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Source Water Protection Planning for Ontario First Nations Communities: Case Studies Identifying Challenges and Outcomes

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Received: 29 April 2017; Accepted: 18 July 2017; Published: 22 July 2017

Abstract: After the Walkerton tragedy in 2000, where drinking water contamination left seven people dead and many suffering from chronic illness, the Province of Ontario, Canada implemented policies to develop Source Water Protection (SWP) plans. Under the Clean Water Act (2006), thirty-six regional Conservation Authorities were mandated to develop watershed-based SWP plans under 19 Source Protection Regions. Most First Nations in Ontario are outside of these Source Protection Regions and reserve lands are under Federal jurisdiction. This paper explores how First Nations in Ontario are attempting to address SWP to improve drinking water quality in their communities even though these communities are not part of the Ontario SWP framework. The case studies highlight the gap between the regulatory requirements of the Federal and Provincial governments and the challenges for First Nations in Ontario from lack of funding to implement solutions to address the threats identified in SWP planning. This analysis of different approaches taken by Ontario First Nations shows that the Ontario framework for SWP planning is not an option for the majority of First Nations communities, and does not adequately address threats originating on reserve lands. First Nations attempting to address on-reserve threats to drinking water are using a variety of resources and approaches to develop community SWP plans. However, a common theme of all the cases surveyed is a lack of funding to support implementing solutions for the threats identified by the SWP planning process. Federal government initiatives to address the chronic problem of boil water advisories within Indigenous communities do not recognize SWP planning as a cost-effective tool for improving drinking water quality.

Keywords: source water protection; planning; drinking water; First Nations; Ontario; Canada

1. Introduction

The Province of Ontario implemented policies to develop Source Water Protection (SWP) plans for sources of municipal drinking water after the tragic events in Walkerton, ON, Canada in May of 2000. In this small rural town, the public water supply serving approximately 4800 people was contaminated through a series of events that began with a heavy rainstorm lasting from 8 to 12 May 2000 that carried surface water runoff containing cattle manure from a local farm into the groundwater that supplied municipal well number 5 [1].

A judicial inquiry, led by Justice Dennis O'Connor was launched to investigate the events that resulted in the fatal E. coli outbreak. The findings of the inquiry were published as two detailed reports. Part 1 details the events that led to the contamination, and Part 2 makes recommendations for protecting Ontario's drinking water sources through a "multiple barrier approach" [2]. The Inquiry

found that there were several shortcomings in the operation and monitoring of the Walkerton water system that resulted in the contamination. Furthermore, Justice O'Connor addressed the First Nation context in Part 1 when he observed "that water is not provided for Aboriginal people at the standards that generally prevail throughout Ontario" [1] (p. 486). In summary, O'Connor found the situation facing First Nations for access to safe drinking water was far more dire than in the rest of the Province.

Part 2 of the Walkerton Report listed 121 recommendations to ensure drinking water safety throughout the Province, including protection of the sources of water, and improvements to the treatment, distribution, testing and monitoring of drinking water [2].

In response to the 121 recommendations, the Ontario Government enacted and implemented the Clean Water Act, 2006 [3,4]. The Act mandated protection of drinking water at multiple points, the first being to protect the sources of water for human consumption from contamination prior to treatment and delivery.

Further protective measures were recommended to provide proper treatment, storage and delivery to consumers. This multi-barrier approach includes treatment and disinfection, maintenance of the distribution network to ensure that no contamination can take place during distribution, monitoring and testing of finished water on a regular basis, as well as contingency planning for adverse conditions [5]. The Clean Water Act sets out the regulatory framework for Source Water Protection (SWP) for Ontario. SWP is ultimately a public health strategy that is designed to minimize the possibility of contaminants entering the public drinking water supply.

The Clean Water Act delegates authority for the development and implementation of locally derived Source Water Protection plans to 36 regional Conservation Authorities (Figure 1), which are public agencies mandated to manage water and natural resources, and to provide services such as flood control in partnership with government agencies at local and provincial levels [6]. Conservation Authorities manage water at the watershed scale, making them a good fit for developing and implementing SWP plans. An integrated watershed approach administered by existing local Conservation Authorities is seen by the Government of Ontario as an effective way to implement the Clean Water Act, especially since approximately 90% of the provincial population lives in southern Ontario, coincident with the area covered by the Conservation Authorities [7]. However, the majority of the land mass of Ontario, namely the north, is not under the jurisdiction of a local Conservation Authority (Figure 1), resulting in the exclusion of a large number of smaller and remote communities, many of which are First Nations, from the framework for developing SWP plans. This paper, using a descriptive and case study research process, outlines how First Nations in Ontario are developing community SWP plans under the existing political, policy and regulatory regime in Ontario. The present review is based on our collective knowledge and professional practice through working with several First Nations communities that are attempting to protect their community water sources within this context. Using a case study approach, the objectives of this paper are to: (1) describe the complex and unique jurisdictional issues that First Nation communities face in their attempts to engage in SWP planning (2) identify opportunities and challenges that exist within the current SWP framework; and (3) discuss similarities in the adaptive approaches taken by First Nations included in the case study analysis.

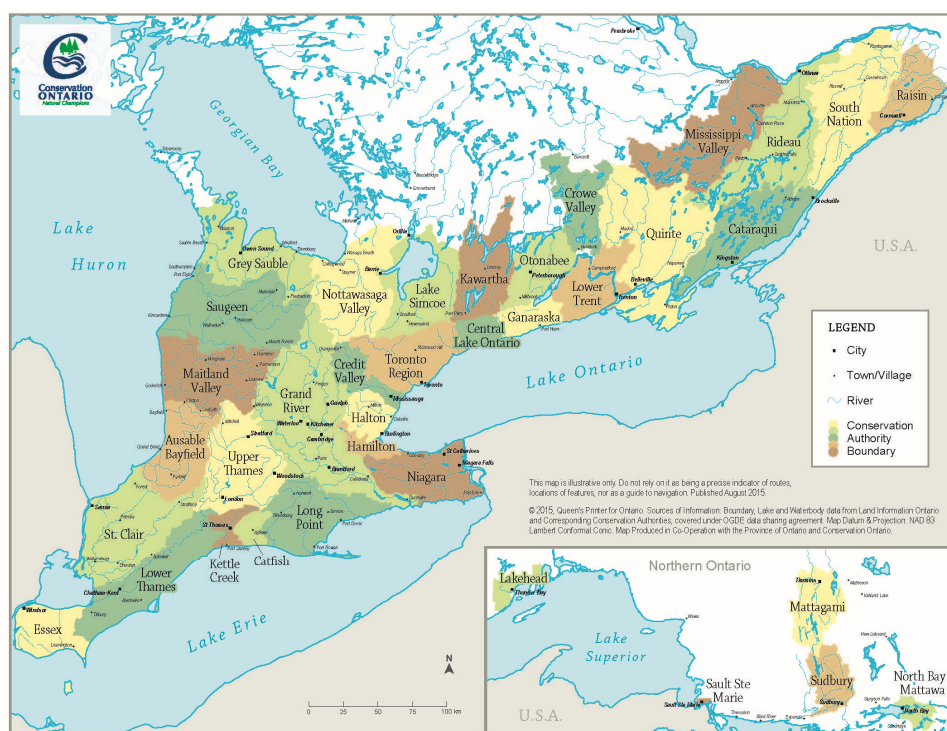


Figure 1. Conservation Authorities of Ontario (Conservation Ontario).

2. Issues of Jurisdiction

The provincial framework for developing and implementing local or regional SWP plans does not adequately address the needs of First Nations communities in Ontario, either geographically or politically. Of the 133 First Nations communities in Ontario, only 27 are within the boundaries of a watershed managed by an existing Conservation Authority. For those First Nations communities that can participate in the provincial process, positions are allocated on the local Source Water Protection Committees. However, involvement by First Nations in the provincial process requires that the community, through a band resolution or a by-law agrees to comply with the provincial SWP planning process. Some First Nations see this approach as an abrogation of inherent and Treaty rights and therefore choose not to participate [8], while others are excluded as they are outside of regions covered by the provincial framework.

Jurisdiction of reserve lands and resources is the responsibility of the Federal Government through the Department of Indigenous and Northern Affairs (INAC) and First Nations governments [8]. Management of water and wastewater in First Nations communities is addressed through policies and guidelines developed by Health Canada, including drinking water quality guidelines, Environment Canada through wastewater regulations, and INAC through approvals of capital projects, including drinking water and wastewater treatment plants. To address the chronic problems of poor drinking water quality among First Nations communities, in 2003 the federal government introduced the First Nations Water Management Strategy, which was a 5-year initiative to address the ongoing problems and the numerous “boil water” or do not consume advisories on First Nations reserves. Under this Strategy, Environment Canada drafted a guidance document to assist First Nations with the process of developing a SWP plan [9]. However, this guidance booklet was never formally published and distributed to First Nations communities to use for developing SWP plans. Subsequently, based on recommendations made by the Expert Panel on Safe Drinking Water for First Nations, the Government of Canada attempted to address the ongoing drinking water quality issues by drafting legislation to overcome regulatory gaps [10]. The Safe Drinking Water for First Nations Act, Bill S-8 [11] was enacted in 2013 by the Federal Government to provide a legislative framework for provision of safe drinking

water within First Nations. However, many First Nations opposed the legislation, as Bill S-8 gives the Federal government sweeping powers to enforce water quality standards in First Nations communities and to enact regulations with respect to operator training and certification, water and wastewater systems and water quality standards and monitoring [12]. Lack of adequate consultation and resources to identify the potential impacts of legislation were identified by Chiefs of Ontario [13]. There is great concern among First Nations that Bill S-8 is unconstitutional and is in violation of Treaty rights. Bill S-8 grants the federal government the right to enforce standards without mandated allocation of funding to support the human resources or technical capacity that are required to meet these targets [12].

Bill S-8 addresses the issue of source water protection in that it recognizes the federal authority to regulate “the protection of sources of drinking water from contamination” ([11] Reg. 4(1)b), but no explicit regulations are included in the legislation in this regard. To address SWP for First Nations across Canada, Aboriginal Affairs and Northern Development Canada (AANDC), now Indigenous and Northern Affairs (INAC) released a guidance document and template for the development of First Nations SWP plans in 2013. The First Nations On-Reserve Source Water Protection Plan Guide and Template [14] was designed to provide First Nations in all provinces with a simplified and inexpensive approach to developing community SWP plans. This approach involves the formation of a community committee to assess the risks to drinking water, rank those risks and prioritize the steps in an implementation plan. The implementation plan would then identify methods, timelines and funding requirements for the necessary studies that are needed to verify the identified risks, and to implement short- and long-term management actions to mitigate risks. The planning process was piloted in three First Nations in Alberta over the period between 2013 and 2014 [15], but to the best of our knowledge, this approach has not been exclusively used by a First Nation in Ontario. The newly elected Federal Government in 2015 stated they would end First Nations boil water advisories within 5 years [16] and has provided substantial funding for improvements to water and wastewater systems on reserves. Improved infrastructure may address some issues for provision of safe drinking water, however, costly infrastructure upgrades alone cannot address poor drinking water quality, if sources of drinking water continue to be contaminated.

The complex and overlapping jurisdictional responsibilities of the federal and provincial governments and the First Nations is a barrier to the development of SWP plans for First Nation communities. The focus of this paper is to present various examples of SWP planning in First Nations communities in Ontario where different approaches have been implemented. The case studies included in this article do not purport to include all SWP activities undertaken by First Nations communities in Ontario, but will highlight various approaches through a discussion of selected cases, showing the successes and challenges faced by the communities in developing and implementing SWP plans, including the approaches taken by the Six Nations of the Grand River, Pays Plat First Nation, Whitefish River First Nation and M’Chigeeng First Nation. Figure 2 identifies the location of the First Nations that are discussed in this paper and Table 1 provides a summary of the various planning initiatives including challenges and benefits for each approach.



Figure 2. Location of the First Nations communities in Ontario discussed in this report.

3. Source Water Protection Planning in First Nations in Ontario-Selected Case Studies

3.1. First Nation following the Ontario SWP framework

Although 27 First Nations are within the boundaries of Ontario Source Protection Regions, only three First Nations have opted into the Ontario provincial SWP framework [17]. Each of these First Nations has enacted Band Council Resolutions through Chief and Council to have their water treatment plant intakes included in the provincially approved regional SWP plans through amendments to the Regulation 287/07 of the Clean Water Act, 2006. These First Nations include Six Nations of the Grand River [18], Chippewas of Kettle and Stony Point First Nation [19], and Chippewas of Rama First Nation [20].

Six Nations of the Grand River

Six Nations of the Grand River (Figure 2) is the largest reserve in Canada, with an on-reserve population of close to 13,000 and a total registered population of 25,660 [21]. The reserve comprises 18,000 hectares of land. The Haudenosaunee population is spread throughout the territory and the village of Oshweken houses municipal buildings, such as the water treatment plant and Band Office, as well as numerous village households. In 2006–2007, Six Nations undertook the process of developing a SWP plan for the reserve [22]. The community was provided with funding through Environment Canada to pilot the use of a federally developed guidance booklet that was ultimately not distributed for use by other First Nations but used much of the same processes as the Ontario SWP protocols, including a detailed assessment of watershed characteristics, potential threats and risk analysis and plan development. Subsequently the Six Nations community elected to join the Grand River Source Protection plan, developed through the Ontario SWP planning process under a Band Council Resolution and amendment to the Ontario Regulation 287/07 of the Ontario Clean Water Act.

Table 1. Summary of Examples of First Nations Source Water Protection Plans.

First Nation	Source of Drinking Water	Type of Source Water Protection Plan	Assisting Organizations/Agencies	Challenges/Benefits of Planning Process
Six Nations of the Grand River	Grand River at Village of Oshweken	Included in the provincially approved Grand River SWP plan. Oshweken Water Treatment Plant is part of Grand River Source Water Protection Plan in Lake Erie Source Protection Planning Region. Water Treatment Plant has delineated Intake Protection Zones within the Grand River plan.	Grand River Conservation Authority, Ontario Ministry of Environment and Climate Change, Area Municipalities	Benefits: <ul style="list-style-type: none"> The Oshweken water treatment plant is considered in the overall Grand River SWP plan. Able to leverage highly technical process to create the IPZs for the water treatment plant. Challenges: <ul style="list-style-type: none"> The First Nation has no regulatory control over actions taken by area municipalities toward the plan. The provincial system does not address on reserve issues. Residents who use private wells are not included in the plan. The provincial system does not fund any on reserve planning or mitigation.
Pays Plat First Nation	Adjacent Bay of Lake Superior	Community SWP plan	Canadian Environmental Law Association (CELA)	Benefits: <ul style="list-style-type: none"> Community able to hire a “community animator”.- Environmental coordinator to lead planning process. Direct community input into plan. Community has control over regulatory measures to mitigate threats. Challenges: <ul style="list-style-type: none"> Lack of funding to implement measures to mitigate identified threats.
Whitefish River First Nation	North Channel, Lake Huron	Community SWP plan	United Chiefs and Councils of Mnidoo Mnising (UCCMM), Ontario First Nations Technical Services Corporation (OFNTSC) Health Canada	Benefits: <ul style="list-style-type: none"> Community driven and linked to overall health and water security planning. Used available guidance, resources and technical information. Focus on Anishinabek law and tradition for cultural appropriateness. Challenges: <ul style="list-style-type: none"> Mixed water provisioning in community, private wells not included. No existing guidance or planning method suited the needs of the community. Lack of funding to implement measures to mitigate identified threats.
M’Chigeeng First Nation	West Bay, Lake Huron	Community SWP plan	Ontario First Nations Technical Services Corporation (OFNTSC), Institute for Watershed Science (IWS) Trent University, United Chiefs and Councils of Mnidoo Mnising (UCCMM)	Benefits: <ul style="list-style-type: none"> Community driven plan. Access to technical expertise from partner agencies. Used available guidance, resources and technical information. Challenges: <ul style="list-style-type: none"> Unable to find a community “champion” to guide the planning. No existing guidance or planning method suited the needs of the community. Mixed water provisioning in community, private wells not included. Lack of funding to implement measures to mitigate identified threats.

Six Nations, although much larger than other First Nations communities in Ontario, has many challenges in common with other smaller communities. The water delivery system for the community is mixed in that the water treatment plant that takes its water from the Grand River serves only a portion of the community, including public buildings and some residences. The previous drinking water treatment plant was operating above capacity, but a new water treatment plant that opened in 2015 and incorporates conventional treatment with sand filtration and ultraviolet light (UV) disinfection is designed to address future expansion of the drinking water system. A large number of households on the reserve take water from personal wells, or have their water delivered to cisterns by truck. The draft community-based SWP plan emphasized the vulnerability of the groundwater resources and approaches to mitigate well water contamination on reserve. The plan also addressed threats from contaminants in surface water (i.e., the Grand River) and acknowledges that upstream and off-reserve land use activities may impact Six Nations water supplies [22]. Ultimately the draft SWP plan was not finalized or implemented. The community has historically had a cooperative relationship with the Grand River Conservation Authority and this collaborative arrangement facilitates the sharing of information about water contamination [23]. The Grand River SWP plan identifies intake protection zones (IPZs) for the Oshweken water treatment plant water intake situated in the Grand River, and includes policies to address upstream threats for the Oshweken water source. However, the plan has no mechanisms to address on-reserve threats to the surface or groundwater sources in the community. Implementation of the Grand River SWP plan is through the larger SWP Committee of the Lake Erie Source Protection Region [24]. Numerous municipalities and the Grand River Conservation Authority are the responsible parties for implementing zoning restrictions, risk management plans, by-laws and other tools to mitigate or remove upstream threats to the Six Nations water intake, whereas any on-reserve mitigation measures are the responsibility of the First Nation.

3.2. First Nations using Alternative Source Water Protection Planning frameworks

Several First Nations that are not within an Ontario planning region or are not participating in the Ontario framework process are highlighted below. These communities vary in size and capacity to undertake SWP planning and have chosen to use alternative processes to develop plans that suit the needs of their community.

3.2.1. Pays Plat First Nation

Pays Plat First Nation is a small community situated 183 km east of Thunder Bay along the Highway 17 corridor, a major highway route through northern Ontario (Figure 2). The First Nation membership is reported as just over 246 people, with 72 people living in the on-reserve community [25]. The drinking water supply for the community is from the adjacent bay on Lake Superior. The community water treatment plant has a slow sand filtration unit with secondary chlorination. The Pays Plat River and Pays Plat Creek flow in a southward direction through the reserve, discharging into the bay [26]. The community partnered in 2013–2014 with the Canadian Environmental Law Association (CELA) through funding from the Law Foundation of Ontario, and initiated the development of a First Nations Source Water Protection “Toolkit”. A companion Legal Toolkit designed to assist First Nations governments with implementation of by-laws or Band Resolutions for regulatory measures for source water protection was also developed [27]. This CELA initiative was designed to address the policy and regulatory gap for Ontario First Nations. The Source Protection Toolkit, published through CELA in 2014 is a narrative description of the process of initiating a SWP plan within the community. The process was led through a “community animator”, whose role was to champion the project in the community and lead the plan development. In this case, the community animator worked for 8 months between May 2013 to January 2014 to identify potential or existing threats to the community water source, through water testing, surveys and community open house events. Subsequently, a Community Planning Group was developed, once the potential or existing threats were identified, to assess the scale of these threats and prioritize them in terms of risk to the community.

drinking water supply [26]. Between February and June 2014, a risk analysis was conducted through the Community Planning Group that resulted in a list of threats and associated mitigation measures that could be applied to minimize or eliminate the risk to the water supply.

In general, the approach to source protection discussed in this Toolkit follows the approach developed and implemented by the province of Ontario. It consists of three phases, threat identification; threat assessment to gauge the severity of the threats, and a source protection plan to mitigate threats, followed by a plan implementation phase where threat mitigation measures are put into action. Given the small size of the community, the community animator took on the role of project lead and implemented some scientific monitoring prior to development of the community planning committee. Input from the community members was undertaken and taken into consideration during the threat assessment phase. Further development of the Pays Plat SWP plan is continuing at this time, and the final plan and implementation of mitigation measures continues.

3.2.2. Whitefish River First Nation

The Whitefish River First Nation (WRFN) is an Anishinaabe community located on the northern shore of Georgian Bay (Figure 2). Situated along the LaCloche Peninsula on Highway 6 just north of Manitoulin Island, the WRFN is situated midway between two small, non-First Nation towns. To the south of the First Nation lies Little Current, located on Manitoulin Island, and to the north lies Espanola, located on the mainland. This location also places WRFN approximately midway between two larger urban centers on Highway 17; Sudbury to the east and Sault Ste. Marie to the west.

The land base is mostly surrounded by water (i.e., the North Channel and Georgian Bay) with several lakes, rivers, creeks and marshes located within the reserve boundaries. Most of the residents live in or are immediately adjacent to the main village of Birch Island, which is located between the west side of McGregor Bay and the east side of the Bay of Islands along Highway No. 6. As of October 2015, the on-reserve members living in the community consisted of 368 people; the off-reserve population amounted to 916, for a total member population of 1284. Currently, the on-reserve population is 448 people.

Many families rely on the water distribution system offered by the WRFN. The surface water supply for this system is taken from the Bay of Islands in the North Channel of Lake Huron and is delivered to homes by truck. The community water system has evolved from a simple pump house commissioned in 1972 to the current slow sand filtration plant that was constructed in 2010, complete with ozonation, UV and chlorine disinfection. However, not all homes utilize the community water distribution system, as some residents have private wells and others continue to obtain surface water from other sources (e.g., McGregor Bay). Many residents utilize single dwelling filtration and treatment technologies to obtain potable drinking water. A few residents continue to obtain their drinking water directly from untreated surface waters, although this practice has generally been discouraged. Public and community owned buildings all utilize the community water distribution system. Many households obtain drinking water from multiple sources, such as the community water distribution system and commercial bottled water.

It must also be noted that many others who are not band members reside on-reserve, particularly cottagers. For the most part, cottagers are not served by the community water system and do not have water delivered. Cottagers that reside on reserve obtain water from various sources, including surface water, groundwater (wells), and the purchase of bottled water. The drinking water supply continues to evolve as the community gets larger and community members build their homes off the community system or in areas not accessible to water delivery. At the same time, the quality of drinking water supplies will diminish if the multiple sources of water are not properly protected.

Fundamentally, and like many other First Nation communities, WRFN holds a wealth of Traditional Knowledge (TK) regarding protecting water [28]. Protecting the waters for future generations is thus not a new concept for the Anishinabek, and the WRFN has not been idle in this regard. Over the past decade, community-based strategic plans have addressed the water

protection issue through health and environmental planning. Furthermore, WRFN holds a profound understanding that protecting the waters for future generations is critical to the success of its people. Water security has been identified as a priority in the community health plan and a coordinated approach among different departments was convened to deliver on this priority. A WRFN water advisory committee was established to provide overall expertise, experience and guidance for the SWP phase of the project. The committee was comprised of First Nation government staff (i.e., Public Works, Health, Lands), representation from the United Chiefs and Councils of Mnidoo Mnising Tribal Council (UCCMM), water treatment experts, academics and Chief and Council representatives. The WRFN Water Advisory committee also consulted with the Ontario First Nation Technical Services Corporation (OFNTSC) on best practices for SWP in First Nation communities. A SWP planning coordinator was hired with expertise in environmental community development and planning. The WRFN water advisory committee then hired a First Nation youth member from the community to assist with the broader goals of capacity-building.

The approach used in developing a community-based SWP plan involved acknowledging the community's existing expertise and TK as a basis for community engagement. The WRFN already knows how to care for and protect water; the contemporary challenge is how to implement this responsibility, given a situation of regulatory and information gaps, as well as negative impacts occurring from sources external to the community. The WRFN community is affected by the actions of numerous external interests and activities, such as the forest and mining industry, fish farms, cottage lot waste disposal, and shipping, to name a few. As a result, ground and surface water quality has declined over the years, and fish consumption guidelines are now also in effect.

An explicit priority relating to the development of a SWP plan was to ensure community involvement. An important objective was to make certain that everyone was aware of their responsibilities for protecting the waters, and that community members could assist in identifying threats and potential mitigation measures and could also share knowledge that would assist in implementing the plan. Funding was obtained from Health Canada to develop the SWP. As this funding was not sufficient to permit additional technical assessments to be carried out specifically for this project, the development of this SWP plan relied on information (e.g., capital plans, emergency planning documents, etc.) that already existed in the community. In addition, a systematic review was undertaken of existing publicly available First Nation SWP plans, as well as various SWP templates and protocols, available from Canada and the USA. In particular, the following resources, designed specifically for a First Nation context, were reviewed for their applicability: INAC's First Nation On-Reserve Source Water Protection Plan Guide and Template (2013), CELA's First Nation Source Protection Toolkit (2014) and Environment Canada's First Nation SWP Protocol. The Province of Ontario's SWP process established under the Clean Water Act (e.g., Technical Rules: Assessment Report 2009) was also examined. Although not specific to First Nations, the Ontario SWP process is regarded as one of the most rigorous in the world.

It was determined that each protocol on its own could not address the complexity of the WRFN situation, nor did these protocols recognize TK as a key component of the process. The protocols clearly privileged science and technological knowledge over TK and community knowledge, symptomatic of larger source water protection processes [29]. The approach taken by WRFN was to balance different forms of knowledge and to draw on community strengths. The WRFN community relates to water holistically, as people are concerned about all aspects of water, including its restoration and healing for the benefit of all life, not just people. From the outset, attempts to fit community knowledge into SWP templates defined by INAC became exercises in frustration and were quickly abandoned. Instead, the water advisory committee developed their own community-based SWP process, building upon the applicability of the protocols mentioned above.

Threats to source water were identified by the Water Advisory Committee and community members through engagement activities, key informant interviews, and existing reports. The risk analysis was conducted, utilizing provincial Intake Protection Zone (IPZ) criteria in combination with

risks identified by the community and through examination of existing technical reports. Protection measures were prescribed based on this analysis, along with identified community values (e.g., ceremonies). A community-based SWP plan was developed that identified goals, as well as the objectives, outcomes, strategies and actions required to deliver on those goals. The SWP highlighted long-term, intermediate- and short-term strategies and actions. It also identified activities from other community-based plans (e.g., emergency plan) that serve to protect waters, other existing activities that could be enhanced through the plan (e.g., through education), and activities that require secured funding or political advocacy. In this way, implementing certain elements of the plan becomes possible, despite the lack of financial resources.

This fiscal planning is critical, since at this time there is no funding available either federally or provincially to implement SWPs on-reserve. This represents a major constraint of the INAC and CELA protocols, in that, once a First Nation develops a SWP plan there is no funding to implement it. There is a long history of plans, strategies, etc., being developed for (but not often by) First Nation communities, that once completed sit on a shelf collecting dust. WRFN does not want this unfortunate outcome. The water advisory committee continues to operate and provides guidance for the coordinated implementation of those aspects of the plan that do not require external interventions or funding (e.g., water awareness in schools, participation in water walks, ceremonies). As well, the water advisory committee continues to seek additional sources of funding and partnerships that can assist with building the community capacity to engage in further implementation of the SWP plan. The creation of the SWP plan thus represented one stage in an overall strategy to achieve water security for future generations. Other related initiatives continue to be developed. Future plans include documenting Anishinaabek water laws that will inform the basis of community water governance.

3.2.3. M'Chigeeng First Nation

M'Chigeeng is an Anishinaabek First Nation situated on West Bay on the north shore of Manitoulin Island in Georgian Bay. The community is situated directly on West Bay in the North Channel (Figure 2). M'Chigeeng has a total registered population of 2610, with an on-reserve population of 941 [30]. The primary source of water for the M'Chigeeng drinking water plant is surface water from West Bay. The M'Chigeeng Drinking Water Plant was constructed in 2003 [31], and uses a membrane ultra-filtration (UF) system for primary filtration and secondary chlorination disinfection, with the option of tertiary, granular activated carbon filtration. The tertiary treatment is only required for 3 to 4 weeks in the spring and fall to address taste and odour problems. Residents outside the main community are not connected to the water distribution system and either use private wells or have treated water delivered to their cisterns by truck.

In 2013, the Ontario First Nations Technical Services Corporation (OFNTSC) began exploring a First Nations approach to SWP, recognizing that SWP, as the first barrier in a multi-barrier approach, was not being comprehensively addressed in Ontario First Nations. Similar to the process in White River First Nation, the OFNTSC looked to existing approaches in Ontario, federal guidance, and examples from other jurisdictions, including tribes for examples and approaches to SWP planning. Coincident with OFNTSC's efforts, AANDC released the First Nations On-Reserve Source Water Protection Plan Guide and Template [14]. Given the release of the AANDC Guide, OFNTSC decided to work with one First Nation as a pilot to develop a SWP plan using this approach, and based on that experience, develop training materials and approaches to support any other Ontario First Nations interested in SWP planning. M'Chigeeng First Nation was approached to be the pilot, as this First Nation is outside of the Ontario Conservation Authority SWP planning area and has many of the elements within its watershed that would translate into threats common to other First Nations in Ontario. Other considerations in selecting M'Chigeeng for the pilot included support from M'Chigeeng's leadership and involvement from the technical services unit at the United Chiefs and Councils of Mnidoo Mnising (UCCMM), which is the Tribal Council serving M'Chigeeng.

Community engagement throughout the planning process was understood from the outset of the M'Chigeeng pilot to be critical to the success of the SWP plan, with TK serving as the foundation for the plan. Early in the study, attempts were made to hire a local community plan champion. Unfortunately, this was not successful, but that position remains a recommended best practice. A working group comprised of band administration managers, including the Chief Administrative Officer, Health Director, Public Works Manager, and Lands Officer; tribal council technical advisors; and community members was created. This committee was supported by OFNTSC, who partnered with the Institute for Watershed Science, Trent University (IWS) to guide the plan development and support the committee with technical aspects of the plan. IWS was approached as this organization had several years of direct experience working on training and development of community based SWP planning with governments and Indigenous communities in Canada's north. Throughout the development of the plan, there were numerous opportunities to engage the community through participation at existing events, such as Treaty Day, Pow-Wow and Harvest Day celebrations, as well as hosting water specific events, including teachings from a local Elder involved in the larger Mother Earth Water Walks.

One of the objectives of the M'Chigeeng pilot project was to determine how to develop a SWP plan with limited financial resources, while recognizing that a technical watershed assessment was needed to address the requirements of the First Nation. OFNTSC also recognized that water systems in Ontario First Nations are chronically under-funded by the federal government and any technical assistance or guidance developed would need to account for the reality of limited or non-existent financial resources to support the plan development and implementation. Through partnership with OFNTSC and IWS, the community was able to access map products of the community watersheds and were provided with some technical information on water flow and time of travel of contaminants, leading to the development of intake protection zones (IPZs) for the municipal water intake. This information was critical to plan development as it showed that there are three separate watersheds within the community boundaries, only one of which influences the municipal drinking water intake. Identifying the three sub-watersheds helped to guide plan priorities.

The information gained from the community became the foundation of the plan. Community members provided insight into why protecting water is important, what concerns they have for their local waters, and offered suggestions to protect those waters. Through community engagement, the plan was expanded to ensure that not just those homes on the communal water system were protected, but that consideration was also given to other local sources of drinking water, including individual wells, lake intakes, holding tanks, and natural springs. It also was clear that the view of First Nations regarding water resources is more holistic than the narrow source water protection definition used within Ontario's Clean Water Act. Therefore, for the plan to have meaning to the community it had to encompass their world view. Finally, the community's input was crucial to identifying and assessing the threats to their source waters, with a locally-developed list of 31 threats.

The M'Chigeeng experience also highlighted that existing documents hold much information that can be incorporated into a community SWP plan. Both within the community and the Tribal Council offices, existing documentation provided a source of technical information applicable to the process. No one protocol served the purposes of the community and the final plan was developed by utilizing certain aspects of both the Ontario SWP process and the AANDC template. As with the WRFN experience, these processes are based on technical knowledge and the community plan needed to be expanded to include Indigenous perspectives on water in a more holistic manner.

4. Discussion

The events of Walkerton precipitated a government response to ensure the safety of drinking water for Ontario citizens through policies and regulations that aim to protect raw water sources, noting that protection is more cost effective than highly technical treatment methods. The provincial approach applied the best available technical capacity and tools, as well as a large pool of human resources and an investment of over \$250 million for scientific and technical studies and plan development [17].

The majority of Ontario's citizens live in the more developed and urbanized southern part of the province, and it was possible to leverage the capacity and the resources available through the regional Conservation Authorities to develop SWP plans and guide implementation. Through this approach, the drinking water supplies of 90% of the provincial population fall under regional SWP plans [7]. Private well users, which numbered 1.6 million residents in 2016, according to the Auditor General of Ontario [32], as well as First Nations are not covered under the provincial policy framework. The Province attempted to address First Nations through designation of a number of seats on Source Protection Committees for the 19 Source Protection Regions. However, given the political complexity and strained relationships between the Federal, Provincial and First Nations governments lack of participation by First Nations in the provincial framework is not surprising.

Provincially mandated Regional Source Water Protection Committees consist of representatives of numerous stakeholders that promote the interests of a variety of sectors, ranging from agriculture, industry, government and the broader public. The Ontario regulations set the numbers of members from various sectors for these committees [33]. The number of seats on the committee allocated to First Nations, which is a maximum of three on the larger committees, is often not equal to the number of different First Nations communities within the source protection region. Under these circumstances, the provincial expectation is for the various First Nations Chiefs and Councils to appoint a First Nations member to the Source Protection Committee who would represent more than one community. There are significant First Nations concerns about joining the provincial process, as it requires adhering to provincial regulations, seen as an abrogation of inherent and Treaty rights over water on First Nations lands [34]. First Nations within a SWP area may not have similar expectations and views on water resource protection, or similar priorities and needs between their own communities as observed in other jurisdictions [35]. Having a non-community member sit on a provincial committee could be seen as a further erosion of an individual First Nation's governance rights regarding water, making this an unpopular mechanism for water protection. First Nations governments, through their relationship to the Crown through Treaties expect to be addressed as more than sectorial interests, and consulted on a government to government basis.

Jurisdictional rights regarding water resources continue to be a source of friction between the federal government and Indigenous peoples in Canada. The regulatory framework for providing safe drinking water on reserves, established through Bill S-8, are seen as clear violation of Treaty rights by Ontario First Nations. The Chiefs of Ontario (COO) presented their opposition to Bill S-8 to the Standing Committee on Aboriginal Peoples in May 2013 [36]. In their submission, the COO stated that the regulations set out in this legislation fail to recognize jurisdiction of First Nations over their lands and resources, in that it allows for governance from new authorities that are non-Treaty entities, such as the Provinces. The bill also allows for the federal government to over-rule First Nations governments to enact regulations that supersede First Nations by-laws or band council resolutions [36]. The Bill puts the onus on the First Nation Chiefs and Councils to provide safe drinking water, without allocating any new funding to meet the new standards for drinking water treatment plants [36]. Bill S-8 includes the power to regulate "the protection of sources of drinking water from contamination"([11] Reg. 4[b]), but the mechanisms for ensuring SWP are not laid out, nor addressed with regard to funding or capacity.

In spite of the passage of Bill S-8, Ontario First Nations communities continue to struggle with poor water quality as evidenced by the ongoing issues of boil water and do not consume advisories currently in place, including 85 separate advisories in 42 First Nations communities within the province of Ontario at the time of writing in April 2017 [37]. The current federal government initiative to remove all boil water advisories within 5 years is focused on improvements to water and wastewater treatment infrastructure. To quote the Federal Budget of 2016, this response entails "\$1.8 billion over five years for on-reserve water and wastewater infrastructure to address health and safety needs, ensure proper facility operation and maintenance, and end long-term drinking water advisories on INAC-funded systems on reserve" [38]. Improvements to infrastructure alone, without regard to the quality of the source of raw drinking water may not improve the situation for all First Nations in Ontario, although

improvements to wastewater infrastructure may provide for improvement to raw water supplies affected by wastewater effluents. Treatment plants are designed to remove bacterial and parasite pathogens which are an obvious, acute health threat. However, some nutrients (e.g., nitrate) and chemical contaminants (e.g., heavy metals, mercury, pesticides, pharmaceuticals) that are a health threat are not easily removed from drinking water using conventional treatment technologies. Highly technical solutions are not a feasible option in small, remote or rural communities, due to higher costs and ability to train or retain highly qualified operators and to support higher operation and maintenance costs for complex water treatment systems.

The above case studies highlight a variety of approaches that Ontario First Nations are taking with respect to SWP for their communities. Those communities not using the provincial process are addressing drinking water threats that are within the jurisdiction of their own lands, using approaches that respect community TK and incorporate technical information that is available through a variety of existing sources. For Six Nations of the Grand River, as well as Kettle and Stony Point and Rama First Nations, inclusion in the provincial SWP plans has allowed those First Nations to access and leverage the technical and human resources required to complete the highly technical provincial source water assessment process. However, the provincial SWP plans address issues and threats that occur off of reserve lands and do not include TK as a key element of the planning process, which is considered essential to plan development by the other First Nation communities. The local municipalities upstream of the First Nations drinking water intakes have responsibility for mitigating or removing threats on non-First Nation lands. Addressing threats on-reserve are under the jurisdiction of the First Nation, but this process is dependent on the technical capacity of the First Nation and availability of adequate funding. Off-reserve activities require a broader approach and engagement in the process of SWP planning with other stakeholders, which may include industry and municipalities.

The Government of Ontario recently approved all 22 SWP plans that were developed through the 19 Source Protection Regions. Financial support was made available to implement some remedial actions through specific provincial programs designed to address drinking water protection. Through the Ontario Drinking Water Stewardship Program (2008–2014), the Kettle and Stony Point First Nation partnered with the local Source Protection Committee and staff to access Ontario Drinking Water Stewardship funds. This funding was used to upgrade several on-reserve septic systems, which were identified as potential sources of microbial contamination for the reserve drinking water intake [39]. However, this funding was limited as a short-term initiative and is no longer available. SWP plan implementation and associated funding is currently expected to be driven by local municipalities and those First Nations included in the larger regional SWP plans must attempt to access sources of funding to implement any actions on their own lands to mitigate local threats.

Initially, the Six Nations of the Grand River were funded through Environment Canada to pilot development of a SWP plan using the Environment Canada template. However, there was no further funding provided to continue the process. Through adopting the Ontario regulatory process, the surface water intake for the community drinking water plant is considered in the overall Grand River SWP plan, but no provincial funds are allocated for use on reserve to mitigate threats to either surface or groundwater originating on reserve lands. This case history illustrates the limited options for First Nations that participate in the provincial SWP process.

Other First Nations communities have had to find funds to support the development of a local SWP plan. Pays Plat is an example of a small remote community that accessed funding from a non-governmental source to develop a SWP plan. The funding through the Law Foundation of Ontario allowed the community to hire a dedicated “community animator” to lead the development of their local SWP plan. The role has been maintained as a full time Environment Coordinator to carry forward the implementation process. Funding is currently being sought to address mitigation of threats that have been identified in the SWP plan. Pays Plat has acquired spill kits for the most immediate threats of road or rail spills into the local river systems upstream of the water intake and is installing intake protection zone and spills reporting signage for the rail and road crossings [40].

The approach by Whitefish River First Nation emphasizes long-term community development and planning to achieve water security in light of growing threats, such as climate change. The SWP plan served an important starting point by serving as a catalyst to revitalize TK and recognize both community and individual responsibilities regarding protection of water. WRFN undertook a balanced and holistic approach to knowledge, valuing both TK and scientific/technological knowledge throughout the development of the plan [41]. The SWP was also situated within broader community initiatives to develop a water security plan that addresses both water quality and quantity. A focus on water security would ensure long term commitment and enable community level water governance based on Anishinaabek water law [42]. Emphasis was placed on community involvement, with youth and children forming an important part of engagement. The SWP plan in this respect was not viewed as simply a technical exercise with boxes to fill in and templates to fill out, but was regarded as integral to the community future relationship with water. Although initial funding for the project was provided through Health Canada, sustained funding for implementation of mitigation measures must be sought out from other sources highlighting again in this case that plan development is disconnected from implementation and leaves the First Nation without the means to actually solve identified issues leading to source water contamination.

The approach to SWP planning undertaken in M'Chigeeng ultimately developed into a hybrid of the 2013 AANDC Guide approach and the Ontario framework. The two most prominent challenges not adequately addressed in the AANDC Guide but critical to SWP planning for First Nations are community involvement in the planning process and the need for a technical input into the watershed assessment. For instance, in the AANDC 2013 Guide, watershed delineation is not addressed, but rather all reserve lands are considered to be in the same watershed and further delineation, if required, is left to plan implementation. In contrast, the Ontario process followed under the Clean Water Act 2006 is highly technical and involves a two-stage planning process, with the first being a technical watershed assessment phase and the second, the protection phase. In retrospect, based on the M'Chigeeng experience, a two-phase process similar to the Ontario approach is preferred as it allows for an assessment phase to characterize the watershed and collect background information that is both technical and TK-based, followed by a plan development phase, including engaging with time-constrained working group members.

This cross-case analysis reveals that although First Nations communities in Ontario have taken different approaches to SWP planning, it is evident that "source water" is not considered as water solely for human consumption. Cultural perspectives of the various Indigenous peoples in Ontario all state that water is sacred, water is life [42,43] and protecting only identified "protection zones" for surface or groundwater intakes does not respect this cultural perspective of water that recognizes that all water on Earth is connected. These values are evident in the Water Declaration of the Anishinaabek, Mushhegowuk and Onkwehonwe [44] which emphasizes a holistic perspective of water, including the value of all waters for all life. This is similar to findings in other jurisdictions in Canada and elsewhere [41,45].

One important point to note is that First Nations in Ontario have been and continue to be actively involved in protecting their source waters, even without a formal SWP plan [41]. Many First Nations in Ontario are taking actions that reduce threats to their source water, such as establishing solid waste diversion programs, including used oil and household hazardous wastes, developing and testing their community emergency plan, ensuring that fuel tanks meet federal regulations and ensuring training in spill response procedures, and revitalization of language and culture programs which inevitably involve teachings related to water. For example, in M'Chigeeng, the Women's Water Walkers have been active for many years, youth have been engaged with Elders to document water stories, and a band council resolution was passed directing roads staff to ensure that plowed snow is not piled near waterbodies. This First Nation has also taken a stand against nuclear waste burial in the Lake Huron watershed, and in the past, community members have stopped aquaculture operations from being established in West Bay, which is the source of community drinking water. More recently, the First

Nation hired a Traditional Knowledge Project Coordinator to work with the community to identify knowledge that will aid in the conservation and restoration of the Great Lakes. First Nations source water protection planning fundamentally is about recognizing traditional community knowledge and building upon the good work already happening to protect and care for local waters.

Most First Nations in Ontario do not have in-house capacity to undertake the technical aspects of source water assessment and it is a challenge to access funding for outside contractors to undertake this work. These challenges are noted in Indigenous, remote and small communities, in which capacity remains a significant challenge [46,47]. Technical documents related to emergency plans, capital projects and other forms of land use and environmental planning consider water as part of the planning process. These documents and others contain vital technical information that can be leveraged for SWP planning.

Using already existing technical information can help address the need for information to support SWP plans. First Nations are adopting methods to address watershed management within their capacity and with respect their own lands. There are examples of jurisdictions globally that use complex decision support systems with sophisticated modelling for contaminant loading and water usage that guide decision making for policy and actions for watershed and water management [48,49], however systems of this complexity do not suit the needs or scale of Ontario First Nations communities.

A prevalent issue with water source protection in First Nations communities is the mixed nature of water provisioning. Many communities have a water treatment plant, a piped and or trucked delivery system and residences on private well supplies. This mix of surface and groundwater sources and/or public and private sources create difficulties for developing a comprehensive plan that takes into account the variable nature of source water. The Six Nations example highlights this. Oshweken recently built a new state-of-the-art drinking water treatment plant which is considered in the Grand River SWP plan, but many community residents still rely on groundwater sources of variable quality for their residential water supply. All communities have challenges with addressing private well users in the SWP planning process as only municipal water wells or surface water intakes are considered in the Ontario framework.

Jurisdictional issues continue to be an impediment to the development of SWP plans on reserve lands. Beyond the concerns about federal or provincial infringement on First Nations, even within communities some lands are held privately by band members under a "Certificate of Possession". For example, within the Six Nations reserve, the majority of the land is held in certificate of possession [21]. According to personal interviews reported by Dyck et al. [23], the community members stated that the Council has no jurisdiction on privately held lands and can't tell people what to do. These unregulated lands within communities are a source of friction between community members [23] and are an impediment to a community wide planning exercise.

Source water protection requires "buy in" and involvement from the community in order to ensure success. The community led plans of Pays Plat, WRFN and M'Chigeeng emphasize the need for community involvement, including the integral contributions of youth and holders of TK in the process. Integral to each SWP approach, despite distinct challenges and context, was that each process was community led, based on community priorities and knowledge, and sought to empower the community. Finally, SWP in First Nations communities is starting to be addressed by First Nations and their Tribal Councils and technical organizations, as government initiatives are aimed at water and wastewater treatment systems. Community led approaches, based on both traditional and cultural values, as well as scientific and technical information will be successful only if financial resources are made available to help the communities implement the actions that are identified in their plans. First Nations SWP planning requires a coordinated approach that can be applied to a variety of community circumstances. OFNTSC is working to address this need through the development of training specifically designed to address SWP for Ontario First Nations communities. The course will draw on the lived experiences of the communities highlighted in this article and best practices

for training and building capacity through expertise at OFNTSC and partner organizations that is responsive to First Nations' needs.

5. Conclusions

Through reviewing these different community approaches to SWP planning, it is obvious that no one SWP approach will work for all of the diverse communities, cultures and landscapes within Ontario. The Ontario SWP process is excessively technical and difficult to implement for small and remote communities, and the policy approach does not suit the jurisdictional situations on First Nations reserves. The AANDC template and guide attempts to simplify the planning process and leaves the technical requirements to the later implementation phase. Implementation of the SWP plans remains an outstanding issue, with no funding provided to actually deliver on the plans, let alone provide the required financial resources to undertake the technical work. Implementation of plan initiatives are the goal of producing a SWP plan, therefore lack of ability to undertake implementation through lack of financial resources still prevents First Nations communities from achieving their goals of SWP. These cases highlight the critical gap between the regulatory requirements of both the federal and provincial governments and the fiscal requirements to address the threats identified in SWP planning for First Nations in Ontario. Continued conditions of poor quality drinking water, requiring boil water or do not consume advisories are still prevalent in Ontario First Nations communities. Although funding has been allocated by the Federal Government to attempt to eradicate this issue Canada-wide within 5-year time frame, the focus is on water and wastewater treatment, which may not fully address the issue of poor drinking water quality. The Federal strategy does not provide funding for SWP and is relying on upgrades to water and wastewater treatment to address ongoing drinking water issues for First Nations. The current circumstances highlight the difficulty of relying on treatment, including difficulty with operator retention and expensive operation and maintenance and consistent monitoring. Investing in protection of the raw water source to avoid contamination as much as possible has been shown to be a cost-effective way to address poor drinking water quality [50].

With the gap in Federal funding for SWP, First Nations are competing for special project, private or charitable funding sources to help protect their drinking water supplies, in contrast to the financial resources available to other Ontario communities. Provision of funding for First Nations to address SWP using planning tools that are appropriate to their community, and that support implementation of community SWP plans in Ontario could address on reserve drinking water threats in a cost-effective manner and reduce reliance on expensive treatment options. Finally, for SWP planning to be successful for First Nations, a holistic approach is required, respecting community, culture and traditional teachings, and not a purely technical approach.

Acknowledgments: The authors acknowledge Environment Coordinator Debbie King of Pays Plat First Nation and the Ontario First Nations Technical Services Corporation (OFNTSC) for information used toward completion of this manuscript.

Author Contributions: Leslie Collins wrote the manuscript, Deborah McGregor contributed the section on Whitefish River First Nation and informed the discussion, Stephanie Allen contributed the section on M'Chigeeng First Nation and informed the discussion, Craig Murray provided Figures and the Table and editorial comments, Chris Metcalfe edited the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

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