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Water is Medicine: Reimagining Water Security through Tr'ondëk Hwëch'in Relationships to Treated and Traditional Water Sources in Yukon, Canada

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Abstract: There is growing acknowledgement that the material dimensions of water security alone are inadequate; we also need to engage with a broader set of hydrosocial relationships. Indeed, more holistic approaches are needed to explain Indigenous peoples' relationships to water including the use of traditional water sources such as mountain creeks and springs. In this paper, we seek to reimagine water security through a case study of Tr'ondëk Hwëch'in's relationships to both treated and traditional water sources throughout the First Nation's traditional territory in Yukon, Canada. Through community-based research including interviews with Elders and other community members, we examine the importance of traditional water sources for meeting important health requirements including physical, spiritual and cultural wellbeing. This intervention contributes to ongoing debates about what it means to secure safe and affordable water in three key ways: First, we argue that Indigenous water relations invite a shift towards more a holistic understanding of water security; second, we contend that settler colonial politics should be understood as a root cause of water insecurity; finally, we explore how Two-Eyed Seeing can be applied as an alternative to the 'integration' of Western scientific and Indigenous approaches to drinking water.

Keywords: community-based research; drinking water; hydrosocial; Indigenous knowledge; settler colonialism; political ontology; risk; Two-Eyed Seeing; Yukon; Canada; water security

1. Introduction

> It just runs so clear. And it just filters...It must have its own filter because we never get sick from it. We believe that is good water to drink and a lot of us go up. Sometimes we make a water run and make sure that people have some at home, too. It just seems like here I don't like drinking water from the tap because I am so used to really good water...We used to have good water in Dawson. Now I can taste the chlorine in it, and I don't like chlorine. (Angie Joseph Rear (2015), Tr'ondëk Hwëch'in Elder)

Water security is a matter of global importance. Defining this complex and often contested concept has been also been attempted from within many conceptual domains, and assessing security has occurred at multiple spatial scales [1–4]. Research and policy with Indigenous peoples also

frequently address water security [5–10]. In part, this focus stems from the recognition that Indigenous communities often experience a disproportionate burden of water insecurity compared to non-Indigenous populations [10–15].

Many Indigenous peoples continue to rely on traditional water sources, as they have for millennia [5,7–10,16–19]. These sources vary between communities but tend to include "raw" or untreated water sources such as springs, creeks, and ponds throughout their traditional territories, which have been used for millennia. Reflecting broader trends in the literature, research on water security for Indigenous peoples tends to focus on the material dimensions of household water security including parameters such as water access, quantity, quality and affordability [20]. More specifically, a number of studies examine the microbiological and chemical quality and risk of treated and untreated water sources [8,16,21,22]. Others have assessed the implications of water scarcity [5,9], water access including distance travelled to water sources or seasonal barriers to access [5,7,9] and affordability related to the cost of water itself or the fuel needed to travel to distant sources [5,7,9].

While the above contributions highlight the importance of the material dimensions of water security, greater attention to the significance of the consistent patterns of traditional water use is needed [10]. As indicated by the opening quote by Elder and former Chief, Angie Joseph-Rear—also one of the authors of this paper—for the Tr'ondëk Hwëch'in (TH) traditional water sources remain in continual use. This is even the case when treated water is abundant, of good quality according to Western scientific health risk assessments, and in many cases, arguably offers greater convenience (e.g., treated water piped directly to homes) [7,21]. Against this backdrop, we identify the need to reframe water security to better account for the complexities of Indigenous peoples' relationships to water through the use and value of traditional water sources. As recent works have highlighted, the "non-material" dimensions of water security including emotional, affective, relational and spiritual relationships to water need to be considered alongside material dimensions such as water access, quality and use [17,23–27]. Encouraging a shift from a narrow and so strictly material definition of water security, Jepson and others (2017) note the need to "reorient the concept of water security away from a utilitarian focus on material water and towards a critical approach based on water-society relations" [20] (p. 50). In this framing, water security is less about obtaining water and more about fostering a wider set of hydro-social relations to promote well-being—highlighting the complex and patterned relations through which water is accessed, used, managed and manipulated; and the social and political dynamics and processes in which these relations are embedded [28].

In this paper, we engage a hydrosocial approach to rearticulate a framework for Indigenous water security that is consistent with Indigenous peoples' relationships to water. Based on a case study of the use of traditional and treated sources of drinking water by TH citizens, in Yukon, Canada, we contribute to the water security literature in three key ways: First, we argue that Indigenous water relations, based on reciprocal responsibilities to water as a living entity, invite a shift towards a more holistic understanding of water security; second, we argue that politics are central to understanding water security where settler-colonialism must be understood as a root cause of water insecurity; finally, we explore how Two-Eyed Seeing can be applied to engage with the differences and similarities between Western scientific and Indigenous approaches to health and risk, while remaining cognizant of the ontological and epistemological politics, or differences in ways of being and knowing, respectively. These differences, we argue, underpin misunderstanding and so effect Indigenous sovereignty and authority as people seek to follow their own traditions. To develop these points, and before moving to our case study, we outline a theoretical framework for understanding water security according to Indigenous water relations.

Theoretical Framework: Reimagining Water Security according to Indigenous Water Relations

Water security frameworks must be reimagined to reflect Indigenous water relationships more fully [10,29]. Indigenous peoples rely on water to meet their material needs (e.g., as a source of drinking water, as habitat for medicinal plants, fish, and animals, as a travel route in multiple seasons), but

water is not merely valued as a material substance. While Indigenous relationships to water are highly diverse, they tend to express and understand water as a living entity with agency or "spirit" to which Indigenous peoples have reciprocal responsibilities; a perspective which sharply contrasts with settler views of water as a 'resource' available for human use and extraction [30–36]. For instance, Wilson and Inkster (2018) examine how Yukon First Nations' (including TH) invocations of the need to "respect water" make clear the complex connectivity between the material and non-material dimensions of water where water is understood as "a living entity, with the 'person-like' quality of agency referred to as 'spirit.' From this perspective, water not only enables human life by meeting physical needs, but water *is* life or alive" [36] (p. 9). In other words, all aspects of Indigenous water relations are informed by relational ontologies and epistemologies that are not easily characterized by a dualistic lens that separates the material from non-material dimensions of water, and humans from other than human relatives such as water [34,37]. These relationships to water are multifaceted, structured by protocols, and encompass practices and knowledge about the relationships between humans and the other-than-human world that are the basis of Indigenous systems of governance and law [31,32,38,39].

Water security frameworks based on material understandings alone fail to account for the complexity of Indigenous water relationships. This parallels critiques of conventional health risk assessments, which continue to focus on the physical dimensions of health to the exclusion of many other sources of exposure and harm that impact the social, cultural, psychological and spiritual health of Indigenous peoples [40–42]. Such aspects are interlinked with physical health and involve dimensions that many Indigenous peoples consider to be of equal or greater importance [43,44]. For instance, using a case study of the forced relocation of traditional riverbed communities from river basin settlements on the Narmada River to a resettlement site on the plains in Malu, Gujarat, Mehta (2013) shows that a focus on the material dimensions of water alone did not account for the dramatic impacts on well-being brought about by changing relationships, access and control over water [17]. Focusing on the material dimensions of water alone can thus erase, and even contribute to dramatic losses to identity, health, knowledge and traditions associated with Indigenous ways of life [44–46]. In this instance, the contamination of a traditional water source not only physically restricts access to these water sources, but also prevents Indigenous peoples from meeting reciprocal obligations to water, resulting in relational losses with material and non-material implications for identity, spirituality, and culture.

Indigenous peoples frequently identify historical and ongoing settler colonialism as the most important factor affecting their well-being [47,48]. Settler colonialism refers to a form of colonialism in which colonizers dispossess Indigenous peoples of their land for settlement and resource development. Dispossession is initially carried out through physical force, but a variety of technologies are used to maintain this state (e.g., maps, numbers, and law). Both are legitimated, justified and reinforced through mechanisms including policy, ideology, and discourse about identity [49]. Although both colonialism and settler colonialism are based on domination by an external power, only settler colonialism seeks to replace Indigenous peoples with a settler society [50]. As such, settler colonial governance structures constrain Indigenous peoples' ability to maintain relationships to the lands and waters within their territories, which are fundamental to sustaining material needs as well as for identity formation and enacting physical, communal and spiritual relationships [18,36,51–53]. Indigenous scholars have described settler colonial domination as violence that disrupts relationships between Indigenous peoples and the more than human world [54–56]. Tuck and Yang (2012) discuss how "the disruption of Indigenous relationships to land represents a profound epistemic, ontological, cosmological violence" [54] (p. 5). Thus, settler colonialism impacts water security not only through initiating material loss (e.g., the impacts of resources development on water quality), but also has political ontological implications (e.g., the imposition of systems of governance based on settler understandings of water as a resource rather than as a living relation impacts the social-sociocultural and spiritual connections with water). In the same vein, Mushkegowuk (Swampy Cree) scholar Michelle Daigle (2018) highlights the need to situate "drinking water issues [for Indigenous peoples]

within structural colonial legacies and continuities such as the Canadian government's ongoing disinvestment in infrastructure within Indigenous communities" [52] (p. 162). Thus, any approach to water security for Indigenous peoples must acknowledge settler colonialism as a root cause. Further, the social, cultural, psychological, and spiritual health of Indigenous peoples is not often accounted for in assessments because they can be more difficult to characterize and measure [45,46]. Their exclusion is also highly political because a truly holistic assessment that includes colonialism would reveal that water insecurity cannot be addressed through technical solutions alone, but requires the transformation of broader governance structures in order to acknowledge Indigenous water rights, responsibilities and authorities [18,31,57].

We therefore propose here a conceptual model for Indigenous water security that goes beyond a focus on the material dimensions of water security (e.g., water quality, quantity, access and affordability) to account for Indigenous water relations in a broader sense including agency and self-determination, identity, traditional use, knowledge transmission and more (Figure 1). We build on similar frameworks related to water security for Indigenous peoples in North America and the Global South [10,17,58]. First, Latchmore and others (2018) develop a multi-dimensional framework that contributes to conceptualizing Indigenous water security in a number of ways. Indeed, they note fundamental interconnections between physical, social, economic and health and wellbeing for Indigenous water security. Toward this end, "spiritual and cultural uses," as well as "health and wellbeing" are counted among the many elements of importance for Indigenous water security. Furthermore, they acknowledge the influence of broader scale political processes on water security by noting the role of water governance, rights and responsibilities [10]. Second, based on a case study of freshwater systems in Nunavut, Canada, Medeiros and others (2017) develop a framework for water security in the Canadian North. While they develop understandings of the biophysical dimensions of water security given various drivers of environmental change (e.g., climate change and legacy contamination of water sources), they also note the importance of Indigenous Knowledge, and local control and decision-making for water security given the legacy of colonialism and present movements toward Indigenous self-governance and self-determination [59]. Third, Mehta and Punja (2007) engage a well-being framework to illustrate the implications of material, symbolic and cultural values of water for the water security of different social actors for varying social, political and economic purposes [58]. Through a concentric circle model, they highlight the ways that water security policy interventions often focus on material dimensions of water and well-being, while neglecting local and Indigenous peoples' subjective and intangible understandings of well-being (see also [17]). Our framework builds on and contributes to this literature by rearticulating water security according to Indigenous water ontologies and epistemologies. While we separate the material from non-material dimensions of water security we do so for conceptual ease and do not intend to reinforce a false dichotomy between nature and culture. In developing and applying this framework we show that not only are material and non-material dimensions of water security linked but they are complexly connected in ways that are shaped by broader social and political processes including settler colonialism. In the section that follows, we also advance this reimagined water security framework using a case study of TH relationships to traditional and treated water sources.

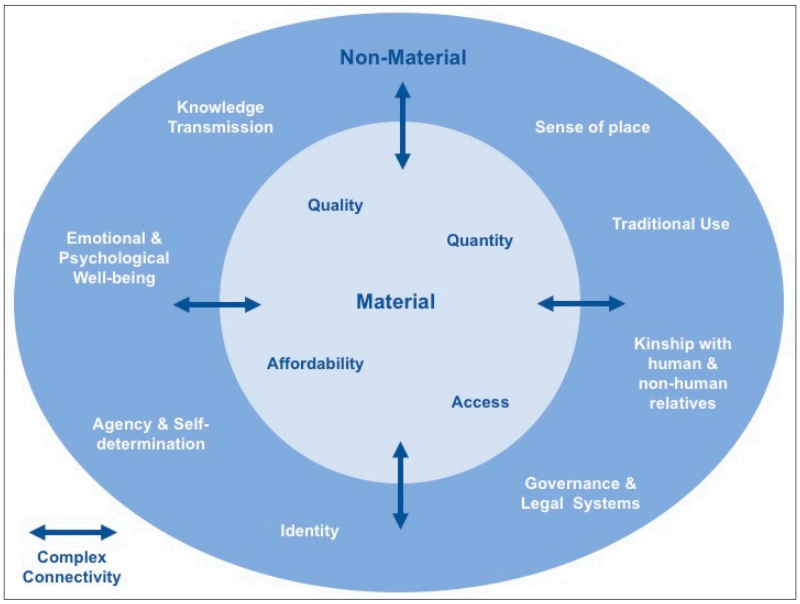

Figure 1. This diagram rearticulates water security according to Indigenous water relations based on holistic understandings of the complex connections between material and non-material dimensions of water. While we separate the material from non-material dimensions of water security we do so for conceptual ease and do not intend to reinforce a false dichotomy between nature and culture and the tangible and intangible dimensions of water.

2. Research Setting

Tr'ondëk Hwëch'in (TH) is one of 14 Yukon First Nations. The First Nation's current citizenship is comprised of roughly: 1100 descendants of the Hän-speaking people, who have lived along the Yukon River for millennia; and a diverse mix of families descended from Gwich'in, Northern Tutchone, and other language groups [60]. The name Tr'ondëk Hwëch'in, tells the story of TH's ancestral occupation of the site at the mouth of the Klondike River, where Dawson City, Yukon is located today. In the Hän language Tr'o refers to the hammer rocks used to drive the salmon weir stakes into the mouth of the river, ndëk means "river," and Hwëch'in means "people" [61]. The people of TH engaged in harvesting—moving throughout their vast territory following seasonal patterns for harvesting fish, animals and plants including salmon, large game such as moose and caribou, and berries, which included spending much of the year at the confluence of the Klondike and Yukon Rivers at a site called Tr'ochëk [61].

The TH have faced massive social changes over the past century [61] that include dramatic shifts in legal and governance arrangements in the territory [62]. After more than 30 years of negotiations, beginning in 1973, TH signed land claim (1998) and self-government (1998) agreements [63,64]. Through their land claim agreement, the First Nation agreed to retain Aboriginal rights and title to Settlement lands, which represent less than 10% (2590 km^2) of the lands within their traditional territory in exchange for partnership in the governance of all lands and waters in Yukon (Figure 2). Despite the rights and authorities acknowledged in these agreements, full implementation of co-governance arrangements in relation to water has yet to be realized [65]. Regardless of these changes, TH citizens continue to maintain complex relationships to the waters throughout their Traditional Territory, which includes the use of traditional water sources.

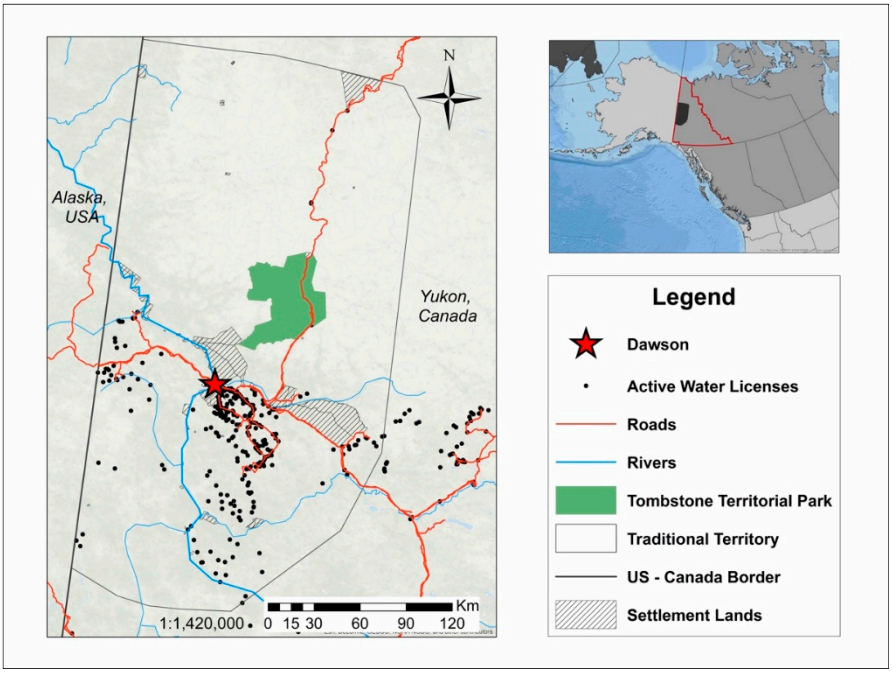

Figure 2. Map of the Tr'ondëk Hwëch'in (TH) Traditional Territory illustrates the spatial distribution of Settlement Lands, active water licenses, and protected areas. Map produced by the lead author.

Treated drinking water is supplied to TH citizens by Dawson City's drinking water system. This water source, drawn from three wells near the junction of the Klondike and Yukon Rivers, was recently designated as groundwater under the direct influence of surface water (GUDI) [66]. Treated water is piped to the majority of TH citizens' homes. A small portion of homes receives trucked water delivery, while a few have private wells. Drinking water in Yukon is governed under the Drinking Water Regulation of the Yukon Public Health and Safety Act (2009) [67]. According to existing assessments based on Western scientific approaches, the TH experience a high level of water security compared to other First Nations across Canada given that First Nations' drinking water crises are pressing and severe across the country [68]. Many First Nations do not have access to safe drinking water, and are frequently under Boil Water Advisories, and, in more severe cases, "Do not consume" or "Do not use" advisories are resulting in impacts on physical health (i.e., high incidence of illnesses associated with water-borne disease) [11,15,69–71]. We acknowledge the importance of studies of water security and insecurity for First Nations who have do not have access to "safe" water by any measure. At the same time, we view this case study of TH water relationships as useful for rearticulating water security frameworks according to more holistic understandings of health and relationships to water.

3. Research Methods and Positionality

This paper is co-authored paper by academic and community researchers. Three of us, Wilson, Harris, and Satterfield, are scholars of settler origin. Two of the authors of this paper are affiliated with TH. The lead author has been collaborating with TH since 2012. Throughout this partnership, the lead author worked closely with staff from the TH Heritage Department including co-authors Joseph-Rear and Beaumont. All work reported here is based on community-based research conducted in partnership with TH between 2012 and 2017.

Community-based research focuses on topics of real importance to communities, involves community members in all phases of the research process, and seeks to advance positive and locally-desired social change [72]. Given the decidedly negative histories of research involving university researchers and Indigenous peoples [73–75], community-based research must be developed in a way that aims to "decolonize" conventional research relationships [76]. Towards that end,

Indigenous peoples are developing their own protocols to protect their communities and knowledge systems, all of which build on the core principles of Indigenous research methodologies including respect, responsibility, reciprocity, and relevance (the "four Rs") [77,78]. We aim to conduct research in a way that lives up to these principles and the ethical standards set by these protocols including TH's own protocols.

All of the interviews were conducted by the lead author between 2012 and 2015 in Dawson City, Yukon. This includes interviews conducted as part of a community-based research project with the Yukon River Inter-Tribal Watershed Council (YRITWC). Working closely with the TH government and staff from their Heritage Department, 11 Elders, and four other knowledge holders were recruited to participate in interviews. Elders were given honoraria to acknowledge the time and knowledge they shared. In 2012, Wilson and employees from the YRITWC held a focus group with seven people (two Elders and five TH staff members), which identified 26 water-based sites of concern to TH citizens. Water quality monitoring was conducted in the fall of 2012 and 2013 at five of these sites—including two of the traditional water sources that are central to this paper. Baseline water quality samples were collected for each of the five sites following the USGS protocols employed by the YRITWC within the Indigenous Observation Network. Depending on the site, additional parameters such as metals, nutrients, bacteria and hydrocarbons were analyzed [79,80].

Using the names of Elders and other experts can be understood as a form of citation. However, with two exceptions, the names of Elders are not used in this work. Interviews were transcribed and thematically coded using NVivo. In 2017, research results were shared with and validated by TH through sharing plain language reports and discussing the contents of these reports during three community presentations in 2013, 2014 and 2017. Finally, all interview audio and transcriptions were returned to the TH archives for future use at their discretion. This research was approved by the UBC Behavioural Ethics Review Board (BREB Cert # H13-02577).

We identify three main limitations to our methodologies. First, water security was not the specific focus of these interviews. However, the themes arising from interviews with citizens of TH related to water use and relationships to traditional and treated water sources revealed insights relevant to water security. Second, while four younger TH citizens were interviewed, this study was not specifically designed to investigate intergenerational differences. Future studies could highlight these themes more explicitly by engaging purposive sampling stratified across multiple generations. Third, water quality sampling was conducted in 2012 and 2013 at a variety of water sources of importance including several sources identified as traditional drinking water sources. Future research could include a more systematic and longitudinal approach to sampling traditional drinking water sources in order to understand the differences between sources and to track changes across seasons and years.

4. Results

4.1. Chuu: Tr'ondëk Hwëch'in Relationships to Water

Interviews with TH Elders reveal complex relations to water, linked in many ways to dynamic harvesting and livelihood practices within their traditional territory. Elders described numerous ways that the people of TH use and relate to water or *Chuu*, in the Hän language, including as habitat for fish, plants and animals; for swimming and transportation in the winter and summer; for drinking water and other domestic uses including washing and cooking. For example, one Elder stated, "The water heals you. Without the water, you'll just die like that. Water is a healer. If it weren't for water, we wouldn't be living here." When asked about the importance of water, another Elder expanded on this understanding, adding that water is fundamental to the TH way of life:

> You know the creeks and all, it keeps us going, water. As long as it's healthy water. So every creek, for years, the old people used to always get water. It's a source of clean water so it's part of our life, you know. It's a traditional way. [. . .] Land too, we think about land too, to

> make sure. A lot of people tell me, 'how come you don't mine gold?' I tell them, 'we think about the land and the water and make sure it's pure to drink.' It's part of life, our ways.

In other words, water is not only important to maintain "life," but a "way of life." Relationships to water involve a lot more than physical access but are linked to broader understandings of water security and health that include socio-cultural and spiritual relationships.

Relationships to water are informed by reciprocal obligations that go beyond simplistic understandings of the need for material access to highlight the broader hydrosocial relations to support Indigenous understandings of health. "Respect" is foundational to TH understandings of the world and their position within it including relationships to other humans and more-than-human beings including water [36]. In an archival interview from 1993, Elder Percy Henry described the relational ontologies that are fundamental to this way of life. He said, "Keep your land clean, keep your animal, that's your friend. You look after them; they'll look after you. You look after your water, land, trees, you look after it, respect it. That's our spirituality. Respect your fellow men, all these elder will tell you" [61] (p. 60). While there is no single word or phrase in the Hän language for the word "respect," it is frequently used to refer to a range of beliefs, values and practices that illuminates the ontologies that are fundamental to TH understandings of the world and relationships to water. Based on research with TH and three other Yukon First Nations (Carcross/Tagish, Kluane, and White River First Nations), Wilson and Inkster (2018) highlight how Yukon First Nation calls to "respect water" "make clear that water is not just seen as a material element that makes life possible, rather for Yukon First Nations, water is a living entity, with the 'person-like' quality of agency referred to as 'spirit.' From this perspective water not only enables human life by meeting physical needs, but water is life or alive" [36] (p. 9). In the Hän ontology (ways of being) and epistemology (ways of knowing), water has many roles: water is alive or has "spirit"; water is a relative; water is a teacher; water is a healer, and; is at times considered medicine. Illustrating this perspective, Elder and former Chief, Percy Henry shared a story about a "spring" (most likely a hot spring) that conveyed these understandings of water as linked to the need to respect water:

> . . . There's a little spring come outta rock and it got power, that water. So people go up there, just sick and they give it something and they drink it or have a little bath and it's good. And this Indian here [. . .] he went there, and he said, "that isn't medicine." Then that water quit. Been running for millions a' year and he quit. See? Things like that you have to respect it. (Archival interview 2012)

While Percy is not specifically referring to "drinking water," the teachings he shared are important for framing understandings of water security for the TH. Indeed, his description of respect and story about the spring not only highlights TH water relations, including understandings of water as a living entity that has agency, but also links respect to other principles that animate their relational ontology and epistemology including Relationality, Responsibility and Reciprocity: Relationality refers to the idea that Indigenous peoples are fundamentally rooted in their relationships [75,81,82]. Responsibility and Reciprocity are also fundamental to understanding Indigenous concepts of Respect. Humans have a responsibility to follow specific protocols or rules for behavior in relation to water [18,34,51,53,83]. Reciprocity is about engaging with water according to protocols to ensure mutual survival. In other words, if you take care of the water, it will take care of you. These protocols and the oral traditions that inform them are the basis for Indigenous water laws that have existed for millennia [31,38,39,84,85]. As conveyed by the story above, water has agency and actively participates in relationships across the human and non-human world. The individual in the story above broke protocol by stating that they did not believe that the spring water was medicine. The spring stopped running as a consequence of this disrespect. Therefore, it ceased to "take care" of people because the healing properties of the water were no longer available. TH relationships to water or Chuu are foundational to understanding the perspectives about treated and traditional water sources elaborated in the sections that follow.

4.1.1. Treated Water Sources

Only one interview participant specifically expressed a positive perspective of treated water originating from the municipal supply in Dawson City, Yukon. Conversely, interview participants shared a general distrust of treated drinking water sources and a distaste for chlorinated water. For example, one Elder, conveyed a particularly strong distrust of the treated drinking water, including attributions of chronic disease. When asked why they do not drink the tap water they answered,

> Because I don't know what's in the water and I don't know if that's making so many people sick. Because, you know, cancer. You know you hear more about cancer than you ever did before. Of course, I know there's all kinds of other things but that's. Yah, because you just don't know what's in it.

Other Elders noted that they experienced more immediate and negative health impacts after drinking the tap water. For example, Elder Percy Henry said, "You see, if I drink tap water one day I'll be sick and get pain. So that's why I can't drink it." While many (seven) interviewees reported that they regularly drink the treated tap water, the majority stated that they do not like the tap water, and several (four) stated that they only consume this water after filtering, or in one case after boiling the water to get rid of impurities.

We found that an aversion to chlorinated water was a prevailing reason cited for disliking and/or avoiding of tap water. It was also referenced as sharply different and lesser than water from preferred traditional sources including creeks. For instance, one Elder stated,

> No, we got tap water, but I don't drink it because it's got that stuff inside and I'm so used to creek water. If I drink that water like for tea or something, I get it in my mouth, and it stays in my mouth for a while. What do you call it, chlorine? It stays in my mouth for a while, maybe three days or so. I could taste it because I am always drinking water from creeks.

Two individuals stated that they prefer to drink bottled water; the majority of Elders expressed a preference for traditional water sources over treated water sources.

4.1.2. Traditional Water Sources

The use of traditional water sources is widespread among the citizens of TH. Ten out of 11 of the Elders interviewed stated that they currently drink water from traditional water sources. Seven specific sources of drinking water were identified. We identify water sources by type rather than by name or specific location out of respect for the sensitivity of these sources and their importance to the people of TH. These sources included sites on the Yukon River, two other large rivers (Klondike and Blackstone Rivers), three smaller creeks and one spring. Some of these drinking water sources were only used while on the land at fish camp or hunting camp. However, one of the creeks mentioned is used year-round by the majority of Elders interviewed (eight out of 11). Its use is not merely as a matter of convenience as its access is difficult—through a family camp, located about a one-hour drive from downtown Dawson. The TH Heritage Department actively gathers water from this creek and distributes it to Elders. As Angie Joseph Rear stated in 2012,

> Here we are in Dawson City. Water is very important. I think as a human, we are in need of it and what's more important is the environment of the water. Like, right now, I think a lot of us would go up the Dempster [Highway] and get water from [a particular creek]. Even our department does that. I work for the Heritage Department with TH.

Several Elders noted that they would get a ride out to this creek with the Heritage Department to collect water. For example, one Elder stated, "well, if I taste the chlorine. No, I don't drink it. I go out, I get a ride out to [that creek] and get water there. Not just one jug. You get four or five jugs just for tea and coffee. I cook with it. You get used to life like that." In the section that follows, we describe the Indigenous knowledge of water quality shared by interview participants, before returning to the broader questions relevant to water security in the conclusion.

4.2. Indigenous Knowledge of Water Quality: How Do You Know If It Is Safe?

Indigenous knowledge of water informs TH understandings of the nature of "safe" or "healthy" drinking water. We define Indigenous knowledge as "a constantly evolving body of information, which originated generations ago and is built upon daily; [. . .] any definition of traditional knowledge will not be static and must be given room to expand and change" [86]. Indeed, the value of Indigenous knowledge for observing and responding to changes in water quality, quantity and/or flows is widely acknowledged [70,87–89].

We asked the Elders how they determine traditional water sources are safe for human consumption. Our findings indicate that Elders prefer certain organoleptic properties (i.e., sensorial information from taste, odor, color and turbidity), and these properties are in part used to tell if the water is safe for consumption (Table 1). The water should be clear and free of sediments. Elders referred to this as "White Water." It should have no smell. One Elder said, "if it smells like mossy or you know a funny smell, then you know, I wouldn't drink it." The water should also be "running" ("The water I drink is the water that runs") and there should be no moss or anything growing on the rocks. Similarly, they noted that it should taste good and "fresh." When asked how they know the water is safe, one Elder stated "We could see it. We could taste it. And it's different from tap water because that water is fresh, and you could taste the difference between town water and out there." Another Elder said, "You would taste the difference immediately, yourself, if you had that [creek] water and actually I just got containers all ready to go again and pick some more water up." This water was also considered to make "good tea." The tea stays red unlike tea made with tap water, which would "blacken-up your cup" or has a "black scum" on it.

Table 1. Summary of indicators used by TH Elders to determine if traditional drinking water sources are safe for human consumption.

Indicator	Description
Sensorial Properties	
Color	Water should be clear with no color (e.g., tap water can be grayish or yellow).
Turbidity	The term "White Water" refers to clear water that you could see through. This means that water with limited turbidity is desirable.
Running Water	Water should be fast flowing and not stagnant.
Nothing Growing	No moss or plants should be growing on the rocks.
No animals in vicinity	There should be no animals around to contaminate the water. Ducks swimming in water can be a sign that it is not contaminated.
Makes Good Tea	Water should make red tea. Bad water makes black tea that leaves stains in your cup.
Odor	There should be no smell.
Taste	It should have a "fresh" taste. It should taste "good." It should not taste like chlorine.
Prior Knowledge and Use	
Prior Use	The water source has been used by many generations.
Knowledge of sources of contamination	There should be nothing above the water source in the watershed (e.g., no outhouses, septic fields, or resource extraction).
Water Quality Testing	Several Elders noted that they would like water quality sampling to be conducted at the water sources they use.

Prior use also informs the assessment of the safety of a water source, specifically, when people have used it for a long time, and nobody has become ill. As one Elder put it in relation to one particular source,

> Us, we drink that since we were little kids. We were raised up drinking that water. Then, every summer we go down there. We still drink it. Some people, well, they still bring water from town for people.

Similar to other sources we have discussed, the site this Elder mentions has been used for many generations. In such examples, knowledge of the water source and the surrounding area is key and contributes to the assessment. The Elders noted there should be nothing above the water source in the watershed (e.g., no outhouses, no septic tanks, no resource extraction). In this vein, one Elder said, "Well, we know what's above the creek or what's not above the creek. Like no one's in there. You know and it's coming out of the mountains, in between like this, in a valley. So, we know." Furthermore, while the presence of animals (e.g., ducks) can be a sign that the water is not contaminated by other sources (e.g., mining), it is important that no animals are present to contaminate the water source.

Conventionally, Western scientific approaches to drinking water quality assess the untreated or "raw" water sources used by the TH as unsafe because there is no way to ensure these sources are free of microbial contaminants [12,90]. In 2012 and 2013, TH and the YRITWC conducted water quality sampling as part of a community-based monitoring initiative. Grab samples were collected at two traditional water sources, including a mountain creek the majority of Elders use on a regular basis. Bacteriological tests for *Escherichia coli* (*E. coli*) and total coliform bacteria were conducted both years [79,80]. In September 2012 and 2013, *E. coli* was less than 1 per 100 mL at both traditional water sources. Total coliforms varied between sites and across years: at one lesser used traditional water source, total coliform bacteria were 5 per 100 mL in 2012 and 16 per 100 mL in 2013, while at the main traditional water source these were found to be 5 per 100 mL both years. According to the Federal-Provincial-Territorial Committee on Health and the Environment, there should be no detectable *E. coli* and or total coliform bacteria per 100 mL [90]. The minimal levels of microbial content in these two traditional water sources suggest that even according to Western scientific assessments, the risk of contracting waterborne diseases, at least at the time of sampling, was minimal. This does not negate the vulnerability of these water sources to environmental change including seasonal fluctuations in the microbial content of a water source [9], contamination from resource development (e.g., extensive placer mining), or changes to water quality, quantity or flows resulting from climate change [91]. For instance, two of the traditional water sources identified are no longer used because they are considered to have been contaminated by extensive placer mining. The majority of traditional water sources presently used by TH citizens are located in the northern portion of their territory where mining activity is limited (Figure 2). For example, several of the sources are located in protected areas such as Tombstone Territorial Park. In the section that follows, we highlight key implications of these findings for reimagining water security according to Indigenous water relations.

5. Discussion and Conclusions

In this paper, we seek to reconceptualize water security in ways that respectfully engage Indigenous water relations. It is therefore not the purpose of this paper to evaluate the validity of the knowledge shared by our interview participants. Instead, we highlight the multidimensional material and non-material socio-cultural relationships to water maintained by Indigenous peoples, or what we call Indigenous water relations, that must be included in water security assessments. Toward this end, we present a case study of TH relationships to treated and traditional water sources based on interviews with Elders and several other community members. We find that TH Elders have a strong preference for traditional water sources because the use of these sources is considered healthier than treated drinking water and connects them to a way of life that has been passed down through generations. Western scientific approaches to water security fail to incorporate the importance of the use of traditional water sources because they focus on an overly narrow understanding of water health, which is confined to physical expressions alone. To better understand the complex interrelationships between physical, spiritual and cultural health and wellbeing for Indigenous peoples we take up calls within existing water security literature to reorientation of water security away from a sole focus on the material dimensions of water towards an approach that considers the importance of a broader set of hydrosocial relations [17,20]. In doing so we contribute to the water security literature in three key ways:

First, we find that a radical shift in water security framings is needed to respectfully engage Indigenous water relations including ontologies, epistemologies and governance systems that center on understandings of water as a living entity to which they have reciprocal responsibilities; a perspective which differs substantially from settler understandings of water as a resource [31,32,34,36]. Where Indigenous water relations are considered 'cultural constructions' or 'perceptions' reinforcing the overarching tendency to treat Indigenous epistemologies and ontologies as symbolic rather than literal [92,93]. For example, two studies examine water security for Indigenous peoples in Arctic and sub-Artic contexts in important ways that extend beyond the material. To explain the preference for traditional water sources Goldhar and others (2013) incorporate "preferences," with attributes such as desirability, perception, and values, as a dimension of water security "to create space for consumption practices and preferences of drinking water that may differ from those currently assumed by the norms of water security discourse" [7] (p. 463). Similarly, Eichelberger (2017) explores the cultural dimensions of water insecurity in the Yupik village of Newtok, Alaska where residents rely on a combination of treated and traditional water sources. She notes, "daily practices around water access and use vary by season and availability of treated water and are shaped by cultural constructions and risk perceptions related to particular water sources and contamination" [5]. Both papers push the boundaries of mainstream water security frameworks beyond the material dimensions of water as they seek to include Indigenous peoples' relations to traditional water sources but fail to take seriously Indigenous understandings of water as a living entity. As Anishinaabe scholar Deborah McGregor (2009) states, environmental justice for Indigenous peoples is about "justice for all beings of Creation, not only because threats to their existence threaten ours but because from an Aboriginal perspective justice among beings of creation is life affirming" [94] (p. 27). Thus, reframing water security to account for Indigenous understandings of water as a living entity not only allows for better assessment of impacts to Indigenous peoples but considering the reciprocal relationships between Indigenous peoples and water also decenters the role of humans. From this perspective, we understand water insecurity as something that interferes with Indigenous peoples' ability to fulfill their responsibilities to water (e.g., the need to "respect water"). Conversely, water insecurity also impedes water from fulfilling its duties to Indigenous peoples (e.g., as a relative, a teacher, a healer etc.) [34,94]. Such a shift requires consideration of what it would mean for water security frameworks to "take seriously the possibility and politics of a multiplicity of water-related worlds, highlighting multiple water realities and ways of being-with-water, not just different perceptions of knowledge systems tied to water's (singular) material existence" [37] (p. 2). The consumption of water from traditional sources also contributes to health by facilitating the continuation of a broader set of water relations that are part of a "way of life" that has been handed down through generations. A direct connection to water as a living entity also connects people to the land—where relationships to water and land are the language of all past and ongoing practices of ancestors and the community and not just individuals. Maintaining those connections is essential to fulfilling reciprocal responsibilities, and maintaining associated identities, and is thus basic to water as a living entity.

Second, our case study highlights the ways that settler-colonial politics and histories shape assessments of water security. We understand settler colonialism as a key driver of water insecurity as it contributes to loss or contamination of traditional water sources in the form of unsustainable resource use, global environmental change, and other drivers of change [18,52,56,95,96]. Furthermore, political inequalities created by settler colonialism also drive what is identified as a risk to drinking water. According to Tansey (2004), context (e.g., the social divisions and hierarchies around which people are organized) drives what is identified as a risk, wherein the definition of risk itself is intimately linked to issues of power [97]. Risk attributions thus shed light on who is in charge and who is liable: "[r]isk becomes politicized not simply because it is a threat to life but because it is a threat to ways of life" [97] (p. 29). Our research shows significant differences between the way TH Elders understand water—as a living entity rather than as a resource—and the risks associated with chlorination. While chlorination is justified according to Western scientific assessments of risk, adding chemicals, such

as chlorine to water may be understood as unsafe not only because of an overall attitude towards chlorine but because such an action is disrespectful to the spirit of water itself [98].

We consider ontological politics as fundamentally contributing to differing assessments of the microbial and chemical risk associated with the consumption of treated and traditional water sources. Blaser (2009) defines ontological politics as "the conflicts that ensue as different worlds or ontologies strive to sustain their own existence as they interact and mingle with each other" [99] (p. 877). Similarly, it has been argued elsewhere [37], different answers to the question of what is "safe" or "healthy" water is often rooted in ontological differences. Indigenous water ontologies, which understand water as a living entity, can be seen in distinction to settler views of water, which draw upon a 'treatment ontology.' In the latter exists the assumption that it is possible to break water down water into constituent parts (or merely H_2O) and remove (or eradicate) some parts. In this way, a "treatment ontology" undermines or clashes with Indigenous water ontologies because in imagining water as a mere resource, it disregards the possibility of water as a living entity.

Elsewhere, authors have expressed concern that distrust of chlorinated tap water can lead Indigenous communities to use "high-risk" water sources [7,16,21]. However, assessments of sources as "high-risk" tend to ignore Indigenous peoples' views of water and health (and their measures of quality and safety noted above). In other cases, the very idea of what is safe and what is being protected is challenged. Donatuto and others (2008), for example, examine the ways colonial health risk assessments fail to explain the Swinomish Tribal Community's continued consumption of seafood despite knowledge that the seafood is contaminated [100]. This is in large part because these assessments fail to account for the spiritual and cultural importance of these foods or what they refer to as 'the feeding of the soul'. According to the Swinomish assessment of risk, spiritual or cultural health considerations outweighed concerns over risks to physical health (see also [43]). In our case study, a 'treatment ontology' fails to acknowledge that water is a spirited and living entity toward which Indigenous people hold relational obligations. As a result, it fails to explain why Elders continue to consume traditional water sources regardless of Western scientific assessments of risk.

Third, we find that Two-Eyed Seeing can be applied to productively engage with the differences and similarities in approaches to water security. The concept of "Two-Eyed Seeing" (translated from Etuaptmumk) was first articulated by Mi'kmaq Elder Albert Marshall in 2004 [101]. As Martin (2012) states, "Western scientific approaches to health research often ignore or undermine alternative ways of knowing, preferring to focus on the pursuit of objective, detached research that can uncover the 'truth' about a particular topic" [102] (p. 30). In contrast, Two-Eyed Seeing represents a call to the research community to see the strengths of Indigenous knowledge (one eye) on equal terms as the Western scientific knowledge (one eye), and to learn how to use both eyes to answer pressing research questions in more holistic ways.

Ultimately, Two-Eyed Seeing encourages a useful re-articulation of water security frameworks, which engage Indigenous water relationships, and so also involve forms of cooperation that recognize multiple types of social, political and ecological limits while simultaneously prioritizing the authority of Indigenous peoples [77,103–105]. Such an approach is required to overcome the trend towards "integration" of these knowledge systems in ways that reproduce colonial injustices. By this, we mean the "integration" of Indigenous Knowledge in a solely instrumental manner, whereby no challenge to Western scientific convention is launched or considered [106,107]. Furthermore, many researchers and decision-makers are dismissive of Indigenous Knowledge and frequently assume that Western knowledge is needed to validate Indigenous knowledge [92,108]. This does not mean we should discard Western science. Indeed, Castleden and others (2017) find that there are "instances where such approaches are working, where integrative Indigenous and Western knowledges have come together in respectful and responsible ways to challenge colonial policies and practices in the context of water research and management" [103] (p. 74). That said, moving beyond problematic approaches to "integration" are key to more completely and holistically redefining water security, wherein the *conjunctures* and *disjunctures* between systems are revealed [37]. This involves prioritizing a multiplicity

of hydrosocial relations in ways that stress the importance of articulating and re-affirming Indigenous water laws, customs and knowledge [35,36]. For instance, the results of water quality sampling at times converge or coincide with Indigenous Knowledge of water. Indeed, preliminary water quality sampling for microbial parameters conducted at two of TH's traditional water sources showed the minimal presence of both *E. coli* and total coliforms [21]. Convergence or divergence between these knowledge systems aside, respecting Indigenous authority to determine their own health practices means that the mere presence of microbial content should not automatically result in a recommendation suggesting that this water is no longer consumed. Rather, we believe that Western science can be engaged to inform decision-making without disrespecting the authority of Indigenous peoples to maintain their own health practices.

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References

1. Cook, C.; Bakker, K. Water security: Debating an emerging paradigm. *Glob. Environ. Chang.* **2011**, *22*, 94–102. [CrossRef]
2. Zeitoun, M.; Lankford, B.A.; Bakker, K.; Conway, D. Introduction: A Battle of Ideas for Water Security. In *Water Security: Principles, Perspectives and Practices*; Lankford, B.A., Bakker, K., Zeitoun, M., Conway, D., Eds.; Routledge: New York, NY, USA, 2013; ISBN 978-0-415-53470-3.
3. Pahl-Wostl, C.; Bhaduri, A.; Gupta, J. *Handbook on Water Security*; Edward Elgar Publishing: Cheltenham, UK, 2016.
4. Staddon, C.; James, N. Water security: A genealogy of emerging discourses. In *Globalized Water*; Springer: Dordrecht, The Netherlands, 2014; pp. 261–276.
5. Eichelberger, L. Household water insecurity and its cultural dimensions: Preliminary results from Newtok, Alaska. *Environ. Sci. Pollut. Res.* **2017**, *21*, 1–14. [CrossRef] [PubMed]
6. Eichelberger, L. Spoiling and Sustainability: Technology, Water Insecurity, and Visibility in Arctic Alaska. *Med. Anthr.* **2014**, *33*, 478–496. [CrossRef]
7. Goldhar, C.; Bell, T.; Wolf, J. Rethinking existing approaches to water security in remote communities: An analysis of two drinking water systems in Nunatsiavut, Labrador, Canada. *Water Altern.* **2013**, *6*, 25.
8. Hanrahan, M.; Sarkar, A.; Hudson, A. Exploring Water Insecurity in a Northern Indigenous Community in Canada: The "Never-Ending Job" of the Southern Inuit of Black Tickle, Labrador. *Arct. Anthr.* **2014**, *51*, 9–22. [CrossRef]
9. Sarkar, A.; Hanrahan, M.; Hudson, A. Water insecurity in Canadian Indigenous communities: Some inconvenient truths. *Rural Remote Health* **2015**, *15*, 3354. [PubMed]

10. Latchmore, T.; Schuster-Wallace, C.J.; Longboat, D.R.; Dickson-Anderson, S.E.; Majury, A. Critical elements for local Indigenous water security in Canada: A narrative review. *J. Water Health* **2018**, *16*, 893–903. [CrossRef] [PubMed]
11. Bradford, L.E.A.; Bharadwaj, L.A.; Okpalauwaekwe, U.; Waldner, C.L. Drinking water quality in Indigenous communities in Canada and health outcomes: A scoping review. *Int. J. Circumpolar Health* **2016**, *75*, 32336. [CrossRef] [PubMed]
12. Dunn, G.; Bakker, K.; Harris, L. Drinking Water Quality Guidelines across Canadian Provinces and Territories: Jurisdictional Variation in the Context of Decentralized Water Governance. *Int. J. Environ. Res. Public Health* **2014**, *11*, 4634–4651. [CrossRef]
13. Dupont, D.; Waldner, C.; Bharadwaj, L.; Plummer, R.; Carter, B.; Cave, K.; Zagozewski, R. Drinking Water Management: Health Risk Perceptions and Choices in First Nations and Non-First Nations Communities in Canada. *Int. J. Environ. Res. Public Health* **2014**, *11*, 5889–5903. [CrossRef]
14. Harris, L.; McKenzie, S.; Rodina, L.; Shah, S.H.; Wilson, N.J. Water Justice: Key concepts, debates and research agendas. In *The Routledge Handbook of Environmental Justice*; Holifield, R., Chakraborty, J., Walker, G., Eds.; Routledge: New York, NY, USA, 2017; pp. 338–349.
15. Patrick, R.J. Uneven access to safe drinking water for First Nations in Canada: Connecting health and place through source water protection. *Health Place* **2011**, *17*, 386–389. [CrossRef] [PubMed]
16. Wright, C.J.; Sargeant, J.M.; Edge, V.L.; Ford, J.D.; Farahbakhsh, K.; RICG; Shiwak, I.; Flowers, C.; IHACC Research Team; Harper, S.L. Water quality and health in northern Canada: Stored drinking water and acute gastrointestinal illness in Labrador Inuit. *Environ. Sci. Pollut. Res.* **2017**, *25*, 1–13.
17. Mehta, L. Water and Ill-Being. In *The Social Life of Water*; Wagner, J.R., Ed.; Berghahn Books: New York, NY, USA, 2013; pp. 61–77.
18. Todd, Z. Refracting the State through Human-Fish Relations: Fishing, Indigenous Legal Orders and Colonialism in North/Western Canada. *Decolonization Indig. Educ. Soc.* **2018**, *7*, 60–75.
19. Anderson, K.; Clow, B.; Haworth-Brockman, M. Carriers of water: Aboriginal women's experiences, relationships, and reflections. *J. Clean. Prod.* **2013**, *60*, 11–17. [CrossRef]
20. Jepson, W.; Budds, J.; Eichelberger, L.; Harris, L.; Norman, E.; O'Reilly, K.; Pearson, A.; Shah, S.; Shinn, J.; Staddon, C.; et al. Advancing human capabilities for water security: A relational approach. *Water Secur.* **2017**, *1*, 46–52. [CrossRef]
21. Bernier, J.-L.T.; Maheux, A.F.; Boissinot, M.; Picard, F.J.; Bissonnette, L.; Martin, D.; Dewailly, É.; Bergeron, M.G. Onsite microbiological quality monitoring of raw source water in Cree community of Mistissini. *Water Qual. Res. J. Can.* **2009**, *44*, 345–354. [CrossRef]
22. Martin, D.; Bélanger, D.; Gosselin, P.; Brazeau, J.; Furgal, C.; Déry, S. Drinking Water and Potential Threats to Human Health in Nunavik: Adaptation Strategies under Climate Change Conditions. *Arctic* **2007**, *60*, 195–202. [CrossRef]
23. Kruger, D.J.; Cupal, S.; Franzen, S.P.; Kodjebacheva, G.; Bailey, E.S.; Key, K.D.; Kaufman, M.M. Toxic trauma: Household water quality experiences predict posttraumatic stress disorder symptoms during the Flint, Michigan, water crisis. *J. Community Psychol.* **2017**, *45*, 957–962. [CrossRef]
24. Shah, S.H.; Angeles, L.C.; Harris, L.M. Worlding the intangibility of resilience: The case of rice farmers and water-related risk in the Philippines. *World Dev.* **2017**, *98*, 400–412. [CrossRef]
25. Sultana, F. Suffering for water, suffering from water: Emotional geographies of resource access, control and conflict. *Geoforum* **2011**, *42*, 163–172. [CrossRef]
26. Wutich, A.; Ragsdale, K. Water insecurity and emotional distress: Coping with supply, access, and seasonal variability of water in a Bolivian squatter settlement. *Soc. Sci. Med.* **2008**, *67*, 2116–2125. [CrossRef]
27. Workman, C.L.; Ureksoy, H. Water insecurity in a syndemic context: Understanding the psycho-emotional stress of water insecurity in Lesotho, Africa. *Soc. Sci. Med.* **2017**, *179*, 52–60. [CrossRef] [PubMed]
28. Linton, J. *What Is Water? The History of a Modern Abstraction*; Nature/History/Society Series; UBC Press: Vancouver, BC, Canada, 2010; ISBN 978-0-7748-1701-1.
29. Longboat, S. First Nations Water Security: Security for Mother Earth. *Can. Woman Stud.* **2015**, *30*, 6.
30. Anderson, K. *Aboriginal Women, Water and Health: Reflections from Eleven First Nations, Inuit, and Métis Grandmothers*; Atlantic Centre of Excellence for Women's Health & The Prairie Women's Health Centre of Excellence: Winnipeg, MB, Canada, 2010.

31. Craft, A. Giving and receiving life from Anishinaabe nibi inaakonigewin (our water law) research. In *Methodological Challenges in Nature-Culture and Environmental History Research*; Thorpe, J., Rutherford, S., Sandberg, L.A., Eds.; Routledge: New York, NY, USA, 2017; pp. 105–119. ISBN 978-1-318-95603-2.
32. Craft, A. *Anishinaabe Nibi Inaakonigewin Report: Reflecting the Water Laws Research Gathering Conducted with Anishinaabe Elders, June 20-23, 2013 at Roseau River, Manitoba*; University of Manitoba, Centre for Human Rights Research (CHRR) and Public Interest Law Centre (PILC): Winnipeg, MB, Canada, 2014.
33. LaBoucane-Benson, P.; Gibson, G.; Benson, A.; Miller, G. Are We Seeking Pimatisiwin or Creating Pomewin? Implications for Water Policy. *Int. Indig. Policy J.* **2012**, *3*, 1–22. [CrossRef]
34. McGregor, D. Traditional Knowledge and Water Governance: The ethic of responsibility. *Altern. Int. J. Indig. Peoples* **2014**, *10*, 493–507. [CrossRef]
35. Wilson, N.J. Indigenous water governance: Insights from the hydrosocial relations of the Koyukon Athabascan village of Ruby, Alaska. *Geoforum* **2014**, *57*, 1–11. [CrossRef]
36. Wilson, N.J.; Inkster, J. Respecting water: Indigenous water governance, ontologies, and the politics of kinship on the ground. *Environ. Plan. E Nat. Space* **2018**. [CrossRef]
37. Yates, J.S.; Harris, L.M.; Wilson, N.J. Multiple ontologies of water: Politics, conflict and implications for governance. *Environ. Plan D* **2017**, *35*, 797–815. [CrossRef]
38. Borrows, J. *Recovering Canada: The Resurgence of Indigenous Law*, 1st ed.; University of Toronto Press, Scholarly Publishing Division: Toronto, ON, Canada, 2002; ISBN 978-0-8020-8501-6.
39. Napoleon, V. Thinking about Indigenous Legal Orders. In *Dialogues on Human Rights and Legal Pluralism*; Provost, R., Sheppard, C., Eds.; Ius Gentium: Comparative Perspectives on Law and Justice; Springer: Dordrecht, The Netherlands, 2013; Volume 17, pp. 229–245.
40. Donatuto, J.; Satterfield, T.; Gregory, R. Poisoning the body to nourish the soul: Prioritising health risks and impacts in a Native American community. *HealthRisk Soc.* **2011**, *13*, 103–127. [CrossRef]
41. Harris, S.; Harper, B.I. Measuring risks to Tribal community health and culture. In *Environmental Toxicology and Risk Assessment*; Price, F.T., Brix, K.V., Lane, N.K., Eds.; American Society for Testing & Materials: West Conshohocken, PA, USA, 2000; pp. 195–211. ISBN 978-0-8031-5430-8.
42. Hoover, E. Cultural and health implications of fish advisories in a Native American community. *Ecol. Process* **2013**, *2*, 1–12. [CrossRef]
43. Basdeo, M.; Bharadwaj, L. Beyond Physical: Social Dimensions of the Water Crisis on Canada's First Nations and Considerations for Governance. *Indig. Policy J.* **2013**, *23*, 1–14.
44. Gregory, R.; Trousdale, W. Compensating aboriginal cultural losses: An alternative approach to assessing environmental damages. *J. Environ. Manag.* **2009**, *90*, 2469–2479. [CrossRef] [PubMed]
45. Satterfield, T.; Roberts, M. Incommensurate risks and the regulator's dilemma: Considering culture in the governance of genetically modified organisms. *New Genet. Soc.* **2008**, *27*, 201–216. [CrossRef]
46. Turner, N.J.; Gregory, R.; Brooks, C.; Failing, L.; Satterfield, T. From invisibility to transparency: Identifying the implications. *Ecol. Soc.* **2008**, *13*, 7. [CrossRef]
47. Bourassa, C.; McKay-McNabb, K.; Hampton, M. Racism, sexism and colonialism: The impact on the health of Aboriginal women in Canada. *Can. Woman Stud.* **2004**, *24*, 23–29.
48. Greenwood, M.; Leeuw, S.D.; Lindsay, N.M.; Reading, C. *Determinants of Indigenous Peoples' Health*; Canadian Scholars' Press: Toronto, ON, Canada, 2015; ISBN 978-1-55130-732-9.
49. Harris, C. How Did Colonialism Dispossess? Comments from an Edge of Empire. *Ann. Assoc. Am. Geogr.* **2004**, *94*, 165–182. [CrossRef]
50. Wolfe, P. Settler colonialism and the elimination of the native. *J. Genocide Res.* **2006**, *8*, 387–409. [CrossRef]
51. Coulthard, G.S. *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition*; Univ Of Minnesota Press: Minneapolis, MN, USA, 2014; ISBN 978-0-8166-7965-2.
52. Daigle, M. Resurging through Kishiichiwan: The spatial politics of Indigenous water relations. *Decolonization Indig. Educ. Soc.* **2018**, *7*, 159–172.
53. Yazzie, M.K.; Baldy, C.R. Introduction: Indigenous peoples and the politics of water. *Decolonization Indig. Educ. Soc.* **2018**, *7*, 19.
54. Tuck, E.; Yang, K.W. Decolonization is not a metaphor. *Decolonization Indig. Educ. Soc.* **2012**, *1*, 1–40.
55. Watts, V. Indigenous place-thought and agency amongst humans and non humans (First Woman and Sky Woman go on a European world tour!). *Decolonization Indig. Educ. Soc.* **2013**, *2*, 20–34.

56. Whyte, K. Indigenous experience, environmental justice and settler colonialism. In *Nature and Experience: Phenomenology and the Environment*; Bannon, B., Ed.; Rowman & Littlefield International: New York, NY, USA, 2016; pp. 157–174. ISBN 978-1-78348-521-5.
57. Phare, M.-A.S. *Denying the Source: The Crisis of First Nations Water Rights*; Rocky Mountain Books: Vancouver, BC, USA, 2009; ISBN 978-1-897522-61-5.
58. Mehta, L.; Punja, A. Water and Well-being: Explaining the gap in official and displaced people's understandings of water. In *Waterscapes: The Cultural Politics of a Natural Resource*; Nature, Culture, Conservation Series; Permanent Black: New Delhi, India, 2007; pp. 188–210. ISBN 978-81-7824-176-0.
59. Medeiros, A.S.; Wood, P.; Wesche, S.D.; Bakaic, M.; Peters, J.F. Water security for northern peoples: Review of threats to Arctic freshwater systems in Nunavut, Canada. *Reg. Environ. Chang.* **2017**, *17*, 635–647. [CrossRef]
60. Tr'ondëk Hwëch'in Who We Are. Available online: http://www.trondek.ca/aboutus.php (accessed on 7 May 2018).
61. Dobrowolsky, H. *Hammerstones: A History of the Tr'ondëk Hwëch'in*; Tr'ondëk Hwëch'in: Dawson City, YT, Canada, 2014; ISBN 978-0-9688868-2-3.
62. Nadasdy, P. *Hunters and Bureaucrats: Power, Knowledge, and Aboriginal-State Relations in the Southwest Yukon*; UBC Press: Vancouver, BC, Canada, 2003; ISBN 978-0-7748-0983-2.
63. Government of Canada. Tr'ondëk Hwëch'in Final Agreement; 1998. Available online: https://www.rcaanc-cirnac.gc.ca/DAM/DAM-CIRNAC-RCAANC/DAM-TAG/STAGING/texte-text/al_ldc_ccl_fagr_ykn_tro_thfa_1330369623386_eng.pdf (accessed on 20 March 2019).
64. Government of Canada. The Tr'ondëk Hwëch'in Self-Government Agreement; 1998. Available online: http://www.eco.gov.yk.ca/aboriginalrelations/pdf/th_sga.pdf (accessed on 20 March 2019).
65. Wilson, N.J. *"More Precious Than Gold": Indigenous Water Governance in the Context of Modern Land Claims in Yukon*; University of British Columbia: Vancouver, BC, Canada, 2018.
66. Stantech; City of Dawson. *City of Dawson: Evaluation of Water Supply, Treatment, & Distribution Systems*; Stantech: Dawson City, YT, Canada, 2013.
67. Yukon Government. Public Health and Safety Act. 2009. Available online: http://www.gov.yk.ca/legislation/acts/puhesa.pdf (accessed on 20 March 2019).
68. Neegan Burnside. *National Assessment of First Nations Water and Wastewater Systems—Yukon Regional Roll-Up Report—Main*; Aboriginal Affairs and Northern Development Canada: Ottawa, ON, Canada, 2011.
69. Harper, S.L.; Edge, V.L.; Schuster-wallace, C.J.; Berke, O.; Mcewen, S.A. Weather, Water Quality and Infectious Gastrointestinal Illness in Two Inuit Communities in Nunatsiavut, Canada: Potential Implications for Climate Change. *Ecohealth N. Y.* **2011**, *8*, 93–108. [CrossRef]
70. McGregor, D. Traditional Knowledge: Considerations for Protecting Water in Ontario. *Int. Indig. Policy J.* **2012**, *3*, 1–21. [CrossRef]
71. Brown, B.; Wachowiak-Smolíková, R.; Spence, N.D.; Wachowiak, M.P.; Walters, D.F. Why Do Some First Nations Communities Have Safe Water and Others Not? Socioeconomic Determinants of Drinking Water Risk. *Glob. J. Health Sci.* **2016**, *8*, 99. [CrossRef]
72. Minkler, M.; Wallerstein, N. *Community-Based Participatory Research for Health: From Process to Outcomes*, 2nd ed.; Minkler, M., Wallerstein, N., Eds.; Jossey-Bass: San Francisco, CA, USA, 2008; ISBN 0-470-26043-2.
73. Denzin, N.K.; Lincoln, Y.S.; Smith, L.T. *Handbook of Critical and Indigenous Methodologies*; Sage: Los Angeles, CA, USA, 2008; ISBN 978-1-4129-1803-9.
74. Smith, L.T. *Decolonizing Methodologies: Research and Indigenous Peoples*; Zed Books: New York, NY, USA, 1999; ISBN 978-1-85649-623-0.
75. Wilson, S. *Research Is Ceremony: Indigenous Research Methods*; Fernwood Publishing Co., Ltd.: Winnipeg, MB, Canada, 2009; ISBN 1-55266-281-0.
76. Castleden, H.; Morgan, V.S.; Lamb, C. "I spent the first year drinking tea": Exploring Canadian university researchers' perspectives on community-based participatory research involving Indigenous peoples. *Can. Geogr./Le Géographe Can.* **2012**, *56*, 160–179. [CrossRef]
77. Arsenault, R.; Diver, S.; McGregor, D.; Witham, A.; Bourassa, C. Shifting the Framework of Canadian Water Governance through Indigenous Research Methods: Acknowledging the Past with an Eye on the Future. *Water* **2018**, *10*, 49. [CrossRef]
78. McGregor, D.; Restoule, J.-P.; Johnston, R. *Indigenous Research: Theories, Practices, and Relationships*; McGregor, D., Restoule, J.-P., Johnston, R., Eds.; Canadian Scholars' Press: Toronto, ON, Canada, 2018.

79. Mulligan, B.; Donovan, S.; Inkster, J.; Mutter, E. *Climate Adaptation Strategies An Intergenerational Effort to Combine Indigenous Knowledge and Western Science: Tr'ondëk Hwëch'in First Nation*; Yukon River Inter-Tribal Watershed Council: Whitehorse, YT, Canada, 2014.
80. Wilson, N.J.; Inkster, J.; Toohey, R.; Donovan, S.M. *Integrating Indigenous Knowledge into a Community Contaminant and Climate Change Monitoring Program: Trondek Hwechin First Nation*; Yukon River Inter-Tribal Watershed Council: Whitehorse, YT, Canada, 2013.
81. Atleo, E.R. *Tsawalk: A Nuu-Chah-Nulth Worldview*; UBC Press: Vancouver, BC, Canada, 2004; ISBN 978-0-7748-1084-5.
82. Manson, J. *Relational Nations: Trading and Sharing Ethos for Indigenous Food Sovereignty on Vancouver Island*; University of British Columbia: Vancouver, BC, Canada, 2015.
83. Chiblow (Ogamauh annag qwe), S. Anishinabek Women's Nibi Giikendaaswin (Water Knowledge). *Water* **2019**, *11*, 209. [CrossRef]
84. Napoleon, V.; Friedland, H. An Inside Job: Engaging with Indigenous Legal Traditions through Stories. *MLJ* **2016**, *61*, 725–754.
85. Craft, A. Navigating Our Ongoing Sacred Legal Relationship with Nibi (Water). In *UNDRIP Implementation: More Reflections on the Braiding of International, Domestic and Indigenous Laws*; Centre for International Governance Innovation: Waterloo, ON, Canada, 2018; pp. 53–62.
86. Tr'ondëk Hwëch'in. *Tr'ondëk Hwëch'in Traditional Knowledge Policy*; Tr'ondëk Hwëch'in Government: Dawson City, YT, Canada, 2012.
87. Singh, N. Indigenous Water Management Systems: Interpreting Symbolic Dimensions in Common Property Resource Regimes. *Soc. Nat. Resour.* **2006**, *19*, 357–366. [CrossRef]
88. Toussaint, S.; Sullivan, P.; Yu, S. Water ways in aboriginal Australia: An interconnected analysis. *Anthropol. Forum J. Soc. Anthropol. Comp. Sociol.* **2005**, *15*, 61. [CrossRef]
89. Wilson, N.J.; Walter, M.T.; Waterhouse, J. Indigenous Knowledge of Hydrologic Change in the Yukon River Basin: A Case Study of Ruby, Alaska. *Arctic* **2015**, *68*, 93–106. [CrossRef]
90. Health Canada. *Guidelines for Canadian Drinking Water Quality—Summary Table*; Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada: Ottawa, ON, Canada, 2017.
91. Toohey, R.C.; Herman-Mercer, N.M.; Schuster, P.F.; Mutter, E.; Koch, J.C. Multi-decadal increases in the Yukon River Basin of chemical fluxes as indicators of changing flowpaths, groundwater, and permafrost. *Geophys. Res. Lett.* **2016**, *43*. [CrossRef]
92. Cruikshank, J. Are Glaciers 'Good to Think With'? Recognising Indigenous Environmental Knowledge 1. *Anthropol. Forum* **2012**, *22*, 239–250. [CrossRef]
93. Nadasdy, P. The Gift in the Animal: The Ontology of Hunting and Human-Animal Sociality. *Am. Ethnol.* **2007**, *34*, 25–43. [CrossRef]
94. McGregor, D. Honouring Our Relations: An Anishnaabe Perspective on Environmental Justice. *Speak. Ourselves Environ. Justice Can.* **2009**, *27*, 27–41.
95. Simpson, L.; DaSilva, J.; Riffel, B.; Sellers, P. The Responsibilities of Women: Confronting Environmental Contamination in the Traditional Territories of Asubpeechoseewagong Netum Anishinabek (Grassy Narrows) and Wabauskang First Nation. *J. Aborig. Health* **2009**, *4*, 6–13.
96. Whyte, K. Indigenous Climate Change Studies: Indigenizing Futures, Decolonizing the Anthropocene. *Engl. Lang. Notes* **2017**, *55*, 153–162. [CrossRef]
97. Tansey, J. Risk as politics, culture as power. *J. Risk Res.* **2004**, *7*, 17–32. [CrossRef]
98. Lawless, J.-A.; Taylor, D.; Marshall, R.; Nickerson, E.; Anderson, K. Women, Diverse Identities and Indigenous Water and Wastewater Reponsibilities. *Can. Woman Stud.* **2013**, *30*, 81–88.
99. Blaser, M. Political Ontology. *Cult. Stud.* **2009**, *23*, 873–896. [CrossRef]
100. Donatuto, J. When Seafood Feeds the Spirit Yet Poisons the Body: Developing Health Indicators for Risk Assessment in a Native American Fishing Community. Ph.D. Thesis, University of British Columbia, Vancouver, BC, Canada, 2008.
101. Bartlett, C.; Marshall, M.; Marshall, A. Two-eyed seeing and other lessons learned within a co-learning journey of bringing together indigenous and mainstream knowledges and ways of knowing. *J. Environ. Stud. Sci.* **2012**, *2*, 331–340. [CrossRef]
102. Martin, D.H. Two-eyed seeing: A framework for understanding indigenous and non-indigenous approaches to indigenous health research. *CJNR (Can. J. Nurs. Res.)* **2012**, *44*, 20–42. [PubMed]

103. Castleden, H.; Hart, C.; Cunsolo, A.; Harper, S.; Martin, D. Reconciliation and relationality in water research and management in Canada: Implementing indigenous ontologies, epistemologies, and methodologies. In *Water Policy and Governance in Canada*; Springer: Berlin/Heidelberg, Germany, 2017; pp. 69–95.
104. Sandford, R.W.; Phare, M.-A.S. *Ethical Water: Learning to Value What Matters Most*; RMB: Victoria, BC, Canada, 2011; ISBN 978-1-926855-70-7.
105. Phare, M.-A.S. Indigenous peoples and water: Governing across borders. In *Water without Borders? Canada, the United States, and Shared Waters*; Norman, E.S., Cohen, A., Bakker, K., Eds.; University of Toronto Press: Toronto, ON, Canada, 2013; pp. 27–46.
106. Nadasdy, P. The politics of TEK: Power and the "integration" of knowledge. *Arct. Anthropol.* **1999**, *36*, 1–18.
107. Cruikshank, J. Glaciers and climate change: Perspectives from oral tradition. *Arctic* **2001**, *54*, 377–393. [CrossRef]
108. Truth and Reconciliation Commission of Canada. *Honouring the Truth, Reconciling the Future: Summary of the Final Report of the Truth and Reconciliation Commission of Canada*; Truth and Reconciliation Commission of Canada: Winnipeg, MB, Canada, 2015.