-22-safe-drinking-water-remains-a-ma

Assembly of First Nations. (2013). *Submission to the House of Commons Standing Committee*

on Aboriginal Affairs and Northern Development. Ottawa, Canada: AFN. Retrieved

May 2014 from http://www.afn.ca/uploads/files/2012-05-

16_afn_submission_to_the_senate_standing_committee_on_bill_s-8.pdf.

Assembly of First Nations. (2014). *National water declaration*. Ottawa, Canada: AFN.

Retrieved from http://www.afn.ca/uploads/files/water/national_

water_declaration.pdf

Assembly of First Nations. (n.d.). *AFN environmental stewardship respecting and protecting mother earth: Traditional knowledge*. Ottawa, Canada: AFN. Retrieved from http://www.afn.ca/uploads/files/env/ns_-_traditional_knowledge.pdf

Atleo, A. S. (2011). *National Chief letter to First Nations on Bill S-11*. Ottawa, Canada: Assembly of First Nations.

Bakker, K., & Cook, C. (2011). Water governance in Canada: Innovation and fragmentation. *International Journal of Water Resources Development*, *27*(2), 275-289.

Basdeo, M., & Bharadwaj, L. (2013). Beyond physical: Social dimensions of the water crisis on Canada's First Nations and considerations for governance. *Indigenous Policy Journal*, *23*(4), 1-14. http://www.indigenouspolicy.org/index.php/ ipj/article/view/142

Baxter, J., & Trebilcock, M. J. (2009). 'Formalizing' land tenure in First Nations: Evaluating the case for reserve tenure reform. *Indigenous Law Journal*, *7*(2), 45-122. Retrieved from https://papers.ssrn.com/abstract=2102787

Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking. *Natural Hazards, 41*(2), 283–295.

Berkes, F. (2009). Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand*, *39*(4), 151–156. http://dx.doi.org/10.1080/03014220909510568

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications, 10*(5), 1251–1262.

Bernard, H. R. (2000). Social research methods: Qualitative and quantitative approaches (1st ed.). Thousand Oaks, CA: Sage.

Biermann, F., & Gupta, A. (2011). Accountability and legitimacy in earth system governance:

    A research framework. *Ecological Economics, 70*(11), 1856–1864.

Blackstock, M. (2001). Water: A First Nations' spiritual and ecological perspective. *Journal of*

    Ecosystems and Management, 1(1), 1-14

Borrows, J. (1997). Living between water and rocks: First Nations, environmental planning

    and democracy. *The University of Toronto Law Journal*, *47*(4), 417–468.

    http://www.jstor.org/stable/825948?seq=1#page_scan_tab_contents

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code*

    development. Thousand Oaks, CA: Sage.

Boyd, D. R. (2011). No taps, no toilets: First Nations and the constitutional right to water in

    Canada. *McGill Law Journal, 57*(1), 81-134.

Boyd, D. R., & Phare, M.-A. (2010). Safe, running water should be a right. Retrieved April

    2017, from http://www.winnipegfreepress.com/opinion/analysis/safe-running-

    water-should-be-a-right-111773284.html

Brandes, O.M., Ferguson, K., M'Gonigle, M., & Sandborn, C., (2005). At a watershed:

    Ecological governance and sustainable water management in Canada. In E. Reinolds,

    (Eds.), *Polis Project* (pp. 1-105). Victoria, Canada: University of Victory.

Brunner, R. D. (2002). Finding common ground. *Policy Sciences, 43*(4), 301–341.

Brunner, R. D., & Steelman, T. (2005). Beyond scientific management. In R. Brunner, T.

    Steelman, L. Coe-Juell, & C. Cromley, (Eds.), *Adaptive governance: Integrating science,*

    policy, and decision making (pp. 1–46). Chichester, NY: Columbia UP.

Burnett, S. (2005). *Six Nations of the Grand River hydrogeological study*. Orangeville, Canada:

    Neegan Burnside Engineering and Environmental.

Cash, D. W., Adger, W. N., Berkes, F., Garden, P., Lebel, L., Olsson, P., . . . Young, O. (2006).

    Scale and cross-scale dynamics: Governance and information in a multilevel world.

    Ecology and Society, 11(2), 8.

Cave, K. (2012). *Exploring the influences of institutions on water governance and*

    management: A First Nation case study (MA Thesis). University of Waterloo,

    Waterloo, Canada. Retrieved from http://www.uwspace.uwaterloo.ca/

    handle/10012/6492

Cave, K., Plummer, R., & de Loë, R. (2013). Exploring water governance and management in

    Oneida Nation of the Thames (Ontario, Canada): An application of the institutional

    analysis and development framework. *Indigenous Policy Journal, 23*(4) 1-27.

    Retrieved from http://www.indigenouspolicy.org/index.php/ipj/article/view/145

Canadian Council of Ministers of the Environment. (2002). *From source to tap: Multi-barrier*

    approach to safe drinking water. Ottawa, Canada.

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council

    of Canada, and Social Sciences and Humanities Research Council of Canada. (2014).

    Tri-council policy statement: Ethical conduct for research involving humans. Ottawa,

    Canada: Interagency Secretariat on Research Ethics. Retrieved from

    http://www.pre.ethics.gc.ca/pdf/eng/tcps2-2014/TCPS_2_FINAL_Web.pdf

Chaffin, B. C., Gosnell, H., Cosens, B. A., Works, M., & Situating, A. G. (2014). A decade of

    adaptive governance scholarship: Synthesis and future directions. *Ecology and*

    Society, 19(3), 56. Retrieved from

    http://www.ecologyandsociety.org/vol19/iss3/art56/ES-2014-6824.pdf

Christensen, R. (2006). *Waterproof: Canada's drinking water report card 2*. Vancouver,

    Canada: Sierra Legal Defence Fund.

Christensen, R., Goucher, N. & Phare, M.-A. (2010). *Seeking water justice: Strengthening legal protection for Canada's drinking water*. Canada: Flow, NSSCM, Ecojustice.

Centre for Indigenous Environmental Resources. (2008). Appendix 2: Adaptation network survey and results. *Climate change and First Nations south of 60: Impacts, adaptation, and priorities* (pp. 1-14). Winnipeg, Canada: Centre for Indigenous Environmental Resources.

Centre for Indigenous Environmental Resources. 2009. *Climate risks and adaptive capacity in Aboriginal communities Final Report: An Assessment south of 60 degrees latitude*. Winnipeg, Canada: Centre for Indigenous Environmental Resources.

Cleaver, F. (2002). Reinventing institutions: Bricolage and the social embeddedness of natural resource management. *The European Journal of Development Research, 14*(2), 11–30.

Chiefs of Ontario. (2008). *Water declaration of the First Nations in Ontario*. Toronto, Canada: Chiefs of Ontario. Retrieved from http://www.chiefs-of-ontario.org/sites/default/files/files/COO%20water%20declaration%20revised%20march%202010.pdf

Chiefs of Ontario. (2011). *Written submission to the Senate Standing Committee on Aboriginal Peoples on Bill S-11: Safe Drinking Water for First Nations Act*. Toronto, Canada: COO. Retrieved from http://www.magnetawanfirstnation.com/Submission.pdf

Chiefs of Ontario. (2013). *Federal Bill S-8 fails to "protect" drinking water for First Nations*. Toronto, Canada: COO. Retrieved June 24, 2013 from http://www.chiefs-of-ontario.org/node/233

Corti, L. (2004). Archival data. In M. Lewis-Beck, B. Alan, & L. Futing Tim (Eds.), *The Sage encyclopedia of social science research methods*. Thousand Oaks, CA: Sage.

Cosens, B. A., & Williams, M. K. (2012). Resilience and water governance: Adaptive

  governance in the Columbia River Basin. *Ecology and Society, 17*(4), 3. Retrieved

  from http://www.ecologyandsociety.org/vol17/iss4/art3/

Crabtree, B., & Miller, W. (1999). A template approach to text analysis: Developing and using

  codebooks. In B. Crabtree & W. Miller (Eds.), *Doing Qualitative Research* (pp. 163–

  177). Newbury Park, CA: Sage.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed method*

  approaches. Thousand Oaks, CA: Sage.

Da Silveira, A. R., & Richards, K. S. (2013). The Link between polycentrism and adaptive

  capacity in river basin governance systems: Insights from the River Rhine and the

  Zhujiang (Pearl River) Basin. *Annals of the Association of American Geographers*,

  103(2), 319–329.

Davidson-Hunt, I. J., & O'Flaherty, M. R. (2007). Researchers, Indigenous Peoples, and place-

  based learning communities. *Society & Natural Resources*, *20*(4), 291–305.

  https://doi.org/10.1080 /08941920601161312

Day, J. C., & Cardinall, D. (1998). Embracing value and uncertainty in environmental

  management and planning: A heuristic model. *Environments, 25*(2/3), 110.

de Loë, R.C., R. D. Kreutzwiser, & D. Neufeld, (2005). Local groundwater source protection in

  Ontario and the provincial water protection fund. *Canadian Water Resources Journal*

  30(2), 129–144.

de Loë, R., & Plummer, R. (2010). Climate change, adaptive capacity, and governance for

  drinking water in Canada. In D. Armitage & R. Plummer (Eds.), *Adaptive Capacity*

  and Environmental Governance (pp. 157–178). Berlin, Germany: Springer.

Denzin, N. K., Lincoln, Y. S., & Smith, L. T. (2008). *Handbook of Critical and Indigenous*

  Methodologies. Thousand Oaks, CA: Sage.

Diduck, A. P., Bankes, N., Clark, D., & Armitage, D. (2005). Unpacking social learning in
social-ecological systems. In F. Berkes, R. Huebert, H. Fast, M. Manseau, & A. Diduck
(Eds.). *Breaking ice: Renewable resource and ocean management in the Canadian
north.* (pp. 269-290). Calgary, Canada: U of Calgary P.

Dietz, T., & Stern, P. C. (1998). Science, values, and biodiversity. *BioScience, 48*(6), 441–444.

Dietz, T., Ostrom, E., & Stern, P. C. (2003). The struggle to govern the commons. *Science,
302*(5652), 1907-1912.

Dilthey, W., & Makkreel, R. A. (1977). *Descriptive psychology and historical understanding*.
Hague, Netherlands: Martinus Nijhoff.

Duncan, L., & Bowden, M. A. (2009). *A Legal guide to Aboriginal drinking water: A prairie
province perspective*. Tomorow Foundation, Alberta Law Foundation, Walter &
Duncan Gordon Foundation. Retrieved from http://www.1six1.com/wp-
content/uploads/2010/02/Water-Brochure_LR.pdf

Duit, A., & Galaz, V. (2008). Governance and complexity: Emerging issues for governance
theory. *Governance, 21*(3), 311–335.

Dupont, D., Waldner, C., Bharadwaj, L., Plummer, R., Carter, B., Cave, K., & Zagozewski, R.
(2014). Drinking water management: Health risk perceptions and choices in First
Nations and non-First Nations communities in Canada. *International Journal of
Environmental Research and Public Health, 11*(6): 5889–5903. Retrieved from
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4078554/

Dyck, T., Plummer, R., & Armitage, D. (2015). Examining First Nations' approach to
protecting water resources using a multi-barrier approach to safe drinking water in
Southern Ontario, Canada. *Canadian Water Resources Journal, 40*(2), 204–223.

Ellis, S. C. (2005). Meaningful consideration? A review of traditional knowledge in
environmental decision making. *Arctic, 58*, 66–77.

Fereday, J., & Muir-Cochrane, E. (2008). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods, 5*(1), 80–92.

Finn, S. 2010. *The Multiple Barrier approach to safe drinking water for First Nations communities: A case study*. (MA Thesis), University of Waterloo.

FNIGC. (2014).*Ownership, control, access and possession (OCAP™): The path to First Nations information governance.* Retrieved from http://fnigc.ca/sites/default/files/docs/ocap_path_to_fn_information_governance_en_final.pdf

Folke, C. (2002). *Social-ecological resilience and behavioural responses*. Interdisciplinary Centre for Research on Natural Resources and the Environment and Beijer International Institute of Ecological Economics. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.200.6031&rep=rep1&type=pdf

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., Walker, B., . . . Svedin, U. (2002). Resilience and sustainable development: Building adaptive capacity in a world of transformations. *AMBIO: A Journal of the Human Environment, 31*(5), 437–440.

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change, 16*(3), 253–267.

Folke, C. (2007). Social–ecological systems and adaptive governance of the commons. *Ecological Research, 22*(1), 14–15.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources, 30*, 441–473.

Galaz, V., Hahn, T., Olsson, P., Folke, C., & Svedin, U. (2008). The problem of fit between governance systems and environmental regimes - Stockholm Resilience Centre. In O.

Young, H. Schroeder & L. King, (Eds.), *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers* (pp. 147–182). Cambridge, MA: The MIT.

Gearey, M., & Jeffrey, P. (2006). Concepts of legitimacy within the context of adaptive water management strategies. *Ecological Economics, 60*(1), 129–137.

Glass, G. V. (1976). Primary, Secondary, and meta-Analysis of research. *Educational Researcher, 5*(10), 3–8.

Gleick, P. H. (2003). Global freshwater resources: Soft-path solutions for the 21st century. *Science, 302*(5650), 1524 –1528.

Government of Canada. (2001). *Federal-provincial jurisdiction and Aboriginal Peoples*. Ottawa, Canada: Parliament of Canada. Retrieved November 2014 from http://www.parl.gc.ca/Content/LOP/ResearchPublications/tips/tip88-e.htm

Government of Canada. (2005). *Report of the Commissioner of the Environment and Sustainable Development*. Ottawa, Canada: Office of the Auditor General of Canada. Retrieved from http://www.oag-bvg.gc.ca/internet/English/parl_cesd_ 200509_e_1122.html

Government of Canada (2010). *Backgrounder - Aboriginal title in Canada's courts [fact sheet].* Ottawa, Canada: AANDC. Retrieved March 11, 2011 from http://www.ainc-inac.gc.ca/ai/mr/is/tcc-eng.asp

Government of Canada. (2011). *Research involving the First Nations, Inuit and Métis Peoples of Canada*. Ottawa, Canada: Government of Canada. Retrieved October 8, 2011, from http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/chapter9-chapitre9/

Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today, 24*(2), 105–112.

Greif, A. (1998). Historical and comparative institutional analysis. *American Economic Review, 88*(2), 80–84.

Guest, G. (2012). *Applied thematic analysis*. Thousand Oaks, CA: Sage.

Gunderson, L. (1999). Resilience, flexibility and adaptive management—antidotes for spurious certitude. *Conservation Ecology*, *3*(1), 1-8.

Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., van den Brink, M., Jong, P., . . . Bergsma, E. (2010). The adaptive capacity wheel: A method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy, 13*, 459–471.

Gupta, J., & Pahl-Wostl, C. (2013). Global water governance in the context of global and multilevel governance: Its need, form, and challenges. *Ecology and Society, 18*(4), 53.

Global Water Partnership. (2000). *Towards water security: A framework for action, Stockholm: GWP*. Retrieved from http://www.gwp.org/Global/ToolBox/References/ Towards%20water%20security.%20A%20framework%20for%20action.%20Mobil ising%20political%20will%20to%20act%20%28GWP,%202000%29.pdf

Hall, P., & Taylor, R. C. (1996). Political Science and the three new institutionalisms. *Political Studies, 44*(5), 936–957.

Halpin, B. (2009). *First Nation participation in source protection in Ontario*. Toronto, Canada: Walter & Duncan Gordon Foundation.

Harden, A., & Levalliant, H. (2008). *Boiling Point!* Ottawa, Canada: Polaris Institute.

Haudenosaunee Environmental Task Force. (1995). *The words what come before all else: Environmental philosophies of the Haudenosaunee*. Cornwall Island, Canada: Native North American Travelling College.

Health Canada. (2016). *Drinking water and wastewater: First Nations, Inuit and Aboriginal Health*. Retrieved June 2016 from http://www.hc-sc.gc.ca/fniah-spnia/promotion/public-publique/water-dwa-eau-aqep-eng.php

Himley, M. (2008). Geographies of environmental governance: The nexus of nature and neoliberalism. *Geography Compass, 2*(2), 433–451.

Hodgson, G. M. (2006). What are institutions? *Journal of Economic Issues, 40*(1), 1–25.

Holling, C. S., & Meffe, G. K. (1996). Command and control and the pathology of natural resource management. *Conservation Biology, 10*(2), 328–337.

Huitema, D., Mostert, E., Egas, W., Moellenkamp, S., Pahl-Wostl, C., & Yalcin, R. (2009). Adaptive water governance: Assessing the institutional prescriptions of adaptive (co-) management from a governance perspective and defining a research agenda. *Ecology and Society, 14*(1), 26.

Huntjens, P., Lebel, L., Pahl-Wostl, C., Camkin, J., Schulze, R., & Kranz, N. (2012). Institutional design propositions for the governance of adaptation to climate change in the water sector. *Global Environmental Change, 22*(1), 67–81.

Immergut, E. M. (1998). The theoretical core of the new institutionalism. *Politics and Society, 26*, 5–34.

Imperial, M. T. (1999). Institutional analysis and ecosystem-based management: The institutional analysis and development framework. *Environmental Management, 24*(4), 449–465.

Ivey, J. L., R. C. de Loë, R. D. Kreutzwiser, (2006). Planning for source water protection in Ontario. *Applied Geography 26*, 192–209.

Jackson, W. (1995). Methods: Doing social research (4th ed.). Don Mills, Canada: Pearson Canada.

Johnson, E., (1881). *Legends, traditions and laws, of the Iroquois, or Six Nations, and history of the Tuscarora Indians.* Lockport, NY: Union Print and Publishing Company.

Kahn, J., A. Thornton, D. Kamanga, M. Sherry, & D. McGregor. (2001). *Drinking water in Ontario First Nation communities: Present challenges and future directions for on-reserve water treatment in the Province of Ontario.* Toronto, Canada: COO.

Kallis, G., Kiparsky, M., & Norgaard, R. (2009). Collaborative governance and adaptive management: Lessons from California's CALFED Water Program. *Environmental Science & Policy, 12*(6), 631–643.

Kleiner, Y., B. J. Adams, J. S. Rogers, 2001. Water distribution network renewal planning. *Computing and Civil Engineering 15*(1), 15–26.

Kooiman, J. (1993). *Modern governance: New government-society interactions.* London, UK: Sage.

Koontz, T. M. (2006). Collaboration for sustainability? A framework for analyzing government impacts in collaborative-environmental management. *Sustainability: Science Practice and Policy, 2*(1), 15–24.

LaBoucane-Benson, P., Gibson, G., Benson, A., & Miller, G. (2012). Are we seeking Pimatisiwin or creating Pomewin? Implications for water policy. *International Indigenous Policy Journal, 3*(2), 1-22.

Lavalley, G. (2006). *Aboriginal traditional knowledge and source water protection: First Nations' views on taking care of water.* Toronto, Canada: Chiefs of Ontario and Environment Canada.

Leach, M., Mearns, R., & Scoones, I. (1999). Environmental entitlements: Dynamics and institutions in community-based natural resource management. *World Development, 27*(2), 225–247.

Lebel, L., Anderies, J. M., Campbell, B., Folke, C., Hatfield-Dodds, S., Hughes, T. P., & Wilson, J. (2006). Governance and the capacity to manage resilience in regional social-ecological systems. *Ecology and Society, 11*(1), 19.

Lebel, P. M., & Reed, M. G. (2010). The capacity of Montreal Lake, Saskatchewan to provide safe drinking water: Applying a framework for analysis. *Canadian Water Resources Journal, 35*(3), 317–338.

Lee, K. N., (2001) Appraising adaptive management. In L. E. Buck, C.C. Geisler, J. Schelhas, & E. Wollenberg (Eds.), *Biological diversity: Balancing interests through adaptive collaborative management*. Boca Raton, FL: CRC Press.

Lemos, M. C., & Agrawal, A. (2006). Environmental governance. *Annual Review of Environment and Resources, 31*(1), 297–325.

Lewis-Beck, M., B. Alan, and T. F. Liao. (2004). *The Sage encyclopedia of social science research methods*. Thousand Oaks, CA: Sage. Retrieved September 2011 from http://knowledge.sagepub.com/view/socialscience/SAGE.xml

Linton, J. (2010). What is water? The history of a modern abstraction. Vancouver, Canada: U of Washington P.

Longboat, S. (2012). *First Nations water security and collaborative governance: Chippewas of Kettle and Stony Point First Nation* (Doctoral Thesis), Waterloo, Canada: Wilfrid Laurier University.

Low, B., Ostrom, E., Simon, C., & Wilson, J. (2003). Redundancy and diversity: Do they influence optimal management. In F. Berkes, J. Colding & C. Folke (Eds.), *Navigating*

social-ecological systems: Building resilience for complexity and change (pp. 83–114). Retrieved from http://catdir.loc.gov/catdir/samples/cam033/2002022268.pdf

Lulofs, K., & Bressers, H. (2010). Innovations in water management requiring boundary spanning: Roots and concepts. In H. Bressers & K. Lulofs (Eds.), *Governance and complexity in water management: creating cooperation through boundary spanning strategies*. Cheltenham, United Kingdom: Edward Elgar.

MacIntosh, C. (2013). The right to safe water and crown-aboriginal fiduciary law: Litigating a resolution to the public health hazards of on-reserve water problems. In M. Jackman and B. Porter (Eds.), *Reconceiving human rights practice for the new social rights paradigm*. Retrieved from https://ojs.library.dal.ca/KNOWSL/article/view/4687

Maclean, K., & Cullen, L. (2009). Research methodologies for the co-production of knowledge for environmental management in Australia. *Journal of the Royal Society of New Zealand, 39*(4), 205–208.

March, J. G., & Olsen, J. P. (1989). *Rediscovering institutions: The organizational basis of politics*. New York, NY: The Free Press.

Marshall, C., & Rossman, G. B. (2010). *Designing qualitative research*. Thousand Oaks, CA: Sage.

Mascarenhas, M. (2007). Where the waters divide: First Nations, tainted water and environmental justice in Canada. *Local Environment, 12*(6), 565–577.

Mascarenhas, M. (2012). *Where the waters divide neoliberalism, white privilege, and environmental racism in Canada*. Lanham, MD: Lexington Books.

Maude, B. (2016). *Boiling point: Government neglect, corporate abuse, and Canada's water crisis*. Toronto, Canada: ECW Press.

McArt, E. W., & McDougal, L. W. (1985). Secondary data analysis? A new approach to nursing research. *Journal of Nursing Scholarship, 17*(2), 54–57.

McCullough, J., & Farahbakhsh, K. 2012. Square peg, round hole: First Nations drinking water infrastructure and federal policies, programs, and processes. *The International Indigenous Policy Journal 3*(1), 1-22. Retrieved May 2013 from http://ir.lib.uwo.ca/iipj/vol3/iss1/3

McGinnis, M. (2000). *Polycentric games and institutions*. Ann Arbor, MI: U of Michigan P. Retrieved from http://www.press.umich.edu/10728/polycentric_games_and_institutions

McGregor, D. (2005). Traditional ecological knowledge: An Anishinabek woman's perspective. *Atlantis, 29*(2), 1–10.

McGregor, D. (2012). Traditional knowledge: Considerations for protecting water in Ontario. *The International Indigenous Policy Journal 3*(3), 1-21. Retrieved January 2013 from http://ir.lib.uwo.ca/iipj/vol3/iss3/11

McGregor, D., and S. Whitaker. 2001. *Water quality in the Province of Ontario: An Aboriginal knowledge perspective.* Toronto, Canada: Chiefs of Ontario.

Menzies, C. R. (2006). *Traditional ecological knowledge and natural resource management*. Lincoln, NE: U of Nebraska P.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2013). *Qualitative Data Analysis: A Methods Sourcebook* (3rd ed.). Thousand Oaks, CA: SAGE.

Mississaugas of the New Credit. (2008). *Comprehensive community plan*. Mississaugas of the New Credit, Canada: MOTNC.

Mitchell, B. (2005). Integrated water resource management, institutional arrangements, and land-use planning. *Environment and Planning A, 37*(8), 1335-1352.

Morriseau, A. (2011). [Press release regarding Bill S-11]. Toronto, Canada: Chiefs of Ontario.

Nadasdy, P. (1999). The politics of TEK: Power and the "integration" of knowledge. *Arctic Anthropology*, *36*(1/2). 1–18. http://library.mtroyal.ca:2111/stable/40316502

Nadasdy, P. (2007). Adaptive co-management and the gospel of resilience. In D. Armitage & R. Plummer (Eds.), *Adaptive co-management: Collaboration, learning and multi-level governance*, (pp. 208–227). Vancouver, Canada: U of British Columbia P.

Natcher, D. C., Davis, S., & Hickey, C. G. (2005). Co-management: Managing relationships, not resources. *Human Organization, 64*(3), 240–250.

Natcher, D. C., Hickey, C. G., Nelson, M., & Davis, S. (2009). Implications of tenure insecurity for Aboriginal land use in Canada. *Human Organization*, *68*(3), 245–257. Retrieved from http://library.mtroyal.ca:2048/login?url=http://library.mtroyal.ca:2058/docview/201174377?accountid=1343

Nelson, D., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: Contributions of a resilience framework. *Annual Review of Environment and Resources, 32*, 395–419. Retrieved from http://doi.org/10.1146/annurev.energy.32.051807.090348

Nelson, R., Howden, M., & Smith, M. S. (2008). Using adaptive governance to rethink the way science supports Australian drought policy. *Environmental Science & Policy, 11*(7), 588–601.

North, D. (1990). *Institutions, institutional change and economic performance*. Cambridge ; NY: Cambridge UP.

Nowlan, L., & Bakker, K. (2007). Delegating water governance: Issues and challenges in the BC context. Vancouver, Canada: UBC Program on Water Governance.

O'Connor, D. (2002). Report of the Walkerton commission of inquiry - Ministry of the Attorney General (No. Part 2). Toronto, Canada: Ontario Ministry of the Attorney General. Retrieved March 2013 from http://www.attorneygeneral.jus.gov.on.ca/

english/about/pubs/walkerton/part2/

Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006). Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and Society, 11*(1), 18.

Olsson, P., Folke, C., Galaz, V., Hahn, T., & Schultz, L. (2007). Enhancing the fit through adaptive co-management: Creating and maintaining bridging functions for matching scales in the Kristianstads Vattenrike Biosphere Reserve Sweden. *Ecology and Society, 12*(1), 28. Retrieved April 2015 from http://www.unesco.org/mab/doc/euromab/doc/ES_sweden.pdf

Ontario Ministry of Aboriginal Affairs. (2015). Aboriginal glossary of terms. Retrieved June 2016 from https://www.ontario.ca/page/aboriginal-glossary-terms#section-6

Ontario Ministry of the Environment. (2003). Protecting Ontario's drinking water: Toward a watershed-based source protection framework. Toronto, Canada: Ontario Ministry of the Environment.

Ontario Ministry of the Environment. (2004). *White paper on watershed-based source protection planning*. Toronto, Canada: Queen's Printer for Ontario. Retrieved October 2011 from http://www.sourcewater.ca/SWP_Resources/swp_background_whitepaper.pdf

Ontario, (2015). Large landfill sites. Toronto, Canada: Government of Ontario. Retrieved March 2015 from https://www.ontario.ca/data/large-landfill-sites

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge, United Kingdom: Cambridge UP.

Pahl-Wostl, C., Sendzimir, J., Jeffrey, P., Aerts, J., Berkamp, G., & Cross, K. (2007). Managing change toward adaptive water management through social learning. *Ecology and Society, 12*(2), 30.

Pahl-Wostl, C., Gupta, J., & Petry, D. (2008). Governance and the global water system: A theoretical exploration. *Global Governance: A Review of Multilateralism and International Organizations, 14*(4), 419–435.

Pahl-Wostl, C., Sendzimir, J., & Jeffrey, P. (2009). Resources management in transition. *Ecology and Society, 14*(1), 46.

Pahl-Wostl, C., Lebel, L., Knieper, C., & Nikitina, E. (2012). From applying panaceas to mastering complexity: Toward adaptive water governance in river basins. *Environmental Science & Policy, 23*, 24–34.

Patrick, R. J. (2011). Uneven access to safe drinking water for First Nations in Canada: Connecting health and place through source water protection. *Health & Place*, *17*(1), 386–389.

Patton, M. Q. (2002). Qualitative Research & Evaluation Methods (3rd ed.). Thousand Oaks, CA: Sage.

Payne, G., & Payne, J. (2004). *Key concepts in social research*. London, United Kingdom: SAGE.

Pecoskie, T. (2013). *The new water treatment plant opens this fall: Will it solve the problem?* Hamilton, Canada: The Spectator. Retrieved November 2011 from http://search. proquest.com/canadiannews

Phare, M.-A. S. (2009). *Denying the source: The crisis of First Nations water rights*. Victoria, Canada: Rocky Mountain Books.

Pickering, M. (2008). *Research methods for cultural studies.* Edinburgh, Scotland: Edinburgh UP.

Pittman, J., Armitage, D., Alexander, S., Campbell, D., & Alleyne, M. (2015). Governance fit for climate change in a Caribbean coastal-marine context. *Marine Policy, 51*, 486–498. Retrieved March 2016 from http://doi.org/10.1016/j.marpol.2014.08.009

Plummer, R., & Armitage, D. (2007). Crossing Boundaries, Crossing Scales: The Evolution of

    Environment and Resource Co-Management. *Geography Compass*, *1*(4), 834-849.

Plummer, R., & Armitage, D. (2010). Integrating perspectives on adaptive capacity and

    environmental governance. In D. Armitage & R. Plummer (Eds.), *Adaptive capacity*

    and environmental governance (1st ed., pp. 1–19). Heidelberg, Germany: Springer.

Plummer, R., Spiers, A., FitzGibbon, J., & Imhof, J. (2005). The expanding institutional context

    for water resources management: The case of the Grand River watershed. *Canadian*

    Water Resources Journal 30(3), 227–244.

Plummer, R., de Grosbois, D., Armitage, D., & de Loë, R. C. (2013). An integrative assessment

    of water vulnerability in First Nation communities in Southern Ontario, Canada.

    Global Environmental Change, 23(4), 749–763.

Plummer, R., Velaniskis, J., de Grosbois, D., Kreutzwiser, R.D., & de Loë, R. C. (2010). The

    development of new environmental policies and processes in response to a crisis:

    The case of the multiple barrier approach for safe drinking water. *Environmental*

    Science & Policy 13(6): 535–548.

Pollution Probe. (2001). *The management and financing of drinking water systems:*

    Sustainable asset management. Toronto, Canada: Walkerton Inquiry.

Pomeroy, R. S., & Berkes, F. (1997). Two to tango: The role of government in fisheries co-

    management. *Marine Policy, 21*(5), 465–480. https://doi.org/10.1016/S0308-

    597X(97)00017-1

Ponterotto, J. G. (2005). Qualitative research in counseling psychology: A primer on

    research paradigms and philosophy of science. *Journal of Counseling Psychology,*

    52(2), 126.

Ransom, J. (1995). *The words that come before all else: Environmental philosophies of the*

    Haudenosaunee. Hogansburg, NY: Native North American Travelling College.

Ransom, J. (1997). Building new partnerships between Canadians and First Nations

 societies to achieve a sustainable seventh generation for all peoples. In D. Shrubsole

 & B. Mitchell (Eds.), *Practising sustainable water management: Canadian and*

 international experiences. Cambridge, NY: Canadian Water Resources Association.

Reed, M. S. (2008). Stakeholder participation for environmental management: A literature

 review. *Biological Conservation, 141*(10), 2417–2431.

Ritchie, S. D., Wabano, M. J., Beardy, J., Curran, J., Orkin, A., Vanderburgh, D., & Young, N. L.

 (2013). Community-based participatory research with Indigenous communities:

 The proximity paradox. *Health and Place, 24*, 183-189.

Rijke, J., Brown, R., Zevenbergen, C., Ashley, R., Farrelly, M., Morison, P., & van Herk, S.

 (2012). Fit-for-purpose governance: A framework to make adaptive governance

 operational. *Environmental Science & Policy, 22*, 73–84.

Rogers, P., & Hall, A. (2003). *Effective water governance*. Stockholm, Sweden: GWP

 Secretariat.

Rusnak, G. (1997). Co-management of natural resources in Canada: A review of concepts

 and case studies. Ottawa, Canada: International Development Research Centre.

 Retrieved from http://hdl.handle.net/10625/30126

Rutherford, M. (1995). The old and the new institutionalism: Can bridges be built? *Journal of*

 Economic Issues, 29(2), 443–451.

Ryan, G. W., & Bernard, H. R. (2003). Techniques to identify themes. *Field Methods, 15*(1),

 85–109.

Sabatier, P. A., Focht, W., Lubell, M., Trachtenberg, Z., Vedlitz, A., & Matlock, M. (2005).

 Collaborative approaches to watershed management. In P. Sabatier, W. Focht, M.

 Lubell, Z. Trachtenberg, A. Vedlitz, M. Matlock, (Eds.), *Swimming upstream:*

Collaborative approaches to watershed management (pp. 3–21). Cambridge, MA: The MIT P.

Safe Drinking Water Act (2002, S.O. 2002, c. 32), Retrieved August 2011 from https://www.ontario.ca/laws/regulation/030169

Safe Drinking Water Foundation. (2009). A review of the engagement sessions for the federal action plan on safe drinking water for First Nations. *Team Advanced Aboriginal Water Treatment*, 1-17.

Saldaña, J. (2010). *The coding manual for qualitative researchers*. London, United Kingdom: SAGE.

Saravanan, V. (2009). Decentralisation and water resources management in the Indian Himalayas: The contribution of new institutional theories. *Conservation and Society, 7*(3), 176.

Scoones, I. (1998). Sustainable rural livelihoods: A framework for analysis (IDS working paper no. 72). Brighton, United Kingdom: IDS.

Scott, W. R. (1995). *Institutions and Organizations* (2nd ed.). Thousand Oaks, CA: Sage.

Simeone, T. (2010). *Safe drinking water in First Nations communities* (Library of Parliament). Ottawa, Canada: Parliamentary Information and Research Service.

Six Nations of the Grand River. (2007). *Six Nations community-based source water protection plan*. Six Nations, Canada: Six Nations Council - Environmental Office.

Six Nations of the Grand River. (2010). *Six Nations community profile*. Oshweken, Canada: Six Nations of the Grand River.

Smith, L. T. (1999). Decolonizing methodologies: Research and indigenous peoples. Zed books. Retrieved from https://books.google.ca/books?hl=en&lr=&id=Nad7afStdr8C&oi=fnd&pg=PR9&dq=decolonizing+research+methodology&ots=lDlDa5vF9m&sig=3jAPq_eKnwpUGYx8mtjExe4MrGE

Smith, D. B. (1987). *Sacred feathers: The reverend Peter Jones (Kahkewaquonaby) and the Mississauga Indians.* Toronto, Canada: U of Toronto P, Scholarly Publishing Division.

Smith, S. (2009). *Exploring the source water protection interface between Six Nations of the Grand River and the province of Ontario* (MA Thesis), Guelph, Canada: University of Guelph.

Southern First Nations Secretariat. (2001). *Assessment study of water and wastewater systems and associated water management practices in Ontario First Nation Communities.* Bothwell, Canada: SFNS. Retrieved June 2011 from http://www.cbc.ca/slowboil/documents.html

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, Canada: Sage.

Standing Senate Committee on Aboriginal Peoples. (2007). *Safe drinking water for First Nations: Final report of the Standing Committee on Aboriginal Peoples*. Retrieved April 2015 from http://www.parl.gc.ca/Content/SEN/Committee /391/abor/rep/rep08jun07-e.htm

Standish, R., Copeland, T., & Donnelly, P. (2010). *Thames River clear water revival: A proposal for an integrated watershed strategy.* London, Canada: City of London Wastewater and Drainage Engineering.

Stringer, L., Dougill, A., Fraser, E., Hubacek, K., Prell, C., & Reed, M. (2006). Unpacking "participation" in the adaptive management of social–ecological systems: A critical review. *Ecology and Society, 11*(2). Retrieved from http://www.ecologyandsociety.org/ vol11/iss2/art39/main.html

Swain, L., Louttit, S., & Hrudey, S. (2006a). *Report of the expert panel on safe drinking water for First Nations.* (Vol. 1, pp. 1–79). Ottawa, Canada: Ministry of Public Works and Government Services Canada.

Swain, L., Louttit, S., & Hrudey, S. (2006b). *Report of the expert panel on safe drinking water for First Nations.* (Vol. 2, pp. 1–164). Ottawa, Canada: Ministry of Public Works and Government Services Canada.

Tait, P. (2007). *Systems of conflict resolution within First Nations communities: Honouring the elders, honouring the knowledge.* Ottawa, Canada: National Centre for First Nations Governance.

Thornton, A. (2012). *Implications of Bill S-8 and Federal Regulation of Drinking Water in First Nation Communities.* [Powerpoint slides] Retrieved from http://www.afn.ca/ uploads/files/parliamentary/legalanaylsis.pdf

Turner, D. (2006). This is not a peace pipe: Towards a critical indigenous philosophy (1st ed.). Toronto, Canada: U of Toronto P, Scholarly Publishing Division.

United Nations. (2008). *United Nations declaration of the rights of Indigenous Peoples.* New York, NY: United Nations. Retrieved from http://www.un.org/esa/socdev/ unpfii/documents/DRIPS_en.pdf

United Nations World Water Assessment Programme. (2003). *Water for people water for life: The United Nations world water development report.* New York, NY: UNESCO.

United Nations World Water Assessment Programme. (2015). *The United Nations world water development report 2015.* Paris, France: UNESCO.

Van de Vijver, Fons, J.R., & Kwok, L. (1997). Methods and data analysis for cross-cultural research. (Volume 1). Thousand Oaks, CA: Sage.

Vatn, A. (2005). *Institutions and the environment.* Northampton, MA: Edward Elgar.

Vatn, A., & Vedeld, P. (2012). Fit, interplay, and scale: A diagnosis. *Ecology and Society, 17*(4).

von der Porten, S., & de Loë, R. C. (2013). Water governance and Indigenous governance: Towards a synthesis. *Indigenous Policy Journal, 23*(4). Retrieved from http://blog.indigenouspolicy.org/index.php/ipj/article/view/148

von der Porten, S., & de Loë, R. C. (2013). Collaborative approaches to governance for water

    and Indigenous peoples: A case study from British Columbia, Canada. *Geoforum, 50*,

    149–160.

Walkem, A. (2006). The Land is dry: Indigenous Peoples, water, and environmental justice.

    In K. Bakker (Ed.), *Eau Canada: The Future of Canada's Water* (illustrated edition.). U

    of British Columbia P.

Walker, B., C. S. Holling, S. R. Carpenter, & A. Kinzig. (2004). Resilience, adaptability and

    transformability in social–ecological systems. *Ecology and Society, 9*(2). Retrieved

    from http://www.ecologyandsociety.org/vol9/iss2/art5/

Walters, C. J. (1986). *Adaptive management of renewable resources*. Retrieved from

    http://pure.iiasa.ac.at/2752

Walters, C. (1997). Challenges in adaptive management of riparian and coastal ecosystems.

    Conservation Ecology, 2(1). Retrieved from https://www.gcmrc.gov/library/

    reports/Adaptive_Management /Walters1997.pdf

Walters, D., N. Spence, K. Kuikman, & B. Singh. (2012). Multi-barrier protection of drinking

    water systems in Ontario: A comparison of First Nation and non-First Nation

    communities. *The International Indigenous Policy Journal, 3*(3), 1-23. Retrieved

    March 2013 from http://ir.lib.uwo.ca/iipj/vol3/iss3/8

Watson, A., Alessa, L., & Glaspell, B. (2003). The relationship between traditional ecological

    knowledge, evolving cultures, and wilderness protection in the circumpolar north.

    Conservation Ecology, 8(1).

White, J., Murphy, L., & Spence, N. (2012). Water and Indigenous Peoples: Canada's paradox.

    The International Indigenous Policy Journal, 3(3). Retrieved from

    http://ir.lib.uwo.ca/iipj/vol3/iss3/3

Wong, D., (2010), *Water plant crucial for Six Nations*. Hamilton, Canada: The Spectator.

Yin, R. K. (1998). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). Thousand Oaks, CA: Sage.

Young, O. (2002). *The institutional dimensions of environmental change: Fit, interplay, and scale* (1st ed.). Cambridge, MA.: The MIT P.

Young, O. (2008). Institutions and environmental change: The scientific legacy of a decade of IDGEC research. In O. Young, L. A. King, H. Schroeder, (Eds.), *Institutions and environmental change: Principal findings, applications, and research frontiers* (1st ed., pp. 1–45). Cambridge, MA.: The MIT P.

Appendices

Appendix A – Letter of invitation and consent

Letter/Script of Invitation/Consent – Key Informant Interviews On-Reserve

Hello, my name is {*insert name of community partner/principal student researcher*}. I am a {*insert description of title/role and affiliated organization of community partner/principal student researcher*}. I would like to invite you to participate in an interview for the research project: *First Nations and Water: Building Adaptive Water Governance in Southern Ontario*. This research makes up the final stage of the overarching multi-year collaborative research project entitled: *First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance*. Through this overarching project, this research is made up of a partnership that includes three First Nation Community partners (Oneida Nations of the Thames, Six Nations of the Grand River, and Mississaugas of the New Credit First Nation), three university partners (Wilfrid Laurier University, Brock University, and the University of Waterloo), and two organizational partners (Centre for Indigenous Environmental Resources, and Environment Canada). This research is financially supported by the Social Science and Humanities Research Council of Canada, and with in-kind contributions from each of the partners.

This research builds on previous research with the purpose to identify factors that influence water governance within {*insert community name*} and develop strategies for its improvement. Should you choose to participate in the interview, information (e.g., ideas, concerns, etc.) that you provide will be used to help understand and develop strategies to improve water governance in {*insert community name*}. The interview will take approximately 1 hour.

The aim of this research is to directly benefit {*insert community name*} by building on previous assessments of the situation of water by identifying strategies to improve that situation.

The information that is collected is for research purposes. Feedback about the information that you provide is anticipated by April 01, 2013. The information collected will be shared with *{insert community name}* through community publications, newspaper, etc., and with the community partner and/or community researcher. Information collected may also be reported in written reports, journal articles and presentations.

The information that you provide will be very important for understanding the factors that facilitate or constrain water governance and will provide insight into strategies for improving it. To assure accuracy, I would like to record the interview and take notes. After the interview, the recording will be transcribed. You will be given the opportunity to review the transcript for meaning and accuracy. The recording and notes will only be accessible to {*insert community partner, community researcher, and/or principal student researcher*}. The recording and notes will be stored in a secure place. The information will be kept for three years or until one year after the last publication (whichever is longer) and then destroyed. I would like to use your name or the name of your organization to cite information in written reports, article journals, and presentations and list you as a participant in this research. If you notify me or the community partner to not to have your name used, a descriptor will be used in its place. If you choose to have your name replaced by a descriptor, there remains a small possibility of you being inadvertently identified

through your connections/involvement with your community/organization or through information that is collected for research purposes (e.g., documents, archival materials, articles). To reduce this possibility, I will, to the best of my abilities, recognize potential identifiers located in collected research materials and protect them from being disclosed (e.g., through the use of a descriptor, etc.).

There may be potential minimal risks associated with this research. In particular, the information that you provide may become identifiable through your association or involvement with your community/organization/project. There is minimal risk that information that you provide may negatively influence your relationships with peers, colleagues, and/or associated communities or organizations. This potential minimal risk may exist with or without the use of a descriptor. To reduce this risk, you will have the opportunity to review your interview transcript to make any clarifications or amendments necessary.

Participation is voluntary and you can refuse to answer any question. You are welcome to withdraw at any time. Additionally, at any time after the interview you are welcome to withdraw. Should you wish to withdraw, information that you have provided will not be used and any notes and recordings will be shredded or deleted.

To thank you for your time participating in this research, you will be provided an incentive of $50 after you have completed the interview. If you complete the interview and subsequently withdraw at a later time, you are under no obligation to return the incentive amount.

If you have any questions, please feel free to contact Thomas Dyck, at Wilfrid Laurier University (519-884-0710 Ext. 3872 or leave a message at Ext. 4471, dyck3730@mylaurier.ca). This study has been reviewed and received ethics clearance through Brock University`s Research Ethics Board {*insert ethics file number}* and {*insert community and respective ethics process*}. If you have any questions about your role as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you very much for your time and consideration,

Community Researcher	Thomas Dyck,
{*insert community researcher details*}	PhD Candidate
	Department of Geography and Environmental Studies
	Wilfrid Laurier University
	Phone: (519) 884-0710 Ext. 3872
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Letter/Script of Invitation/Consent – Key Informant Interviews Off-Reserve)

Hello, my name is Thomas Dyck. I am a student at Wilfrid Laurier University from the Department of Geography and Environmental Studies. I would like to invite you to participate in an interview for the research project: *First Nations and Water: Building Adaptive Water Governance in Southern Ontario*. This research makes up the final stage of the overarching multi-year collaborative research project entitled: *First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance*. Through this overarching project, this research is made up of a partnerships that includes three First Nation Community partners (Oneida Nations of the Thames, Six Nations of the Grand River, and Mississaugas of the New Credit First Nation), three university partners (Wilfrid Laurier University, Brock University, and the University of Waterloo), and two organizational partners (Centre for Indigenous Environmental Resources, and Environment Canada). This research is financially supported by the Social Science and Humanities Research Council of Canada, and with in-kind contributions from each of the partners.

This research builds on previous research, with the purpose to identify factors that influence water governance within {*insert community name*} and develop strategies for its improvement. Should you choose to participate in the interview, information (e.g., ideas, concerns, etc.) that you provide will be used to help understand and develop strategies to improve water governance in {*insert community name*}. The interview will take approximately 1 hour.

The aim of this research is to directly benefit {*insert community name*} by building on previous assessments of the situation of water by identifying strategies to improve that situation.

The information that is collected is for research purposes. Feedback about the information that you provide in the form of an interview summary report is anticipated by April 01, 2013. The information collected will be shared with *{insert community name}*, through community publications, newspaper, etc. and with the community partner and/or community researcher. Information collected may also be reported in written reports, journal articles and presentation.

The information that you provide will be very important for understanding the factors that facilitate or constrain water governance and will provide insight into strategies for improving it. To assure accuracy, I would like to record the interview and take notes. After the interview, the recording will be transcribed. You will be given the opportunity to review the transcript for meaning and accuracy. The recording and notes will only be accessible to me and the community partner. The recording and notes will be stored in a secure place. The information will be kept for three years or until one year after the last publication (whichever is longer) and then destroyed. I would like to use your name or the name of your organization to cite information in written reports, article journals, and presentations and list you as a participant in this research. If you notify me to not to have your name used, a descriptor will be used in its place. If you choose to have your name replaced by a descriptor, there remains a small possibility of you being inadvertently identified through your connections/involvement with your community/organization or through information that is collected for research purposes (e.g., documents, archival materials, articles). To reduce this possibility, I will, to the best of my abilities, recognize

potential identifiers located in collected research materials and protect them from being disclosed (e.g., through the use of a descriptor, etc.).

There may be potential minimal risks associated with this research. In particular, the information that you provide may become identifiable through your association or involvement with your community/organization/project. There is minimal risk that information that you provide may negatively influence your relationships with peers, colleagues, and/or associated communities or organizations. This potential minimal risk may exist with or without the use of a descriptor. To reduce this risk, you will have the opportunity to review your interview transcript to make any clarifications or amendments necessary.

Participation is voluntary and you can refuse to answer any question. You are welcome to withdraw at any time. Additionally, at any time after the interview you are welcome to withdraw. Should you wish to withdraw any notes and recordings will be shredded or deleted.

If you have any questions, please feel free to contact Thomas Dyck, at Wilfrid Laurier University (519-884-0710 Ext. 3872 or leave a message at Ext. 4471, dyck3730@mylaurier.ca). This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University {*insert ethics file number*}. If you have any questions about your role as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you very much for your time and consideration. Please keep a copy of this form for your records.

Thomas Dyck,
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CONSENT FORM

I agree to participate in this research described above. I have made this decision based on the information I have read in the Invitation-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: _____

Signature: _____Date: _____

Letter/Script of Consent to Collect and Use Personal Information On-Reserve

Hello, my name is {*insert name of community partner/principal student researcher*}. I am a {*insert description of title/role and affiliated organization of community partner/principal student researcher*}. I am involved in the research project entitled: *First Nations and Water: Building Adaptive Water Governance in Southern Ontario*. This research makes up the final stage of the overarching multi-year collaborative research project entitled: *First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance*. Through this overarching project, this research is made up of a partnerships that includes three First Nation Community partners (Oneida Nations of the Thames, Six Nations of the Grand River, and Mississaugas of the New Credit First Nation), three university partners (Wilfrid Laurier University, Brock University, and the University of Waterloo), and an organizational partner (Centre for Indigenous Environmental Resources). This research is financially supported by the Social Science and Humanities Research Council of Canada, and with in-kind contributions from each of the partners.

This research builds on previous research with the purpose to identify factors that influence water governance within {*insert community name*} and develop strategies for its improvement. Information collected (e.g., themes, concerns, ideas, etc.) through the duration of this {*insert event or affair to be observed (e.g., workshop)*} relevant to water governance will be used to help understand and develop strategies to improve water governance in {*insert community name*}.

The aim of this research is to directly benefit {*insert community name*} by building on previous assessments of the situation of water by identifying strategies to improve that situation.

The information that is collected is for research purposes. Feedback about the information that you provide is anticipated by April 01, 2013 in the form of a summary report and will be available through the community partner. The information collected will be shared with {*insert community name}* through community publications, newspaper, etc., and the community partner and/or community researcher. Information collected may also be reported in written reports, journal articles and presentations.

The information collected during this {*insert event or affair to be observed (e.g., workshop)*} will be very important for understanding the factors that facilitate or constrain water governance and will provide insight into strategies for improving it. I will make notes on this information. The notes will be stored in a secure place and viewed only by myself, community partner and/or community researcher. The information will be kept for three years or until one year after the last publication (whichever is longer) and then destroyed. With your permission, I would like to use your name or the name of your organization to cite information in written reports, article journals, and presentations and list you as a participant in this research. If you notify me or the community partner to not have your name used, a descriptor will be used in its place. If you choose to have your name replaced by a descriptor, there remains a small possibility of you being inadvertently identified through your connections/involvement with your community/organization or through information that is collected for research purposes (e.g., documents, archival materials, articles). To reduce this possibility, I will, to the best of my abilities, recognize potential identifiers located in collected research materials and protect them from being disclosed (e.g., through the use of a descriptor, etc.).

There may be potential minimal risks associated with this research. In particular, the information that you provide may become identifiable through your association or involvement with your community/organization/project. There is minimal risk that information that you provide may negatively influence your relationships with peers, colleagues, and/or associated communities or organizations. This potential minimal risk may exist with or without the use of a descriptor. To reduce this risk, you will have the opportunity to review your interview transcript to make any clarifications or amendments necessary.

The use of your name or the name of your organization in this research is voluntary. You are welcome to withdraw at any time. Additionally, at any time after the {*insert event or affair to be observed (e.g., workshop)*} you are welcome to withdraw. Should you wish to withdraw, any personal information (e.g., name, address, position/role, etc.) that you have provided will be shredded or deleted.

If you have any questions, please feel free to contact Thomas Dyck, at Wilfrid Laurier University (519-884-0710 Ext. 3872 or leave a message at Ext. 4471, dyck3730@mylaurier.ca). This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board {*insert ethics file number*} and {*insert community and respective ethics process*}. If you have any questions about your role as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you very much for your time and consideration,

Community Researcher
{*insert community researcher details*}

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Letter of Consent to Collect and Use Personal Information at an event Off-Reserve

Hello, my name is Thomas Dyck. I am a student at Wilfrid Laurier University from the Department of Geography and Environmental Studies. I am a researcher for the project entitled: *First Nations and Water: Building Adaptive Water Governance in Southern Ontario*. This research makes up the final stage of the overarching multi-year collaborative research project entitled: *First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance*. Through this overarching project, this research is made up of a partnerships that includes three First Nation Community partners (Oneida Nations of the Thames, Six Nations of the Grand River, and Mississaugas of the New Credit First Nation), three university partners (Wilfrid Laurier University, Brock University, and the University of Waterloo), and two organizational partners (Centre for Indigenous Environmental Resources, and Environment Canada). This research is financially supported by the Social Science and Humanities Research Council of Canada, and with in-kind contributions from each of the partners.

This research builds on previous research with the purpose to identify factors that influence water governance within {*insert community name*} and develop strategies for its improvement. Information collected (e.g., themes, concerns, ideas, etc.) through the duration of this {*insert event or affair to be observed (e.g., workshop, meeting, etc.)*} relevant to water governance will be used to help understand and develop strategies to improve water governance in {*insert community name*}.

The aim of this research is to directly benefit {*insert community name*} by building on previous assessments of the situation of water by identifying strategies to improve that situation.

The information that is collected is for research purposes. The information collected will be shared with *{insert community name}* through community publications, newspaper, etc., the community partner, and/or community researcher. Information collected may also be reported in written reports, journal articles and presentations.

The information collected during this {*insert event or affair to be observed (e.g., workshop, meeting, etc.)*} will be very important for understanding the factors that facilitate or constrain water governance and will provide insight into strategies for improving it. I will make notes on this information. The notes will be stored in a secure place and viewed only by myself, community partner and/or community researcher. The information will be kept for three years or until one year after the last publication (whichever is longer) and then destroyed. With your permission, I would like to use your name or the name of your organization to cite information in written reports, article journals, and presentations and list you as a participant in this research. If you notify me to not have your name used, a descriptor will be used in its place. If you choose to have your name replaced by a descriptor, there remains a small possibility of you being inadvertently identified through your connections/involvement with your community/organization or through information that is collected for research purposes (e.g., documents, archival materials, articles). To reduce this possibility, I will, to the best of my abilities, recognize potential identifiers located in collected research materials and protect them from being disclosed (e.g., through the use of a descriptor, etc.).

There may be potential minimal risks associated with this research. In particular, the information that you provide may become identifiable through your association or involvement with your community/organization/project. There is minimal risk that information that you provide may negatively influence your relationships with peers, colleagues, and/or associated communities or organizations. This potential minimal risk may exist with or without the use of a descriptor. To reduce this risk, you will have the opportunity to review your interview transcript to make any clarifications or amendments necessary.

The use of your name or the name of your organization in this research is voluntary. You are welcome to withdraw at any time. Additionally, at any time after the {*insert event or affair to be observed (e.g., workshop, meeting, etc.)*} you are welcome to withdraw. Should you wish to withdraw, any personal information (e.g., name, address, position/role, etc.) that you have provided will be shredded or deleted.

If you have any questions, please feel free to contact Thomas Dyck, at Wilfrid Laurier University (519-884-0710 Ext. 3872 or leave a message at Ext. 4471, dyck3730@mylaurier.ca). This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board {*insert ethics file number*}. If you have any questions about your role as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you very much for your time and consideration,

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Appendix B – Interview question guides

STAGE 1: Key informant Interview Guide

First Nations and Water Project: Semi-structured interview script
First Interviewer Name: «First_Interviewers_Name»
Second Interviewer Name: «Second_Interviewer_Name»
Participant Name: «Participant_Name»
Community: «Community_Name»
Location: «Location»
Time and Date: «Time», «Date»
Audio Filename:

Meaning of Water
1. Can you please share with me the meaning of water in your culture?
2. Can you please share with me the role of water in your culture? (role of women, ceremony)
3. How common is traditional knowledge pertaining to water in «Community_Name»?
4. How is traditional knowledge pertaining to water acquired? (Elders, family, schools and camp)
5. How is traditional knowledge pertaining to water used? (If you have traditional knowledge about water, how would you use it?)

Water Governance and Management
1. Please briefly describe your role in water management within «Community_Name»?
2. In your opinion, has there been water related issues within «Community_Name»? If yes, what kind of water issues does «Community_Name» experience?
3. If Yes to question 2: Can you describe what happens when «Community_Name» is confronted with water related issues?
4. Can you please tell me some of the things (programs or activities) that «Community_Name» does to promote safe drinking water?
5. Do you feel that these things (programs or activities) are affective in promoting safe drinking water? Why or why not?
6. Are there other things (programs, activities, quality, quantity, management, environmental) that could be done to improve the water (drinking water, rivers, streams, groundwater in «Community_Name»?
7. In your opinion, how are decisions made about water management within «Community_Name»?
8. In your opinion, how are decisions made about water management within the «Watershed» watershed?
9. Are you aware of any off reserve water management efforts that have linkages with «Community_Name» (watershed, province)? Explain.
10. How well are off reserve water management efforts able to address water management concerns in «Community_Name»?
11. In your opinion, is traditional knowledge pertaining to water incorporated into water management in «Community_Name».
12. If yes is answered for question 11: How is traditional knowledge incorporated into water management in «Community_Name»?

Stage 2 and 3: Key informant Interview Guide

Note to the Research Ethics Board: The following interview questions will be used as a guide when conducting interviews both on-reserve and off-reserve. These questions build on interview questions already asked in Action 2 and 3 (REB 09-262). Whenever possible, the same key informants from each respective community will be interviewed. These questions are guides and will be adjusted to fit the participant's background, role, or situation.

1. Please describe the ways (e.g. regulations, cultural norms, economic incentives) in which water (drinking water, rivers, streams etc.) is managed.
2. Who participates in these ways of managing water?
3. In your experience, how would you describe the relationships between the various people and/or organizations involved in water management?
4. In your opinion, to what degree do aspects of water management (e.g., monitoring, education, and treatment) overlap between departments, organizations, or programs? Please describe.
5. How does/would the incorporation (or lack of incorporation) of diverse knowledge sets (e.g., traditional knowledge) into decisions making processes influence water management?
6. In your opinion, is the decision making process appropriately balanced between those involved in water management (e.g., federal government, provincial government, Band Council, conservation authorities)?
7. In your opinion, have past events, relationships, and/or circumstances played a significant role in the decision making process surrounding water?
8. More broadly, in your opinion have past events, relationships, and/or circumstances played a significant role in shaping water management today?
9. Are there ways to pass on knowledge about what has been experienced in the past (political, environmental, social, and economic)? If so, please explain.

Appendix C – Research observation guide

Research Observation Guide

Date: _____

Event: _____

Location: _____

Strategies for Adaptive Water Governance to Observe	Description of Strategy	Characteristics to Observe
Analytic Deliberation	The process of how actors interact with the goal to "define [what is] to be understood, to identify the values and outcomes of concern, to distinguish disagreements that must be addressed through compromise and tradeoff from those that might be resolved with better information, and to agree on appropriate ways to collect and interpret the needed information" (Dietz and Stern 1998, 442)	Observe how values are included (or not included) in decision making process.
		Observe the nature of communication between individuals, groups, organizations, departments etc.
		Observe the level of participation of individuals, groups, organizations, departments etc. in water management activities (e.g., decision making, implementation, evaluation, etc.).
		Observe how information flows across or within levels (e.g., national, provincial, municipal, local, etc.).
		Observe feedback loops of information gathering and reflection that inform future decisions and direction.
		Observe how collective memory of past experiences is supported.
Institutional Variety	The employment of multiple types of institutions for governing resources (Akamani and Wilson 2011)	Observe different types of institutions or systems of rules for governing resources (regulations, cultural norms, economic incentives, etc.) and how they are employed.
		Observe the level of participation
Nesting	A response that recognizes that the focus on a single level of scale is inadequate in dealing with complex social ecological systems (Akamani and Wilson 2011)	Observe the nature and location of decision making authority (e.g., single actor of authority, multiple centres of authority, etc.).
		Observe any redundant function in water management across or within levels (e.g., redundant monitoring, regulations, etc.).

Appendix D – Community report back materials

Ensuring that the First Nation case study communities had opportunity to be informed about the research results, ask questions about the research and provide feedback, the core findings of this dissertation were presented at community events (e.g., community picnic, fall fair) in the form of an information booth. The process of presenting research results and attaining feedback was developed in collaboration with the research partners, including design, and presentation. The process of using an information booth was determined by the research partner to be the best way to reach respective community members.

Water issues are a concern within each community. How members experience water within their community was taken into consideration with the design. The goal of the booth was to provide opportunities for community members to learn about the research, it's findings, and discuss the research, ask questions and provide feedback. As an outsider to the community, I along with the community partners felt that the best way to express ideas and concerns within the community is through the voices of community members that are knowledgeable about water.

The booth consisted of three portal style displays each outlining a major finding from the research (see images below). Accompanying each portal was a recording of an actual community member discussing an issue about water in their community[28]. Visitors to the booth could read the findings and then listen (using an MP3 player with headphones) to a fellow community member discuss a water issues pertaining to the finding.

The booth was presented at multiple events within each community (2 in Six Nations, 1 in Oneida, and 3 in New Credit). Overall, each community received the booths well and were curious about what their community is saying about water. This was particularly true for children. Children attending the events were drawn to the MP3 players and listened intently to the recordings in each booth. In one event that took place in New Credit, the booth was visited by over 40 children in one afternoon.

Supplementary materials were also provided at the booth for community members to take home with them if desired. Materials provided included a 1 page summary of research and its findings, CDs with a copy of the recordings and an electronic version of the one page summary. See below for a sample of these materials.

---

[28] Recordings were captured during the semi-structured interview process. In some cases depending on advice from research partner and clearance from the Elected Chief and Council some voices were dubbed over to maintain anonymity

Community report back booth in Six Nations at a community event
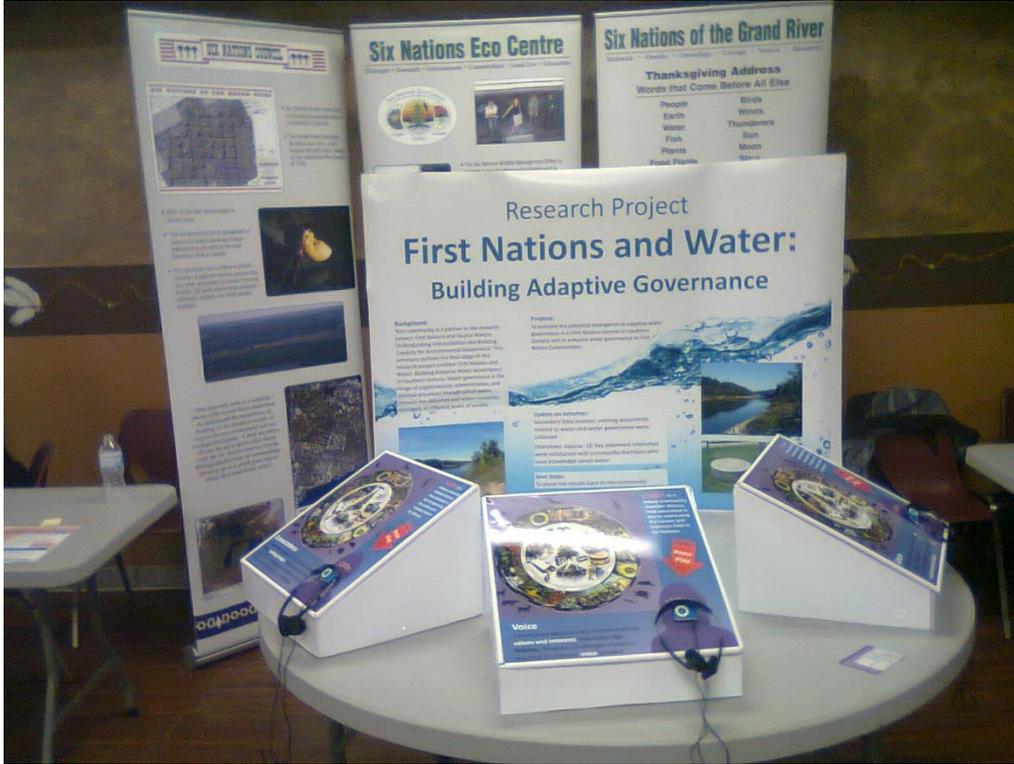
Students listening at booth to research findings during the New Credit Community Health Career Fair

Sample of booth material that was presented in each community

New Credit booth design

Accompanying audio quote

"We as first nations people, I myself looked at all the different treaties and no place does it name water in the inside of the treaties. I urged my Chiefs and from that was developed the water policies that we utilize for first nations on what we look at what our issues are, because [federal and provincial governments] never consult... We are talking about Chiefs of Ontario.
And so years ago I've seen that that is there, so I said to them, I went to the lawyers why they doing this? They have no regard for the first nation people when it comes to water and if they did they would've engaged us in the discussion long ago maybe we could've looked at it. Being not consulted at all is really hard on me.
Even though [federal and provincial governments] developed all kinds of different safeguards for the general populace the First Nations Peoples, when it comes to their regards for waters, they do not look at us as an entity in any of their planning any of the regulations."

"How it started was just saving the trees in the grove. Because the grove was always been called the grove"... "...So we started to hold the pow wow there and just that compaction of the soil and stuff like that, it all looked good, but it started to, the trees started to die, because we held an event there, a public event. Then the trees were dying due to compaction, lots of things, drought, Gipson moth, and tree disease, and then compaction of the soil. We just created a whole circle of things that caused the trees to die, so then we have to cut them down because they are dying we have people sitting under them, one year we cut down 10 trees. I said we have to do something. I call it we were loving it to death. We all wanted to be there, cause just being amongst the trees is such a special thing, I thought we should leave and host the powwow somewhere else for a couple of years until this rejuvenates, which is like a traditional concept. You`ve spent it abilities, move on, let it rejuvenated, as we go around we come back to it. Giving it time to get its strength back"...
"...If we are keepers of mother earth here, we can't keep doing what we are doing. We need to look at remediation. Helping it. If we are going to go in there and impact it, then we have to help it get back to its own life".

"It's sort of off-balance because in a sense, like I said, we would love to be able to, when we started the water system on New Credit, we would love to be able to give everybody water at the end, but because of the money funding there, well that's getting unbalanced right away stuff that we need, and what, we want cannot always get it. ...We didn't have the money and we didn't have the power to do it we have the ability to do it, but not, you know, the money. ...Yes we can't tell them to give it to us."

Booth background display board

One Page Research Summary

First Nations and Water: Building Adaptive Water Governance Research Project

Research Summary and Update

Background:
Six Nations of the Grand River is a partner in the research project: First Nations and Source Waters: Understanding Vulnerabilities and Building Capacity for Environmental Governance. This summary outlines the final stage of this research project entitled: First Nations and Water: Building Adaptive Water Governance in Southern Ontario. Water governance is the range of organizational, administrative, and political processes through which water services are delivered and water resources managed, at different levels of society.

Purpose: to examine the potential emergence of adaptive water governance in a First Nations context in southern Ontario and to enhance water governance in First Nation Communities.

Objectives:
1. Characterize and examine how water is managed and governed;
2. Identify and understand what aspects of water governance facilitate or constrain adaptive water governance in Six Nations
3. Identify strategies, opportunities, and policy changes that foster adaptive governance.

Ethical Process: A "Living Ethics" document was adopted at the first research team meeting (November, 2009) which establishes principles for how the research team works together. Prior to conducting any research, the Research Ethics Board from Brock University, Wilfrid Laurier University as well as Six Nations Chief and Council reviewed the project. All ethics processes granted clearance for the activities described below.

Update on Activities:
- Document collection: existing documents related to water and water governance were collected
- Interviews: 8 key informant interviews were conducted with community members who have knowledge about water

Next Steps: To share the results back to the community. All secondary information collected as well as a final report and workbook will be provided to Paul General.

Acknowledgements and Support:

Preliminary Interview Results

How do values and interests get expressed in water decision making?

Community decisions are informed by the values and interests held within Six Nations. However, challenges remain in assuring Six Nations' voice is heard.

In what ways is your water governed?

Six Nations has multiple ways to govern water resources that include:
- federal regulations;
- provincial regulations (as guidelines), and;
- cultural norms and values.

How is Six Nations connected with others to govern water resources?

Six Nations recognizes the multi-level nature of water governance, building linkages with governments and organizations. However, an imbalance in decision making power continues to be a challenge.

Please note: Results are preliminary