Water Quality Differences Living On and Off Reserve Lands in Canada

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Abstract

Research suggests the water quality of Canada's aboriginal groups has often been disregarded by the Canadian Government. In southern Calgary, Alberta, both water quality and water rights are important issues that First Nation communities are currently facing. Previous research has failed to confront problems regarding the quality of water on First Nations reserves as well as the causes for these issues. Because Canada's First Nations are a minority in society even today, these concerns have often been put aside. Our aim with this research is to determine the water rights of the Canadian First Nations, the understanding the public has around this topic, and the causes of the difference in water quality on reserves compared to municipalities. By gathering facts through research studies and surveys, we hope to develop a greater understanding of the water rights and the popular perceptions surrounding First Nations' water rights. Ultimately, we would like to collect a water sample from the Siksika reserve to compare it with and contrast it to water standards in Alberta. In order to compare Albertan water quality standards to that of the Siksika Nation reserve we will be testing for phosphate and nitrate levels. Overall, our research addresses the importance of acknowledging the problems relating to First Nation's water rights and quality, and the awareness the public has around this affair

Key Words

Treaty: Solemn agreements that set out promises, obligations and benefits for both parties (Treaties with Aboriginal People in Canada, 2010).

Reserve: Tact of land, the legal title to which is held by the Crown (England), set apart for the use and benefit of an Indian band (Terminology, 2012).

Province and Territory: Provinces and territories are divided sections of land that make up Canada. Canada consists of 10 Provinces and 3 territories. This paper is focusing on one province, Alberta.

Allocation: To divide and share something for a specific reason or to certain companies, or people. In the case of this research, the dividing of water to cities, companies, and first nation reserves.

Introduction

Canada is a multicultural country. The first culture to have inhabited Canada was the First Nations people. The Canadian government describes First Nations people in Canada as, "descendants of the original inhabitants of Canada who lived here for many thousands of years before explorers arrived from Europe" (First Nations People in Canada, 2014). It is our perception that in Canada there are different standards of drinking water quality. Most particularly, the drinking water standards between municipalities and First Nation reserves. We believe that safe drinking water should be considered a basic human right. Especially now that the United Nations considers universal access to clean water a basic human right and an essential step towards improving living standards worldwide (Global Health and Education Foundation, 2007). It seems surprising that in a developed, democratic country like Canada differentiation in water standards occurs. Therefore, this research project is intended to investigate whether or not differences in drinking water standards exist and what perceptions might be creating this problem.

Water Allocations for those *not living on Reserve Lands*

In the following paragraphs, we will examine how Albertans and Calgarians not living on reserves get their drinking water and, in the next section, how reserves get their drinking water. The last section will examine why differences between municipal water quality and reserve water equality exist.

Although the province is responsible for providing clean water to its residents, it has not invested the same time and money used for treatment of water on reserves as it has in municipalities. In other words, the reserves do not receive the same access to infrastructure funds in order to insure the quality of their drinking water. The following sections of our research seek to clarify why such inequities exist. The reasons for the inequities are complex, as there are many different legislations and governing bodies that are responsible for water in Canada. These legislations and bodies often work in opposition to each other, which in turn, creates inequity in water access for Canadian and, specifically, Albertan residents.

Water allocation in Alberta. In 2005, Alberta allocated more than 9.5 billion m^3 of water throughout the province, the majority (97%) being from surface water sources (Water Allocation, 2016). According to Alberta Environment and Parks, the allocation of Alberta's water is not uniform across the province (2016). Most of the water in the province comes from the eastward-flowing Saskatchewan River Basin. This is due to the majority of Albertans (88%) living in southern Alberta, where the Saskatchewan River Basin is found. The South Saskatchewan River Basin, according to Alberta Environment and Parks, in terms of total groundwater and surface water allocations, is the most licensed basin in the province, accounting for over 58% of all water allocated in Alberta. What this means is that The South Saskatchewan River Basin has the highest number of total licenses on its water source. Therefore, The South Saskatchewan River Basin provides water to most of the businesses, families

and services in Alberta through license agreements provided by the province to regulate water usage.

Since the founding of Alberta, population growth and industrial development have increased the amount of water allocated in the province each year from 2 billion m^3 to over 9 billion m^3 today. However, allocations do not measure the true water usage within the province. Allocations simply measure the total water maximum that owners are permitted to use per year, in accordance with their license. As well, there are many variables that may decrease the need for water in that year and the owners might not use the entirety of the water they are allocated. This fact is especially important and indicative of the increasing demand for water to support activities and development in the province (Water Allocation, 2016). With increasing demand for water support comes the increasing demand for water to be cleaned and returned to its rivers and lakes, which is done through wastewater treatment plants in Calgary.

Water allocation and licensing. Licenses for water are required in Alberta. These licenses determine the amount of water allocated to the licensee. The *Water Act,* as stated by Alberta Environment and Parks' legislation (2016), was designed to reduce the challenge presented by the increasing demand for water in the province. Large consumers of water are required to disclose the amount of water they have diverted, consumed, and returned each year. In Alberta, the largest consumers include the irrigation districts, coal-fired power plants and municipalities (Alberta Environment and Parks, 2015). A license is not required for household owners because the Water Act has protected household access to water as a statutory right. Water allocated for household use is given priority over all other uses of water. One can qualify for household use of water by owning or occupying land that adjoins a river, stream, lake, natural watercourse or other natural water body, or own or occupy land under which groundwater exists. Household water rights exist up to a maximum of 1,250 cubic metres of water per year.

For other water allocations, a different system exists. According to Alberta Environment and Parks (2010), the body in charge of water allocations, water allocation in Alberta is determined by a seniority system or, "First in time, First in right", not by a need or for purpose system. . When licenses are granted, they are given a priority number that corresponds with the date the application for the license was received. This prioritizing system has been in place in Alberta since 1894, and The *Water Act* reinforces these laws (Water Allocation Transfer Under a License, 2010). The current water allocation and licensing system is important in order to understand why differences in water rights may exist. The current allocation systems imply where the government's priorities lay – in outdated water allocation systems – and how Albertans water is distributed.

Water Act: goals, strategies and principles. The following list outlines the key tenets of the Alberta Water Act (Alberta Environment and Parks, 2016). The bullet points indicate the expectations that *all* Albertans should have, according to the law, about water and water access.

- Albertans will be assured their drinking water is safe.
- Albertans will be assured that the province's aquatic ecosystems are maintained and protected.
- Albertans will be assured that water is managed effectively to support sustainable economic development.
- Albertans must become leaders in using water more effectively and efficiently, and will use and reuse water wisely and responsibly.
- Alberta's water resources must be managed within the capacity of individual watersheds.
- Groundwater and surface water quality must be preserved in pursuing economic and community development.

Water treatment in Calgary, Alberta. Calgary, a major city in Alberta, is in charge of its own water treatment. Calgary has two rivers running through the city and three wastewater treatment plants. The City of Calgary has, through ample funding and planning, ensured clean drinking water and access for all of its citizens. As a result, Calgarians have the benefit of clean water all year round. Additionally, because the water that flows through Calgary further travels to Airdrie, Cochrane and Strathmore, the city is especially careful in its water treatment. Even as the city continues to grow in population, Calgary has kept up with the demand by building new treatment facilities or by upgrading old facilities. The city of Calgary receives its funding from municipal taxes, the Albertan government and the Federal government of Canada and, therefore, has a significant amount of money for the water treatment infrastructure.

Water Allocations for Indigenous Peoples *living on Reserve Lands*

The legislations for water allocation and treatment to indigenous reserve lands differs completely from those not living on reserves. The reasons for these differences are complex and historical. The following section seeks to unearth the complexities of legislations and water rights for those living on reserve lands. For the purposes of this paper, the terms indigenous, First Nations, and aboriginal refer to the same group of people: those living on reserve land. The Federal government, not the Provincial or Municipal governments, is responsible for looking after water on reserve lands.

In Canada, there are three levels of government: Municipal, Provincial, and Federal. The Federal government is

responsible for all of Canada, the Provincial Governments are responsible for their respective province in Canada. And the Municipal governments are responsible for the needs of their municipalities and/or cities. Figure 1.1 illustrates the basic functions and responsibilities for each level of government in Canada.

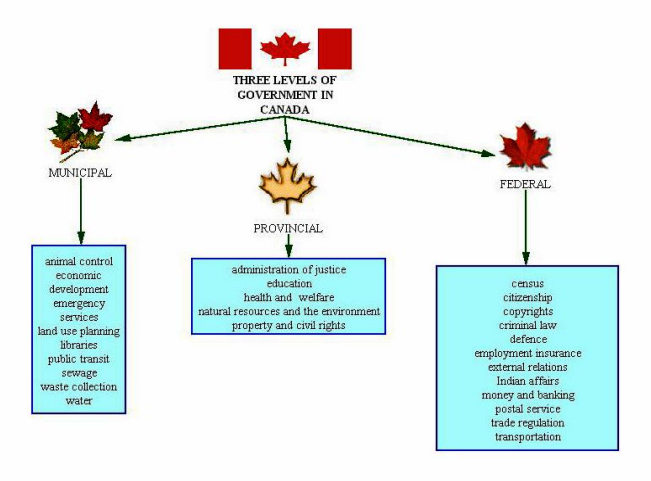

Figure 1.1 Branches of Government in Canada

Water allocations for reserve lands. *Provincial and municipal* governments are responsible for water for Canadians *not* living on reserve lands. However, indigenous peoples, living on reserve lands, are under the jurisdiction of the Ministry of Indian Affairs and Northern Development, a ministry that is led by the *Federal Government of Canada*. This fact alone, that the same legislative bodies do not always govern water, accounts for confusion regarding water allocations in Canada.

Additionally, the Federal Government has separate agreements – called Treaties – with indigenous peoples, based on their location within the country. For example, Treaty 7 includes five First Nations on 130, 000 square kilometers of land in Alberta (Beal, 2007). Figure 1.2 shows the number of Treaty agreements (and the areas covered by those treaties) in Canada. Figure 1.3 shows the treaty agreements in Alberta. The figure further illustrates the diversity of indigenous groups within each treaty agreement.

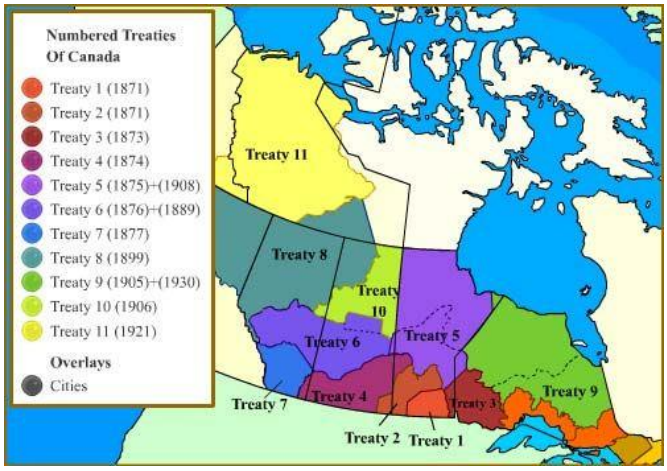

Figure 1.2 Treaty Agreements across Canada

Figure 1.3 First Nation Communities in Alberta, Canada

Illustrated in Figure 1.3 are the many First Nations communities in Alberta, Canada. First Nation communities are diverse and multitudinous.

The laws and rights outlined in the treaty agreements vary according to when the government of Canada ratified these agreements. The indigenous peoples of Canada, were the first inhabitants of this country, and as such hold "First in time, First in right" privileges (mentioned in the previous section "Water allocations and licensing"). According to Penner, the Federal Government has not made the drinkability of water and wastewater treatment of First Nations a priority (2015) and further, new and expanding industries like agriculture and mining consume and contaminate large amounts of water throughout Canada making the First in time, First in right privileges irrelevant. According to Penner, the water licensing agreements made by the province of Alberta favours these industries (2015). Penner further suggests the agreements circumvent the rights of First Nations' Treaty rights.

Another complication for water allocation to reserve lands stems from the reserves' geography. Penner's research illustrates that First Nations communities were established in areas where there is insufficient access to supplies of water and where high salinity of groundwater contaminates the water quality and treatment plants of many reserve lands (2015). According to Penner, both the indigenous people and the animals on reserve lands face health problems as a result of poor water quality. Penner suggests that the effects of this water contamination on reserves are far-reaching and complex; for example, First Nations

traditional foods, such as fish and game animals, have become unsafe to eat.

As a result of ineffective environmental legislation, pollution from industries, and water privatization efforts, First Nations' water is at risk. In Alberta, specifically, fracking (oil and gas industries), mega-dams, mining, tar sands development and pipelines, are threats, which pose a problem to the lakes, rivers and groundwater on First Nations' reserve lands (Patrick, 2014).

Finally, because indigenous reserve lands are often separated into low and dispersed populations, they do not have the funding or capability (like the City of Calgary does) to build or update the infrastructure necessary to improve their water treatment facilities (Patrick, 2014).

The Effect of Discrepant Water Legislations and Allocations

There are large discrepancies in Canadian water legislation and allocation; this discrepancy does not even include the massive discrepancy between water legislation for reserve and non-reserve lands. Firstly, there is variation between the water policies of each province. Additionally, each province must follow thirteen different policies dictated by the Federal government regarding water exports within and outside of Canada. Such diversity creates inequities within and between provinces and, therefore, many rural areas are not receiving the same water quality as larger municipalities. The reserve lands are further marginalized because of the complexity regarding their water rights and legislations. The Canadian government did try to establish a census across the country about water allocation in order create equitable systems for water distribution. However, drinking water legislations still remain obscure and problematic (Hill, Furlong, Bakker, Cohen, 2008). According to Hill et al.'s research, while municipalities generally have the responsibility to implement the provincial water policies, there is a lack of national drinking water standards.

The fragmentation of the province's water policies on allocation and drinking water have negative impacts on those living in rural areas, especially First Nations people. Most indigenous communities have been under a boil water advisory on a regular basis in Alberta. In 2016, 17 First Nation communities had boil water advisories. Of these 17 boil water advisories in First Nation communities, only three have been revoked (Health Canada, 2016). A boil water advisory indicates that the residents should not, under any circumstance, drink untreated water. The federal legislations governing the drinking water of First Nations on reserves gets in the way of an efficient water management system (Hill, Furlong, Bakker, Cohen, 2008). This ineffectiveness is most evident when looking at the sheer volume of boil water advisories (Littlechild, 2014).

It is important that we understand these legislations in order to understand why such a discrepancy exists between municipal water quality and reserve water quality. By analyzing the way the rest of the country has organized the allocation of their water, we understand that there are limits to the allocation policies when it comes to First Nations and this may be a reason why they are experiencing problems with safe drinking water.

Methodology

This research uses a mixed methods design and is designed to first investigate the respondents' perceptions regarding First Nations water rights and second to measure the quality of drinking water on a reserve land close to the city of Calgary.

Setting

The research was conducted in Calgary. The survey was posted online and access was granted via social media, specifically, Facebook. This means that respondents came from a variety of backgrounds, educational levels, and cities. For the water testing, water was collected from several communities within the City of Calgary municipality and one was collected from reserve land, located adjacent to the southwest, central side of The City of Calgary.

Participants

The participants in the survey portion of this study were varied. This research allowed us to gain perspectives from several different points of view with little demographic restriction. In total, 100 subjects responded to the survey; 72 female respondents, 27 male respondents, and 1 self-identified "Other." In terms of ethnicity/culture, 77 participants identified as Caucasian, 3 identified as Asian, 2 identified as First Nation and 11 participants did not identify as any of the above-mentioned ethnicities. In terms of education, 19 participants completed Junior High school (typically ages of 12-14), 45 participants completed Senior High school (typically ages 15-17), four participants completed College, and 23 participants completed University. Of those who completed University, two participants have a Master's Degree, eight participants completed Graduate School and three participants did not specify which of the above they had completed. In terms of the participants' geographical location, 93 were from Canada, three from the United States, one from Mexico, one from the Netherlands and one from Zimbabwe.

Survey Research Design (Qualitative)

Research was gathered in an online survey using Surveymonkey.com. The survey was posted on Facebook

with the request that anyone who read the post answer the questionnaire. This opened up the opportunity to examine the extent of awareness and concern this topic had from a variety of respondent perceptions. The survey asked the following questions:

1. What is your gender?
2. What is your age?
3. Please describe your race/ethnicity.
4. What is the highest level of education you have completed?
5. In what country do you currently reside?
6. What do you consider the most important issue Canada is currently facing with their water?
7. Has it come to your attention that the drinking water quality of many First Nation reserves in Canada are not held at the same standards made by the Canadian Government in comparison to other Canadian homes?
8. If yes, what solutions would you suggest for this problem?
9. How important is this issue to you?

Water Sample Research Design (Quantitative)

Water samples were retrieved from five Calgary communities (Hidden Valley, Forest Lawn, Cochrane, Cranston, Scenic Acres) and from one reserve land (the east side of the Siksika Nation reserve).

Tests conducted on the water samples were:

1. Nitrate Test from API Pharmaceuticals
2. Phosphate Test from API Pharmaceuticals

Appendices A and B show the procedures for these tests.

Sampling Procedures

The water samples were collected from different communities across Calgary, Alberta and the small town of Cochrane on the outskirts of northern Calgary. Using mason jars to collect the samples, water was filled in the jar until it was overflowing and then covered by a lid to tightly secure the solution. The samples were collected from tap water in homes with the precaution to not collect filtered water. This was done so that all water would be coming directly from the City of Calgary Glenmore Water Treatment Plant in the south end of the city, the Bearspaw Water Treatment Plant in the north of the city, and the Arthur Ayoungman Water Treatment Plant for the Siksika Nation. Each sample is then labeled to identify the water's origin, then tested in the science lab at William Aberhart High School.

Results

Quantitative

The researchers tested the water samples using phosphate and nitrate test kits that are intended to measure the concentration of phosphates and nitrates in the water samples. These test results align with The Alberta Water Quality Index. The provincial government uses this index to ensure that water is safe and drinkable (Water Act, 2015).

Upon observation, the test results show that the concentration of phosphate is slightly elevated in water samples taken from Hidden Valley and Cranston. The tests also show that there is a higher concentration of nitrate in the water sample taken from the Siksika Reserve.

The results for the phosphate and nitrate tests are shown in Table 3.1. We performed these water tests to see if a difference in water quality between municipalities and the Siksika reserves exist.

Table 3.1 Results for the phosphate and nitrate tests on communities in Calgary and surrounding it, as well as the Siksika Reserve.

Community where water samples were collected	Concentration of Phosphate in Water (ppm)	Concentration of Nitrate in Water (mg/L)
Cranston	0.25	0
Hidden Valley	0.25	0
Scenic Acres	0	0
Forest Lawn	0	0
Cochrane	0	0
Siksika Reserve	0	5.0

Qualitative

The survey was intended to investigate what participants believe is the most important issue regarding water in Canada, what they know about the water issues for indigenous peoples living on reserve land, and what solutions they suggested to address the problem of inconsistent water standards between those living on reserves and not living on reserves.

The participants identified three water issues as being of greatest importance to Canadians: safe drinking water, water consumption, and conservation. They further names agriculture, infrastructure and other as much less important (see Figure 3.2).

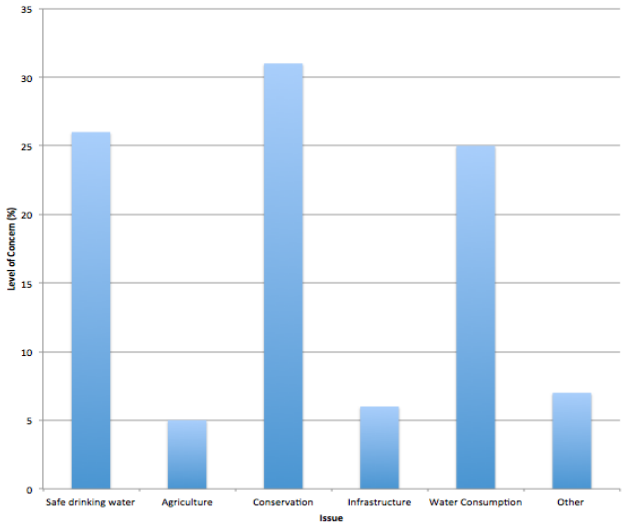

Figure 3.2 Survey results to the sixth question asked on the questionnaire: What do you consider the most important issue citizens in Canada are currently facing with their water? 31% of participants answered Conservation, 26% of participants answered Water Consumption, 25% of participants answered Safe Drinking Water, 6% of participants answered Infrastructure, and 5% of participants answered Agriculture (Answered: 100, Skipped: 0).

The results from the survey further indicate that slightly less than 50% of respondents are aware that there is a discrepancy between water quality for those living on reserve land compared to those not living on reserve land (see Figure 3.3).

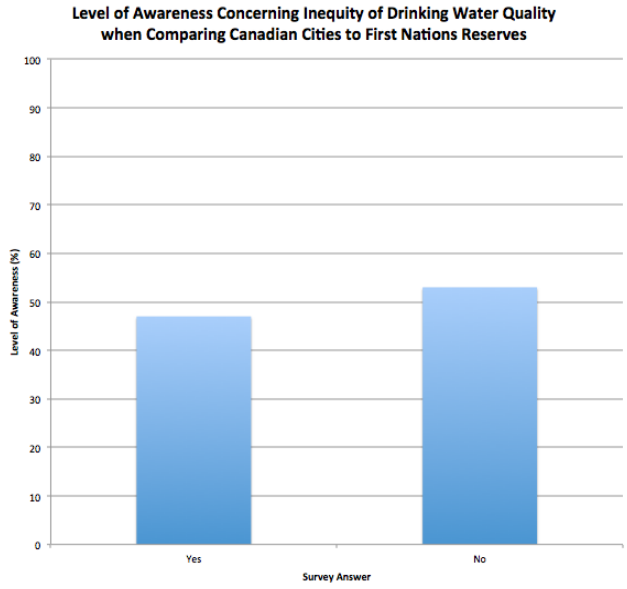

Figure 3.3 Survey results in response to the seventh question on the questionnaire: Has it come to your attention that the drinking water quality of many First Nation reserves in Canada are not held at the same standards made by the Canadian Government in comparison to other Canadian homes? The majority of the participants were not aware of the issues regarding water quality for First Nations reserves in Canada. Of the participants, 53% answered no and 47% answered yes (Answered: 100, Skipped: 0).

Respondents, who did know of a water quality difference in reserve vs. non-reserve land, suggest a wide variety of solutions to this problem.

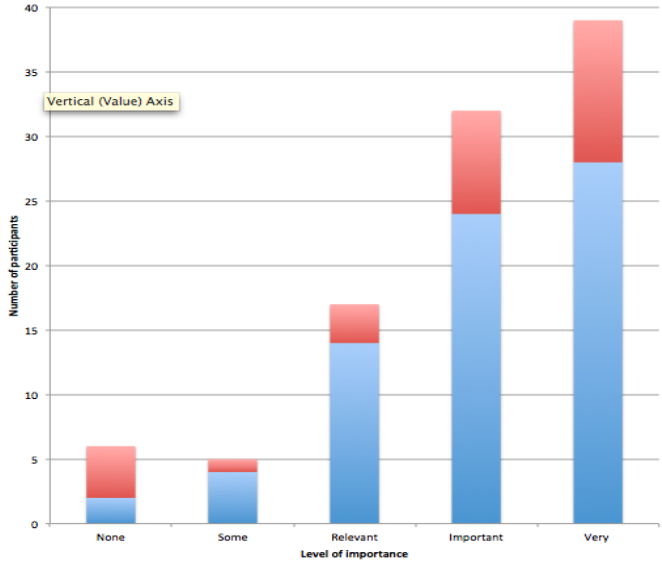

Figure 3.4 Survey results when asked the ninth question on the survey: How important is this issue to you (clean water for First Nation reserves). Female participants are represented in blue, male participants are represented in red (Answered: 100, Skipped: 0).

Discussions

After testing the water samples we collected in different areas in and around Calgary, there were unique results while testing phosphates and nitrates. The water samples from the north and outer regions of Calgary (Hidden Valley, Scenic Acres, Forest Lawn and Cochrane) showed all equal levels of nitrate concentration. A higher level of phosphate concentration was found in Hidden Valley and Cranston. Looking at Siksika Nation Reserve, it showed a light orange color on the nitrate test, opposed to the yellow colour that was shown in all the other water samples. This shows that there is a higher level of nitrates in the tap water found on the reserve than the rest of Calgary.

Excessive concentrations of nitrates in bodies of water like lakes and streams can cause excessive growth of algae and other plants (EPA, Nutrient Pollution, 2016). According to the United States Environmental Protection Agency, this leads to accelerated 'aging' of lakes and loss of dissolved oxygen.

The nitrates present in the water on the reserve indicate an elevated pH, which could, according to research (EPA, Nutrient Pollution, 2016), significantly damage the body. This same research indicates that excessive amounts of phosphate in water can also cause algae to grow, creating algal blooms, which reduce and eliminate oxygen in the water. Algal blooms lead to illnesses and death in aquatic life, and can be harmful to humans if ingested (The Problem, 2016).

Survey Results. The results from the survey indicate participants' varying levels of awareness and understanding

of water rights issues in Canada, specifically when discussing the difference in rights between those living on non-reserve lands versus those living on reserve lands.

The lack of understanding is particularly obvious in suggestions made by the younger demographic and in the participants who have only completed a High School or College education. When asked for solutions, the participants made suggestions like, "make a common water treatment", or, "stop being jerks to the First Nations and provide them the proper water supply", or, "it has come to my attention just now. Change the laws", and "encourage First Nations to reorganize their current spending plan to bring this up to the same standards as everyone else and maybe have additional government funding but mostly trying to do it efficiently and independently." None of these suggested solutions address the complexity of legal agreements, First Nations' rights, current water allocations, or the problem of governing inconsistencies. So while respondents realize there is a problem, the survey answers indicate a lack of understanding.

This lack of knowledge could indicate a larger issue of a lack of exposure to First Nations issues in general; of the 100 participants in the survey, only one suggests: "Create more awareness around the issue." Other participants felt strongly that the government, not the individual, was responsible for the problem with First Nations' drinking water.

A further analysis suggests that participants with higher levels of education are better informed about the issues of water rights in Canada. They composed answers that were more factual and developed compared to others' responses. The results suggest that a higher level of awareness by these participants may have a positive correlation with a higher level of education. One respondent from this group aptly outlined the complexity of the water issues when they stated:

> It is time that the government put time and resources towards working with indigenous peoples in Canada to support the development of infrastructure in First Nations, Inuit and Metis communities. In addition, it is incredibly important that the government cease industrial development on Indigenous lands where it has the possibility of threatening the water supply. Any industrial development that does occur on Indigenous lands should be done in accordance with the rights of aboriginal people in Canada to consultation, consent and self-governance and should in no way contradict the Canadian charter of rights and freedoms

Besides the fact that more women participated in the survey than men, the women's responses tended to show more sensitivity towards the issue. Their response to the question of First Nations water issues and the level of importance they attach to it was a positive gradient, moving from no importance to very important. Only two of 72 female respondents answered that this problem was of no importance to them. The male respondents were more or less scattered in their results, indicating a broad spectrum of opinions and priorities on their portion of the scale. The same trend continued on the short answer portion of the survey. The women's answers varied in suggestions, but remained supportive of the indigenous cause. Meanwhile, the men had a tendency to use condescending language when referring to First Nations peoples. The men displayed a strong tendency to use words such as "Indians" and "they" when referring to First Nations, suggesting a lack of empathy.

Overall, while many participants openly acknowledge there was a problem, they also acknowledge that they had no idea how to fix the problem. A common answer was: "I have no idea", further supporting the idea that a lack of exposure to this issue and a general lack of knowledge about First Nations' water problems has created a gap between citizens not living on reserves and indigenous peoples living on reserves. No matter how hard we try to bridge the gap between "us" and "them", discrimination may continue to ensure that equitable water allocations, safe drinking water and equity for indigenous peoples living on reserve lands will remain a distant hope.

The survey results indicate that there are some prevailing perceptions about indigenous peoples in Canada that are shaping the extent to which First Nations' water issues become a high priority. The water quality results indicate that there is, in fact, a difference between the quality of water on reserve and non-reserve lands. The reasons for the inconsistencies in water quality and the prevailing opinions regarding water issues are complex and, perhaps as shown in this research, stemmed from discriminatory or incomplete understandings of First Nations issues in Canada.

Implications and Recommendations for Further Research

This survey illustrates that often the respondents did not understand First Nations' water issues. Our first recommendation is to further investigate where this lack of understanding stems from and how we could better address lack of knowledge surrounding indigenous water issues.

Another area of needed future research is with respect to government oversight and water allocation policies. Current government policies are inconsistent and inequitable between and amongst provinces in Canada. Until research and policies are developed to fix these inconsistencies, water quality will continue to be an issue especially for indigenous peoples living on reserve lands.

Water rights issues are intricately linked to First Nations' way of life. First Nations people need to be closely involved in decision-making processes. Unfair treatment of indigenous peoples living on reserve lands seems to be prevalent across Canada and could be a large contributor to the issues First Nations face in trying to gain better water standards. Unfair treatment stems from government policies to social apathy. Further study into water allocations systems that are fair and equitable for all is needed.

Limitations

In creating the survey, our group should have paid closer attention to language when referring to First Nations to avoid inappropriate and discriminatory language. As well, our group should have been careful of how the questions were worded. The questions used in the survey were insufficient in detail and fluency, and may have confused the participant, generating inaccurate results. We may have been able to achieve greater, more accurate results if we had used the proper terms and language for the participant to understand. As well, it would have been beneficial to have generated more questions based on opinion and perspective, as opposed to generating questions based on demographic, as this would have broadened our analysis on the respondents' perceptions regarding First Nations water rights.

More women participated in this survey than men. This affected our results because we were not given perspectives from the same number of males and females. This affected the overall results and variation in responses.

Only one First Nation community was tested for water quality. Had we been given the opportunity to test the water quality of several First Nation communities, surely more could be said about the average water quality for First Nation communities. Access to reserves was definitely a large limitation when collecting this data.

Additionally, as students under the Calgary Board of Education, we are limited to the type of testing we are allowed to conduct with collected samples. Due to these limitations, we were unable to run tests indicative of other pollutants in the water and potential waterborne illnesses.

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Appendices

Appendix A: Nitrate test procedure used for testing

API Nitrate test procedure

1. Fill the test tube with 5mL of the sampled water
2. Add 10 drops from Nitrate Test Solution Bottle #1
3. Tip upside down to mix the liquids
4. Shake Nitrate solution #2 vigorously for 30 seconds
5. Add ten drops of Nitrate Solution #2
6. Cap the test tube and shake vigorously for 1 minute
7. Let sit for five to let the colour develop
8. Read test results by using the solution colour with the Nitrate Colour Card in a well lit area.

Appendix B: Phosphate test procedure used for testing

API Phosphate test procedure

1. Fill the test tube with 5mL of the sampled water
2. Add 6 drops of from Phosphate Test Solution bottle #1
3. Shake vigorously for 5 seconds
4. Add 6 drops from Phosphate Test Solution bottle #2
5. Shake vigorously for 5 seconds
6. Let sit for 3 minutes to let the colour develop
7. Read test results by using the solution colour with the Nitrate Colour Card in a well lit area.