

Nipiih (Water) quality study of the Lesser Slave Lake: Working together in science, engagement and youth outreach.

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Summary

Access to an adequate supply of potable water is foundational for human health and socio-economic stability of any community, and the quality of ground and surface waters impacts the health of aquatic and terrestrial ecosystems. The view that we are part of an ecosystem that provides for all who are good stewards of it is inherent in Indigenous culture in Canada, and water quality has both scientific and spiritual significance. In 2019, the University of Calgary was invited by the Sucker Creek First Nation (SCFN) to visit their community, tour the Lesser Slave Lake, and discuss water quality concerns. Water quality issues in First Nations communities have long been recognized by the Government of Canada, evidenced by Call-to-Action No.19 (Truth and Reconciliation Commission 2015³), referring to the right to accessible clean drinking water. In recent news, under the 2021 class action settlement agreement on water advisories (i.e., Plaintiffs, Tataskweyak Cree Nation, Curve Lake First Nation, and the Neskantaga First Nation), the Government of Canada committed to work towards replacing the *Safe Drinking Water for First Nations Act 2013*, by March 31, 2022.

This talk will describe a water quality study of the Lesser Slave Lake, conducted jointly by the University of Calgary and the Sucker Creek First Nation (SCFN), where seven sites were selected for annual collection of water samples over a 3-year period. These authors are not aware of any publications documenting the integration of Indigenous ways of knowing with western scientific method in a hydrogeological study. Methods have been discussed and determined in a thoughtful way with community elders and field techniques have been demonstrated with local high school students as part of an outreach initiative. Two annual sampling campaigns have been conducted at sites selected jointly by the researchers and the elders. Through a unique program coined "NIYAK", graduate students from engineering and geoscience learn how to engage with Indigenous people and Indigenous youth make connections to help with career path choices.

In the Cree language, NIYAK means "*for the future*". It is also an acronym for *Network for Indigenous Youth Academic Knowledge*. This talk will also demonstrate how this study was used as the foundation for outreach activities, connecting graduate, undergraduate and high school students to discuss the applicability of post-secondary education in science, technology, engineering and math disciplines, also known as STEM, in community life.

Lesser Slave Lake – A Hydrogeophysical Profile

The Lesser Slave Lake was formed by the retreating Laurentide Ice Sheet 12,000 years ago. The ice sheet retreated and exposed a low, broad basin which captured glacial meltwater forming the proglacial lake referred to as Lake Peace. Over time, the water level of Lake Peace dropped to the present level forming present-day Lesser Slave Lake. The Lesser Slave Watershed is 20,000 km² of agricultural, recreational, traditional and residential lands. Five major rivers drain into the

Lesser Slave Lake (i.e., the South Heart, West Prairie, East Prairie, Driftpile and Swan Rivers) and there is one main outlet (i.e., the Lesser Slave River) (Figure 1). Flow through the lake comes largely from the Swan Hills region, where the most precipitation and snowfall is received. The substantial size of the watershed makes the area resistant to long-term climate changes; however, this means water levels in this lake, spanning 100 km in length, can rise rapidly during runoff events causing flooding.

Numerous studies have been published by the Alberta Government and the Lesser Slave Watershed Council since 1991, but none of these reports referenced comparisons with the Guidelines for Canada's Drinking Water Quality. Instead, they describe the state of the lake and its tributaries in relation to Surface Water Quality Guidelines for Alberta, associated with aquatic life and recreational uses. Highlights from these reports include the presence of algal blooms and high levels of nutrients which have been identified as a concern for drinking water usage, recreational use, and aquatic life.¹ Paleolimnological studies suggest that the productivity of the lake increased substantially after the 1950s, when flood controls were built on many of the inflowing rivers.² It is also noteworthy that the Swan Hills Treatment Centre opened in 1987, as a national 1.3 km² facility for the disposal of hazardous waste, including polychlorinated biphenyl's (PCB's), some 80 km south of where the Swan River flows into the Lesser Slave Lake.

Lesser Slave Lake – A Place to Call Home

Eighteen meters at its deepest point, the Lesser Slave Lake is situated in the Athabasca River Basin and covers an area of almost 1200 km² (Figure 2). Its shores represent home to a number Indigenous communities, including: the Sucker Creek First Nation, the Driftpile First Nation, the Swan River First Nation, the Sawridge First Nation, and the Kapawe'no First Nation. For more than 100 years, communities have come to rely on the lake as a source of fresh water and its ecosystem as a food source in the form of fishing, trapping, hunting and traditional medicines. During consultation meetings, the team of researchers and community elders compiled a list of key documented (literature review) and undocumented (local knowledge) information upon which to identify factors of concern and to select sampling sites.

The SCFN reserve lands encompass almost 60 km² along the southwest shore of the Lesser Slave Lake within the Treaty 8 region. The band language is Cree, with a registered population greater than 2,000 and a Council that supports: education, training, traditional land use and socio-economic development. Since stewardship of the lands and waters is inherent in Indigenous culture, water quality concerns appear to weigh heavily on the community elders. Turbidity levels measured during years 1-2 of this study exceed the recommended limit of 1.0 NTU (nephelometric units) per 100 mL for effective filtration and disinfection according to *Canadian Drinking Water Quality Guidelines*, and members currently rely on bottled drinking water. Wash water is extracted from a raw water intake on the southwest side of the lake, treated and transported by truck to each household cistern on a weekly basis. Agricultural land practices, flooding and water diversion in the vicinity of the intake, where *E.coli* (*Escherichia coli*) counts of up to 488 per 100 mL, were detected were factors. A decline in fish health and small mammal abundance were also factors. The history of a brownfield left by a demolished wood preserving plant in Faust, and the presence of a national hazardous waste treatment facility in Swan Hills

were also identified as factors. The loss of fertile lands hosting traditional medicines and herbs was suspected to be attributed to increased flooding.



Figure 1. Lesser Slave Lake Watershed, its major sub-basins and its resident Indigenous communities within the Province of Alberta.

Evolution of the Program

NIYAK evolved from the REDEVELOP program that is covered in a separate contribution to this conference. While REDEVELOP's mission is to train graduate students, the under-representation of Indigenous students in that program was indicative of systemic barriers to undergraduate opportunities in science, technology, engineering and math (STEM) disciplines. Reconnaissance discussions with SCFN youth, parents, elders and numerous academic partners facilitated some brainstorming to determine some first steps. One of these steps became a corner stone of the

NIYAK project. High school students need access to post-secondary mentors from STEM disciplines to form relationships, build trust and ask questions about financial assistance, housing and how to navigate the application process. REDEVELOP students have proven to be strong candidates for a “students helping students” format; however, challenges associated with the COVID pandemic has been a cause for loss of momentum, that we hope to overcome this year.

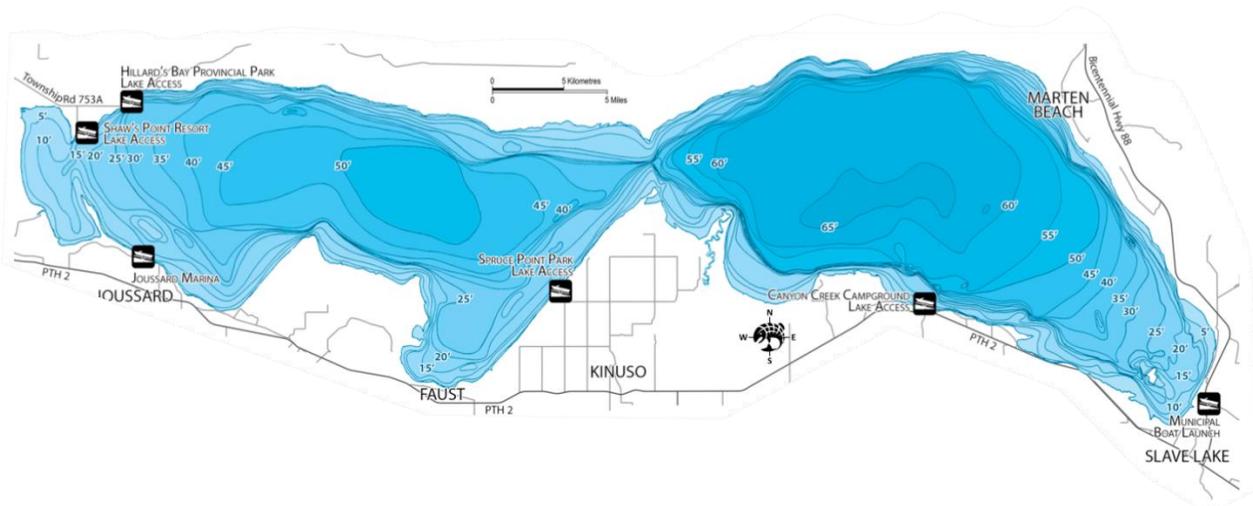


Figure 2. Lesser Slave Lake bathymetry, shoreline communities and fishing boat launch locations (Source: AnglersAtlas.com).

Future Plans

With the relaxation of COVID restrictions, a final sampling campaign is being planned with local high school students for August 2022, along with a community meeting where results of this study may be presented and discussed. More frequent visits with the community are planned, along with tours of a number of universities and colleges in Calgary and Edmonton by SCFN high school students, accompanied by REDEVELOP mentors. Like many projects during the pandemic, NIYAK has struggled, but it has endured too. Lessons learned from bringing the SCFN community members and researchers from the REDEVELOP program together brought understanding and awareness as we defined a holistic approach to this water quality study.

Acknowledgements

The NIYAK program is funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) PromoScience initiative in collaboration with the University of Calgary and the Sucker Creek First Nation. Sincere thanks to the elders of the SCFN, Chief Jim Badger (retired), Emily Calliou and Chuck Rouleau (SCFN), Steven Saddleback (Indian Resource Council), Dr. Chelsea Benally (U.Alberta), and the REDEVELOP students/interns: Kevin Grimeau, Lonn Brown, Eric Willier, Shelley Alexander and Joseph Leadley.

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