YUKON LAKES MONITORING OVERVIEW

PROJECT REPORT

PREPARED FOR: WATER RESOURCES BRANCH, DEPARTMENT OF ENVIRONMENT, GOVERNMENT OF YUKON

LIVING LAKES CANADA

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KLUANE LAKE, YUKON TERRITORY

DISCLAIMER

The information and concepts expressed in this document are based on information available at the time of the preparation of this document. The document may contain inaccuracies or omissions. The views and opinions expressed in this report are those of Living Lakes Canada and are not official policy.

We acknowledge we were not able to involve all rights holders and stakeholders in the information gathering process. Our aim is to be as inclusive as possible, and we welcome any interested groups to contact Living Lakes Canada to further discuss lake monitoring (contact details below).

For questions about this document, contact Living Lakes Canada: info@livinglakescanada.ca.

LAND ACKNOWLEDGEMENT

Living Lakes Canada is grateful for the opportunity to support water stewardship activities in the Yukon territory. We acknowledge that these lands and waters are the traditional territories of Yukon First Nations and transboundary Indigenous governments and groups. This land acknowledgement means that we recognize the role and responsibility that First Nations and transboundary Indigenous governments and groups have to the lands and waters in the Yukon, and that Living Lakes Canada commits to supporting First Nations and transboundary Indigenous governments and groups in these stewardship actions.

Living Lakes Canada acknowledges that our water stewardship work originated in the unceded, ancestral, and traditional territories of the Ktunaxa, Secwepemc, Sinixt, and Syilx Nations who have cared for these lands and waters for generations. Recognizing Indigenous Peoples as the rightful caretakers of their unceded territories, we work to complement their intergenerational water stewardship.

CONTRIBUTORS ACKNOWLEDGEMENT

We want to thank all the participants and contributors who offered their time, energy, knowledge, and interest for this project through conversations, interviews, and survey responses. Your voices made this collective project possible. Living Lakes Canada aims to reciprocate by advocating for Yukon lakes and by supporting your efforts to care for the lands and waters where you live. Thank you.

All participants who consented to be publicly acknowledged for their contributions to this project are listed in Table 1.

Table 1. List of participants who consented to be publicly acknowledged for their contributions to this project.

Name of the Contributor	**Name of their Affiliated Organization** *(if applicable)*
Alice McCulley	Tr'ondëk Hwech'in
Alison Fung	Government of Yukon - Climate Change Secretariat
Brandon Crawford	Ta'an Kwäch'än Council
Cameron Eckert	Yukon Parks
Chad Thomas	Village of Teslin
Christopher Pinkerton	CPAWS - Yukon
Coralee Johns	7Generations Consulting
Edda Mutter	Yukon River Inter-Tribal Watershed Council
Ellorie McKnight	Yukon University
Gillian Rourke	Teslin Tlingit Council

Kent Bretzlaff	Yukon Environmental and Socio-economic Assessment Board
Kristy Kennedy	Kluane First Nation
Mark Conner	Taku River Tlingit First Nation
Pat Tobler	EDI Environmental Dynamics Inc.
Sean Carey	McMaster University
Sebastian Jones	Yukon Conservation Society
Tanya Ball	Dena Kayeh Institute
Tyler Obediah	Carcross/Tagish First Nation

We also want to thank the review committee members for their time and efforts. We want this work to be impactful and to benefit people living in the Yukon and we believe it is essential to draw on your diverse perspectives, experience, and expertise for this purpose. Thank you for contributing to this report and your vision of the potential long-term benefits of lake monitoring and stewardship in the Yukon.

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LIST OF ABBREVIATIONS

CCME - Canadian Council of Ministers of the Environment

ION - Indigenous Observation Network

NGO - Non-governmental organization

OCAP® - Ownership, Control, Access and Possession (note: refers to the First Nations Principles of OCAP®)

TK - Traditional Knowledge (note: Traditional Knowledge is a term used in this report solely by interview participants. In an effort to maintain the participant's intended meaning, these terms were kept as they were spoken. The term for these concepts used in the rest of the report is Indigenous Knowledge, which we use to describe Indigenous ways of knowing, doing and being that include knowledge that is not just traditional.)

Y2C2 - Yukon Youth Conservation Corps

EXECUTIVE SUMMARY

The Yukon is a vast territory with numerous creeks, lakes, and rivers that are environmentally, socially, and culturally important to people and wildlife. However, there are currently large knowledge and data gaps on lake health with no long-term coordinated lake water quality monitoring initiatives in the territory (World Wildlife Fund - Canada, 2020).

The overarching objective of the Yukon Lakes Monitoring Overview Project is to understand the current and historic lake monitoring efforts and explore the possibility of a coordinated lake monitoring approach in the Yukon. To meet this objective the following project tasks were completed:

Step 1) A desktop review was conducted to identify and compare governmental lake monitoring efforts across Canada (see Appendix A).

Step 2) A desktop review was also conducted to develop an inventory of lake monitoring initiatives in the Yukon. Right holders and stakeholders potentially interested in lake monitoring in the Yukon were also identified (see Appendix B).

Step 3) Living Lakes Canada also collected information from individuals and organizations on lake monitoring interests through 19 interviews, nine survey responses, and one focus group. Participants included representatives from First Nations governments, municipal governments, territorial government branches, not-for-profit organizations, academia, and industry.

Step 4) Information sources from Steps 1-3 were analyzed to identify common themes as well as recommendations.

This report presents our findings from the desktop review, focus group, interviews, and survey, which formed the basis of the recommendations brought forward in Section 4.0. These recommendations were made to help the Government of Yukon understand the current needs for lake monitoring and potential approaches that could be taken towards coordinated lake monitoring in the Yukon.

Pressures on Yukon lakes include mining, agriculture, forestry, recreation, development, wildfires, and climate change. In particular, the changing climate is impacting lakes through changes in hydrologic balance and water quality, increasing temperatures, ice thinning, changing fish populations, and algal blooms, among others. The participants in this project shared some of their concerns and priorities, which included fish and wildlife habitat conservation, drinking water, increase in recreational uses, ecosystem health, preservation of archaeological and cultural sites, wastewater management, and carbon cycling. The participants also shared a list of lakes of interest, which should be considered for future monitoring (see Table 4, Section 3.7).

Nine main themes emerged throughout the project. These themes are listed here and described in more detail in Section 3.8 of the report.

Theme 1 - Changes in lake landscapes: Participants mentioned noticing changes around lakes over the past several years including changes to water levels (and more frequent/intense flooding), increased water temperatures, and changes in fish populations.

Theme 2 - Relationships with people, land, and water: Building relationships with people and the land and water are key elements to successful environmental monitoring programs. This involves showing respect by spending time in the communities and on the lands that we are trying to protect.

Theme 3 - Transboundary collaboration: Due to the geography of colonial borders and First Nations traditional territories, the Yukon is a region that requires collaboration across many governments including Alaska, British Columbia, Northwest Territories, Yukon First Nations and transboundary Indigenous Nations and Inuvialuit.

Theme 4 - Proactive actions: Participants highlighted the importance of taking action and making decisions for land and water before negative environmental impacts appear. Waiting for detrimental impacts to occur before acting is inappropriate.

Theme 5 - Land Guardian programs: Indigenous-led Land Guardian programs were mentioned by participants as a possible opportunity to expand the capacity of lake monitoring because often, Land Guardians are already out on the land monitoring and visiting vast areas. The role of Land Guardian programs in a lake monitoring network across the Yukon can also support the more equal recognition of Indigenous ways of knowing in lake monitoring.

Theme 6 - Education: The need for more education and awareness of the impacts of climate change and human activities was raised by participants, with a focus on empowering youth and generating opportunities for intergenerational knowledge sharing.

Theme 7 - Communication: Effective communication was highlighted as the key to developing strong relationships between individuals, communities, and organizations, especially in the context of lake stewardship where there are shared interests but a diversity of worldviews and approaches. Effective communication facilitates transparency and accountability which in turn promotes trust and credibility in relationships.

Theme 8 - Jurisdictional overlaps: Overlapping jurisdictions between First Nations governments, municipal governments, and territorial governments brings confusion and barriers, but also opportunities in decision-making. Overcoming these barriers involves

discovering what Indigenous self-determination means in the context of environmental decision-making and working collaboratively based on shared values of environmental stewardship.

Theme 9 - Indigenous Knowledge and Western science: Indigenous Knowledge and Western science can collaboratively inform the lake monitoring efforts. It was noticed that interweaving of knowledge systems is highly supported, yet it is not practiced widely around lake stewardship in the Yukon at this time.

Listening to the participants and analysis of the findings gathered through this project led to an overarching vision to implement a coordinated territory-wide lake monitoring network where Indigenous perspectives and Western science are interwoven. This vision is supported by eight recommendations and further sub-recommendations that describe potential pathways to implement long-term lake monitoring that supports the protection of lakes for future generations.

1.0 INTRODUCTION

1.1 SIGNIFICANCE OF LAKES IN THE YUKON

The Yukon is a vast territory spanning over 480,000 square kilometers with over 8,000 square kilometers made up of water. Yukon creeks, lakes, and rivers are critical to the life cycles of wildlife from fish to bears, as well as the health and wellbeing of people.

Yukon's rivers and lakes have been central to First Nations ways of life and are deeply connected to culture, identity, and traditional practices of taking care of the land and water. A big part of these practices are seasonal fishing camps along Yukon waterways, which have been happening for thousands of years (Carcross/Tagish First Nation, Ta'an Kwächän Council, Kwanlin Dün First Nation, and Dennis Zimmermann, 2023). In many Indigenous cultures, water is thought to have a spirit, to be a relative, and therefore needs to be treated with respect (Wilson and Inkster, 2018).

> *"The water cares for us and all other living things and to keep it clean and healthy means that we will continue to persist with a clean and healthy environment. The connection to water is also spiritual and can be used in ceremonies from travel, to harvest, to drinking and honoring and much more."*
>
> - Anonymous participant

Lakes also provide critical habitat for fish and wildlife, such as Yukon Chinook Salmon, Lake Trout, Bull Trout, Lake Whitefish, and Trumpeter Swans, among others (Government of Yukon, 2022b). Yukon lakes support traditional subsistence and cultural activities along with providing recreational opportunities (Government of Yukon, 2022b). The health of lakes is therefore important to overall community and ecosystem health.

1.2 CURRENT LAKE MONITORING GAPS

In 2014, the Government of Yukon developed the Yukon Water Strategy, which calls for a better understanding of the Yukon's water resources and to expand on the collection and sharing of water knowledge (Government of Yukon, 2014). In the report titled "Yukon Water Strategy: Five-Year Report", the Government of Yukon listed "coordinating efforts to monitor water quality" as a priority moving forward (Government of Yukon, 2019). A more recent document published by the Government of Yukon in 2022, Water Resources Branch Data Networks, describes six long-term water monitoring networks operated or co-operated by the government of Yukon but none of these initiatives involve lake water monitoring (Government of Yukon, 2022a).

In 2019, a team of researchers from University of Sherbrooke conducted an extensive synoptic sampling program in 23 lakes across the Yukon. Each lake was sampled once for over 100 biological, physical, and chemical variables to assess the aquatic ecosystem health, contamination, temporal changes, and physical and chemical water properties. A report presenting the results is available from the Government of Yukon.

In 2022 and 2023, teams of Yukon students conducted lake monitoring in five different lakes through the Yukon Youth Conservation Corps (Y2C2) program and were mentored by staff from the Water Resources Branch, Government of Yukon. Although this initiative is in its early days, it has the potential to generate scientific data over the long-term and to generate interest in lakes for local youths.

Aaron Barker (Water Resources Branch, Government of Yukon) and summer students with the Yukon Youth Conservation Corps (Y2C2) collecting water samples in Shallow Bay, Yukon (August 2022).

Overall, the Yukon was identified to be data deficient in a 2020 World Wildlife Fund national reassessment of Canada's freshwater with no long-term coordinated lake water quality monitoring initiatives in the territory (World Wildlife Fund - Canada, 2020). Appendix C documents the lake monitoring initiatives that we have been made aware of through this project. Although the list of current lake monitoring initiatives is substantial, the lack of long-term and coordinated lake monitoring initiatives is apparent.

1.3 PROJECT OVERVIEW

The Yukon Lakes Monitoring Overview Project was initiated by the Government of Yukon, Water Resource Branch, and led by Living Lakes Canada in close collaboration with staff from the Water Resources Branch. Together, with the project contributors and participants, we explored the current state of lake water quality monitoring, the values and interest for future lake monitoring initiatives across the Yukon territory and explored potential approaches.

As a facilitator and coordinator, Living Lakes Canada acknowledges the intrinsic relationship between lakes, other water bodies, and the land ecosystems. We guided and supported the process and identified the priorities and concerns of various decision makers, rights holders, and stakeholders. This exploratory project is focused on information-gathering from academia, industry, not-for-profit organizations, and decision makers.

Ultimately, Living Lakes Canada hopes that the project will enable collaboration and partnerships to address the priorities and concerns of people living in the Yukon. Communities and decision makers require access to robust scientific data to better understand the impacts of climate change and land use on lakes in order to develop and adopt climate-resilient water management strategies.

Living Lakes Canada was guided by a Traditional Knowledge Advisor, Coralee Johns, from 7Generations Consulting, through the project to help ensure that the work conducted was respectful and appropriate. The project team made specific efforts to uplift the voices and perspectives of Yukon First Nations and transboundary Indigenous governments and groups by visiting communities and providing tailored opportunities for First Nation representatives to engage in interviews and surveys.

The objective of the Lakes Monitoring Overview Project is to understand the current and historic lake monitoring efforts, concerns, and priorities of Yukon rights holders and stakeholders. This report presents our findings from a desktop review, interviews, surveys, and a focus group, and makes recommendations towards a coordinated lake monitoring effort in the Yukon.

2.0 PROJECT APPROACH AND METHODS

A thoughtful and holistic approach was used throughout the project to understand current and potential future lake monitoring efforts in the Yukon and across Canada. This section provides background on the decisions that were made in establishing and going about the project. This section outlines the completed tasks, specific methods for information gathering, and project approach, as well as the associated limitations.

2.1 POSITIONALITY

ABOUT LIVING LAKES CANADA

Living Lakes Canada is an award-winning water stewardship non-governmental organization that facilitates collaboration in science, education, monitoring, restoration, and policy development for the long-term protection of lakes, rivers, wetlands, and watersheds in Canada. We have been recognized by the federal government and other agencies as an example of applied “best practices” within community-based ecological monitoring.

A settler-founded organization, Living Lakes Canada has been leading water stewardship initiatives for almost two decades, with a long history of successful community engagement and water monitoring trainings with Indigenous Peoples across Canada. Living Lakes Canada collaborates with Indigenous and non-Indigenous communities, all levels of government, academia, and water stewardship groups on a range of water-related projects across the country. Our successful leadership and stewardship approach has supported the creation of many water stewardship programs including an Integrated Lake Monitoring Framework for British Columbia, the East Kootenay Integrated Lake Management Partnership, and the Columbia Basin Water Monitoring Framework (CBWMF) and Water Hub. The CBWMF is a network of water quality monitoring sites throughout the Canadian Columbia Basin, identified by a process that integrates Western science with local Indigenous and non-Indigenous community water concerns and priorities. The data collected by this growing monitoring network is held on the open source Columbia Basin Water Hub database and is accessible to decision makers for climate adaptation efforts.

ABOUT THE AUTHORS

The authors of this report are employed by Living Lakes Canada and identify as of settler descent. We each have a lifelong interest in and connection to water, see the importance of water to all aspects of life, and strive towards helping protect it, regardless of place.

Part of this journey includes acknowledging, reflecting on and addressing preconceived notions about the roles of differing knowledge systems and ensuring Living Lakes Canada’s work is guided by Indigenous worldviews alongside settler worldviews.

The team members who conducted the interviews have life experiences from various locations across Canada, from the west coast of Vancouver Island, British Columbia to Halifax, Nova Scotia, therefore bringing diverse experiences and insight into how lake stewardship is conducted in other regions. To begin to understand and appreciate the local context, the authors were grateful to spend a week in the Yukon Territory, travelling, meeting with people, and getting out on the land. This helped establish a connection to the land and the people, which was vital for interpreting the perspectives shared throughout this project.

Report authors, Sophie Gonthier and Claire Armstrong, at Łu Zę̀ la Mān[1] (Fish Lake), April 2023.

2.2 PROJECT STEPS AND METHODS

This project focused on gathering information on lake monitoring in the Yukon from academia, industry, different levels of Indigenous and non-Indigenous governments, and not-for-profit organizations, with an emphasis on water quality monitoring. Living Lakes completed the following project steps in close collaboration with Government of Yukon staff:

Step 1) Comparison of provincial and territorial coordinated lake monitoring efforts across Canada.

- A desktop review process was conducted that included reviewing government websites and reports for information on coordinated provincial and territorial lake water quality monitoring efforts.
- Program information including stewardship group partners, numbers of lakes monitored, monitoring protocols, and monitoring parameters were examined and summarized (see Appendix A).

[1] Yukon Native Language Centre, Dákeyi Teaching Guide (2017), 6.

Step 2) Preliminary inventory of lake monitoring initiatives in the Yukon.

- This inventory was built based on the initial inventory provided by the Government of Yukon of programs known to them, additional review of Yukon and Transboundary First Nations, Government of Yukon, federal government, Yukon municipalities, private consulting companies, and universities was conducted. Further research of key words ("water stewardship", "water monitoring", "lake monitoring", "lake stewardship", "lake network"), on water, conservation, climate change, and non-government organizations and charities, and on each specific Yukon watershed was conducted (see Appendix B and C).

Step 3) Collection of information and data on values, interests, lake monitoring practices, resources, priorities, and concerns from community representatives and decision-makers.

- 19 interviews were completed, and one focus group was held in Spring 2023 (see Appendix E for interview guide). Most interviews and the focus group were held in one week in April 2023 in different locations across the Yukon to accommodate participants. Following this, online interviews were offered for interested parties that were not available to meet during the in-person dates.
- In addition, nine online surveys were collected through this project. The survey was open from May 2023 to August 2023. Survey responses were gathered using a google forms survey (see Appendix F for survey questions).
- A consent form was filled out by all individuals prior to taking part in surveys, focus groups, and interviews (see Appendix D for consent form).
- The survey results and the interview transcripts will not be made public to ensure confidentiality and to respect participant consent.

Step 4) Analysis of information collected on the current lake monitoring efforts and concerns in order to formulate recommendations towards a coordinated lake monitoring approach in the Yukon.

- The interviews were recorded and then transcribed by the Project Lead.
- The interviews, survey responses, and focus group data were analyzed using a manual approach to qualitative data analysis.
- The Project Lead used inductive coding to elicit key themes and deductive coding to describe priorities, pressures, climate change impacts, lakes of interest, and perspectives on different knowledge systems.
- The Project Assistant also completed thematic analysis using inductive coding, and these results were compared and combined with the Project Leads' to increase credibility (e.g. the results presented align with the participants' experiences) and

confirmability (e.g. the results presented are not due to researcher's bias or perspectives).

- Recommendations were developed based on key themes, insights from project participants, as well as the authors' knowledge and experience of successful lake stewardship efforts in other regions.

2.3 OCAP ®

Control over data is an important point for self-determination and asserting sovereignty, especially for First Nations. This project was designed to follow the First Nations Principles of Ownership, Control, Access and Possession (First Nations Principles of OCAP®) and the project team carefully crafted processes that respect these principles when gathering information, handling qualitative data, and sharing knowledge. We have made best possible efforts to ensure that the way we collect, protect, interpret, use, and share data from Indigenous and non-Indigenous participants is aligned with the desires and interests of those participants (First Nation Information Governance Centre, 2023).

2.4 LIMITATIONS

This project is a preliminary overview of the lake monitoring landscape and opportunities for future coordinated lake monitoring. It does not serve as a comprehensive lake monitoring strategy. Some of the limitations of the project include:

1. Engagement in this project was limited to community and First Nation government representatives, staff from non-governmental organizations and decision-makers. Though invitations were sent to all Yukon First Nations, municipalities, and environment organizations the project team was aware of, not all groups responded. Therefore, there may be additional lake monitoring activities not captured in the report. Additionally, though broader public engagement was not included in the project, it is outlined in Section 4.0 as a recommended next step.

2. The project team conducted in-person interviews and provided an online survey. The structure of the project was initially built for the online survey to be distributed prior to the interviews. However, due to delays and travel logistics, we conducted the interviews before we received the survey results. This change in the timeline affected the consistency of the responses since some participants only participated in the interview while others only responded to the online survey. Although very aligned, there are differences between the interview and survey questions.

3. The information gathered through the desktop research related to lake monitoring in other provinces and territories across Canada is included in the report appendices as a tool to inform future steps towards a coordinated approach to lake monitoring in the Yukon but was not used to inform the recommendations. Instead, the recommendations are specific to the Yukon, to inform future steps towards a tailored approach to lake monitoring.

3.0 WHAT WE LEARNED AND HEARD

3.1 SUMMARY OF DESKTOP RESEARCH FINDINGS

3.1.1 Lake monitoring across other Canadian provinces and territories

- 10 provincial and territorial coordinated lake water quality monitoring programs were documented, and it was found that the Yukon was not one of these.
- The findings from this desktop work are presented in Appendix A and further highlight the need for a coordinated lake monitoring approach in the Yukon along with the importance of involving Indigenous and non-Indigenous community partners.

2.1.2 Inventory of Lake monitoring in the Yukon

- We documented 19 organizations with known lake monitoring initiatives that are currently generating data on lakes in Yukon (Appendix C).
- We also listed over 60 organizations that are involved and/or potentially interested in territorial lake monitoring efforts (Appendix B).

3.2 SUMMARY OF INTERVIEW AND SURVEY RESPONSES

Lake Monitoring Activities Overview

As an introductory question both in the interviews and survey, the participants were asked about their priorities related to lake monitoring and what pressure(s) and climate change impacts they are monitoring for at surrounding lakes. They were also asked about their current lake monitoring efforts and why past initiatives ended.

3.2.1 PRIORITIES

The main priorities related to lake monitoring brought forward by participants included:

- Fish and wildlife habitat
- Sources of drinking water
- Overall ecosystem health

- Recreational uses
- Archaeological and culturally valued sites
- Climate change
- Agricultural impacts on water
- Water resources in general
- Carbon cycling
- Water quality
- Wastewater management

3.2.2 PRESSURES

The main pressures that participants are monitoring lakes for include:

- Forestry, Industrial (e.g. mining)
- Agricultural (e.g. nutrient, pesticide, stormwater runoff)
- Recreation (e.g. boating, lake access)
- Development (e.g. change to land use, septic systems, and grey water)
- Wildfires
- Atmospheric deposition
- Climate change (e.g. warming temperature, decreasing lake levels, changing water cycle pattern)
- Fish habitat degradation (either in isolation or the result of other main pressures)

3.2.3 CLIMATE CHANGE IMPACTS

The main climate change impacts that participants are monitoring lakes for include:

- Changes in lake hydrologic balance
- Decreasing ice cover
- Increasing lake surface water temperatures
- Declining salmon populations
- Trends in precipitation and flooding
- Impacts of hydro-electricity generation

- Water quality
- Invasive species
- Increasing algal blooms

3.2.4 CURRENT LAKES MONITORED (FOR WATER QUALITY)

Participants were asked about their current lake monitoring efforts for water quality. Table 2 summarizes the lakes identified through the interviews, survey responses, and focus group that are currently being monitored for water quality.

Table 2. Lakes in the Yukon that are currently being monitored for water quality. (Note: References for the source of Indigenous lake names that have not been confirmed with the Yukon Government are provided in footnotes in Table 4, Section 3.7.)

Colonial Lake Name	Indigenous Lake Name
Atlin	Áa Tlein
Bennett	
Coal Lake	
Emerald	
Kluane	Łù'àn Män
Lake Laberge	Tá'aan
Little Atlin	
Marsh	Tàkádàdhà / Sāa Tl'áh Ni
Nares	
Spirit	
Tagish	
Teslin	Dèsłìn Âyi

3.2.5 CURRENT LAKES MONITORED (FOR METRICS OTHER THAN WATER QUALITY)

Participants were asked about additional metrics being monitored for, outside of water quality. Table 3 summarizes the lakes identified through the interviews, survey responses and focus groups and what they are being monitored for.

Table 3. Lakes in the Yukon that are currently being monitored for metrics other than water quality and the associated additional lake monitoring activities. (Note: References for the source of Indigenous Lake Names that have not been confirmed with the Yukon Government are provided in footnotes in Table 4, Section 3.7.)

Colonial Lake Name	Indigenous Lake Name	Additional Lake Monitoring Activities
Atlin	Áa Tlein	Fish, wildlife, waterfowl & residential bird habitat
Bennett		Flood mapping, power generation storage, ice on / ice off, fish, wildlife, flora, lake foreshore, archaeological and cultural value sites around lakes, waterfowl & residential bird habitat, wetlands habitat
Hermit		Fish
Marsh	Tàkádàdhà / Sāa Tl'áh Ni	Flood mapping, power generation storage, ice on / ice off, fish, wildlife, flora, lake foreshore, archaeological and cultural value sites around lakes, waterfowl & residential bird habitat, wetlands habitat
Nares		Flood mapping, power generation storage, ice on / ice off, fish, wildlife, flora, lake foreshore, archaeological and cultural value sites around lakes, waterfowl & residential bird habitat, wetlands habitat

Colonial Lake Name	Indigenous Lake Name	Additional Lake Monitoring Activities
Lake Laberge	Tá'aan	Fish, wildlife, flora, archaeological and cultural value sites around lakes, ice on / ice off, waterfowl & residential bird habitat, wetlands habitat, contaminants
Little Atlin		Ice on / ice off
Sydney Lake		Fish
Tagish		Flood mapping, power generation storage, ice on / ice off, fish, wildlife, flora, lake foreshore, archaeological and cultural value sites around lakes, waterfowl & residential bird habitat, wetlands habitat
Teslin	Dèsłìn Âyi	Fish, contaminants, flood mapping
Windy Arm		Fish, wildlife, flora, lake foreshore, archaeological and cultural value sites around lakes, waterfowl & residential bird habitat, wetlands habitat

3.2.6 HISTORIC LAKE MONITORING ACTIVITIES

Participants were asked why historic lake monitoring activities have stopped. The main contributing issues identified by the participants included unavailable resources (e.g. funding, equipment, and human resources), a perceived lack of interest, and a perceived shift in priorities of the decision makers.

3.3 FOCUS GROUP SUMMARY

Living Lakes Canada hosted a 90-minutes focus group meeting on April 21, 2023. Staff from various units of the Department of Environment, Government of Yukon were in attendance.

The intention of this workshop was to learn about current concerns and identify potential priority lakes for monitoring from a Government of Yukon perspective.

3.3.1 CHANGES OBSERVED

Participants were asked to share the changes they have witnessed in lakes around them. This feedback was arranged on the wall with similar or related sticky notes appearing closer to one another (Fig.1).

The focus group feedback on changes participants have noticed to lakes in the Yukon included:

- Increased fishing pressures
- Garbage and pollution on shorelines
- Varied lake and water levels, overflow
- A large variation in spring melt
- Increased lake use (humans and motor crafts)

Figure 1. Participant responses to the prompt “what changes have you witnessed in the lakes around you?”. Participants were then asked to group their responses based on similarities.

3.3.2 LAKES OF INTEREST

Participants were shown maps of various Yukon watersheds and asked to identify priority lakes for the Government of Yukon and why, and to describe both ongoing and completed projects that included lake monitoring (Fig. 2). The priority lakes identified by the focus group are part of Table 4 presented in Section 3.7.

Figure 2. Yukon watershed maps with participants' sticky notes identifying priority lakes (yellow) for future monitoring, including reasoning, along with current (blue) and historic (pink) lake monitoring projects.

Some of the reasons behind the priority lakes identified by participants included:

- Hydropower development
- Salmon spawning areas
- Increased recreation, concerns regarding development, and park planning processes
- Cultural significance
- Algal blooms
- Overflow and flooding issues
- Ice thinning
- Areas for important wildlife (e.g. swans)

3.3.3 DATA NEEDS

Focus group participants were further asked about what kind of data is needed to inform government decisions surrounding lakes. It was expressed that better climate modeling and flood mapping could assist in decision making. Other information discussed that is used to inform decision making included the cultural importance of lakes, ecological importance/sensitivity, water uses, and whether the quality is fit for its intended use, contaminants, lake levels, and fish and wildlife data. Through these discussions, one of the main outcomes that was expressed by multiple participants in the Government of Yukon focus group was the concern around flooding and changes in lake hydrologic balance.

3.4 INDIGENOUS KNOWLEDGE AND WESTERN SCIENCE IN LAKE MONITORING

Participants have been asked about their perspectives on the roles of Western science and Indigenous perspectives and values in lake monitoring as well as how they integrate both systems of knowledge in their lake monitoring efforts.

3.4.1 ROLE OF WESTERN SCIENCE PERSPECTIVES IN LAKE MONITORING

Participants indicated that Western science perspectives are important in lake monitoring when it comes to study design, standardized research, and peer-reviewed research. It is considered highly important when it comes to trend monitoring, ensuring the water quality meets the Canadian Water Quality Guidelines for the Protection of Aquatic Life set out by Canadian Council of Ministers of the Environment (CCME), and to characterize the lake's physical attributes.

The survey responses showed that most projects and initiatives seek to collaborate with expert scientists in order to integrate a Western science perspective and ensure scientific standards are met.

3.4.2 ROLE OF INDIGENOUS PERSPECTIVES AND VALUES IN LAKE MONITORING

Participants overwhelmingly indicated that Indigenous perspectives and values were key to holistic and effective lake monitoring in the Yukon. Participants often described Indigenous Knowledge as grounded in values systems and focused on an understanding of the land and relationship with it. For example, one participant mentioned that Indigenous Knowledge observations may reflect what bird species frequent lakes at certain times of the year, or where certain species of fish spawn. Such knowledge may be based on thousands of years of observations and a deep understanding of patterns on the land and in the water that comes from spending long amounts of time on the land.

Participants spoke about how Indigenous Knowledge is sometimes more intuitive and connected to present events, compared to Western science where there is often a delay between experiencing an event and understanding its implications. For example, one participant recounted how one year, community members spoke about the high levels of snow observed in comparison to other years and therefore anticipated flooding issues for the coming summer. In this instance, the community worked on flooding plans many months before the Western science snow reports were available. It was this knowledge of patterns based on an understanding of the land that allowed the community to prepare adequately.

Another participant mentioned how Elders knew what kind of wildfire season to expect based on their understanding of patterns in seasonal and annual differences.

In terms of Indigenous Knowledge and water stewardship, one participant recounted a foundational value prioritized by their Elders:

> *"Our Elders tell us that water is life."*
>
> - Anonymous participant

The sentiment that water is life is reflected in their ecological land use planning where water quality is the number one priority.

However, there are challenges to working with Indigenous Knowledge, perspectives, and values, especially when working within colonial systems. Participants discussed how Indigenous Knowledge is based on values systems that are more qualitative, and therefore do not align with Western science systems often founded in quantitative data analysis. Instead, participants indicated that new structures should be designed by Indigenous Knowledge Keepers and Western scientists together to create space for both knowledge systems. Designing a lake monitoring network that is based on values from the beginning could make space for Indigenous Knowledge where previously there has been limited space.

Participants also mentioned that translating observations between knowledge systems was a challenge. However, one participant stressed the importance of navigating both Indigenous Knowledge and Western science:

> "Those connections need to be made so that there's like a translation between the types of observation Western scientists make and the types of observation that community members might make."
>
> - Anonymous participant

Despite the challenges that arise based on the differences between Indigenous Knowledge and Western science, it was emphasized by participants that these differences are part of the

reason why their stories recounted successful cases where two knowledge systems were used in tandem.

3.4.3 INTERWEAVING INDIGENOUS KNOWLEDGE AND WESTERN SCIENCE IN LAKE MONITORING

Participants indicated that the interweaving of Indigenous Knowledge and Western science was crucial for effective lake monitoring. Some struggled to describe how this interweaving could happen and what it could look like, while others stated that both worldviews inform their monitoring efforts.

> *"Both Western science and Indigenous Knowledge/Traditional Knowledge have a lot of importance when it comes to monitoring. Both of these ways of seeing, doing and knowing should be weighted equally when collecting and analyzing samples. As more time goes on, Western science is seeing the benefit of integrating Traditional Knowledge into monitoring practices and that is amazing. I try very hard to weave TK and Western science but would like to continue to learn and improve my practice."*
>
> - Anonymous participant
>
> *"A holistic approach of Traditional Knowledge and Western science informed the Indigenous Observation Network lake monitoring efforts."*
>
> - Anonymous participant

The municipality representatives who contributed to this report shared they all work closely with the First Nation with which they have shared territories to align their work with the First Nation priorities. Even though there are legal territorial boundaries, the community is one with all members living alongside each other.

Participants share that some barriers to including both worldviews equally in lake monitoring approaches are:

- Staff turnover,
- Continued need for citizen engagement and participation on Lands & Resources programs,
- Lack of Indigenous Knowledge in some subject areas, and,
- Loss of Elders and oral history that is not documented.

3.5 CHALLENGES TO LONG-TERM LAKE MONITORING IN THE YUKON

Participants were asked what the main challenges are to long-term lake monitoring in the Yukon. Lack of capacity, funding, equipment, and time, as well as limited field season, staff turnover, rapid impacts of climate change, and logistics were identified. Funding for monitoring equipment, boats, and trucks is also a barrier to consistent lake monitoring. Funding support is often short-term and hard to predict.

Some secondary barriers were also mentioned:

- The lack of baseline data and the lack of data accessibility from current and past consultants makes it difficult to drive data-informed decision making regarding lakes.
- The challenge of coordinating governing bodies to establish a long-term monitoring strategy.
- The lack of resources needed for effective citizen engagement and participation.

3.6 WHAT WOULD THE WATER WANT?

Participants were asked to speak for the water and tell us what they feel the Water would want to see happen to ensure the health of Yukon lakes for future generations.

Here are some of their answers:

> *"The water would want a unified vision to support its health and usage. The water gives life to everything on this planet and so working together to support its health is of utmost importance. If some are not on board with this it can never work, everyone needs to work together and care for the water as it cares for everything and everyone always."*
> - Anonymous participant

> *"Keep us clean - keep our tourists and outdoor recreation users educated, regulate the Yukon's growing local food network and agriculture system (potential sources of runoff), monitor the fish for signs of stress (warming waters)."* - Anonymous participant

"Keep it clean and natural." - Anonymous participant

"The ability to provide in an interconnected way, the needs of land, aquatic, human and spiritual beings while allowing for all watercourses and adjacent lands to thrive."
- Anonymous participant

"I would like to see water honored. Even a few minutes of reflection on the importance and power of lakes, of water by all Yukon people will serve to raise the level of territorial lake stewardship." - Anonymous participant

"Establishing fish and wildlife habitat protection zones." - Anonymous participant

"Continuous monitoring, less mining in and around lakes, rivers and tributaries."
- Anonymous participant

"No more pollution, and less activity on the water during important parts of the seasons i.e.: salmon migration and spawning grounds. All freshwater species habitat life cycles are also important. Water Protection for the future. Eliminate industrial power globally."
- Anonymous participant

3.7 PRIORITY LAKES

Participants were asked which lakes they think should be considered for water quality monitoring in the future and why. A list of lakes was developed, based on what was heard through the interviews, the focus group, and the survey. Collectively, a list of 55 priority lakes was compiled (Table 4). Yukon First Nations Final Agreements and the Yukon community-based fish and wildlife monitoring plans also contributed. The map below presents the location of all the lakes listed (Fig. 5).

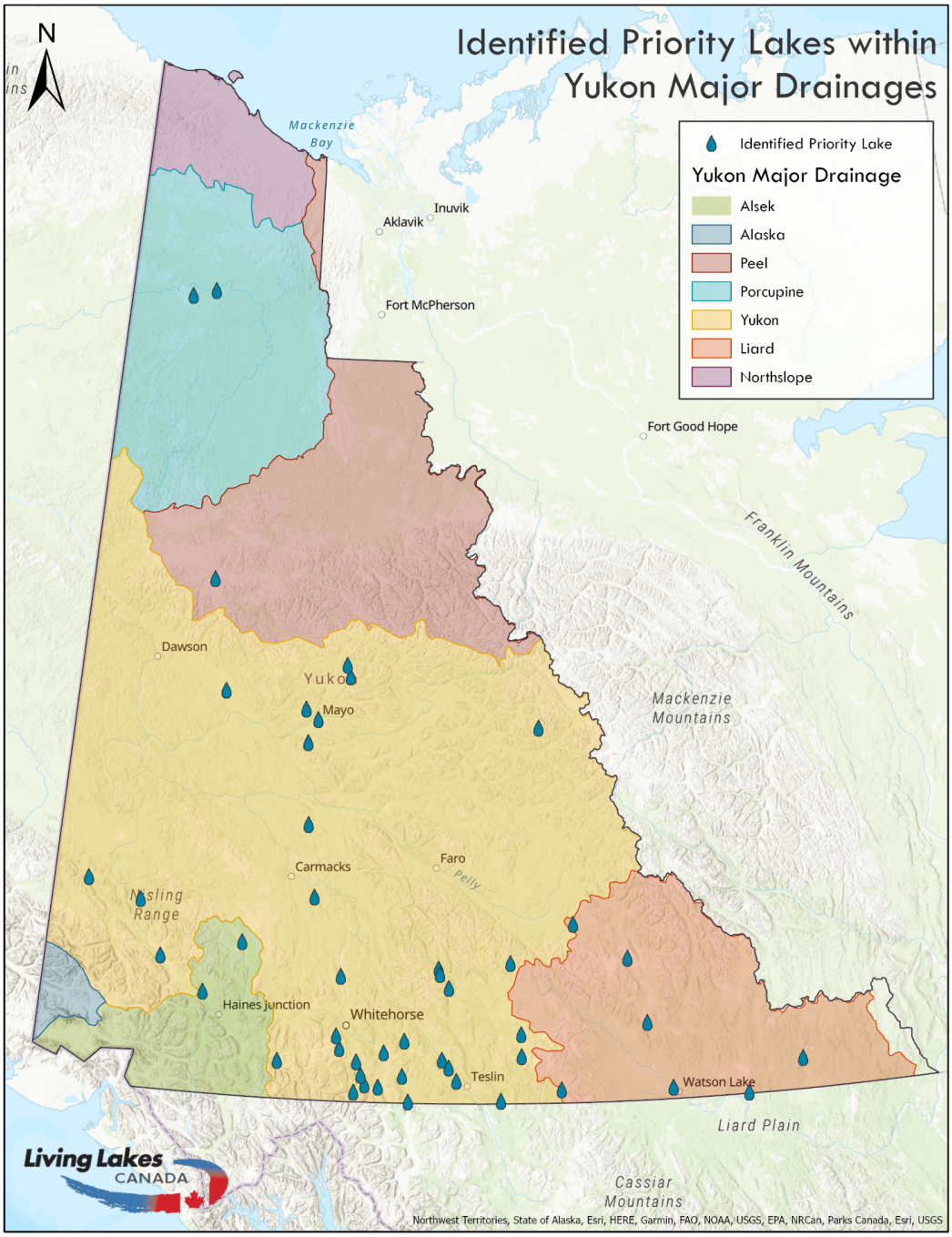

Figure 5. A map of identified lakes of interest for future water quality monitoring based on the interviews, focus group, and the survey, as well as on Yukon First Nations Final Agreements and Yukon community-based fish and wildlife monitoring plans.

Table 4. Identified lakes of interest for future water quality monitoring based on the interviews, focus group, and the survey, as well as on Yukon First Nations Final Agreements and Yukon community-based fish and wildlife monitoring plans. (Note: References for the source of Indigenous Lake Names that have not been confirmed with the Yukon Government are provided in the footnotes.)

Colonial Lake Name	Indigenous Lake Name	English Translation	Indigenous Language	Latitude	Longitude
Aishihik	Äshèyi	"Head of lake"	Tlingit	61° 27' 14"	137° 09' 49"
Atlin Lake	Áa Tlein[2]	"Big water/lake"	Tlingit	60° 00' 48"	133° 49' 51"
Barney Lake				60° 00' 36"	127° 23' 40"
Bennett Lake				60° 05' 30"	134° 51' 56"
Big Salmon Lake	T'à Tlèn Âyi	"Big salmon lake"	Tlingit	61° 16' 29"	133° 16' 47"
Brooks Brook				60° 24' 52"	133° 11' 50"
Chapman Lake				64° 50' 55"	138° 20' 51"
Coal Lake				60° 29' 56"	135° 09' 51"
Deadman Creek	Adàgayi Hîni		Athapaskan	60° 20' 26"	133° 04' 05"
Donut Lake					
Efflie Lake					
Emerald				63° 32' 49"	131° 13' 44"
Ethel Lake	Takwän't'ye	"handling fire (torches) by the lake shore (to attract fish)"	Northern Tutchone	63° 22' 11"	136° 04' 58"
Finalyson Lake				61° 41' 13"	130° 37' 15"

[2] Keri Edwards, Dictionary of Tlingit (2009), 51.

Colonial Lake Name	Indigenous Lake Name	English Translation	Indigenous Language	Latitude	Longitude
Fish Lake	Łu Zę̀ la Mān[3]	“Skimming fish lake”[4]	Southern Tutchone	60° 37' 04"	135° 14' 06"
Fish Lake / Cadzow Lake / Chiidaatsik		“Red stone”	Gwich’in	67° 33' 13"	138° 58' 15"
Frances Lake	Tū Chō[5]	“Big water”[6]	Kaska	61° 20' 52"	129° 34' 21"
Gravel Lake				63° 48' 35"	137° 53' 38"
Grizzly Lake					
Hermit Lake					
Horseshoe Lake					
Kloo Lake	K’ùa Mān[7]	“Fish lake” or “Fishtrap lake”[8]	Southern Tutchone	60° 57' 29"	137° 51' 46"
Kluane	Łù’àn Män	“Big whitefish lake”	Southern Tutchone	61° 15' 50"	138° 44' 40"
Kusawa Lake	Nekhuǭ Män / Kùsawu.â[9]	“Raft lake” or “Rafting across lake”[10] / “narrow lake”[11]	Southern Tutchone / Tlingit	60° 21' 23"	136° 20' 26"
Lake Laberge	Tá’aan (Mān)		Southern Tutchone	61° 10' 57"	135° 11' 33"
Ladue Lake				64° 00' 34"	135° 15' 00"
Lewes Marsh				60° 22' 44"	134° 49' 53"

[3] Yukon Native Language Centre, Dákeyi Teaching Guide (2017), 6.
[4] YNLC, Dákeyi, 6.
[5] Government of Yukon, Frances Lake Campground (n.d.).
[6] Government of Yukon, Frances Lake Campground (n.d.).
[7] YNLC, Dákeyi, 52.
[8] YNLC, Dákeyi, 52.
[9] Government of Yukon, Kusawa Lake Campground (n.d.).
[10] YNLC, Dákeyi, 29.
[11] Government of Yukon, Kusawa Lake Campground (n.d.).

Colonial Lake Name	Indigenous Lake Name	English Translation	Indigenous Language	Latitude	Longitude
Little Atlin		“Big water/lake”	Tlingit	60° 15' 14"	133° 57' 12"
Mandanna Lake				61° 55' 07"	135° 47' 06"
Marsh	Tàkádàdhà / Sāa Tl’áh Ni[12]	“Sandy beach”[13]	Southern Tutchone / Tagish	60° 28' 22"	134° 18' 37"
Mayo Lake	Ts’agro Män	Ts’agro - forked; Mān - lake	Northern Tutchone	63° 35' 33"	135° 53' 52"
McClintock Lake				60° 35' 16"	133° 55' 22"
McKenna Lake					
McNeil Lake				61° 19' 44"	131° 52' 20"
McQuesten Lake	Et’onyäk Mān	Et’o - nest; nyäk - river; Mān - lake	Northern Tutchone	64° 07' 06"	135° 19' 41"
Minto lake				63° 41' 07"	136° 09' 47"
Morley Lake				60° 01' 34"	132° 04' 34"
Morris Lake				60° 26' 52"	131° 40' 31"
Nares				60° 09' 48"	134° 39' 45"
Pickhandle Lakes				61° 55' 28"	140° 19' 17"
Pine Lake	Tsí Män[14]	“Red ochre lake”[15]	Southern Tutchone	60° 07' 33"	130° 55' 36"
Quesnel Lake					

[12] Government of Yukon, Marsh Lake Campground (n.d.).
[13] Government of Yukon, Marsh Lake Campground (n.d.).
[14] YNLC, Dákeyi, 52.
[15] YNLC, Dákeyi, 52.

Colonial Lake Name	Indigenous Lake Name	English Translation	Indigenous Language	Latitude	Longitude
Quiet Lake	Chu Lą / Kìt Den Â	Chu - water, lake; Lą - limit of, head waters of / “high-lying lake”	Northern Tutchone / Tlingit	61° 05' 37"	133° 04' 33"
Sandy Lake				61° 13' 26"	133° 15' 09"
Simpson Lake				60° 43' 56"	129° 14' 44"
Spirit				60° 15' 13"	134° 44' 24"
Sydney Lake					
Tack Lake				67° 29' 04"	139° 31' 33"
Tagish				60° 08' 48"	134° 24' 21"
Tatlmain Lake / Ta’tla Mun	Tetl’ámą̄n	Tetl’á - bay; mą̄n - lake	Northern Tutchone	62° 35' 58"	135° 58' 54"
Teslin Lake	Dèsłìn Âyi[16]	“Long narrow water”	Tlingit	60° 12' 51"	132° 55' 13"
Tincup Lake	Cheghą̄r Mą̄n[17]	“Broad whitefish”[18]	Southern Tutchone	61° 46' 29"	139° 14' 44"
Toobally Lake				60° 17' 30"	126° 19' 26"
Watson Lake				60° 06' 23"	128° 48' 46"
Wolf Lake	Ghùch Âyi	“Wolf lake”	Tlingit	60° 39' 20"	131° 40' 44"

3.8 KEY THEMES

Through the surveys and interviews, nine key themes arose that can be considered as key takeaways to help the Yukon move towards a unified lake monitoring approach:

[16] Government of Yukon, Teslin Lake Campground (n.d.).
[17] YNLC, Dákeyi, 76.
[18] YNLC, Dákeyi, 76.

Theme 1 - Changes in Lake Landscapes

Participants have noticed multiple changes around their lakes in the last several years that are often associated with climate change impacts. These changes include the water level, which has led to flooding in some areas, increased water temperatures, and changes in fish populations. Changes were also noticed in the tributaries (water flow and water physical characteristics) and on the land surrounding lakes (snow levels, and wildlife habitats). It is interesting to note that not all changes are viewed negatively. For example, although increasing water temperatures are known to have a negative effect on fish, participants noted that the higher water temperatures also make recreational activities such as swimming more enjoyable.

One participant noted that some of the change is geology-based and predictable, regardless of anthropogenic activities. They indicated that not all changes observed should be attributed to anthropogenic-driven climate change and that some changes observed are independent of human activities and based on the dynamic nature of the landscape instead.

Theme 2 - Relationships with People, Land, and Water

Respect is one of the foundations of strong relationships with people, the land, and the water. Throughout this project, Living Lakes Canada recognizes the importance of going out into communities and how powerful in-person interactions are to developing relationships, not only with people, but also with the surrounding environment. Meeting people in the communities where they live, instead of requesting they travel outside their communities to participate in public engagement, helps demonstrate respect and can strengthen the relationship. Going out to the communities also enables spending time on the land and seeing some of the lakes discussed in the conversations. Being on the land and the water is invaluable and supports land management decisions that will protect people and ecosystems for future generations.

Respect also means that all interested parties in the planning process should be included. Inclusivity is essential to developing a collaborative process.

> *"Community meetings are always valued."*
>
> - Anonymous participant

Figure 3. Respect is the foundation. Graphic developed from a hand-drawn sketch recorded by Amelie Janin during one of the interviews.

Theme 3 - Transboundary Collaboration

The Yukon shares territorial boundaries with Alaska in the USA, and with Northwest Territories and British Columbia in Canada. Thousands of years before these colonial borders were created, First Nations and Inuvialuit made this land their home. Many of these Indigenous groups have territories that span across these colonial borders today. Water flows through these borders and therefore water management and stewardship requires a high level of transboundary cooperation. The Yukon First Nations representatives who contributed to this project stated it is very challenging to manage water and lakes on their territory without knowing what is happening on the other side of the border. Transboundary cooperation is essential to meaningful and effective lake monitoring in transboundary watersheds.

Theme 4 - Proactive Action

The Yukon landscape remains relatively untouched by negative human influences as compared to the lands and water located in southern provinces. Based on surveys, interviews, and other discussions, it is clear that the residents of the Yukon want to keep their land and water as pristine as possible by acting in a proactive way to avoid negative environmental actions instead of waiting for impacts to occur and responding thereafter. It was expressed that there has been a long history of waiting to react until after an environmental impact or disaster occurs instead of putting resources towards being proactive about future concerns in order to mitigate potential impacts. Participants spoke about looking to the south (e.g. BC) as an example of areas that face high levels of environmental degradation —degradation

extensive enough to make it challenging and resource-intensive to reverse. Participants expressed that in the face of climate change, development, and recreational pressures, the time to act is now to preserve the waters and environment in the Yukon, and lake monitoring is an important step in this direction.

Theme 5 - Land Guardian Programs

Assigned with a responsibility to care for the land, Land Guardians travel throughout their traditional territories and carry out cultural and traditional practices to observe, monitor, and maintain the health of their lands and waters. Often grounded in Indigenous Knowledge systems that value long-term sustainability, these programs are invaluable in preserving the land for future generations. Building on thousands of years of observation, Land Guardian programs have an opportunity to bring alternative perspectives to climate change adaptation. Moreover, Land Guardians bring in an opportunity to weave Western science and Indigenous Knowledge systems together, leading to holistic and inclusive approaches to environmental management. As Indigenous-led initiatives, Land Guardian programs demonstrate how environmental decision-making processes can be grounded in Indigenous values, perspectives, and cultural teachings and yet can be effective in Western land management processes.

By including lake monitoring activities in their practices, Land Guardians can and do contribute to maintaining the health of lake ecosystems. Due to the vast territories that Land Guardians monitor, these programs can be leveraged in a widely connected lake monitoring approach to expand the capacity for lake monitoring in the region.

Theme 6 - Education

There is a need for education and greater awareness around the impacts caused by climate change and human activities. Public messaging and education campaigns should highlight the changes that are happening and enable sharing of intergenerational knowledge and perspectives to support engagement of the people in climate action efforts. It is critical to empower the youth as they become the leaders of tomorrow.

> *"More community involvement and education in the public-school sector. Our Elders are a wealth of knowledge."*
>
> - Anonymous participant

Theme 7 - Communication

Effective communication, asking questions, facilitating two-way dialogues and discussions, and providing consistent and frequent updates on projects are key to building relationships between individuals, communities, and organizations. It is important to share the information

gathered about lakes with the local communities in a way that creates space for people to engage meaningfully with the materials and to participate in the development of lake monitoring efforts. Communicating well takes time and effort, but building awareness and education about the land and water can help make a lake monitoring program successful and effective.

Participants highlighted that communicating results is crucial for successful lake monitoring. Communication is important for several reasons:

- Adequate communication allows for transparency and accountability and also promotes trust and credibility in the project.
- Results of broad communication help to disseminate knowledge and findings to a wider audience, including rights holders, stakeholders, researchers, policymakers, practitioners, and the general public.
- Intentional communication serves as a form of validation and recognition of the existing knowledge and expertise amongst the participants and it can showcase the efforts put towards a shared goal.
- Contributing to the wider community can lead to collaborations, partnerships, and further opportunities for research and funding.

Theme 8 - Jurisdictional Overlaps

Jurisdictional overlaps refer to situations where multiple governing bodies or organizations have some authority or responsibilities over the same area or a shared issue. In the Yukon, there are many jurisdictional overlaps between different governments, such as municipal governments, First Nations governments, and territorial governments. This creates a need for negotiation and discussion regarding regulations and logistics for recreational activities and land use. Participants expressed that the lack of full autonomy and decision-making power of many First Nations communities in the Yukon to implement their own rules and limitations towards resource extraction and recreational activities is a challenge. Indigenous sovereignty and self-government is a component of an inclusive and rights-based decision-making process. Jurisdictional overlaps can create confusion and barriers to effective decision making. It is important for all parties involved to work together to identify and address these overlaps to establish clear lines of communication and cooperation.

Bridging gaps between colonial and Indigenous governments requires a multi-faceted approach that focuses on effective communication, mutual respect, and collaboration. It is essential to recognize the historical and current, but unjust, dominance of colonial systems and to identify colonial biases to better support Reconciliation and respect the sovereignty of Indigenous Nations.

Beyond that, building trust and establishing effective partnerships can be established by identifying shared values (e.g. long-term safety of the environment). By actively working to bridge gaps and build strong relationships, governments can create a more inclusive, equitable, just, and sustainable future that respects the rights and responsibilities of Indigenous Peoples.

Theme 9 - Indigenous Knowledge and Western Science

To adopt a holistic approach to lake monitoring, participants emphasized that both Indigenous and Western systems of knowledge should inform the design of a potential future lake monitoring program. Indigenous perspectives are often grounded in an ancestral understanding of the relationships within the ecosystem and between people and nature. Western science is essential to water monitoring to quantify change and/or to compare conditions to baseline water conditions. However, the Yukon territory is generally lacking in Western science data, with a short history of data collection, but rich in Indigenous Knowledge from thousands of years of observation. Together, these two types of knowledge have the potential to initiate effective monitoring that is both values-based and quantitative.

Though participants indicated that the interweaving of Indigenous Knowledge and Western science is crucial for effective lake monitoring, they struggled to describe how this interweaving could happen and what it could look like.

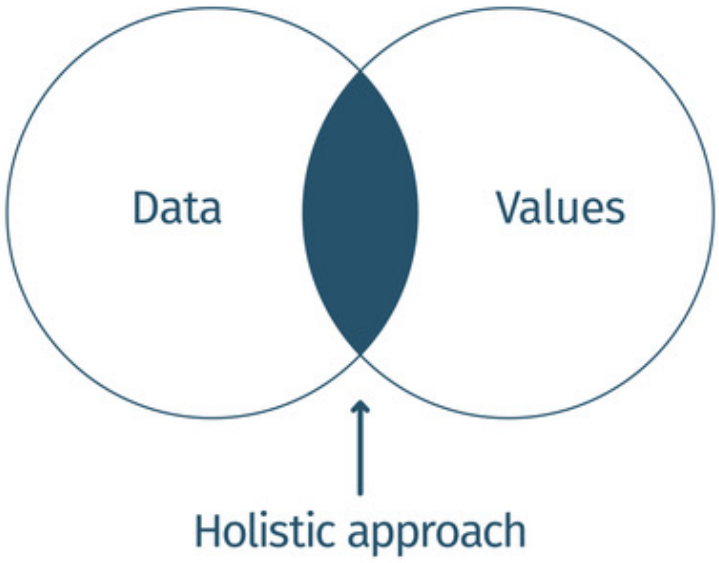

Figure 4. Focusing our efforts on where Western scientific data and Indigenous values intersect might lead to the desired holistic approach. Graphic developed from a hand-drawn sketch recorded by Amelie Janin during one of the interviews.

4.0 RECOMMENDATIONS

As described in Section 3.1, the Yukon territory is one of the few remaining jurisdictions in Canada without some kind of coordinated lake monitoring efforts. Living Lakes Canada presents the following recommendations to the Government of Yukon to encourage future focus on implementing territory-wide lake monitoring that is both coordinated and where Indigenous perspectives and Western science are interwoven.

The recommendations presented below are rooted in the perspectives shared by the participants of this project and by Living Lakes Canada, as an NGO that has specialized in developing community-based water stewardship initiatives and Applied Reconciliation for almost two decades.

RECOMMENDATION #1 - Coordinate, alongside rights holders and stakeholders, a working group to explore a Yukon-specific lake monitoring approach.

Coordinate a working group with representation from multiple levels of governments and organizations, including representatives from all Yukon First Nation governments, transboundary Indigenous governments and groups, local communities, NGOs, academia, and industry. The working group members should include Indigenous Knowledge Keepers and Western scientists, and there should be opportunities to involve youth and Elders. This will help include multiple knowledge systems, intergenerational perspectives, and help facilitate knowledge exchange. The purpose of this working group would be to explore what a coordinated lake monitoring program could look like. This exploratory work could result in a roadmap for the implementation of coordinated lake monitoring and might include the following steps and components:

1.1 Creating a Framework for a community-based territory-wide lake monitoring approach.

1.2 Building on existing water quality monitoring initiatives in the Yukon such as How We Walk with the Land and Water, and the Indigenous Observation Network (ION).

1.3 Working in collaboration with Land Guardian programs to explore opportunities to combine efforts and carry out lake monitoring over considerable distances.

1.4 Defining goals, drawing on experience in other jurisdictions, and using a priority monitoring matrix approach to establish priority lakes for water quality monitoring.

1.5 Individual lake or watershed management plans should be developed where needed such as in areas of high development pressure, or where monitoring indicates a need.

RECOMMENDATION #2 - Develop the capacity to interweave Indigenous Knowledge and Western science in all potential lake monitoring activities.

Parallel to the goals of recommendation #1, the working group should also work towards developing a uniformed, yet adaptable, system for lake monitoring that makes the space for both knowledge systems to work in tandem. Steps towards this recommendation could include:

2.1 Inventorying existing resources, models, and case studies of interweaving these two approaches in environmental projects and exploring how they could apply to water management in the Yukon.

2.2 Talking with and listening to those involved in initiatives that are successfully interweaving knowledge systems to integrate learnings from their stories and processes.

2.3 Ensuring that the outcomes of Recommendation 2.1 and 2.2 are included in any roadmap developed in Recommendation #1.

RECOMMENDATION #3 - Prioritize a watershed-level approach to lake monitoring.

Lake water is a reflection of the entire watershed upstream of the lake. As such, it is important to not consider the lake in isolation, but rather to consider the lake, its surrounding environment, and each of the tributaries feeding directly or indirectly into the lake as a whole. This approach is underway in the Canadian Columbia Basin where the Living Lakes Canada High Elevation Program is monitoring the headwaters of the watersheds being studied as part of the CBWMF. Local lake stewardship groups also take this approach (e.g., the Lake Windermere Ambassadors in B.C. monitor not only the lake, but major tributaries feeding the lake). This recommendation could include the addition of lake foreshore monitoring, such as the federal Foreshore Integrated Management Planning (FIMP) protocol, which involves inventories and surveys to monitor for foreshore values, development encroachment, and shoreline biodiversity and habitat. This recommendation could involve integrating any planned lake monitoring into existing monitoring systems to help develop a more holistic understanding of the health of Yukon watersheds.

RECOMMENDATION #4 - Secure long-term funding in support of long-term lake water quality monitoring programs.

The importance of long-term monitoring programs was consistently brought up by participants in order to fill data and knowledge gaps. Without long-term monitoring, an understanding of how systems are changing is lacking and subsequently so is the ability to plan for these changes. Long-term funding is required for long-term lake monitoring.

Therefore, options for long-term funding in support of community-led lake water quality monitoring programs should be established to ensure longevity and stability. It should be noted that in advance of securing long-term funding, a clear understanding of implementation costs, and the development of a comprehensive budget and clear project pathway is required to determine appropriate funding sources.

RECOMMENDATION #5 - Prioritize a community-led approach to lake monitoring.

In the experience of Living Lakes Canada, local communities have strong relationships with, and interest in, the lands and waters around them. This sentiment was reflected throughout this project's interviews and surveys with participants. By taking a community-based water monitoring approach, diverse lived experiences, skills, knowledge, and perspectives can all help to create innovative solutions to the issues facing communities due to the impacts from climate change, development, recreation, and industry, among others. Large organizations and authorities often do not have the resources, capacity, or understanding to effectively meet the needs of communities alone, and so community-led initiatives are necessary to better meet the needs of these communities. This can also help to increase community resilience in the face of climate change by educating, building capacity, and fostering connections, trust, and support (Eiken et al., 2021).

RECOMMENDATION #6 - Develop a data governance approach and develop an open-source database that aligns with the First Nations Principles of OCAP®.

Control over data is an important point for self-determination and asserting sovereignty, especially for First Nations. Efforts to ensure that the way in which information is collected, protected, interpreted, used, and shared from Indigenous and non-Indigenous participants is aligned with the desires and interests of those who participate should be prioritized (First Nation Information Governance Centre, 2023).

Development of a database that includes these considerations is another opportunity to foster trust and build and strengthen relationships between First Nations and government. Living Lakes Canada acknowledges that there is a history of harm concerning the collection and use of data regarding First Nations. Ensuring that First Nations have ownership, control, and the ability to determine who has access to the data that is collected within their traditional territories can be a step towards Reconciliation.

> **6.1** The co-creation of database features and solutions should reflect the values and priorities of First Nations, including their specific interpretation of First Nations Principles of OCAP®. In practice, aligning a database with the First Nations Principles of OCAP® should look different in different contexts, because the terms ownership, control, access, and possession could be described and interpreted differently by

different First Nations. One example of aligning a database with these principles could be including database features that ensure data contributors have an account that ensures they retain ownership and control over the data uploaded, and with settings allowing them to decide the level of access to their data (e.g. private within their organization or public). Because open datasets are a Western concept that may not be well received in other cultures, a database policy on data contribution should be that any data that is willing to be shared is welcome, while there should not be pressure to share any data that an organization is not comfortable with sharing.

6.2 The database should be a space for interweaving Indigenous Knowledge and Western science to support collaboration in working towards filling data gaps on lake health. Elucidating what this interweaving could look like is an extensive process, but one step towards equal recognition of these knowledge systems is to add features for broader knowledge types. Having the ability to host non-numerical data like photos, videos, audio recordings, links, and maps is key to making the space for Indigenous Knowledge systems.

6.3 Support intergovernmental co-management strategies and decision making to improve lake health.

RECOMMENDATION #7 – Allocate resources to education and outreach initiatives.

It is important to include communication and outreach initiatives while developing and implementing a lake monitoring program. Living Lakes Canada recommends planning for these activities and making sure that the resources required for education and outreach are built into the future steps.

Outreach activities should be focused on primary concerns such as fish and wildlife habitat, sources of drinking water, responsible recreation, climate change, as well as agricultural and industrial impacts on lakes and tributaries.

Communication activities could include tasks such as:

- Developing communication materials tailored to the target audience;
- Partnering with academia and NGOs to offer workshops and training to youths, community members, and interested Yukoners presenting the proposed lake monitoring approach;
- Offering lake monitoring training to Land Guardian programs when and where desired to support implementation of a coordinated lake monitoring approach.

RECOMMENDATION #8 – Celebrate the beauty, the role, and the presence of Yukon lakes as well as the people who care deeply for these lakes.

Creating the time, space, and place to share, collaborate, and celebrate is important to understanding people's relationship with lakes in the Yukon. This should be a time to listen to and learn from people living in the Yukon who care for and work to protect these waters. This is important for building public support and strengthening relationships that may provide the foundation for working towards a coordinated lake monitoring approach.

5.0 CONCLUSION

This report has provided a preliminary overview of the status of lake monitoring in the Yukon, and potential avenues for advancing a coordinated lake monitoring effort. Based on desktop research, a focus group, and interviews and surveys with representatives from First Nations governments, municipal governments, territorial government branches, not-for-profit organizations, academia, and industry, Living Lakes Canada has confirmed that significant data gaps exist about lake health in the territory. Participants expressed that improved data on lake water quality, the cultural importance of lakes, contaminants, lakes levels, and fish and wildlife data is necessary to understand and respond to increasing anthropogenic and climatic pressures on Yukon lakes. However, through conversations with participants from across the Yukon, this project also identified that there is significant interest within the territory to collaborate on lake monitoring.

This report represents the start of what a collective vision for coordinated lake monitoring in the Yukon might look like, including which lakes might be prioritized for monitoring, and what next steps might look like.

It is important to note that successful implementation of the above recommendations would require a commitment from decision makers at all levels to apply the data and information collected to actionable policies for watershed health. In many parts of Canada, applied water policy is impeded by lack of political will, lack of transparency regarding decision-making rationale, and multi-jurisdictional gridlocks. Political will and respecting the process developed to address lake health issues is necessary to overcome these challenges.

It is intended that the recommendations presented help provide the space, time, and opportunities for interested parties to strengthen relationships, share successes and challenges, and work towards building a coordinated and interwoven lake monitoring approach in the Yukon.

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APPENDIX A - Comparison of governmental lakes monitoring across Canada

Province or Territor	Is there currently a lake monitoring protocol in plac	Outline of protocol	Number of lakes monitore	Monitoring parameters	Are they partnering with stewardship group	If so, what groups?	Strengths	Limitations	References
British Columbia	Yes	**BC Lake Monitoring Network:** Samples are taken 2 times per year, 1 in late-winter/spring representative of mixed conditions and 1 in late-summer/fall illustrating stratified conditions. Protocols are outlined for samples at shallow (<10m) and deep (>10m) lake depths. For shallow lakes 1 sample is taken 1m below the water surface and 1 sample is taken 1m above the sediment surface (total 2 samples). For deep lakes both an epilimnion and a hypolimnion composite are taken (total 2 samples). The vertical profiles of lakes are also determined. In shallow lakes a measurement is taken every 1m, while in deep lakes every 1m a measurement is taken up to 20m depth whereafter a measurement is taken every 5m up to a 50m depth. Quality assurance and quality control methods include sampling at 2 sites per region, 2 trips per year, collecting 2 replicates (n=2), and providing 1 field, equipment, or trip DI water blank.	53 lakes (74 lake sites)	Physical parameters include temperature, Secchi depth (water clarity), and turbidity. Chemical parameters include nitrogen (TOTN, NO3, NO2, TKN, NH3), phosphorus (TP, dP, ortho-P), carbon (TOC, DOC), silica, chlorine (Cl), sulphate (SO4), calcium (Ca), magnesium (Mg), hardness, dissolved oxygen (DO), pH, and specific conductance. Biological parameters include chlorophyll-a, and phytoplankton and zooplankton taxonomy.	Yes	**BC Lake Stewardship Society (BCLSS):** B.C. Lake Stewardship and Monitoring Program is in partnership with the Ministry of Environment and Climate Change and the BCLSS. The program aims to collect 12 samples per site per year and for the 2023 season 36 lakes will have level 1 monitoring programs, 12 will implement level 2, and 12 will have level 3.	Strong stewardship group involvement, clearly outlined protocols, QA/QC, and parameters, large monitoring network	Appears to be a lack of Indigenous Knowledge incorporated into program	B.C. Lake Monitoring Network. (n.d.). British Columbia. Retrieved from: https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/lake-monitoring/bc-lake-monitoring-network. B.C. Lake Stewardship and Monitoring Program. (n.d.). British Columbia. Retrieved from: https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/lake-monitoring/bc-lake-stewardship-and-monitoring-program. The Lake Sampler. (May 12, 2023). British Columbia. Retrieved from: https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/lake-program/volunteer-lake-monitoring-program/documents/lake_sampler_spring_2023.pdf.
Alberta	Yes	**Provincial Lake Monitoring Program:** Looks at both water quality and quantity. Monitoring buoys are deployed in certain lakes from June to September to gather continuous measurements. For quantitative data, the provincial government partners with Water Survey of Canada. Continuous monitoring of lake levels occurs in 60+ lakes and reservoirs. Manual measurements of lake levels are taken 3 times per year at more than 200 lakes and reservoirs.	Qualitative data: Grouped with reservoirs (about 30 total) Quantitative data: 60 (continuous monitoring) 200 (manual)	Parameters include temperature and dissolved oxygen (DO). A chemical and biological profile is also determined, but individual parameters for these profiles are not listed. Some key indicators for water quality are identified as chloride and water yield, which are not lake specific, but lake trophic status is another key indicator. Parameters for lake trophic status include chlorophyll-a, total phosphorus (TP), and Secchi depth (water clarity).	Yes	**Alberta Lake Management Society:** Assists in lake monitoring through a citizen science project, LakeWatch. Volunteers in this program test for temperature, clarity, chemical parameters (not specified), invasive species, and biological parameters (not specified) 4 times per year. Approximately 500 monitoring records are produced annually. **Indigenous Lake Monitoring Program:** Part of the provincial monitoring program. Sampling is done 4 times per year to determine physical, chemical, and biological profiles for the lakes. The last available update on the program was for 2019 and so current program status is unknown.	Strong stewardship group involvement, Indigenous partnerships, large monitoring network	Could include more public detail on parameters measured, sampling protocols, and QA/QC methods	About LakeWatch. (2023). Alberta Lake Management Society. Retrieved from: https://aims.ca/about-lakewatch/. Condition of the environment - Water indicators. (2023). Government of Alberta. Retrieved from: https://www.alberta.ca/condition-of-the-environment-water-indicators.aspx. Environmental Monitoring. (2023). Government of Alberta. Retrieved from: https://www.alberta.ca/environmental-monitoring.aspxwater. Indigenous Lake Monitoring Program. (March 2019). Government of Alberta. Retrieved from: https://open.alberta.ca/dataset/71a29cbe-eb13-4c03-9021-3a46bf1087be/resource/64a76c42-0050-4d28-a8e0-e2e5bc296396/download/indigenous-lakes-monitoring-program-fact-sheet.pdf.
Saskatchewan	No: Does not appear to be a specific provincial lakes monitoring protocol, but some related programs exist	**Healthy Beach Program:** Provides water quality monitoring for public beaches some of which are lakes. Weekly, monthly, or seasonal sampling takes place from June to September. **Water Security Agency:** Monitoring of lake levels accomplished at hydrometric stations. There are 24 water stations that monitor for water quality parameters but appears restricted to river monitoring.	n/a	**Healthy Beach Program:** Parameters include fecal coliforms and microcystins. Results are compared to Canadian Recreational Water Guidelines.	Yes (limited)	**The Last Mountain Lake Stewardship Group (LMLSG) Water Quality Monitoring Program:** Previous partnership with Last Mountain Lake Stewardship Group and Saskatchewan Watershed Authority, but cancelled in 2008. Recently, some assistance was provided by SWA (date not specified).	Previous involvement with stewardship groups	No lake specific monitoring program, lack of Indigenous and stewardship group involvement in existing programs	Healthy Beach Program. (n.d.). Saskatchewan. Retrieved from: https://www.saskatchewan.ca/residents/environment-public-health-and-safety/environmental-health/healthy-beach-program. Overview. (n.d.). Water Security Agency. Retrieved from:https://www.wsask.ca/lakes-rivers/overview/. Water Quality Monitoring Program. (n.d.). Last Mountain Lake Stewardship Group. Retrieved from:https://www.lmlsq.ca/.
Manitoba	Yes *but not lake specific	Numerous long-term monitoring programs exist for water quality monitoring including lakes but not a general lake specific program. They partner with the University of Manitoba, Manitoba Hydro, and Conservation Districts. The Integrated Watershed Management Planning program also monitors lakes within various watersheds of Manitoba. This is a partnership between local and provincial governments, local residents, and various stakeholders. There also exists a specific monitoring protocol for Lake Winnipeg. Samples are collected 4 times per year.	n/a	Long-term general monitoring program has looked at 65 sites (not all lakes) in the last 53 years, and measures up to 150 unspecified parameters. For Lake Winnipeg, sample parameters include nitrogen (N), phosphorus (P), chlorophyll-a, pesticides, dissolved oxygen (DO), and others (not specified). Sediment dwelling orgnaisms are also sampled annually as a proxy for ecosystem health.	Yes (not well outlined on provincial websites but partnerships exist)	Lake Manitoba Stewardship Board, Lake Winnipeg Stewardship Board	Lake Winnipeg specific monitoring program, multiple partnerships	No general lake specific monitoring protocols outlined, lack of Indigenous involvement, work with stewardship groups not well outlined on provincial communications	Integrated Watershed Management Planning. (n.d.). Manitoba Environment and Climate. Retrieved from: https://www.gov.mb.ca/sd/water/watershed/iwmp/index.html. Lakes, Beaches and Rivers. (n.d.). Manitoba Environment and Climate. Retrieved from: https://www.gov.mb.ca/sd/water/lakes-beaches-rivers/index.html. Lake Winnipeg. (n.d.). Manitoba Environment and Climate. Retrieved from: https://www.gov.mb.ca/sd/water/lakes-beaches-rivers/lake-winnipeg.html.
Ontario	Yes	The Ministry of Environment, Conservation and Parks uses a Lakeshore Capacity Model. A lake quality monitoring program is used as validation for the predictive model. Data is used for identifying trends, determining if the lakes are behaving as normal, and to detect problems early on. Lake trophic status is determined through measuring TP and for the Lakeshore Capacity Model, multiple years of TP data taken at spring overturn are needed. Epilimnetic samples are less suitable for the modelling system. Through the Lake Partner Program the provincial authority works with the Federation of Ontario Cottagers' Associations, Lake of the Woods District Property Owners Association and other (many) stewardship groups. The collected data through this program is mapped and made publicly available.	800 through Lake Partner Program	Volunteers in the Lake Partner Program sample lakes for both TP and Secchi depth (water clarity). Other parameters that are monitored by the provincial ministry include chlorophyll-a and dissolved oxygen (DO), along with Secchi depth and TP.	Yes	Federation of Ontario Cottagers' Associations, Lake of the Woods District Property Owners Association and other (many) stewardship groups. In 2004 1000 locations of data points were collected.	Large monitoring network, strong stewardship group involvement, mapping of data	Appears to be a lack of Indigenous Knowledge incorporated into program, limited parameters monitored	Monitoring Lake Quality. (June 10, 2019). Ontario Ministry of the Environment, Conservation and Parks. Retrieved from: https://www.ontario.ca/document/lakeshore-capacity-assessment-handbook-protecting-water-quality-inland-lakes/monitoring-lake-water-quality#fn27 Water quality in local lakes. (August 16th, 2021). Ontario Ministry of the Environment, Conservation and Parks. Retrieved from: https://www.ontario.ca/page/water-quality-local-lakes

Quebec	Yes	**Réseau de surveillance volontaire des lacs (RSVL):** This program aims to determine lake trophic level and monitor changes in lakes overtime specifically in eutrophication and water quality. There are qualifying criteria for lakes to be considered in this program including a depth of 3+m, a surface area of 0.05 km2 or more, although some small but deep lakes are acceptable, the lake must be used for dwelling or recreational purposes, and the lake must be supplied by 1 or more tributaries and drain into 1 or more outlets. All samples are taken by volunteers at a station located in the deepest section of the lake. Every year, water clarity measurements are taken biweekly from June to early October. Lab samples are taken in June, July, and August for 2 or 3 years in a row before a 4 year break in sampling is taken. For the water samples, a 500 mL sample is collected between the surface and a 1m depth. This is then used to fill the 3 smaller sample bottles specific for each of the parameters. A lab then utilizes calorimetry analysis for phosphorus determination, fluorometry for chlorophyll-a analysis, and an infrared (IR) detection method for DOC.	*Current number of lakes monitored could not be found but 656 were reported to be monitored in 2011	Parameters include Secchi depth (water clarity), phosphorus, dissolved organic carbon (DOC), and chlorophyll-a. Visual assessment of riparian and littoral zones are also accomplished by volunteers.	Yes	A number of lake associations and stewardship groups assist in the Quebec Volunteer Lake-Monitoring Program (not specified on government website)	Large monitoring network, well outlined protocols and analyses, strong volunteer/local involvement	Appears to be a lack of Indigenous Knowledge incorporated into program	Quebec Volunteer Lake-Monitoring Program. (2023). Government of Quebec. Retrieved from: https://www.environnement.gouv.qc.ca/eau/rsvl/methodes-en.htm. Réseau de surveillance volontaire des lacs (RSVL). (2023). Government of Quebec. Retrieved from:. https://www.environnement.gouv.qc.ca/eau/rsvl/index-en.htm, https://www.environnement.gouv.qc.ca/eau/rsvl/presentation-en.pdf.
Newfoundland and Labrador	Yes *but not lake specific	**Canada-Newfoundland and Labrador Water Quality Monitoring Agreement:** A total of 75 active sites are monitored only some of which are lakes. Samples are taken seasonally or monthly with minimum counts reported at 4 times per year in Newfoundland and 3 times per year in Labrador. On-site monitoring occurs using handheld meters or multi-paramter sondes. All samples are analyzed at provincial laboratories.	A manual count of the 75 active monitoring sites revealed 20 are lakes	Parameters include colour, conductivity, DO, pH, turbidity, alkalinity, calcium (Ca), chloride (Cl), magnesium (Mg), potassium (K), sodium (Na), sulphate (SO4), total organic carbon (TOC), nitrate (NO3), nitrogen, phosphorus, aluminum (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), boron (B), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), gallium (Ga), iron (Fe), lanthanum (La), lead (Pb), lithium (Li), manganese (Mn), molybdenum (Mo), nickel (Ni), rubidium (Rb), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), uranium (U), vanadium (V), zinc (Zn). On-site monitoring looks at temperature, DO, pH, specific conducance, and turbidity. Some labs may also monitor for pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dioxins, and furans.	No		Extensive sampling protocols, many parameters investigated	No lakes specific program, lack of Indigenous and stewardship group involvement	Protocols Manual for Water Quality Monitoring Agreement (WQMA) Sampling in Newfoundland and Labrador. (December, 2019). Government of Newfoundland & Labrador Department of Municipal Affairs and Environment Water Resources Management Division. Retrieved from: https://www.gov.nl.ca/ecc/files/WQMA-SAMPLING-MANUAL-Dec-2019-.pdf Water Quality Monitoring Agreement. (n.d.). Government of Newfoundland and Labrador. Retrieved from: https://www.gov.nl.ca/ecc/waterres/quality/background/agreement/#1.
Nova Scotia	Yes	**Nova Scotia Lake Survey Program:** This program is a partnership between Nova Scotia Environment and Nova Scotia Fisheries and Aquaculture. Water quality samples are collected during summer months for both on-site and laboratory analysis. Acquired data is mapped on the surface water quality network.	n/a	Parameters include nutrients, chlorophyll-a, water clarity, temperature, pH, certain metals, conductivity, alkanlinity, dissolved oxygen (DO), colour, major ions, and some fish habitat data. Both temperature and DO are recorded in-situ. Lake depth, stratification patterns, and volume are also analyzed.	Yes	There is provincial support for both the Halifax-Dartmouth Area Lake Study. and the Kings County Volunteer Lake Monitoring Program. This program is a collaborative effort between the municipality and local volunteers. Monthly samples of 13 lakes are taken from May to October. Community stewardship groups involved in this program include the Lake George Property Owners Society, Black River Lake Association, Kings County Wildlife Federation, Bluenose Atlantic Coastal Action Program, Shubenacadie Watershed Environmental Protection Society, and SGLWAB.	Strong stewardship group involvement	Lack of information available on sampling and analysis protocols, lack of Indigenous involvement	Lake Monitoring Program. (2022). Municipality of the Country of Kings. Retrieved from:. https://www.countyofkings.ca/residents/services/planning/lake/#:~:text=The%20Kings%20County%20Lake%20Monitoring,database%20on%20lake%20water%20quality. Surface Water Quality Monitoring Network. (n.d.). Government of Nova Scotia. Retrieved from:. https://nse.maps.arcgis.com/apps/webappviewer/index.html?id=7ded7a30bef44f848e8a4fc8672c89bd. Nova Scotia Lake Survey Program. (n.d.). Government of Nova Scotia. Retrieved from: https://novascotia.ca/nse/surface.water/lakesurveyprogram.asp.
New Brunswick	Yes	**New Brunswick Volunteer Lakes Monitoring Program:** Biweekly sampling occurs from June to September. All gathered data is inventoried and mapped based on sampling station.	10 with multiple stations at each lake	Parameters include conductivity, pH, dissolved oxygen (DO), Secchi depth (water clarity), and temperature.	Yes	New Brunswick Alliance of Lake Associations which is comprised of 15 lake associations and various volunteer groups. This group utilizes underwater cameras to image shoreline vegetation.	Strong stewardship group involvement	Lack of information available on sampling and analysis protocols, lack of Indigenous involvement	NBALA. (n.d.). NBALA L'AALNB. http://www.nbala.ca/volunteer-lake-monitoring-program New Brunswick Volunteer Lakes Monitoring Program Data. (n.d.). New Brunswick Environment and Local Government. Retrieved from: https://www.elgegl.gnb.ca/VLMP-PSVL/en/SamplingLocation/Index.
Prince Edward Island	No	n/a	n/a	n/a	n/a	n/a		No lakes monitoring protocols were found	
Yukon	Water quality monitoring protocol but no lakes specific program/protocol in place	The Water Sampling 101 water quality monitoring protocol outlines general water sampling guidelines. Lab instructed guidelines are to be followed in terms of sample bottle size, preservation agent used, and temperature. Time between sampling and lab analysis should be minimized. Site conditions should be recorded along with parameter measurements. All bottles should be properly labelled and samples handled with gloves. Proper sampling technique involved fully submerging the bottle facedown which should then be filled with water from the middle of the water column. Finally, a 2-3 cm gap should be left between the sample and the lid and all samples should be stored in a cooler.	n/a	In-situ parameters include pH, temperature, flow rate, and conductivity. Parameters analyzed in the laboratory are not specified.	n/a	n/a	Well outlined sampling protocols	No lakes specific program, lack of Indigenous and stewardship group involvement	Water Sampling 101. (Oct, 2009). Yukon Environment Water Resources Branch. https://yukon.ca/sites/yukon.ca/files/env/env-water-sampling-101.pdf

North West Territories	Yes *includes rivers and streams	**Community-Based Water Quality Monitoring Program:** Department of Environment and Climate Change partners with 21 communities to monitor 40 sites over 24 rivers and lakes. Participants are provided with equipment including YSI 6000 Sondes, YSI Professional Plus, and data sheets. Detailed protocols for gathering in-situ YSI probe measurements are provided. Grab samples are also taken and sent to participating laboratories for analysis. Diffusion gradients in thin-film passive samplers (DGTs) are used for trace metal analysis over 3-7 day sampling periods. Polycyclic aromatic hydrocarbons (PAHs) are measured using polyethylene membrane devices (PMDs) over 30 day periods. Citizen science kits are sent out to volunteers.	24 lakes and rivers	Water quality parameters include pH, chlorophyll, dissolved oxygen (DO), temperature, redox potential, and turbidity. Water is also tested for contaminants including mercury (Hg), organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and some trace metals.	yes	This program is in partnership with multiple stewardship/community groups (not specified) as well as Indigenous partners.	Stewarship group and Indigenous involvement, well outlined protocols, analytical methods, and parameters	Stewardship groups not specified	Community-Based Water Monitoring. (n.d.). Government of Northwest Territories. Retrieved from: https://www.gov.nt.ca/ecc/sites/ecc/files/resources/factsheet_cbm_program_oct2022_1.pdf. , https://www.gov.nt.ca/ecc/en/services/water-management-and-monitoring/community-based-monitoring. . Monitoring Parameters Fact Sheets. (n.d.). Government of Northwest Territories. Retrieved from: https://www.gov.nt.ca/ecc/en/services/water-management-and-monitoring/monitoring-parameters-fact-sheets. Monitoring Resources. (n.d.). Government of Northwest Territories. Retrieved from: https://www.gov.nt.ca/ecc/en/services/water-management-and-monitoring/monitoring-resources.
Nunavut	No *proposed plans but no detailed protocols in place	**Nunavut General Monitoring Plan:** This general monitoring plan includes a section dedicated to freshwater quality monitoring but there is no specific lake monitoring protocols. **Inuu'tuti Baker Lake Basin Cumulative Effects Monitoring:** This is a monitoring plan for the Baker Lake Basin that runs on a 20 year timeline as a project under the Nunavut General Monitoring Plan. It is a partnership between Nunavut General Monitoring Plan, Crown-Indigenous Relations, Northern Affairs Canada, Kivalliq Inuit Association and Nunavut Water Board. One of the key focuses of the project is to incorporate both Inuit Qaujimajatuqangit (IQ) and western science. Community involvement is proposed in data collection, monitoring, and project design/development.	n/a	As outlined in the general monitoring plan, freshwater quality monitoring parameters should include pH, temperature, major ions, nutrients, alkalinity, and metals but it also states that parameters should be made site specific.	Community involvement proposed for Inuu'tuti Baker Lake Basin Cumulative Effects Monitoring program	n/a	Longterm proposed plan for lakes monitoring with community involvement, use of Inuit Qaujimajatuqangit (IQ) and western science together	Lack of outlined protocols and information of current status of proposed projects	Inuu'tuti Baker Lake Basin Cumulative Effects Monitoring. (n.d.). Nunavut General Monitoring Plan. Retrieved from: https://www.ngmp.ca/eng/1506104917887/1506104955137. Nunavut General Monitoring Plan Monitoring Blueprint Compendium 2013. (2016). Nunavut General Monitoring Plant. Retrieved from: https://www.ngmp.ca/eng/1424180769840/1424180806031

APPENDIX B - Inventory of right holders and stakeholders potentially interested in lake monitoring in the Yukon

Sector	Organization Name
Academia	Yukon University
Academia	University of Waterloo
Academia	Wolf Creek Research Basin - Linked to McMaster University
Charity	Canadian Parks and wilderness society (CPAWS) - Yukon Chapter
Charity	Lake Blitz - Living Lakes Canada
Charity	Yukon Conservation Society
Corporate	Yukon Energy
Corporate	Environmental Dynamics Inc.
Education	Round River Conservation Studies
Government	Government of Canada (Yukon Office) Fisheries and Hydrology
Government	Northern Contaminants Program (NCP)
Government	Village of Haines Junction
Government	Kluane National Park and Reserve, Parks Canada
Government	Yukon Parks, Government of Yukon
Government	Yukon Government Fisheries, Government of Yukon
Government	Yukon Government Water Resources Branch, Government of Yukon
Government	Village of Faro
Government	Village of Watson Lake
Government	City of Whitehorse
Government	Village of Teslin
Government	Village of Mayo
Government	Village of Carmacks
Government	Village of Dawson
Government	Renewable Resources Councils
Government	Scientists and Explorers Act, Government of Yukon
Government	Yukon Water Board
Government	Department of Health and Social Services, Government of Yukon
Government	Yukon River Panel, Government of Yukon
Indigenous	Carcross/Tagish First Nation
Indigenous	Champagne and Aishihik First Nations
Indigenous	Kluane First Nation
Indigenous	Kwanlin Dün First Nation
Indigenous	Ta'an Kwäch'än Council
Indigenous	Teslin Tlingit Council

Indigenous	Tr'ondëk Hwëch'in
Indigenous	Taku River Tlingit First Nation
Indigenous	Dena Kaye Institute
Indigenous	Council of Yukon First Nations (CYFN)
Indigenous	Liard First Nation
Indigenous	Little Salmon/Carmacks First Nation
Indigenous	Ross River Dena Council
Indigenous	Selkirk First Nation
Indigenous	Vuntut Gwitchin First Nation
Indigenous	White River First Nation
Indigenous	Acho Dene Koe First Nation
Indigenous	Dease River First Nation
Indigenous	Gwich'in Tribal Council
Indigenous	Inuvialuit Regional Corporation
Indigenous	Kwadacha Nation
Indigenous	Tahltan Central Government
Indigenous	Yukon River Inter-Tribal Watershed Council
Indigenous	Yukon River Basin Indigenous Observation Network
Indigenous	First Nation of Na-Cho Nyäk Dun
Indigenous	Yukon First Nations Climate Action Fellowship
Network	Wildlife Management Advisory Council - North Slope
Network	Lake Pulse
NGO	Water Rangers
NGO	Yellowstone to Yukon
NGO	Yukon Environmental and Socio-Economic Assessment Board (YESAB)
NGO	How we walk with the land and water
NGO	Wolf Creek Research Basin
NGO	Tombstone Waters Observatory
Other	Renewable Resources Councils
Other	Yukon Surface Rights Board
Other	Yukon Land Use Planning Council (YLUPC)
Other	Peel Watershed Planning Commission
Other	Dawson Regional Planning Commission
Other	North Slope Regional Planning Commission
Other	Yukon Fish and Wildlife Management Board

APPENDIX C - Inventory of known lake monitoring initiatives in the Yukon

Sector	Organization Name
Academia	Wolf Creek Research Basin - Linked to McMaster University
Charity	Lake Blitz - Living Lakes Canada
Corporate	Environmental Dynamics Inc.
Government	Government of Canada (Yukon Office) Fisheries and Hydrology
Government	Northern Contaminants Program (NCP)
Government	Kluane National Park and Reserve, Parks Canada
Government	Yukon Government Fisheries, Government of Yukon
Government	Yukon Government Water Resources Branch, Government of Yukon
Indigenous	Carcross/Tagish First Nation
Indigenous	Champagne and Aishihik First Nations
Indigenous	Dena Kaye Institute
Indigenous	Kluane First Nation
Indigenous	Kwanlin Dün First Nation
Indigenous	Ta'an Kwäch'än Council
Indigenous	Teslin Tlingit Council
Indigenous	Tr'ondëk Hwëch'in
Indigenous	Vuntut Gwitchin First Nation
Indigenous	Yukon River Inter-Tribal Watershed Council
Academia	Lake Pulse – Linked to U. Sherbrooke

YUKON LAKES MONITORING OVERVIEW - INTERVIEW CONSENT FORM

Project title: Yukon Lakes Monitoring Overview project

Project team: Sophie Gonthier (Lakes Program coordinator), Claire Armstrong (Applied Reconciliation Program coordinator)

Collaborators: Living Lakes Canada and Government of Yukon, Water Resource Branch

Introduction:
You are invited to participate in the Yukon Lakes Monitoring Overview project initiated by the Government of Yukon, Water Resource Branch and collaboratively led with Living Lakes Canada.

Lakes are central to the lives of many people living in the Yukon, and are depended upon for recreational, cultural, spiritual, and subsistence activities. Lakes are also sentinels of climate change. There are currently large knowledge gaps about lakes in the Yukon, with no long-term coordinated lake monitoring initiatives in the territory. The need for a coordinated long-term monitoring approach has led to a partnership with Living Lakes Canada.

Living Lakes Canada is an award-winning NGO that facilitates collaboration in monitoring, restoration, and policy development initiatives for the long-term protection of Canada's lakes, rivers, wetlands and watersheds impacted by climate risk. Living Lakes Canada has been leading and partnering with water stewardship initiatives for almost two decades, and have worked on specific projects across Canada. Living Lakes Canada acknowledges Indigenous Knowledge as paramount to water protection and restoration success. By unifying our efforts, we hope to decolonize relationships with water.

Objective of the project:
The Yukon Lakes Monitoring Overview project objective is to understand the current lake monitoring landscape in the Yukon to enable future partnerships and collaborations to potentially lead to a coordinated lake monitoring approach in the Yukon. This requires a holistic understanding of the lakes monitoring efforts currently taking place in the Yukon, and of the priorities, values, resources, and concerns of the Yukon interested stakeholders and rights holders. This project aims to enable the Western science and the Indigenous systems of knowledge to meet and support lake monitoring efforts.

What does participation involve?
If you decide to participate in this project you will be asked to take part in one online survey and one in-person or virtual interview. The interview will be led by Sophie Gonthier and Claire Armstrong and will take approximately 60 minutes. During the interview the participant will be asked to answer questions about lake monitoring in the Yukon region. Your participation is voluntary and choosing not to participate will not affect you in any way.

The information gathered will be used to describe and inventory current and past lake monitoring initiatives, as well as current and expected future capacity and resources for a collaborative lake monitoring program in the Yukon.

Data Analysis and Management
We will use an inductive coding approach with narrative and thematic analysis on the survey and interview responses to understand the current and past Yukon lake monitoring landscape.

The information that you provide to us will remain confidential unless you choose to reveal your identity. Only the project team will have access to this information and they have an obligation to keep all information confidential. Your information will only be used in the framework of this project and to elevate the Yukon lake monitoring activities. Your responses will be stored in a private **Google Drive** where only the project team has access to it. All responses will be destroyed two years after the project is complete, which allows time to ensure that the next steps of a coordinated Yukon lake monitoring network are guided by this project.

Data Sovereignty

Living Lakes Canada recognizes that control over data you contribute to is an important point for self-determination and asserting sovereignty, especially for First Nations. This project intends to follow the First Nations Principles of OCAP® (Ownership, Control Access, and Possession) to ensure that the way we collect, protect, interpret, use and share data from Indigenous and non-Indigenous groups is aligned with the desires of these groups. Any data you contribute remains owned by you, and you will have control over its use by having the opportunity to review any quotes or remove any portions of the survey responses prior to the information being presented publicly. You will be sent your interview transcripts for your possession after the data collection phase of the project to ensure you have access to the information you provide. A summary of the collective surveys and of the interviews will be shared with the Government of Yukon as part of our contractual agreement. These summaries won't include any names, but will be owned by the Government of Yukon.

Possible Benefits and Risks

Benefits: Participating in this project will help shape the future of lake monitoring in the Yukon region by establishing a baseline of what monitoring is already occurring and identifying what needs for monitoring there are. This is an opportunity to bring your voice and thoughts to collectively and collaboratively protect lakes of interest.

Risks: You may unintentionally share information you do not want to share publicly during the interview (e.g. information that should not be publicly available or information that places personal, professional, or research relationships at risk). To ensure that the information we report aligns with what you intend to make public, you will have the opportunity to withdraw any portion of your interview. After completing the interview, you will be sent a copy of the transcription. You will have 2 weeks to review these responses and inform us (at sophie@livinglakescanada.ca) of any changes or withdrawals of information. As well, you will have the opportunity to review any quotes or new insights that we may want to include in the findings prior to sharing this information. We will contact you directly to get your consent if there are quotes we would like to use. These steps will ensure that the risks associated with unintentional sharing of information will be minimal.

Next Steps of this project:

A final report will be produced based on the information shared with us via the surveys and interviews, and other methods to adapt to everyone's preference. The report will include recommendations for next steps to work towards a coordinated lake monitoring approach in the Yukon.

Questions:

We are happy to talk with you about any questions or concerns you may have about your participation in this project. Please contact Sophie Gonthier (at sophie@livinglakescanada.ca) at any time with questions, comments, or concerns about the project.

Signature Page

I understand the project's scope, risks and benefits of participating, and confidentiality within the project.
I consent to participating in this interview. ⬜Yes ⬜No

I consent to have my feedback shared publicly and confidentiality (e.g. in reports and other forms of media) for the purpose of sharing project outcomes. ⬜Yes ⬜No

Do you want to be acknowledged in the final report for your confidential contributions to this project?
(Ticking this option will mean that your identity and your organization's identity (if applicable) is revealed as a participant of this project but it will not be linked to specific responses.) ⬜Yes ⬜No

Options (*you can still participate in the project if you select no*):

I agree that my interview may be audio-recorded ⬜Yes ⬜No

I agree that direct quotes from my interview may be used without identifying me ⬜Yes ⬜No

I agree to be added to the Living Lakes Canada mailing list.
(*By ticking yes, you agree to receive the Living Lakes Canada newsletter.)* ⬜Yes ⬜No

_____ _____
Full Name Organisation (if applicable)

_____ _____
Email address Phone number

_____ _____
Signature Date (DD-MM-YYYY)

Yukon Lakes Monitoring Overview Project - Interview Guide

April 2023

- **5 min Brief Land Acknowledgement (Claire) and Welcome and meeting purpose (Sophie)**
- **5 mins~ Roundtable introduction:** Name, affiliation, favorite lake and why
- **10 mins~ LLC and Project introduction (PPT) - Sophie**
- **5 mins~ Questions and consent form signing**

Thank you for your interest in participating in this project. Before we get started, I would like to review the consent form with you. I want to emphasize that you do not have to answer any question you don't want to answer, and you can stop the interview at any time. Do you have any questions or concerns? **Address questions or concerns.**

I have three short questions I'd like to cover before we begin.

- Do you consent to participating? **Ensure consent form is signed. Turn on audio recording.**
- Do you consent to being audio-recorded? **If yes, keep audio recording on. If no, turn audio recording off.** Do you consent to me taking notes during the interview?
- Do you consent to have your identity linked to the record of your interview, or would you prefer to remain anonymous? This may be relevant for any new insights you give so that I can credit them to you in my findings. Do you consent to the use of quotes? You will have the opportunity to review any quotes we may use and to remove them from the record at that stage.
- **30 mins~ Lakes monitoring discussion**

Our overall goal is to understand the current lake monitoring landscape in the Yukon to enable future partnerships and collaborations to eventually lead to a coordinated lake monitoring approach in the Yukon. But first I want to start off with a bit about you and your experiences with lake monitoring in the Yukon.

Before we get started, can you just restate your name and position for the audio recording?

1. What is your organization's interest in lake monitoring? Here's a map, feel free to use it to help us visualize as you describe.

   (goal of the question: what and where)

   a. What monitoring is your organization currently doing?

   b. What past projects related to lake monitoring has your organization been involved in?

   c. Which specific lakes are areas are you most interested in?

    d. Some examples of Lake monitoring includes water quality, water quantity, fish, wildlife and flora, the lake's foreshore, archeological and cultural value sites, and ice on / ice off.

2. FOR NON-INDIGENOUS ORGS/GOV: What you've described so far sounds very grounded in science. In this project we also want to explore the inclusion of Indigenous ways of knowing alongside western science. Are there any initiatives you're aware of that are highlighting Indigenous Knowledge?

   (goal of the question: how, understand use of IK in lake monitoring)

3. FOR INDIGENOUS GOV: What you've described so far sounds very grounded in science. In this project we also want to explore the inclusion of Indigenous ways of knowing alongside western science. How do Indigenous ways of knowing influence your stewardship work on lakes?

    a. IF NOT BUT DESIRED: What would you envision that looks like, for Indigenous Knowledge to more centrally guide your lake monitoring?

4. Why have you been doing this or why are you interested in this monitoring?

   (goal of the question: why)

    a. What changes have you witnessed in the lakes around you?

    b. Which decisions would you like this monitoring to inform?

5. Where have these monitoring data been stored?

6. What would you like to see happen in the future? **State some examples to prompt response:** Round-table meeting and setting up a network…

    a. What do you think are the next steps to make these things happen?

    b. If you had **unlimited** resources, which monitoring activities would you conduct, on which lakes and why?

7. If you could speak for the water, what do you feel the Water would want to see happen to ensure the Yukon lakes' health for future generations?

   Is there anything else you would like to share with us?

- **5 Mins~ Wrap Up** - project next steps and setting expectations

Confirm follow-up with survey and explain how some may overlap with interview questions but are intended to be filled in as desired.

Thank you for your time, efforts, and contributions to this study. The interview responses will be analyzed over the next few months, and you will have the opportunity to review any quotes or new insights you have provided before the findings are published in a 'what we heard' report. I

want to remind you that at any time, you are free to withdraw your contributions from the project or ask that we remove specific responses from the data. **If they chose to remain anonymous:** This interview will be de-identified to ensure your responses are anonymous.

ALSO MENTION THAT THURSDAY EVENT EXISTS.

APPENDIX F - Survey Questions Form

Yukon Lakes Monitoring Overview - Survey

You are invited to participate in the Yukon Lakes Monitoring Overview project initiated by the Government of Yukon, Water Resource Branch and collaboratively led with Living Lakes Canada.

Lakes are central to the lives of many people living in the Yukon, and are depended upon for recreational, cultural, spiritual, and subsistence activities. Lakes are also sentinels of climate change. There are currently large knowledge gaps about lakes in the Yukon, with no long-term coordinated lake monitoring initiatives in the territory. The need for a coordinated long-term monitoring approach has led to a partnership with Living Lakes Canada.

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The Yukon Lakes Monitoring Overview project objective is to understand the current lake monitoring landscape in the Yukon to enable future partnerships and collaborations to potentially lead to a coordinated lake monitoring approach in the Yukon. This requires a holistic understanding of the lakes monitoring efforts currently taking place in the Yukon, and of the priorities, values, resources, and concerns of the Yukon interested stakeholders and rights holders. This project aims to enable the Western science and the Indigenous systems of knowledge to meet and support lake monitoring efforts.

Your participation is voluntary and choosing not to participate will not affect you in any way.

A final report will be produced based on the information shared with us via the survey, interviews, and other methods to adapt to everyone's preference. The report will include recommendations for next steps to work towards a coordinated lake monitoring approach in the Yukon.

* Indicates required question

1. Email *

Informed Consent

Project team: Sophie Gonthier (Lakes Program coordinator), Claire Armstrong (Applied Reconciliation Program coordinator)

Collaborators: Living Lakes Canada and Government of Yukon, Water Resource Branch

What does participating involve?

This survey is one way to contribute to the project. The information gathered in this survey will be used to describe and inventory current and past lake monitoring initiatives, as well as current and expected future capacity and resources for a collaborative lake monitoring program in the Yukon.

There will also be the opportunity to contribute through a focus group interview in an in person or virtual format. If you are not yet registered for the interview portion and wish to participate, please contact Sophie Gonthier at sophie@livinglakescanada.ca.

Data Analysis and Management

We will use an inductive coding approach with narrative and thematic analysis on the survey and interview responses to understand the current and past Yukon lake monitoring landscape.

The information that you provide to us will remain confidential unless you choose to reveal your identity. Only the project team will have access to this information and they have an obligation to keep all information confidential. Your information will only be used in the framework of this project and to elevate the Yukon lake monitoring activities. Your responses will be stored in a private Google Drive where only the project team has access to it. All responses will be destroyed two years after the project is complete to ensure that the next steps of a coordinated Yukon lake monitoring network are guided by this project.

Data Sovereignty

Living Lakes Canada recognizes that control over data you contribute to is an important point for self-determination and asserting sovereignty, especially for First Nations. This project intends to follow the First Nations Principles of OCAP® (Ownership, Control Access, and Possession) to ensure that the way we collect, protect, interpret, use and share data from Indigenous and non-Indigenous groups is aligned with the desires of these groups. Any data you contribute remains owned by you, and you will have control over its use by having the opportunity to review any quotes or remove any portions of the survey responses prior to the information being presented publicly. You will be sent your survey responses for your possession after the data collection phase of the project to ensure you have access to the information you provide. A summary of the collective surveys and of the interviews will be shared with the Government of Yukon as part of our contractual agreement. These summary won't include any names, but will be owned by the Government of Yukon.

Possible Benefits and Risks

Benefits: Participating in this project will help shape the future of lake monitoring in the Yukon region by establishing a baseline of what monitoring is already occurring and identifying what needs for monitoring there are. This is an opportunity to bring your voice and thoughts to collectively and collaboratively protect lakes of interest.

Risks: You may unintentionally share information you do not want to share publicly during the survey (e.g. information that should not be publicly available or information that places personal, professional, or research relationships at risk). To ensure that the information we report aligns with what you intend to make public, you will have the opportunity to withdraw any portion of your survey. After completing the survey, you will be sent a copy of your responses. You will have 2 weeks to review these responses and inform us (at sophie@livinglakescanada.ca) of any changes or withdrawals of information. As well, you will have the opportunity to review any quotes or new insights that we may want to include in the findings prior to sharing this information. We will contact you directly to get your consent if there are quotes we would like to use. These steps will ensure that the risks associated with unintentional sharing of information will be minimal.

Next Steps of this project:

The responses gathered in the survey and focus group interviews will be synthesized and presented in a report for the Water Resource Branch of the Government of Yukon. This report will be shared with all participants by late summer.

Questions:

We are happy to talk with you about any questions or concerns you may have about your participation in this project. Please contact Sophie Gonthier (at sophie@livinglakescanada.ca) at any time with questions, comments, or concerns about the project.

2. I understand the project's scope, risks and benefits of participating, and confidentiality within the project. I consent to participating in this survey. *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to section 13 (**Participation Declined**)*

3. I consent to have my feedback shared publicly and confidentiality (e.g. in reports and other forms of media) for the purpose of sharing project outcomes. *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to section 13 (**Participation Declined**)*

4. Do you want to be acknowledged in the final report for your confidential contributions to this project? *

Ticking this option will mean that your identity and your organization's identity (if applicable) is revealed as a participant of this project but it will not be linked to specific responses.

Mark only one oval.

- ◯ Yes
- ◯ No

General Information

5. Full name *

_____

6. Name of Organization (NGO, Government, First Nation, etc.), if applicable

_____

7. Type of organization

Mark only one oval.

- ◯ Not for profit
- ◯ Charity
- ◯ Network
- ◯ Institution (university, college etc.)
- ◯ Corporation (for profit organization)
- ◯ First Nation government
- ◯ Provincial or Territorial government
- ◯ Municipal government
- ◯ Federal government
- ◯ I am not linked to any organization.
- ◯ Other: _____

8. Is your organization part of a monitoring network?
If yes, please indicate the name of that network.

_____

9. What is your age range?

Mark only one oval.

- ◯ 18-25
- ◯ 26-30
- ◯ 31-35
- ◯ 36-45
- ◯ 46-55
- ◯ 56 and over
- ◯ I don't feel comfortable sharing my age.

10. Living Lakes Canada strives for justice, equity, diversity and inclusion. We are attempting to improve the way we serve and include under-represented groups in water stewardship. If you identify as part of any group that is historically/currently marginalized or under-served in the scientific community and would feel comfortable disclosing this information, select all that applies.

Check all that apply.

- [ ] Indigenous peoples
- [ ] People of colour
- [ ] Persons with disabilities
- [ ] Gender and sexual minorities (LGBTQA2S+)
- [ ] Religious groups
- [ ] Neurodiverse peoples
- [ ] Women
- [ ] People of lower socioeconomic status
- [ ] First generation graduate students
- [ ] Immigrants and international students
- [ ] Other: _____

11. Are you or your organization involved in current or past lake monitoring initiatives in the Yukon? *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 67*

Yukon Lake Monitoring initiatives - ON GOING

This section focuses on lake monitoring initiatives **CURRENTLY** happening in the Yukon. Lake monitoring includes water quality, water quantity, fish, wildlife and flora, the lake's foreshore, archeological and cultural value sites, and ice on / ice off.

12. Are you or your organization **CURRENTLY** involved in lake monitoring initiatives in the Yukon? *
(answer no if your monitoring activity only happened in the past)

Mark only one oval.

- ◯ Yes.
- ◯ No. *Skip to question 33*

13. What are your **CURRENT** priorities related to lake monitoring? *(select all that apply)*

Check all that apply.

- ☐ Fish and wildlife habitat
- ☐ Sources of drinking water
- ☐ Recreational uses
- ☐ Archeological and cultural sites
- ☐ Overall ecosystem health
- ☐ Other: _____

14. Select all pressures that you are **CURRENTLY** conducting monitoring to assess: *(select all that apply)*

Check all that apply.

- ☐ Forestry
- ☐ Industrial (e.g. mining)
- ☐ Agricultural (e.g. nutrient, pesticide, stormwater runoff)
- ☐ Recreation (e.g. boating, foreshore development, etc.)
- ☐ Development (e.g. change to land use, septic systems and grey Water, etc.)
- ☐ Wildfires
- ☐ Fish Habitat Destruction
- ☐ Atmospheric Deposition
- ☐ Climate Change (e.g. warming temperature, decreasing lake, changing water cycle pattern etc.)
- ☐ Other: _____

15. Select all climate change impacts that you are **CURRENTLY** conducting monitoring to assess:
(select all that apply)

Check all that apply.

- [ ] Decreasing Lake Ice
- [ ] Warming Lake Surface Waters
- [ ] Increasing Lake Evaporation
- [ ] Wetting and Drying Trends
- [ ] Changing Lake Water Storage
- [ ] Altered Lake Mixing Regimes
- [ ] Increasing Algal Blooms
- [ ] Invasive Species
- [ ] Other: _____

16. Where do you store the data you are collecting through your **ON GOING** monitoring activities? *

_____

17. Are you conducting water **QUALITY** monitoring on lake(s) in the Yukon? *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 29*

Water QUALITY Lake Monitoring activities - ON GOING

This section focuses on **ON GOING** lake monitoring activities around water **QUALITY**.

18. On which lake(s) are you conducting water **QUALITY** monitoring? *

_____

_____

_____

_____

_____

19. Are you conducting:

Mark only one oval.

- ◯ Point source pollution monitoring
- ◯ Non-point source pollution monitoring
- ◯ Both

20. Which PHYSICAL parameters are you monitoring?

Check all that apply.

- ☐ Temperature
- ☐ Water Colour
- ☐ Clarity (Secchi Depth)
- ☐ Photosynthetically Active Radiation (PAR)
- ☐ Turbidity
- ☐ Depth
- ☐ Other: _____

21. Which BIOLOGICAL parameters are you monitoring?

Check all that apply.

- [ ] Phytoplankton Taxonomy
- [ ] Chlorophyll A
- [ ] Zooplankton Taxonomy
- [ ] Total Coliforms & E. coli
- [ ] Cyanobacteria
- [ ] Other: _____

22. Which CHEMICAL parameters are you monitoring?

Check all that apply.

- [ ] Nitrogen (total N, nitrate, nitrite, TKN, Ammonia)
- [ ] Phosphorus (total P, dissolved P, ortho-P)
- [ ] Carbon (total organic C, dissolved organic C)
- [ ] Silica
- [ ] Cl, SO4, Ca, Mg, Hardness
- [ ] Metals (dissolved or total)
- [ ] Dissolved Oxygen
- [ ] pH, Sp. Conductance
- [ ] Alkalinity
- [ ] Hydrocarbons (EPH, HEPH, LEPH, VH or BTEX)
- [ ] Polyaromatic Hydrocarbons (PAHs)
- [ ] Pharmaceuticals
- [ ] Pesticides
- [ ] Other: _____

23. If you indicated that you monitor more than one lake, are the parameters selected above consistent between all lakes that you sample?

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Other: _____

24. If you are monitoring more than one lake and the parameters are different please summarize the differences below.

_____

_____

_____

_____

_____

25. How long have you been conducting this water **QUALITY** monitoring?

Mark only one oval.

- ◯ Less than 1 year
- ◯ Between 1 and 2 years
- ◯ Between 2 and 3 years
- ◯ Between 3 and 4 years
- ◯ Between 4 and 5 years
- ◯ More than 5 years
- ◯ Other: _____

26. How often is the water **QUALITY** monitoring occurring?

Mark only one oval.

- One time sample event
- Monthly
- Quarterly
- Biannually
- Annually
- Other: _____

27. What else would you like to share with us regarding your **ONGOING** lake water **QUALITY** monitoring activities?

_____

_____

_____

_____

_____

28. Are you conducting other lake monitoring activities such as monitoring the lake's foreshore, archeological and cultural value sites, fish, wildlife and flora, development, water quantity, ice on / ice off? *

Mark only one oval.

- Yes
- No *Skip to question 33*

Other Lake Monitoring activities - ON GOING

This section focuses on **ON GOING** lake monitoring activities, other than water quality monitoring, such as water quantity, fish, wildlife and flora, lake's foreshore, archeological and cultural value sites, and ice on / ice off.

29. What other types of lake monitoring activities are you **CURRENTLY** involved in? *

Check all that apply.

- [ ] Water QUANTITY
- [ ] Fish, wildlife, flora
- [ ] Lake's foreshore
- [ ] Archeological and cultural value sites around lakes
- [ ] Ice on / ice off
- [ ] Other: _____

30. On which lake (s) are you conducting these lake monitoring activities? *

_____

_____

_____

_____

_____

31. How often are these other lake monitoring activities occurring?

Mark only one oval.

- ◯ One time sample event
- ◯ Monthly
- ◯ Quarterly
- ◯ Biannually
- ◯ Annually
- ◯ Other: _____

32. What else would you like to share with us regarding these lake monitoring activities?

Yukon Lake Monitoring initiatives - PAST

This section focuses on lake monitoring initiatives that happened in the **PAST** in the Yukon. Lake monitoring includes water quality, monitoring the lake's foreshore, archeological and cultural value sites, fish, wildlife and flora, water quantity, and ice on / ice off.

33. Have you or your organization been involved **IN PAST** lake monitoring initiatives in the Yukon? *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 55*

34. What were your priorities related to lake monitoring? *
(select all that apply)

Check all that apply.

- ☐ Fish and wildlife habitat
- ☐ Sources of drinking water
- ☐ Recreational uses
- ☐ Archeological and cultural sites
- ☐ Overall ecosystem health
- ☐ Other:

35. Select all pressures that you were conducting monitoring to assess, in the **PAST**: *(select all that apply)*

Check all that apply.

- [ ] Forestry
- [ ] Industrial (e.g. mining)
- [ ] Agricultural (e.g. nutrient, pesticide, stormwater runoff)
- [ ] Recreation (e.g. boating, foreshore development, etc.)
- [ ] Development (e.g. change to land use, septic systems and grey Water, etc.)
- [ ] Wildfires
- [ ] Fish Habitat Destruction
- [ ] Atmospheric Deposition
- [ ] Climate Change (e.g. warming temperature, decreasing lake, changing water cycle pattern etc.)
- [ ] Other: _____

36. Select all climate change impacts that you were conducting monitoring to assess, in the **PAST**:
(select all that apply)

Check all that apply.

- [ ] Decreasing Lake Ice
- [ ] Warming Lake Surface Waters
- [ ] Increasing Lake Evaporation
- [ ] Wetting and Drying Trends
- [ ] Changing Lake Water Storage
- [ ] Altered Lake Mixing Regimes
- [ ] Increasing Algal Blooms
- [ ] Invasive Species
- [ ] Other: _____

37. Where have **PAST** lake monitoring data been stored?

_____

38. Were you conducting water **QUALITY** monitoring on lake(s) in the Yukon? *

Mark only one oval.

- Yes
- No *Skip to question 51*

Water QUALITY Lake Monitoring activities - PAST

This section focuses on lake monitoring activities around water **QUALITY** that happened in the **PAST**.

39. On which lake(s) were you conducting water **QUALITY** monitoring? *

40. Were you conducting:

Mark only one oval.

- Point Source pollution monitoring
- Non-point source pollution monitoring
- Both

41. Which PHYSICAL parameters were you monitoring?

Check all that apply.

- [ ] Temperature
- [ ] Water Colour
- [ ] Clarity (Secchi Depth)
- [ ] Photosynthetically Active Radiation (PAR)
- [ ] Turbidity
- [ ] Depth
- [ ] Other: _____

42. Which BIOLOGICAL parameters were you monitoring?

Check all that apply.

- [ ] Phytoplankton Taxonomy
- [ ] Chlorophyll A
- [ ] Zooplankton Taxonomy
- [ ] Total Coliforms & E. coli
- [ ] Cyanobacteria
- [ ] Other: _____

43. Which CHEMICAL parameters were you monitoring?

Check all that apply.

- [ ] Nitrogen (total N, nitrate, nitrite, TKN, Ammonia)
- [ ] Phosphorus (total P, dissolved P, ortho-P)
- [ ] Carbon (total organic C, dissolved organic C)
- [ ] Silica
- [ ] Cl, SO4, Ca, Mg, Hardness
- [ ] Metals (dissolved or total)
- [ ] Dissolved Oxygen
- [ ] pH, Sp. Conductance
- [ ] Alkalinity
- [ ] Hydrocarbons (EPH, HEPH, LEPH, VH or BTEX)
- [ ] Polyaromatic Hydrocarbons (PAHs)
- [ ] Pharmaceuticals
- [ ] Pesticides
- [ ] Other: _____

44. If you indicated that you monitored more than one lake, are the parameters selected above consistent between all lakes that you sampled?

Mark only one oval.

- ◯ Yes
- ◯ No

45. If you monitored more than one lake and the parameters were different please summarize the differences below.

_____

_____

_____

_____

_____

46. How often did the water **QUALITY** monitoring occur?

Mark only one oval.

- ◯ One time sample event
- ◯ Monthly
- ◯ Quarterly
- ◯ Biannually
- ◯ Annually
- ◯ Other: _____

47. How long was the water **QUALITY** monitoring conducted for?

Mark only one oval.

- ◯ Less than 1 year
- ◯ Between 1 and 2 years
- ◯ Between 2 and 3 years
- ◯ Between 3 and 4 years
- ◯ Between 4 and 5 years
- ◯ More than 5 years
- ◯ Other: _____

48. Why did these water quality monitoring activities stop?

_____

_____

_____

_____

_____

49. What else would you like to share with us regarding your **PAST** lake water **QUALITY** monitoring activities?

50. Were you conducting other lake monitoring activities such as the lake's foreshore, archeological and cultural value sites, fish, wildlife and flora, development, water quantity, ice on / ice off? *

Mark only one oval.

- Yes
- No *Skip to question 55*

Other Lake Monitoring activities - PAST

This section focuses on lake monitoring initiatives, other than water quality monitoring, that happened in the **PAST** in the Yukon. Lake monitoring includes water quality, water quantity, fish, wildlife and flora, the lake's foreshore, archeological and cultural value sites, and ice on / ice off.

51. What other types of lake monitoring activities have you been involved with in the **PAST**? *

Check all that apply.

- [ ] Water QUANTITY
- [ ] Fish, wildlife, flora
- [ ] Lake's foreshore
- [ ] Archeological and cultural value sites around lakes
- [ ] Ice on / ice off
- [ ] Other: _____

52. On which lake(s) were you conducting these lake monitoring activities? *

53. How often did these other lake monitoring activities occur?

Mark only one oval.

- One time sample event
- Monthly
- Quarterly
- Biannually
- Annually
- Other: _____

54. What else would you like to share with us regarding these lake monitoring activities?

Interweaving of Indigenous Knowledge and Western science in lake monitoring

Integrating both Western science and Indigenous Knowledge, perspectives and values when approaching a topic extends our understanding of the problem and possible solutions as both perspectives may complement each other. This section focuses on understanding the way you are using both Indigenous Knowledge and Western science in your lake monitoring activities.

55. On a scale of 1 to 5, how would you rate your use of Western science in your lake monitoring activities?

1 being the lowest and 5 being the highest.

Mark only one oval.

- 1
- 2
- 3
- 4
- 5

56. How do Western science perspectives inform the lake monitoring?

57. On a scale of 1 to 5, how would you rate your use of Indigenous Knowledge, culture and values in your lake monitoring activities?

1 being the lowest and 5 being the highest.

Mark only one oval.

- 1
- 2
- 3
- 4
- 5

58. How do Indigenous perspectives and values inform the lake monitoring?

59. On a scale of 1 to 5, how would you rate your level of interweaving of Indigenous Knowledge and Western science in your monitoring activities?

1 being the lowest and 5 being the highest.

Mark only one oval.

- 1
- 2
- 3
- 4
- 5

60. Please elaborate on why you have rated the level of interweaving as such in the previous question

61. What else would you like to share with us regarding interweaving Indigenous Knowledge and Western science in your lake monitoring activities?

Lake monitoring resources

This section focuses on the resources you have available for lake monitoring activities.

62. If you are comfortable, please share with us what resources you currently have available for lake monitoring activities.
(Select all that apply)

Check all that apply.

- [ ] Paid employee (s)/contractor (s)
- [ ] Volunteer time
- [ ] Equipment
- [ ] Funding
- [ ] I do not currently have resources for lake monitoring activities.

63. What else would you like to share regarding the resources you have for lake monitoring activities?

64. Do you anticipate your resources towards lake monitoring to increase, decrease or stay the same in the foreseeable future?

Mark only one oval.

- ◯ I anticipate my resources to increase.
- ◯ I anticipate my resources to decrease.
- ◯ I anticipate my resources to stay the same.
- ◯ Other: _____

65. If you had **unlimited** resources, which monitoring activities would you conduct, on which lakes and why?

_____

_____

_____

_____

_____

66. What are the biggest challenges you are facing in regard to lake monitoring in the Yukon?

_____

_____

_____

_____

_____

Interest in future coordinated lake monitoring activities in the Yukon

This section focuses on your interest in being part of the conversation around future coordinated lake monitoring activities in the Yukon.

67. What would you like to see happen next to move towards coordinated lake monitoring activities in the Yukon? *

68. If you could speak for the water, what do you feel the Water would want to see happen to ensure the Yukon lakes' health for future generations?

69. Are you interested in being part of the conversation toward shaping a Yukon Lake Monitoring Collaborative? *

Mark only one oval.

- ◯ Yes. I want to participate in the interview part of the project.
- ◯ Yes. I want to be part of the conversation, but I don't want to participate in an interview
- ◯ No. I don't want to participate in the project any further.
- ◯ Other: _____

70. Which people or organizations should be involved in this exploratory project?

71. What else you would like to share with us?
We are listening.

72. I would like to receive updates. Please add me to the Living Lakes Canada mailing list. *

By ticking yes, you agree to receive the Living Lakes Canada newsletter. Please note that your email will not be shared outside of the organization.

Mark only one oval.

- Yes
- No

Participation Declined

Thank you for taking the time time to read about this project. If you want more information or explore other ways to contribute, please contact Sophie Gonthier, Lakes Program Coordinator at Living Lakes Canada: sophie@livinglakescanada.ca