GREAT SLAVE LAKE SURVEY RESULTS

AN OVERVIEW OF KEY FINDINGS

RÉSULTATS DE L'ENQUÊTE COMMUNAUTAIRE SUR LA SURVEILLANCE DES EAUX DU GRAND LAC DES ESCLAVES

UN APERÇU DES PRINCIPAUX CONSTATS

November 2024

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

Suggested citation:

Government of the Northwest Territories. 2024. Great Slave Lake Community Survey Results: An Overview of Key Findings. Report for the Water Management and Stewardship Division, Department of Environment and Climate Change. Prepared by J. Hickman and J. Cederwall. Yellowknife, NT. 2024. i -vii + 26 pages.

Acknowledgements

The Government of the Northwest Territories (GNWT) would like to thank the following Indigenous governments and Indigenous organizations for supporting this work and allocating resources towards delivering the survey in communities around Great Slave Lake. Their expertise and collaboration have been integral to the success of this work.

- Deninu Kųę First Nation
- Fort Resolution Métis Government Council
- Hay River Métis Government Council
- Kátł'odeeche First Nation
- North Slave Métis Alliance
- Łutsël K'é Dene First Nation

We would also like to thank the 94 participants from the listed Indigenous governments and Indigenous organizations for their time and effort in completing the survey, and for the knowledge they have all shared in support of successful research and monitoring of Great Slave Lake.

We acknowledge the support and input provided by the Department of Fisheries and Oceans (DFO) and Arctic Research Foundation (ARF) during the survey development phase and we thank them for their contributions and support of this work.

Jennifer Hickman and Jeffrey Cederwall
Water Monitoring and Stewardship Division
Department of Environment and Climate Change
Government of the Northwest Territories

Executive Summary

The Government of the Northwest Territories (GNWT) Department of Environment and Climate Change (ECC) has initiated a collaborative research and monitoring program for Great Slave Lake, focusing on water quality. This program aims to coordinate efforts, improve communication to reduce duplication, and opportunistically initiate projects that address shared priorities when funding opportunities become available. Since 2021, the Water Monitoring and Stewardship Division (WMSD) has engaged with Indigenous governments and Indigenous organizations around the lake to understand their current research and monitoring efforts, concerns, and priorities. This engagement has included virtual community-specific workshops[1], annual sessions at the Water Stewardship Strategy Implementation Workshop, and an in-person workshop featuring an Elders panel[2]. These efforts have brought together representatives from Indigenous governments and Indigenous organizations to shape the program's development.

To hear directly from community members around the lake, the Great Slave Lake Community Survey was delivered through partnerships with Indigenous governments and Indigenous organizations. Land and water users were asked about their observations of environmental changes to Great Slave Lake over time, preferred methods of community engagement, building partnerships, and effective communication strategies. Between March 2022 and February 2024, 94 participants from 6 communities around Great Slave Lake participated in the survey. The results of the survey will be used jointly with information from other engagement efforts to guide the continued program development and implementation.

Results of the survey indicate that communities are observing a wide variety of changes to the health of the Great Slave Lake ecosystem. Climate change was identified as the main cause of the observed changes. Respondents noted several changes including the temperature, appearance, taste, and smell of the water, algae growth, water levels, timing of ice break-up and freeze-up and ice quality. Unpredictability was the main concern affecting safety and impacting the ways in which survey participants travel on the land and water. There was high agreement among respondents that the abundance of small fur-bearing animals and populations of some large game species, like caribou, have decreased, while other species, like muskox, are doing well and have moved to new territories.

The observed changes and concerns raised by survey participants are reflected in the research and monitoring activities that were collectively prioritized. For water quality research and monitoring, participants focused on studying the impacts of climate change, expanding the network of water quality monitoring sites, and monitoring for long-term changes to water temperature. For the broader watershed, priorities include better understanding the health and contaminant levels of fish and wildlife, as well as studying habitat quality and changes in wildlife populations.

Taken together, survey participants described a chain of ecological changes, starting with climate change and often leading to impacts on ways of life. Examples of this are seen throughout this report, where respondents identify an ecological change, commonly link it to climate change as the cause and note how it has affected their behavior as a result (e.g. traveling further for harvesting, no longer drinking water directly from waterbodies, changing diet).

A dominant theme throughout the survey responses was the importance of including Elders in all stages of research and monitoring activities, from project inception, to planning, field sampling, interpreting results, and reporting back. There was also a strong emphasis on supporting youth involvement, especially from a training and capacity growth perspective. Recognizing the potential that youth hold for their communities, it is clear increasing youth capacity and facilitating intergenerational collaboration will be critical to addressing the challenges identified in the survey.

Many people were unaware of past and ongoing research and monitoring occurring on Great Slave Lake. This shows the need to improve community engagement strategies to better share information. It was indicated that face-to-face engagement methods were favoured, with many noting that internet-based methods were not well suited to life in small communities.

Sommaire

Le ministère de l'Environnement et du Changement climatique (ECC) du gouvernement des Territoires du Nord-Ouest (GTNO) a mis en place un programme de recherche et de surveillance du Grand lac des Esclaves qui se concentre sur la qualité de l'eau. Le but de ce programme est de coordonner les efforts de toutes les personnes qui y participent, d'améliorer la communication dans le but de réduire le travail fait en double et de lancer rapidement des projets répondant à des priorités communes lorsque les possibilités de financement se présentent. Depuis 2021, la Division de la surveillance et de la gestion des eaux a entamé une collaboration avec les gouvernements et les organisations autochtones des collectivités autour du lac pour mieux comprendre les mesures mises en place, ainsi que les préoccupations et les priorités actuelles en matière de recherche et de surveillance. Cette collaboration a entre autres permis d'organiser des ateliers virtuels spécifiques à chaque collectivité[1], l'atelier annuel de mise en œuvre de la Stratégie sur la gestion des eaux des TNO et un atelier en personne avec un groupe d'experts composé d'aînés[2]. Ces efforts ont permis à des représentants de divers gouvernements et organisations autochtones de se rassembler et de participer à l'élaboration du programme.

Pour recueillir directement l'avis des membres des collectivités se trouvant autour du lac, l'enquête communautaire sur la surveillance des eaux du Grand lac des Esclaves a été réalisée par l'entremise de partenariats établis avec les gouvernements et organisations autochtones des collectivités. Nous avons consulté les utilisateurs des terres et des eaux sur leurs constats concernant les changements environnementaux que le Grand lac des Esclaves a connus au fil du temps, sur les méthodes qu'ils privilégient pour les échanges communautaires, sur la mise en place de partenariats et sur les stratégies de communication efficaces. Entre mars 2022 et février 2024, 94 participants de six collectivités autour du Grand lac des Esclaves ont participé à l'enquête, et les résultats obtenus seront utilisés en conjonction avec les informations provenant d'autres initiatives d'échanges avec le public dans le but d'orienter le développement et la mise en œuvre du programme.

Les résultats de l'enquête indiquent que les membres des collectivités constatent que la santé de l'écosystème du Grand lac des Esclaves varie de multiples façons, et le changement climatique a été défini comme étant la principale cause de ces variations. Parmi les changements observés, notons la température, l'apparence, le goût et l'odeur de l'eau, la croissance des algues, les niveaux de l'eau, les périodes de dégel et de gel, et la qualité de la glace. L'imprévisibilité est la principale préoccupation en matière de sécurité et a une incidence sur la manière dont les participants se déplacent sur la terre comme sur l'eau. Les participants à l'enquête s'accordent à dire que l'abondance des petits animaux à fourrure et les populations de certaines espèces de grand gibier, comme le caribou, ont diminué, tandis que les populations d'autres espèces, comme le bœuf musqué, se portent bien et se sont déplacées vers d'autres régions.

Les changements observés et les préoccupations soulevées par les participants à l'enquête se reflètent dans les activités de recherche et de surveillance que l'on a mises en priorité dans les collectivités. En ce qui concerne la recherche et la surveillance de la qualité de l'eau, les participants se sont concentrés sur les effets du changement climatique, sur l'élargissement du réseau de sites de surveillance de la qualité de l'eau et sur la surveillance de la variation à long terme de la température de l'eau. Pour l'ensemble du bassin hydrographique, les priorités sont notamment de mieux comprendre les effets des niveaux de contaminants sur la santé des poissons et des espèces sauvages, ainsi que l'étude de la qualité de l'habitat et l'évolution des populations d'espèces sauvages.

Dans l'ensemble, les participants ont décrit une chaîne de changements écologiques, déclenchée par le changement climatique et entraînant souvent des répercussions sur les modes de vie de tous. On en trouve des exemples tout au long du présent rapport, dans lequel les participants identifient un changement écologique qui est généralement causé par le changement climatique et indiquent la manière dont il a modifié leurs habitudes (par exemple, devoir se déplacer plus loin pour la récolte, ne plus boire l'eau directement à partir des plans d'eau, changer de régime alimentaire).

Les réponses avaient toutes un dénominateur commun, soit l'importance de faire participer les aînés à toutes les étapes des projets de recherche et de surveillance, dès leur lancement et lors de leur planification, de l'échantillonnage sur le terrain, de l'interprétation des résultats et de l'élaboration des rapports. Les participants ont également insisté sur l'importance de soutenir la participation des jeunes, en particulier du point de vue de la formation et du renforcement de leur capacité. Compte tenu du potentiel que les jeunes représentent pour leurs collectivités, il est clair qu'il sera essentiel de renforcer leur capacité et de faciliter la collaboration intergénérationnelle pour surmonter les difficultés définies dans l'enquête.

De nombreuses personnes ignoraient que des activités de recherches et de surveillance avaient été réalisées et continuaient d'être réalisées sur le Grand lac des Esclaves. Ce constat montre qu'il est nécessaire d'améliorer les stratégies d'échanges avec les collectivités afin de mieux partager l'information. On nous a aussi indiqué que les échanges en personne étaient privilégiés, et plusieurs ont fait remarquer que les échanges se servant principalement de l'Internet n'étaient pas bien adaptés à la vie dans les petites collectivités.

Table of Contents

List of Figures

1 Introduction

The Government of the Northwest Territories (GNWT) Department of Environment and Climate Change (ECC), in cooperation with Environment and Climate Change Canada and other federal and territorial departments, collects information about water quantity and quality in the NWT. In partnership with communities around Great Slave Lake, the ECC Water Monitoring and Stewardship Division (WMSD) has created and launched a program for the research and monitoring of lake water quality. To make sure the program remains flexible and continues to meet community needs as the environment changes, we asked the partnering Indigenous governments and Indigenous organizations for more feedback.

The Great Slave Lake Community Survey was developed in 2021 and aimed to gather feedback from local Indigenous governments and Indigenous organizations about observed environmental changes over time, best ways to engage with the community, building partnerships, and effective ways to communicate. The goal of the survey was to inform the continued development and refinement of the Great Slave Lake Research and Monitoring Program (GSLRMP). Input provided by the participating communities will help to ensure community priorities are reflected and that the collaboration continues.

The survey was conducted between March 2022 and February 2024 and included participation by land and water users from communities around Great Slave Lake. There were 94 respondents from various Indigenous governments and Indigenous organizations; specifically, Deninu Kųé First Nation, Fort Resolution Métis Government Council, Hay River Métis Government Council, Kátł'odeeche First Nation, North Slave Métis Alliance, and Łutsël K'é Dene First Nation.

2 Methodology

The Great Slave Lake Community Survey was developed with input from Fisheries and Oceans Canada (DFO) and Arctic Research Foundation (ARF), a non-profit organization with experience working with northern communities and an interest in contributing to monitoring on Great Slave Lake. It included a total of 35 questions about observed changes in water quality, hydrology, fish, wildlife, and landscape level disturbances. It also covered topics such as priority research and monitoring activities, and preferred ways of community participation, engagement practices and communication of results.

The survey included a range of question formats, including yes/no, select-all-that-apply, rating scales (e.g., a scale of 1-6, with 1 indicating "least important" and 6 indicating "most important"), image-based questions (e.g., circling areas of change on a map), and open-ended questions where participants were encouraged to provide more details. Each question, regardless of format, provided an optional text box for participants to add further comments or explanations if they wished. For the analysis of the rating scale questions, results are interpreted and represented as low, medium, and high priority rankings.

The WMSD invited Indigenous governments and Indigenous organizations in each community along the shores of Great Slave Lake to participate in the survey. During previous Great Slave Lake-focused engagement sessions with Indigenous governments and Indigenous organizations, it was expressed that capacity for involvement in new initiatives is a common barrier to effective participation.[1] To help alleviate capacity constraints, funding was provided by GNWT to each participating Indigenous government and Indigenous organization to hire a Survey Coordinator to carry out the survey in their community.

Before beginning the survey, data ownership and sharing terms were discussed with each Indigenous government and Indigenous organization. Several options were considered, including formal data ownership and sharing agreements; however, each participating Indigenous government and Indigenous organization ultimately agreed to proceed with an informal arrangement under the following terms:

- The Indigenous governments and Indigenous organizations and the GNWT will co-own the survey data.
- Each Indigenous government and Indigenous organization will retain ownership of the original survey documents.
- GNWT will provide each Indigenous government and Indigenous organization with a spreadsheet of their individual survey results.
- A confidential report detailing survey results for each Indigenous government and Indigenous organization will be shared exclusively with that respective Indigenous government and Indigenous organization.
- A public-facing summary report combining all survey responses, protecting respondents' anonymity, will be shared broadly.
- Survey results included in the summary report may also be used in GNWT program reporting and presentations related to the Great Slave Lake Research and Monitoring Program.

This arrangement ensures that each Indigenous government and Indigenous organization has clear control over their specific data while allowing for summarized information and insights to be shared publicly in an anonymous format.

WMSD worked with participating Indigenous governments and Indigenous organizations to ensure clarity of the survey and make any requested adjustments before paper copies of the survey were distributed to community members. Each Indigenous government and Indigenous organization pre-selected between 10-25 participants who were identified as land and water users with heightened awareness of environmental conditions. The participants were given 2-3 weeks to complete the survey. The Survey Coordinator for each Indigenous government and

[1]Joanne Barnaby Consulting, Ravensbergen Consulting, and Thorpe Consulting Services Ltd. (2023). Planning & Engagement for the Proposed Great Slave Lake Research and Monitoring Program: Summary Report of Spring/Summer 2022 Virtual Workshops. Vancouver.

Indigenous organization remained available to answer questions related to the survey, and in some cases, assist in completing the survey with participants.

Each participant was compensated for their time to complete the survey based on a rate set by their respective IGIO and reimbursed through the Indigenous government and Indigenous organization by GNWT. Upon completion of the survey, Indigenous governments and Indigenous organizations collected the surveys, scanned and emailed them to WMSD, retaining the original copies for their own records.

3 Survey Results

3.1 Observations of Water Quality

Survey participants observed changes to water quality in Great Slave Lake. The majority of respondents have observed changes to the colour, clarity, and cloudiness of the water (68%), algae and vegetation growth (56%), the presence of foam and bubbles (60%), and the water temperature (56%) (Fig. 3-1). Those who have observed these changes have predominantly reported that each of these indicators are increasing (Fig. 3-2).

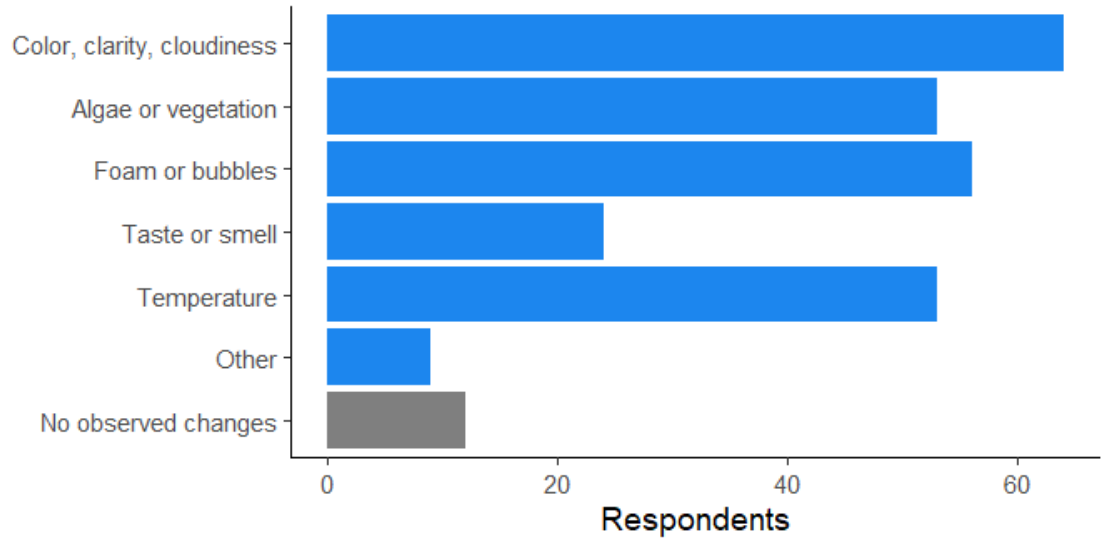

Figure 3-1: Have you noticed changes to Great Slave Lake water quality?

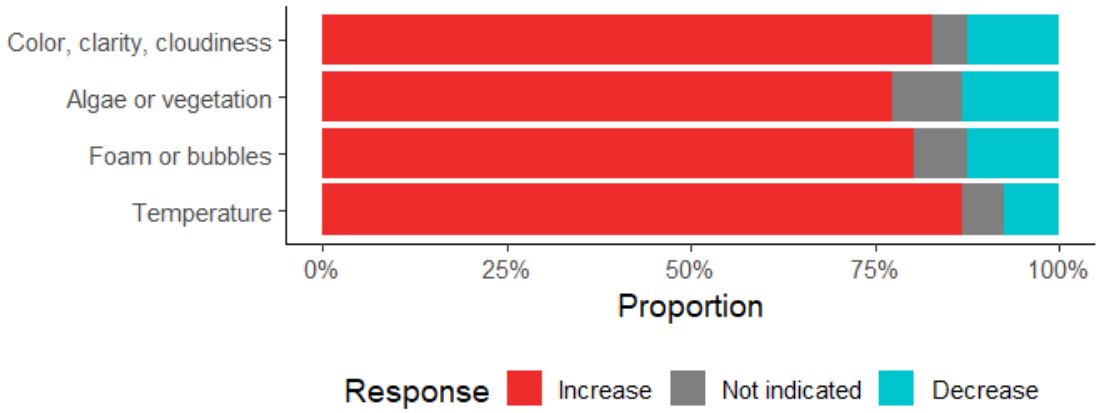

Figure 3-2 :If you observed water quality changes, what direction was the change?

Additional comments relating to "Which of these changes has you most concerned and why? And, how long have you noticed these changes?" included the following themes:

Changes to Water Appearance

Survey participants frequently mentioned the colour, clarity, and overall appearance of water. For those who noted these changes and gave a timeline for the change, it appears to have occurred within the last 10 years.

- *"It doesn't [look] blue anymore; it looks dirty black. These changes were in the last 10 years."*
- *"The water colour in the North Slave region of GSL has been noticeably getting darker (almost chocolate milk consistency)."*

Deterioration in Taste and Smell

Many respondents expressed changes to the taste and smell of the water, with some stating that they will no longer drink directly from the lake and/or rivers.

- *"Not fresh like before—the taste and smell. Can't even drink the water anymore. I used to take a cup and drink right from the rivers and lakes."*
- *"Smells different, and you can't drink it because it's not safe anymore."*

Increased Foam, Algae and Vegetation Growth

Respondents have observed an increase in foam, algae, and vegetation growth on the water surface, with some expressing concerns about the impacts on water quality.

- *"Colour of water is more dark. There are more weeds growing places of the river where did not grow before. Foam has increased and coming into the Fort Res Bay. These changes have increased substantially since 1990s."*
- *"The algae growth on the water—what does it do to the water quality?"*

Water Temperature and Climate Change

Several participants commented on changes to water temperature, and more broadly, some observed climate change impacts such as thinner ice and altered seasonal patterns.

- *"Water temperature has changed. Noticed it about 25 years ago. Thinner ice, and the lake doesn't freeze over until late winter. Ice melting faster in the spring."*
- *"Early break-up + later freeze-up results in longer warming up periods, lake is getting warmer—30+ years."*
- *"Climate has changed over the years. A lot warmer."*

Water Levels

Respondents described fluctuating water levels and their impact on the environment, wildlife, and traditional activities.

- *"Water level going up and down. Low-level water is dangerous for hunters, travelers, and harvesters."*
- *"The water is so low all over Great Slave Lake. Absolutely no berries this year—it was so dry all over."*

Survey participants were asked if they had noticed any unusual growth of green scum (algae) on Great Slave Lake, with 57% reporting that they had observed algae growth in the lake. When further questioned about where and when the algae growth has been observed, respondents indicated that algae was most commonly present near islands and in shallow water (Fig. 3-3), peaking in late summer (Fig. 3-4).

Additional comments from survey participants regarding the observation of algae growth indicate that algae was growing/accumulating mostly during the summer months along shorelines, close to islands, in creeks, bays and near rivers. Factors like water depth, changing water levels, and specific activities, such as fish cleaning, were linked to the presence of algae.

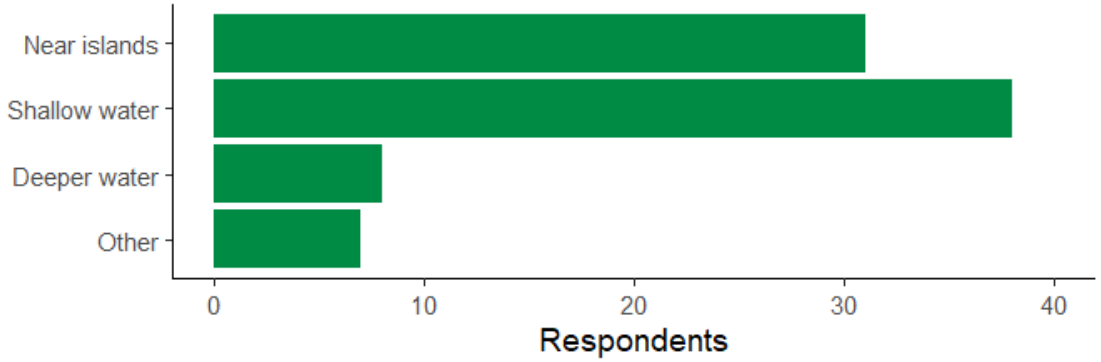

Figure 3-3: Where have you noticed the unusual growth of green scum (algae)?

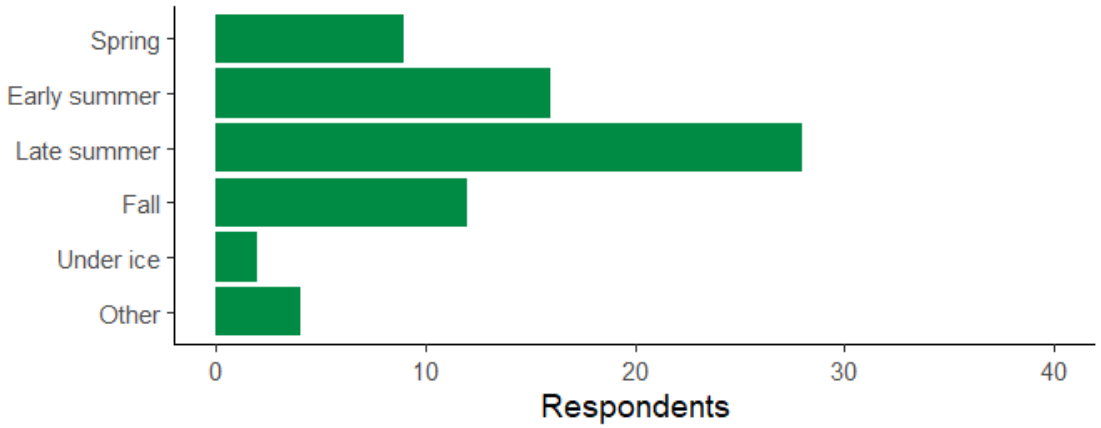

Figure 3-4: When have you noticed the unusual growth of green scum (algae)?

3.2 Observations of Water Quantity

Survey respondents have observed several changes regarding water levels, erosion, flooding activity and ice in the Great Slave Lake watershed. These include:

- 74% have observed unpredictable water levels.
- 67% have observed riverbank and/or shore erosion, and of these, 84% say erosion has increased.
- 82% have observed changes to flooding activity, and of these, 86% say flooding has increased.
- 57% say ice thickness and/or safety has changed, with 67% of these indicating the ice is less thick/less safe.
- 59% have observed changes to overflow, and of these, 88% say overflow has increased.

Of note is that all survey respondents reported that they observed changes to water quantity indicators, with no respondents having selected 'No observed changes' (Fig. 3-5). In contrast, 13% of participants selected 'No observed changes' with regard to water quality (Fig. 3-1). This means that 13% of survey participants haven't seen changes to water quality indicators (Fig. 3-1), but everyone has noticed changes to survey water quantity indicators (Fig. 3-5).

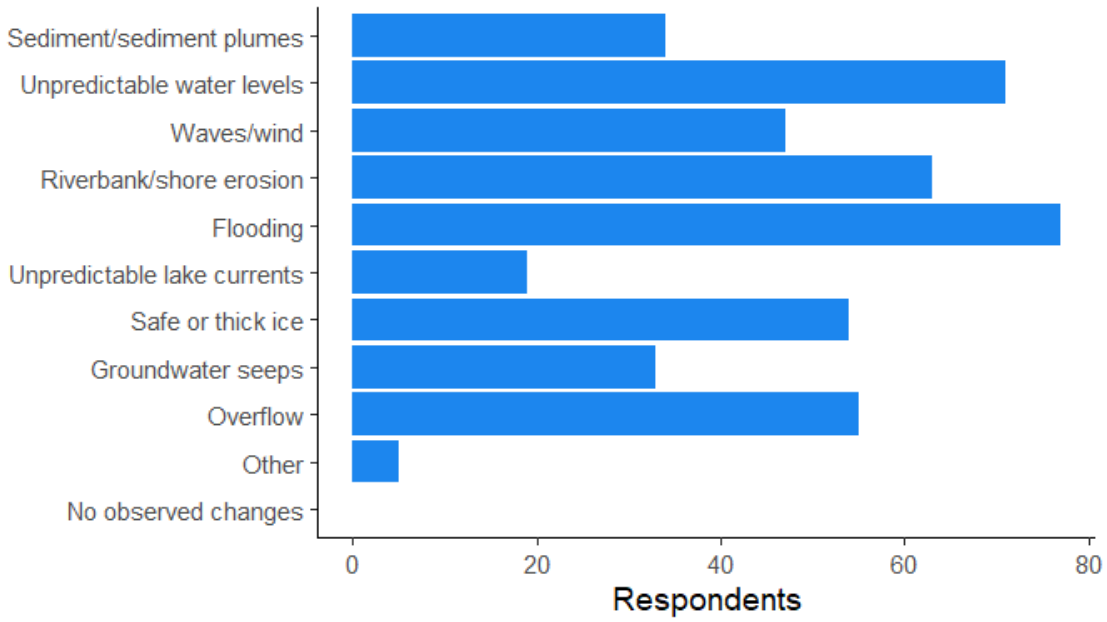

Figure 3-5: What changes have you noticed in the water levels of Great Slave Lake and/or the flow of water into Great Slave Lake?

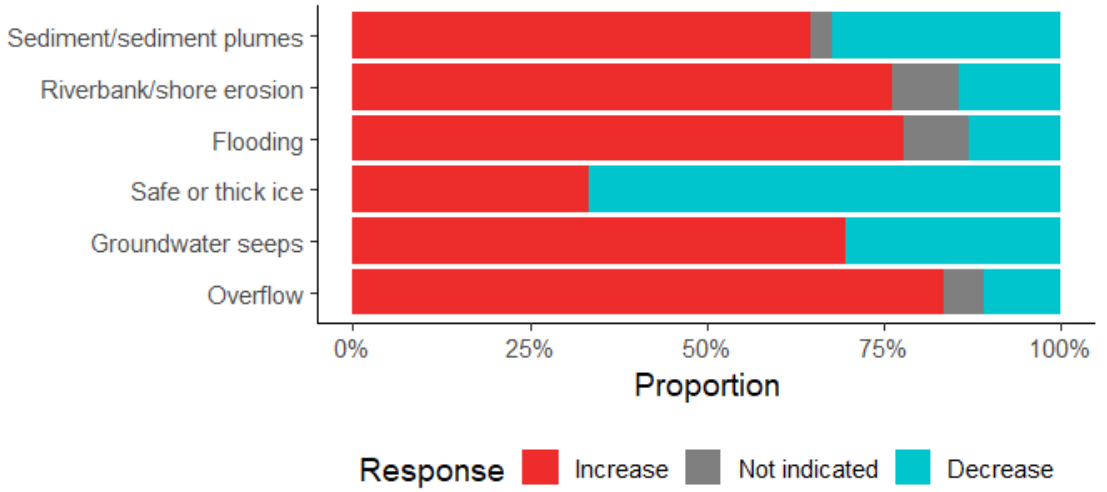

Figure 3-6: If you observed water level or flow changes, what direction was the change?

Additional written comments from survey respondents in response to "Which of these changes has you most concerned and why? How long have you noticed these changes?" included themes of reduced ice thickness and reduced safety when travelling, increased flooding, decreased water levels, and climate change.

Ice Thickness and Safety

Respondents expressed concern about thinner ice, unsafe ice conditions, and a later freeze-up occurring on the lake. Ice safety was a noted concern, with thinner ice and unpredictable ice conditions creating hazardous conditions for travel.

- *"Water temperature. Lake water doesn't freeze until later in winter. Thinner ice and unsafe to travel. Ice melts quicker in the spring."*

Fluctuating Water Levels, Flooding

Of the written comments received, approximately 50% noted concern about changing and unpredictable water level fluctuations including flooding. Respondents noted that higher water levels have caused flooding, erosion, and damage to infrastructure and personal property. Conversely, participants also mentioned that lower water levels have led to visible reefs, shrinking lakes, and have impacted habitat for important species.

The frequent mention of unpredictable water levels and flooding is somewhat expected, as Great Slave Lake has seen both record high and record low water levels within the last five years. Depending on when an individual Indigenous government and Indigenous organization participated in the survey between 2021-2024, they may have recently experienced very high or very low water levels, or both. However, it is notable that several respondents wrote of having observed changes to water levels and direct impacts from changing water levels going back decades.

- *"Flooding seems to happen in areas that we have not seen before."*
- *"Water levels is getting lower, I can see more reefs appearing more now."*

Spring Break-Up

When commenting on spring break up on Great Slave Lake and on inflowing rivers, common themes included the unpredictability and changes to ice conditions over time, attributed broadly to climate change and weather patterns.

Regarding rivers specifically, there was no clear agreement among responses regarding the timing of spring break-up (23% later, 35% earlier, 42% no change) or in the duration of spring break-up (35% longer, 35% shorter, 31% no change) (Fig. 3-7). For those participants that chose to leave written comments, they note that ice tended to take longer to break up completely and flooding has increased, especially around the Slave, Little Buffalo, and Hay rivers. Some note that ice quality has changed, becoming thinner, more fragile, and candle-like. Year-to-year differences in water levels and ice characteristics were attributed as causes behind the unpredictability of river break up.

Regarding Great Slave Lake specifically, there was some agreement that spring break-up was either commencing earlier (44%) or there was no change in break-up timing (39%). Changes to the duration of break-up are less clear, with 40% of responses saying break up was longer, and 27% shorter, and 33% said there is no change (Fig. 3-8). Written comments generally noted that lake freeze-thaw has been affected by warmer temperatures, causing later freeze-up and earlier break-up. Ice was observed to be thinner, melting faster, and disappearing earlier.

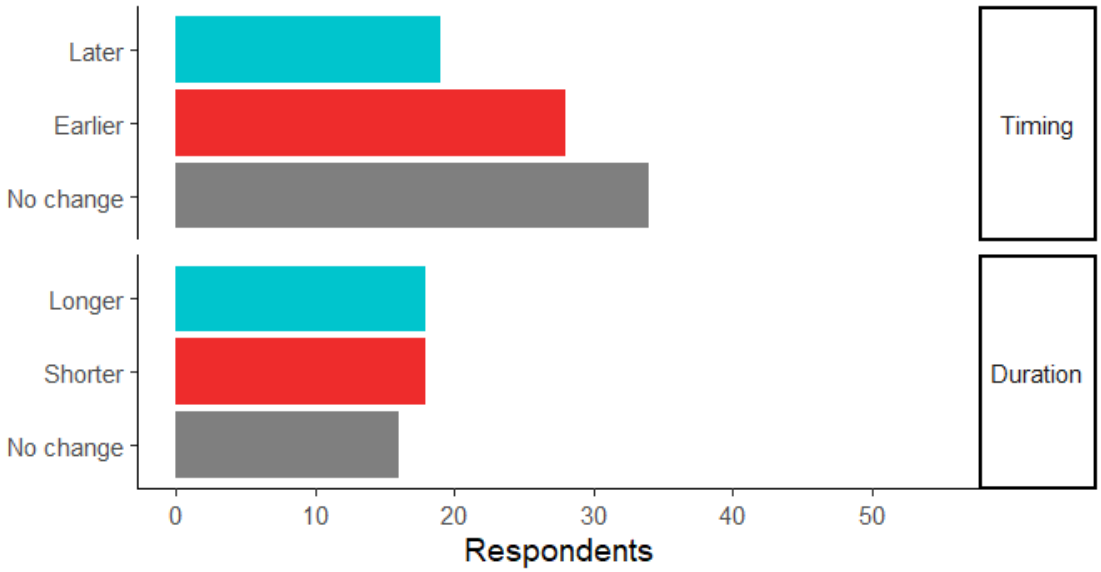

Figure 3-7: What changes have you noticed in the timing and duration of spring break up in the rivers flowing into Great Slave Lake?

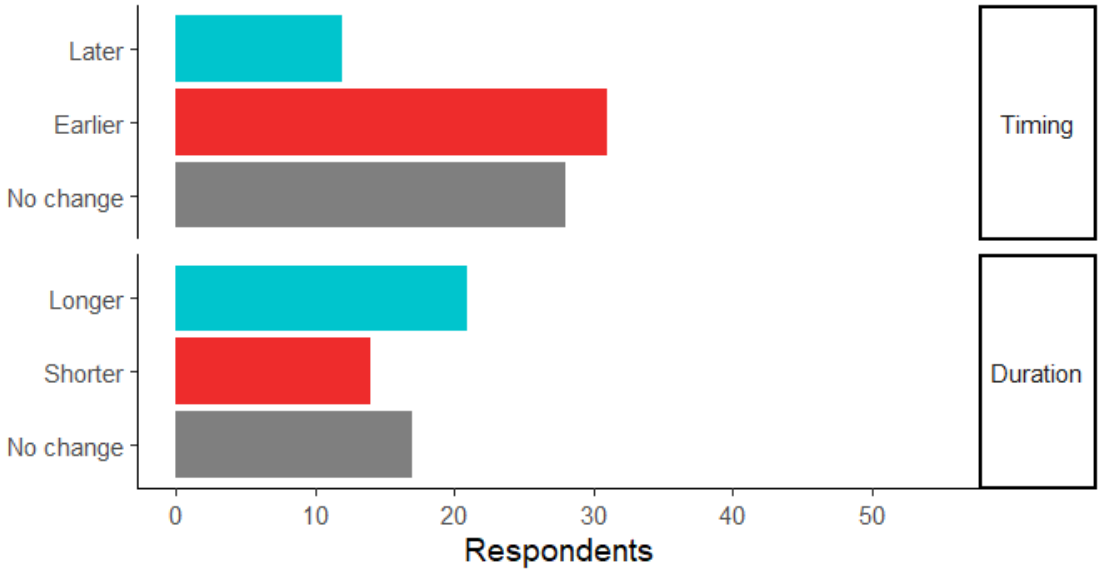

Figure 3-8: What changes have you noticed in the timing and duration of spring break up of Great Slave Lake?

Fall Freeze-Up

Respondents have noticed fall freeze-up on rivers was occurring later in the fall season (75%) and taking longer (77%) than it has in the past (Fig. 3-9), with many specifically noting in the written comments that freeze-up on rivers was more unpredictable now (34%), and that the Slave River in particular has been slower to freeze and was increasingly unsafe to cross. Conditions of freeze-thaw-freeze were noted as having led to rough ice. These changes in

freeze-up timing, ice conditions and safety were largely attributed to warmer fall temperatures caused by climate change.

Freeze-up on Great Slave Lake was observed to occur later in the fall (73%), with ice taking longer to form (87%) and some (26%) respondents considered freeze-up to be more unpredictable now compared to the past (Fig. 3-10). Some respondents noted that the ice is thinner and less stable than before, and some areas of the lake remain open all winter. Overflow has been occurring more frequently, with wind causing rough ice to form. These observations were attributed to climate change and have caused overall unpredictability of ice conditions on the lake.

- *"Warm weather does not allow the lake ice to form, it stays open longer. The ice no longer freezes as thick as in the sixties"*
- *"Lake takes longer to freeze, dangerous for travelers by skidoo to hunt, etc."*

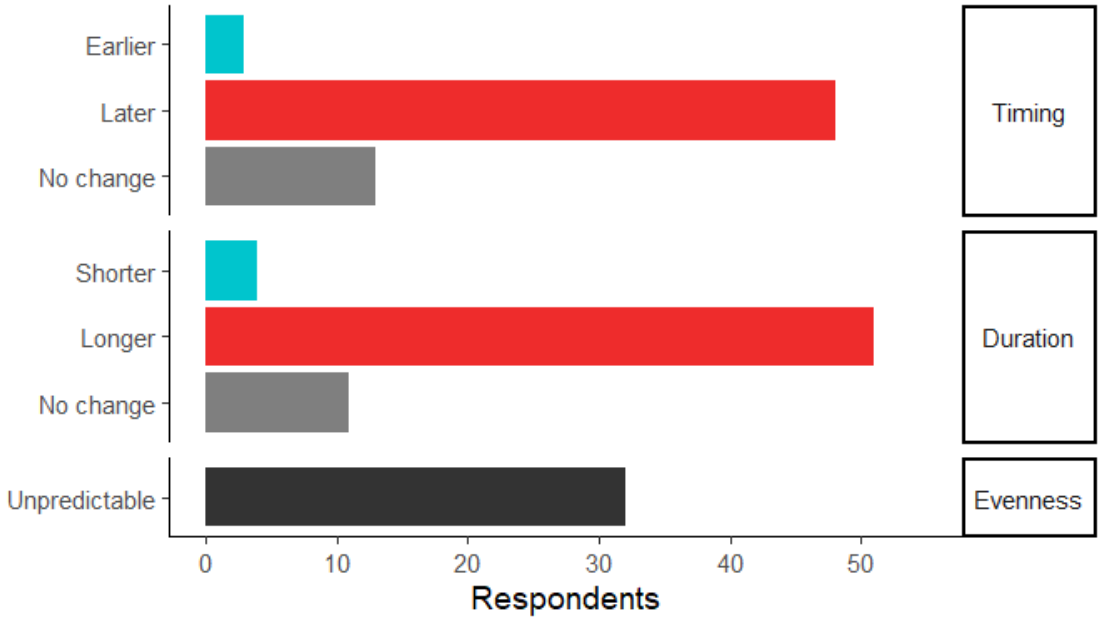

Figure 3-9: What changes have you noticed in the timing and duration of fall freeze up in the rivers flowing into Great Slave Lake?

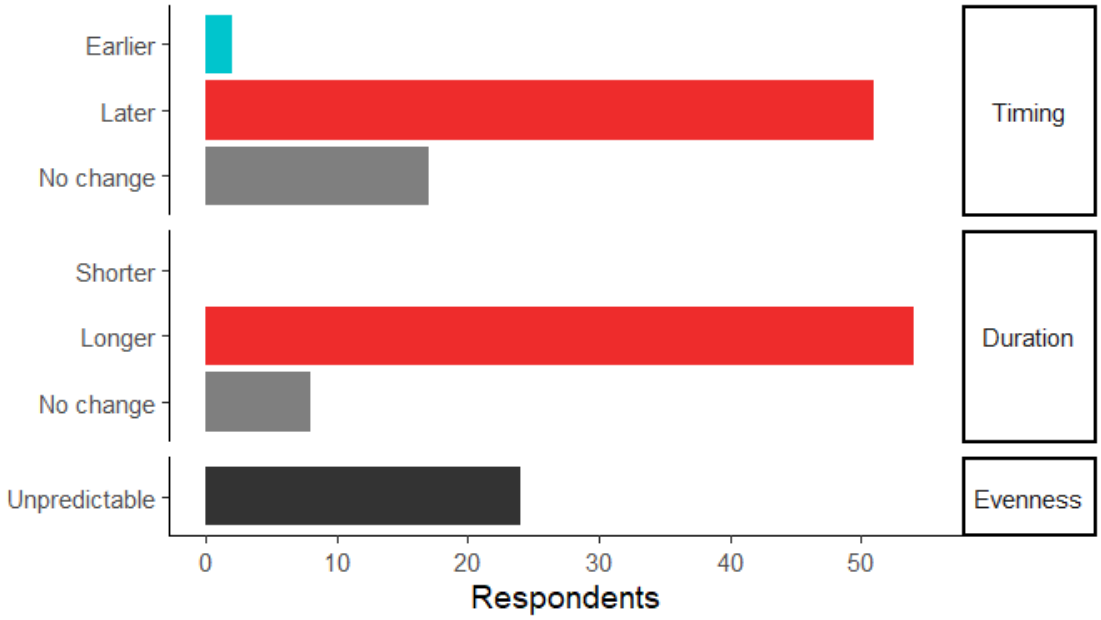

Figure 3-10: What changes have you noticed in the timing and duration of fall freeze up on Great Slave Lake?

About one-third (33%) of respondents reported noticing areas of the lake where water remains open all winter. In some instances, the duration of the open water season was considered normal, for example in the East Arm. Other areas took significantly longer to freeze (but do eventually freeze), such as Birch Creek. Others noted the water had remained open all winter and it's not considered normal, for instance the Snowdrift River, the middle of Great Slave Lake, around Caribou Island, between Mission Island and Moose Deer Island, near the Big Narrows portage road, and near the outflow of Great Slave Lake into the Mackenzie River. Overall, the comments identified many new areas that were not consistently freezing every winter, and that even at locations where open water is known to occur or persist into late winter, the ice-free area is larger and taking longer to eventually freeze (if it freezes at all).

3.3 Fish

Survey responses and written comments are mixed about the overall health of fish populations, with 35% of respondents indicating they have not observed any changes to fish health in Great Slave Lake, while 22% have observed that fish are generally smaller now, and 29% noticed more parasites and lesions on fish (Fig. 3-11). In the written comments, many respondents have noted that whitefish are smaller now, and that generally fish flesh is softer. There are frequent mentions of parasites and lesions on fish, with some saying this problem has persisted over the span of years. Some comments indicate that fish taste different now compared to the past, citing softer texture and less fat content as signs of decreased quality. In some cases, this was attributed to warmer water temperatures.

There have been noticeable changes in the abundance of certain fish species, with written comments noting that populations of trout, burbot (loche), walleye (pickerel) and cisco (tullibee) have increased and populations of whitefish, pike, and inconnu are generally lower than before. Some survey participants (43%) are seeing more rare fish species (for example salmon) (Fig. 3-12) and 30% of respondents noted that their catch success and fishing effort has changed, with no clear agreement on whether more or less effort is required for the same catch success (54% say more effort is required, 46% say less effort is required) (Fig. 3-13). Written comments noted that spawning times and locations have shifted, creating challenges for fishing and fish health.

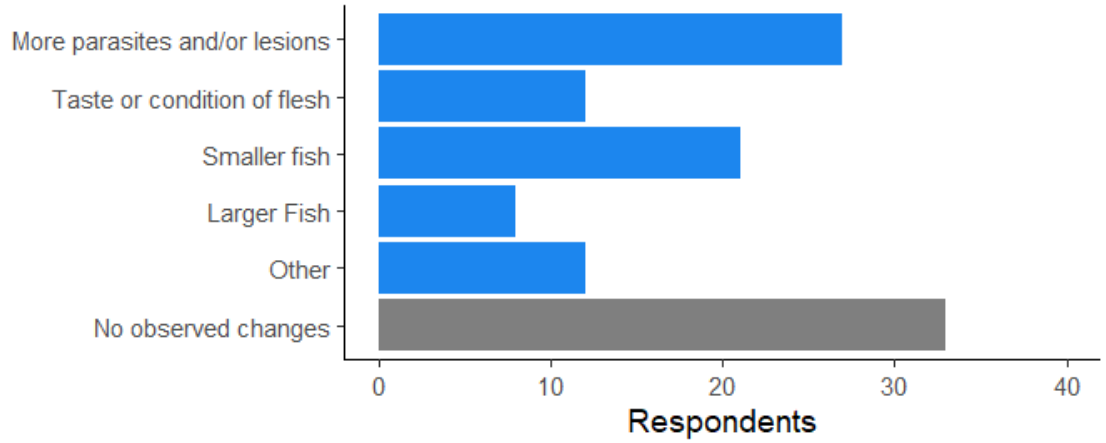

Figure 3-11: What changes have you noticed in fish health in Great Slave Lake?

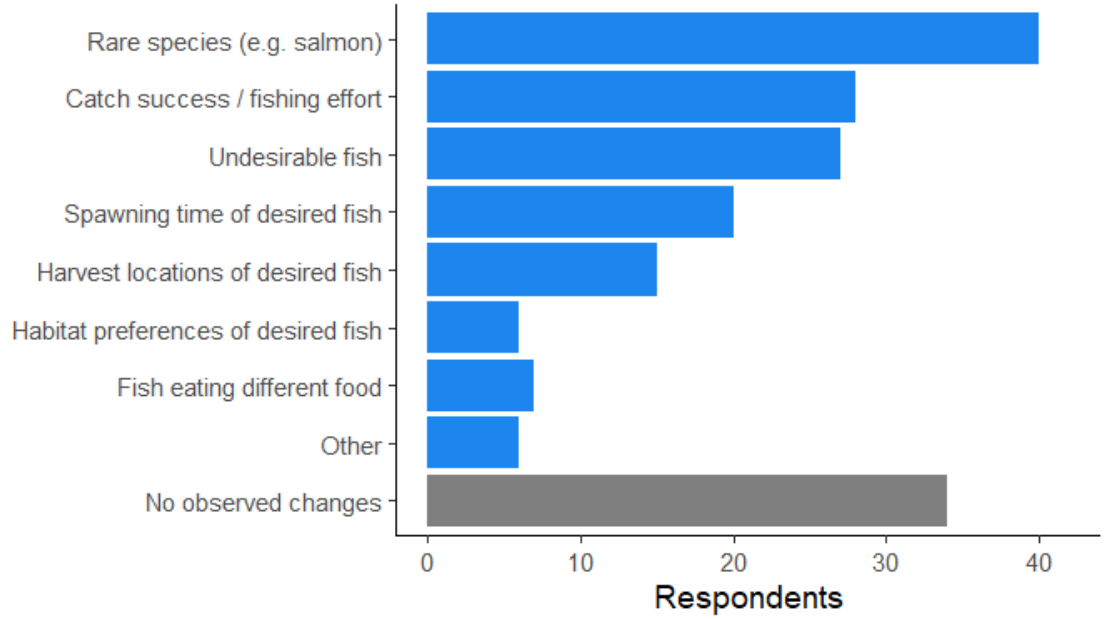

Figure 3-12: What changes have you noticed in fish populations while harvesting in Great Slave Lake?

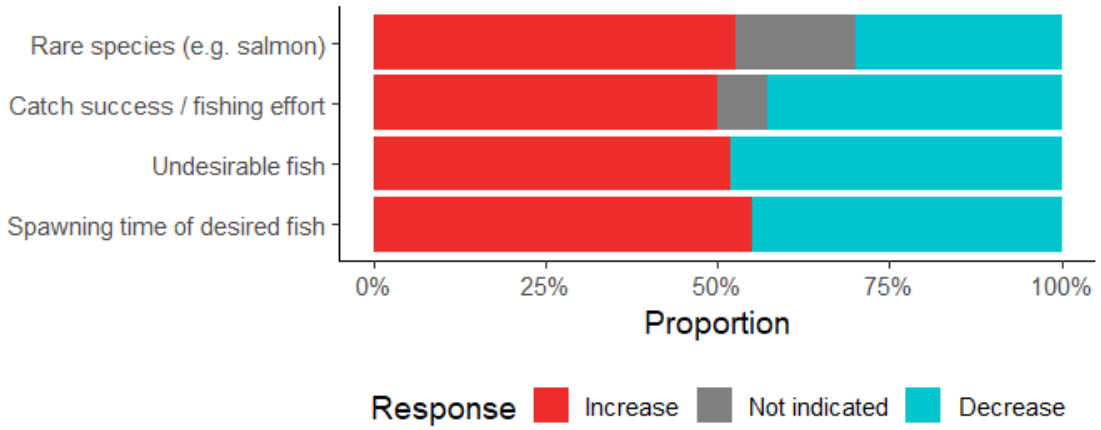

Figure 3-13: If you observed changes in fish populations what direction was the change?

When asked if any of the observed changes regarding fish have affected fish harvesting activities, 26% of respondents reported that, yes, changes they observed made a difference to their or their community's fish harvesting activities. Respondents who have experienced changes to fish harvesting generally noted a decline in fish abundance, later freeze-up and dirtier water all contributing to greater difficulty finding fish and setting nets. Some mentioned there are fewer fish to trade/barter with or share communally.

- *"The fish seem softer and don't really taste like it use to."*

3.4 Wildlife

Survey responses indicated some large shifts occurring with respect to wildlife in the Great Slave Lake watershed. Respondents have noticed changes to migratory bird abundance (65%), migratory bird patterns (57%), numbers of small game for trapping (54%), and numbers of large game for harvesting (70%) (Fig. 3-14). Responses indicated there are less migratory birds, and their timing of arrival and/or departure has become earlier. Of those who have observed changes in small and large game species, 96% agreed that there is less small game for trapping and 70% agreed there is less large game for harvesting (Fig. 3-15).

Written comments highlighted large changes in wildlife populations, habitats, and migration patterns over recent decades, influenced mainly by climate change and human activity. Decline of big game species like caribou, moose, and bison are of major concern, with some attributing the population decline to overhunting and habitat loss from flooding. Caribou declines have been observed for 20+ years, and some survey participants noted they have ceased caribou hunting due to very low populations.

Populations of muskox are noted to be increasing and expanding into new areas previously dominated by caribou and moose. Southern species such as deer and some bird species are observed to be moving further north. Commenters have observed changes to migratory bird patterns, with some species noted to arrive later, leave earlier or bypass areas all together.

The main message of the many written comments is that many big game wildlife populations are in decline, disrupting traditional harvesting practices, with climate change, the arrival of new species, habitat change, and human pressures playing central roles.

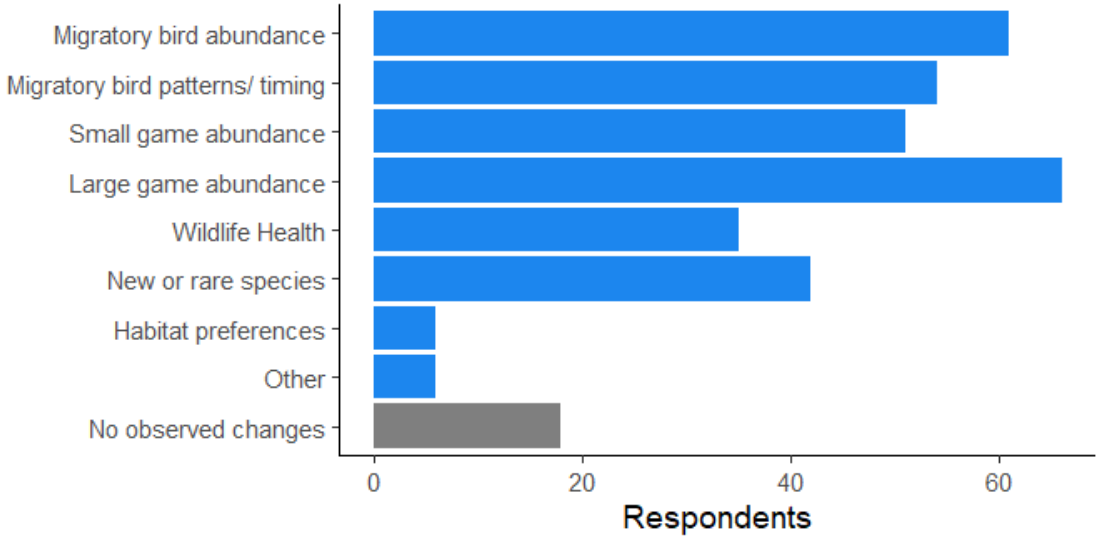

Figure 3-14: What changes have you noticed in wildlife in the Great Slave Lake watershed?

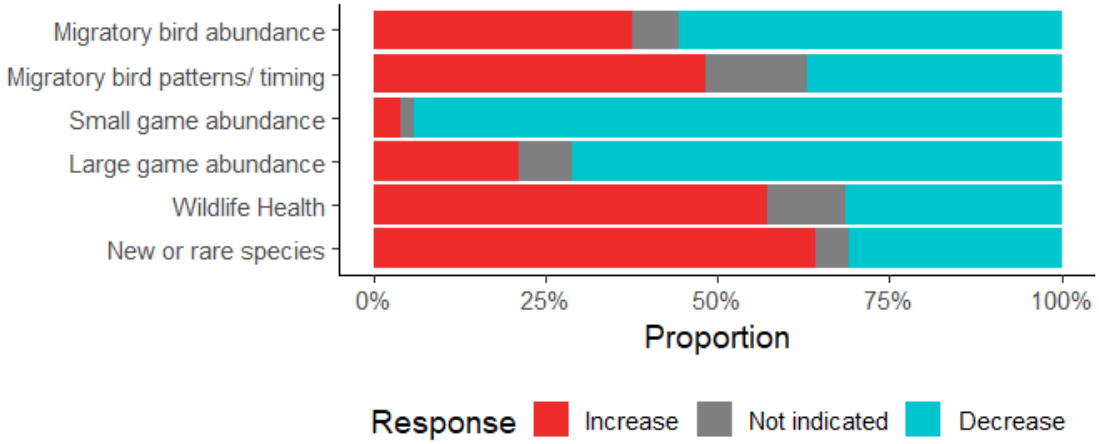

Figure 3-15: If you observed changes in wildlife populations, what direction was the change?

When asked if any of the observed changes to wildlife have made a difference to small or large game harvesting activities, 57% of respondents reported that yes, changes they have observed made a difference to their or their community's harvesting activities. Commenters noted that harvesting activities have increasingly been affected by the combination of environmental changes (such as flooding, low water, general unpredictability of conditions), increased hunting pressures, and declining wildlife populations. As a result, some respondents face challenges in maintaining traditional diets and practices for themselves and their Elders.

- *"Geese come earlier than before and there are more. A lot less marten than before. Less moose and caribou, more wolves and bears. Moose have more ticks than before. Deer moving further north, muskox further south."*

3.5 Landscape and Ecological Disturbances

Survey participants were asked to identify any changes to landscape or ecological disturbances they have observed. Responses revealed that there was more erosion of the lakeshore and riverbanks (56% and 61%, respectively) and the frequency, timing and magnitude of flooding has changed (49%). Survey participants (89%) indicated they had observed at least one of the listed landscape changes or ecological disturbances (Fig. 3-16).

Respondents noted several landscape and ecological disturbances in their written comments. These included erosion of riverbanks (particularly the Slave and Hay rivers), permafrost thaw, flooding and general water level fluctuations, increased frequency of forest fires and a longer forest fire season, changes to timing of seasonal shifts, more insects and some invasive insect species (spruce budworms and pine beetles), more sandbars forming in the rivers, reduced berry-producing plants, and loss of landmass from flooding and erosion. These landscape changes have made traditional land use more difficult.

When asked about the timeframe during which the greatest landscape and ecological changes have been observed, 34% of survey participants said the majority of changes have occurred in the last one to five years (Fig. 3-17).

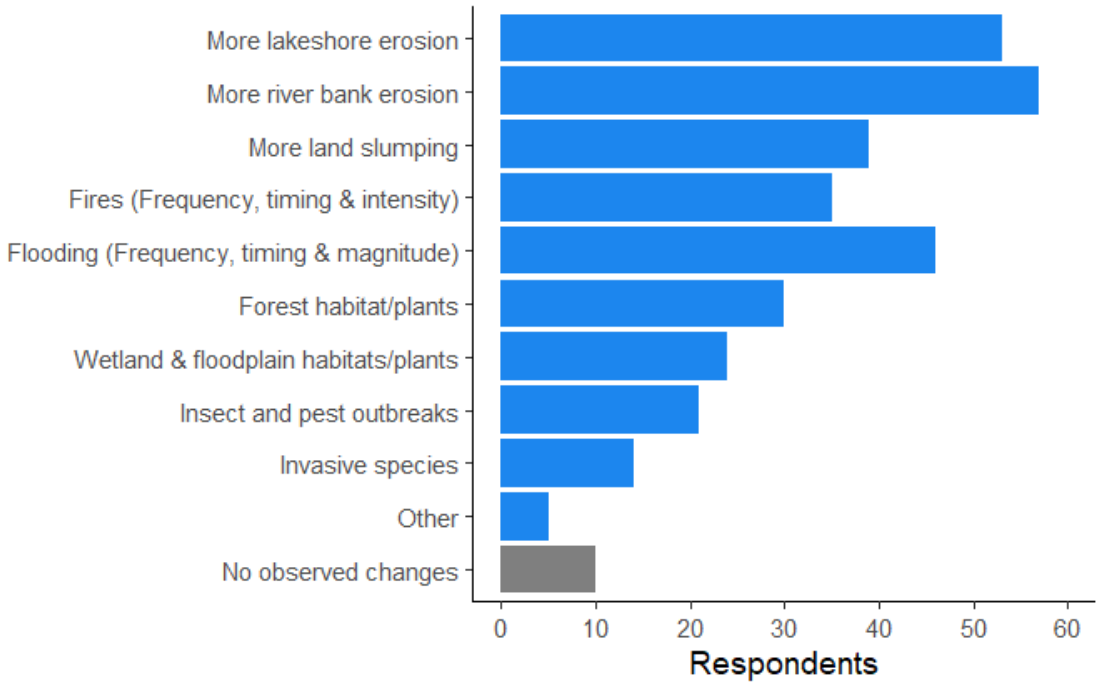

Figure 3-16: What landscape changes or ecological disturbances have you noticed in the Great Slave Lake watershed?

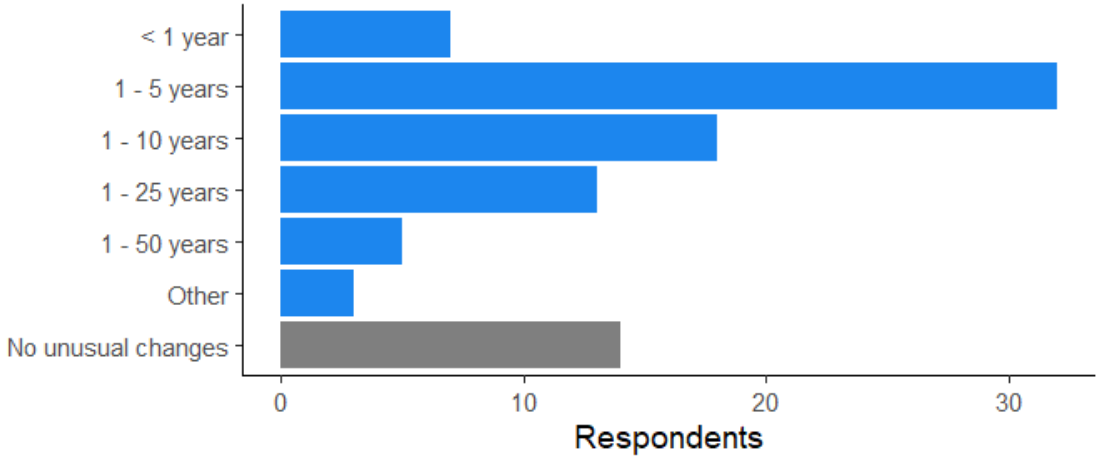

Figure 3-17: Over what timeframe have you witnessed the greatest changes to the Great Slave Lake ecosystem, if any, including water, climate, fish, and wildlife?

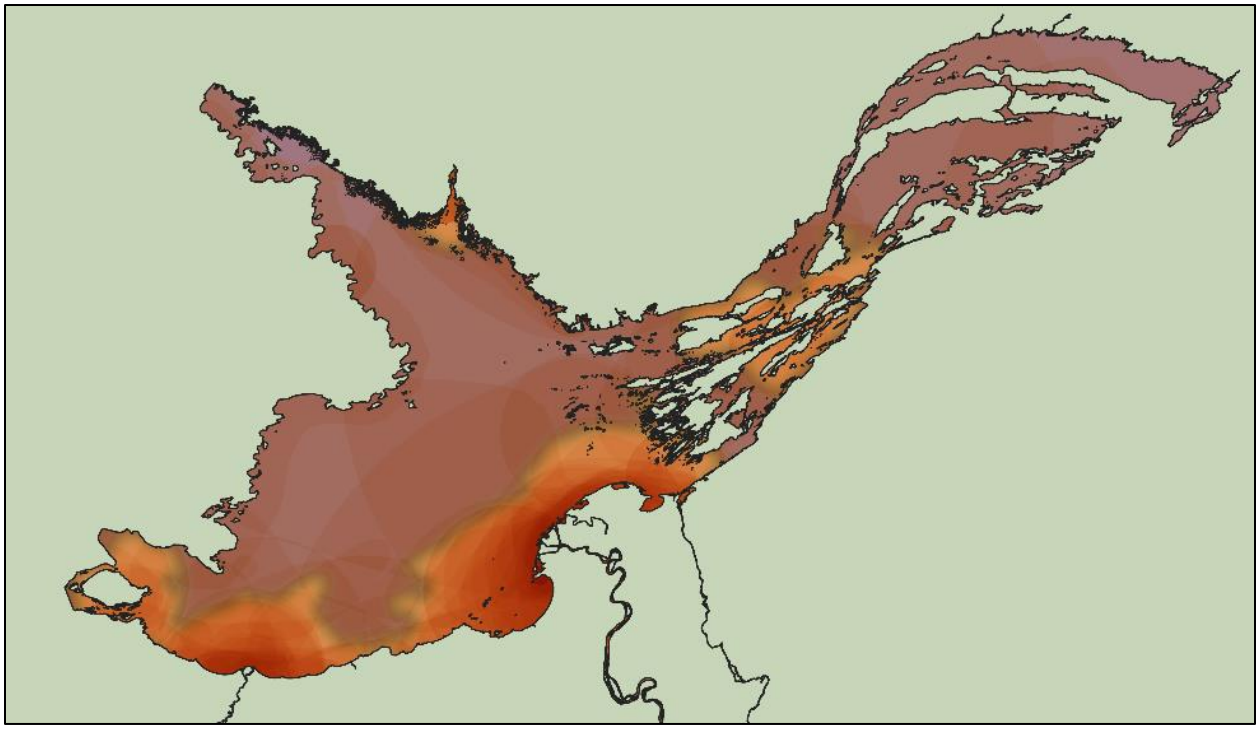

Figure 3-18: Where do you believe the greatest changes to the lake are occurring? Circle the area, or areas, on the map.

Survey participants were asked to circle areas on a map of Great Slave Lake where they have observed the greatest environmental changes and to elaborate on those changes in the textbox provided. The greatest changes were noted to be occurring around Yellowknife Bay, areas of southern river inflows, the outflow of Great Slave Lake, and around the Simpson Islands in the East Arm (Fig. 3-18). These areas of noted change correspond to frequently traveled locations and/or are nearby to surveyed communities. Some key observations noted in the comments and organized according to general location are:

Slave River and Slave River Delta:

- Fluctuating water levels, affecting transport, fish habitats and causing riverbank erosion.
- Increased amounts of driftwood and more visible sandbars in the Delta.
- Warmer, muddier, and foamier water.
- Flooding that has caused changes to bird and fur-bearing animal habitat.

Hay River area:

- Fluctuating water levels and flooding creating dangerous conditions.
- Shoreline erosion.

North Arm and Northeast Shore:

- Receding shorelines creating difficulty for boat travel.
- Low water levels.
- Tributaries to Great Slave Lake taking longer to freeze.

Fort Resolution:

- Fluctuating water levels.
- Thin ice.

Yellowknife:

- Drier landscape.
- Low water levels.
- Changes to underwater currents.

The observed changes are generally attributed to climate change and human activity. The impacts were widespread, affecting navigation, wildlife abundance, harvesting and safety.

3.6 Community Priorities in Research and Monitoring

To better understand how community concerns about the Great Slave Lake ecosystem translate into actionable priorities, survey participants were asked to rank water-related research and monitoring, fish, and wildlife topics.

For water-related priorities, participants highlighted three key areas: addressing climate change vulnerabilities, expanding the number of water quality monitoring locations, and establishing long-term monitoring of lake water temperatures (Fig. 3-19).

Regarding fish and wildlife, the top priorities identified were monitoring health indicators (example, the presence of parasites, size, and reproduction), assessing contaminant levels, and evaluating habitat availability (Fig. 3-20).

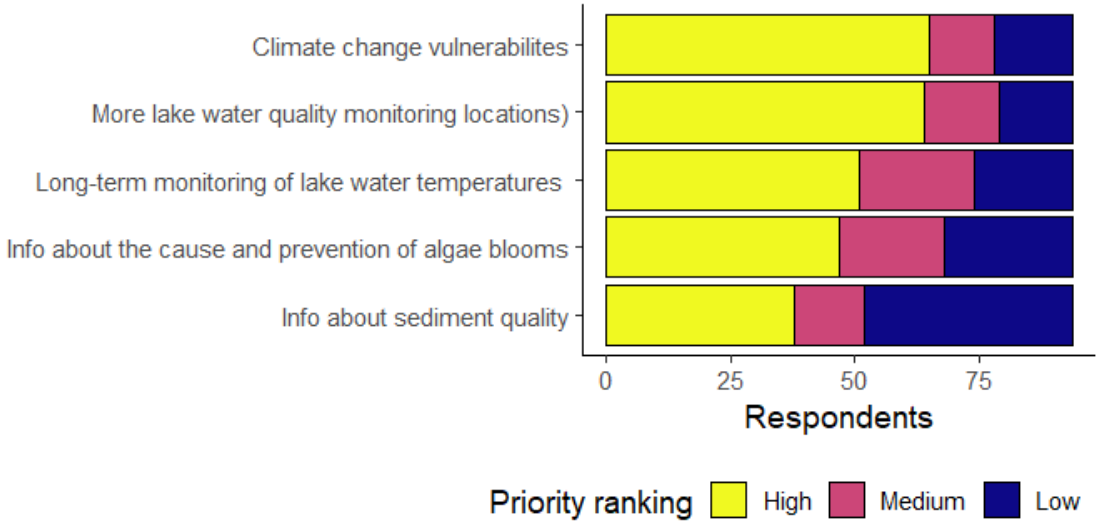

Figure 3-19: What are the most important water research and monitoring priorities in the Great Slave Lake Basin?

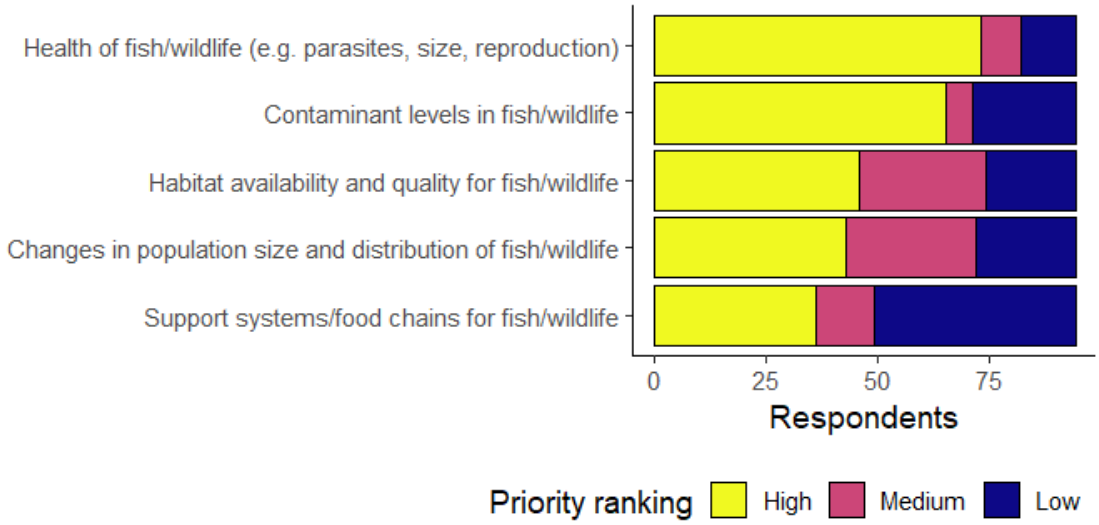

Figure 3-20: What are the most important fish and wildlife research and monitoring priorities in the Great Slave Lake Basin?

These results align closely with the concerns expressed elsewhere in the survey, particularly regarding the impacts of climate change and a broad range of water quality issues. Climate change, frequently mentioned in the comments, was repeatedly highlighted as a driving force behind many of the observed changes in the Great Slave Lake ecosystem. Respondents often linked rising lake water temperatures and climate-related shifts to a cascade of environmental changes, including altered fish and wildlife health (example, softer fish flesh, changes to taste), habitat availability (example, flooding, muddy water from erosion, drier landscape), and the overall stability of the ecosystem.

Focusing on topics like long-term water temperature monitoring and climate change risks shows that people agree these factors are important in causing changes in the environment that affect human health and safety in many ways. Respondents repeatedly identified climate change as a foundational issue affecting many areas like environmental, cultural, health, and safety related concerns. This consistency between expressed concerns and identified priorities highlights the importance of addressing climate change and water quality as key components of any future research or monitoring efforts.

3.7 Human Pressures

When asked about human pressures on the Great Slave Lake watershed, the results clearly indicate that activities associated with resource extraction are of greatest concern, followed by the impacts of climate change (Fig. 3-21).

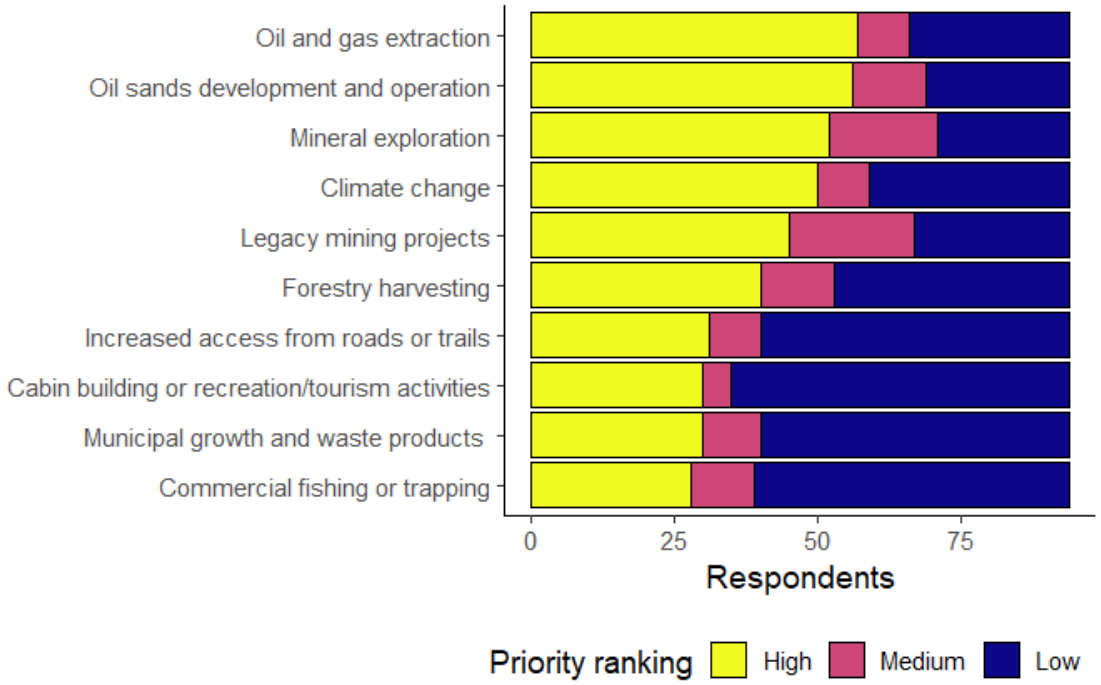

Figure 3-21: What human caused environmental pressures or activities are you most concerned about in the Great Slave Lake watershed?

3.8 Community Participation

When asked about the most and least effective partnership activities, survey respondents identified three key factors for success: involve Elders and land users in research and monitoring programs, frequently engage with communities and report back on program progress, and support Elder and youth involvement to facilitate generational knowledge transfer (Fig. 3-22).

Responses on effective ways to include both Traditional Knowledge and science in research and monitoring, participants prioritized activities that ensure Elder and land user involvement throughout the research and monitoring process, from inception to implementation to reporting back on results (Fig. 3-23).

Taken together, the survey results show a shared emphasis on Elder, youth and land-user involvement as an essential part of effective partnerships and reflecting multiple ways of knowing in research and monitoring. The importance of ongoing dialogue and frequent and ongoing community engagement were also highlighted, reinforcing the benefit of collaborative approaches to Great Slave Lake initiatives.

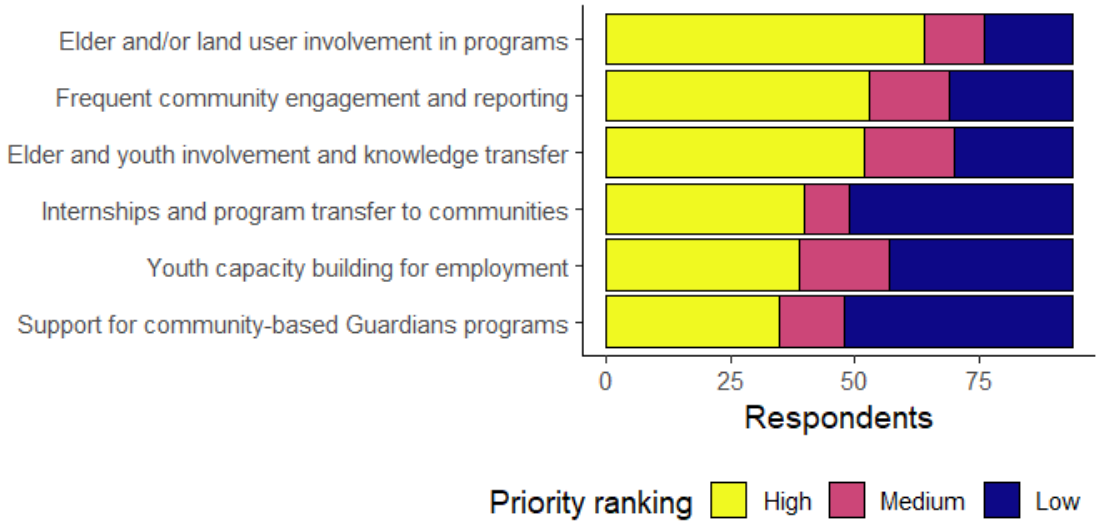

Figure 3-22: What partnership activities are the most and least effective?

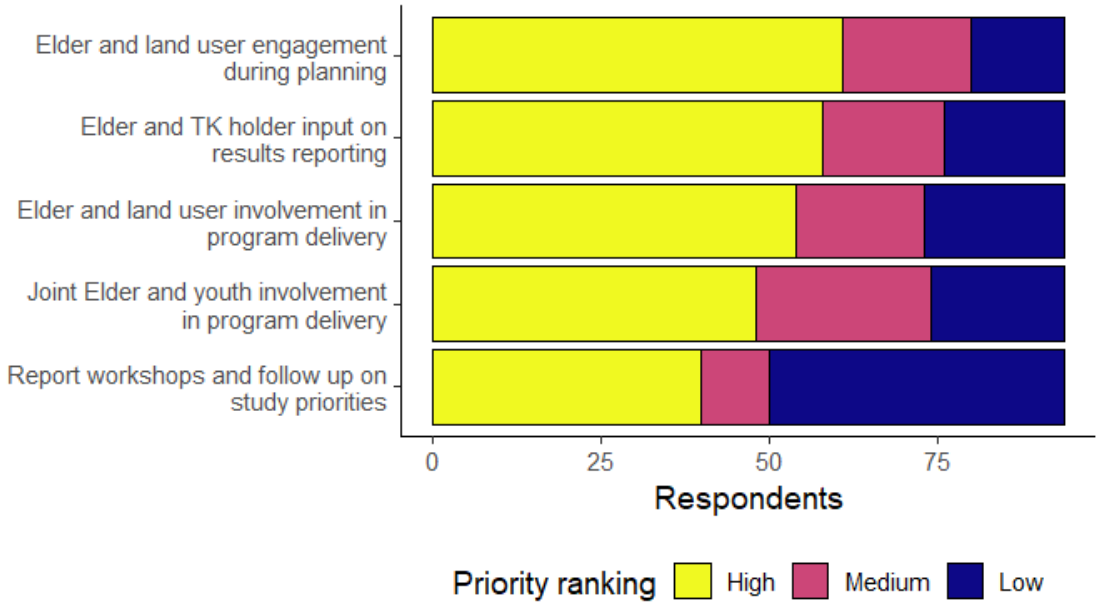

Figure 3-23: What is the most important and effective way to include Traditional Knowledge with science in monitoring and research?

3.9 Communication Methods

When asked whether survey participants were aware of government, academic, industry or community-based research and monitoring program on Great Slave Lake, 69% said they are not.

To better understand how program engagement and reporting could be more effective and reach a broader audience, participants were asked to prioritize different engagement activities based on effectiveness. The results highlighted a preference for face-to-face engagement with

communities. Respondents prioritized open community meetings or public town halls, meetings with community government staff and advisory boards, and annual or bi-annual results workshops (Fig. 3-24). The written comments underscored the preference for face-to-face engagement and highlighted that engagement and reporting methods that rely on the internet can be difficult to access without a computer or computer literacy, and therefore efforts should be made to engage offline.

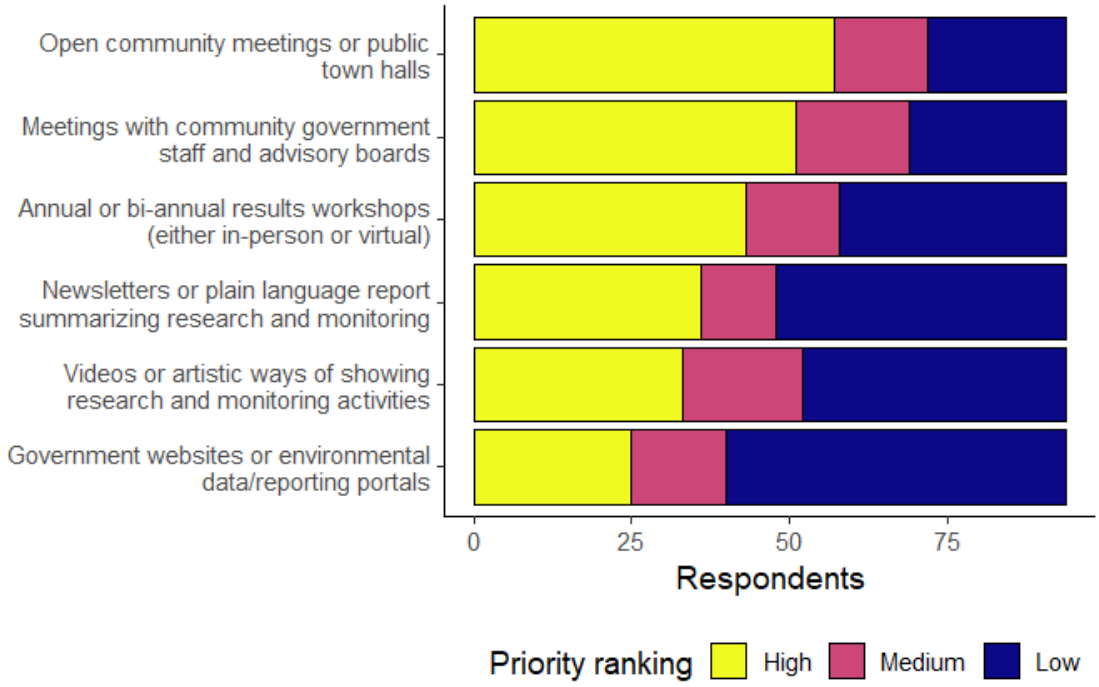

Figure 3-24: What is the best way to learn about and provide your input on research and monitoring programs?

3.10 Community Benefits

When asked about how researchers can ensure projects benefit communities, respondents emphasized the importance of training initiatives to build community capacity and once again, highlighted the importance of early engagement to support co-design of programs was highly prioritized (Fig. 3-25). These themes also align with youth engagement in research and monitoring programs. Training and education to grow youth capacity in a suite of environmental sampling and analysis skills followed by eventual employment utilizing these skills were highlighted as being important (Fig. 3-26). These results imply that communities are not necessarily seeking one-off engagement or reporting sessions (although these should not be discounted as an important means of sharing information depending on the context) but would like to see long-term capacity building of skills to be better prepared for technical involvement in research and monitoring at all stages.

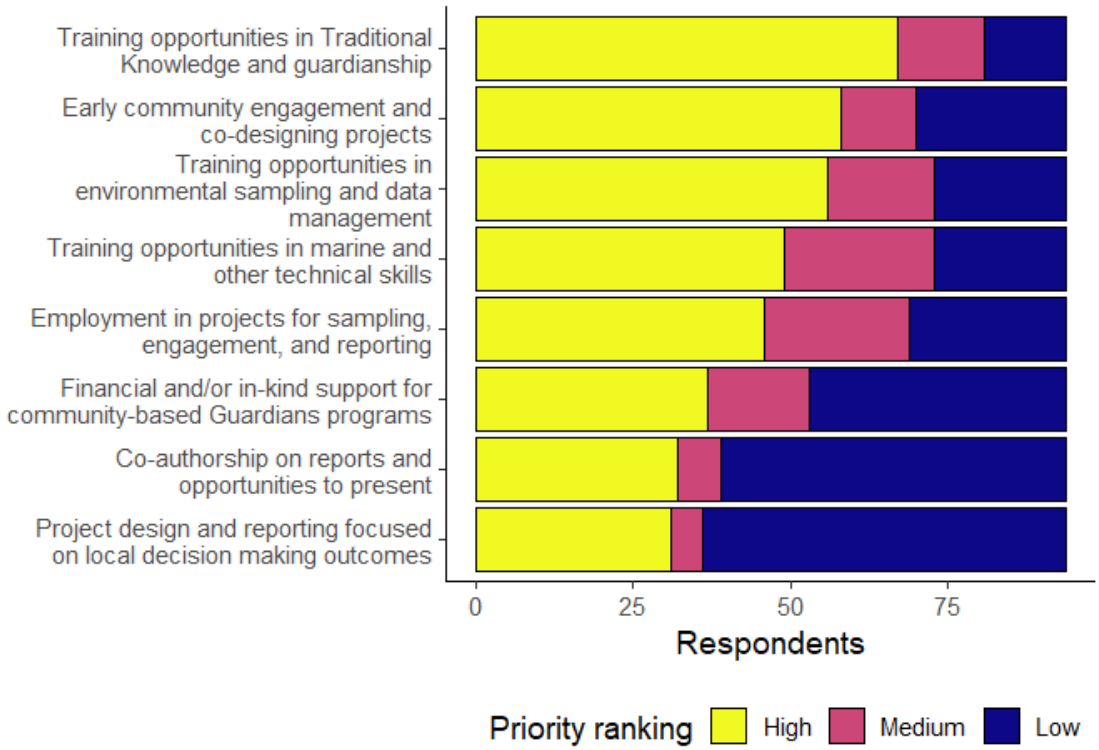

Figure 3-25: How can researchers ensure projects will benefit your community?

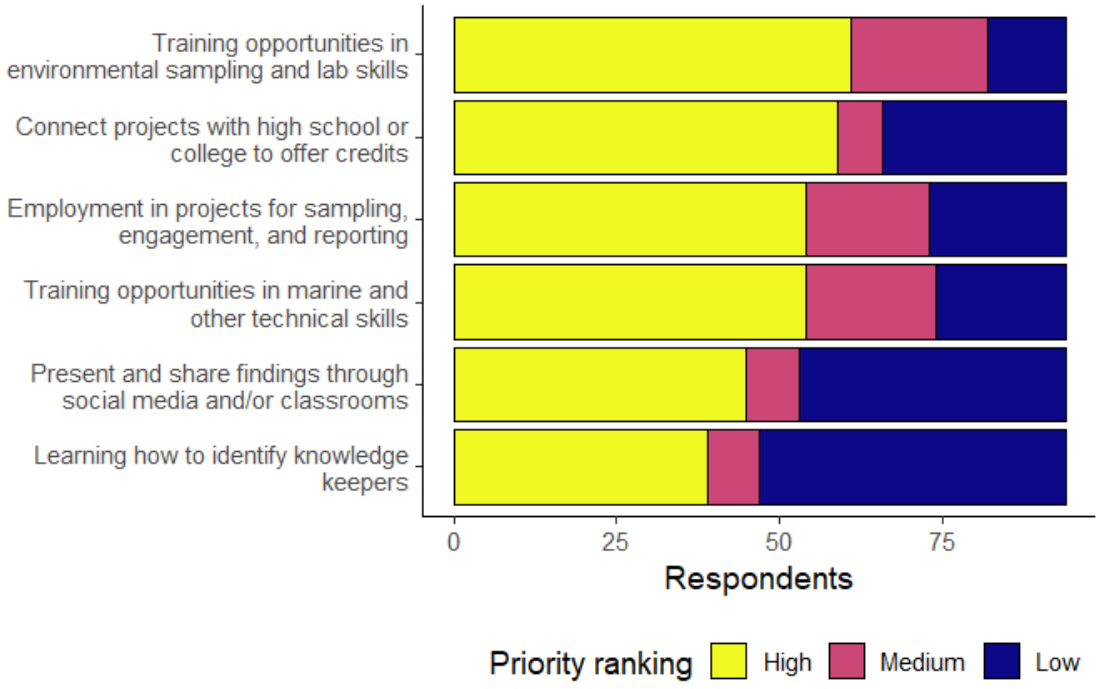

Figure 3-26: How can researchers best engage with local youth?

3.11 Barriers to Community Participation

Survey participants identified several barriers to community participation and partnerships in research and monitoring. Youth training and capacity were identified as the top barriers (79%), while limited Elder and land user involvement (67%), capacity and knowledge to access funding sources (62%), and limitations involving equipment and infrastructure (57%) were also identified barriers (Fig. 3-27).

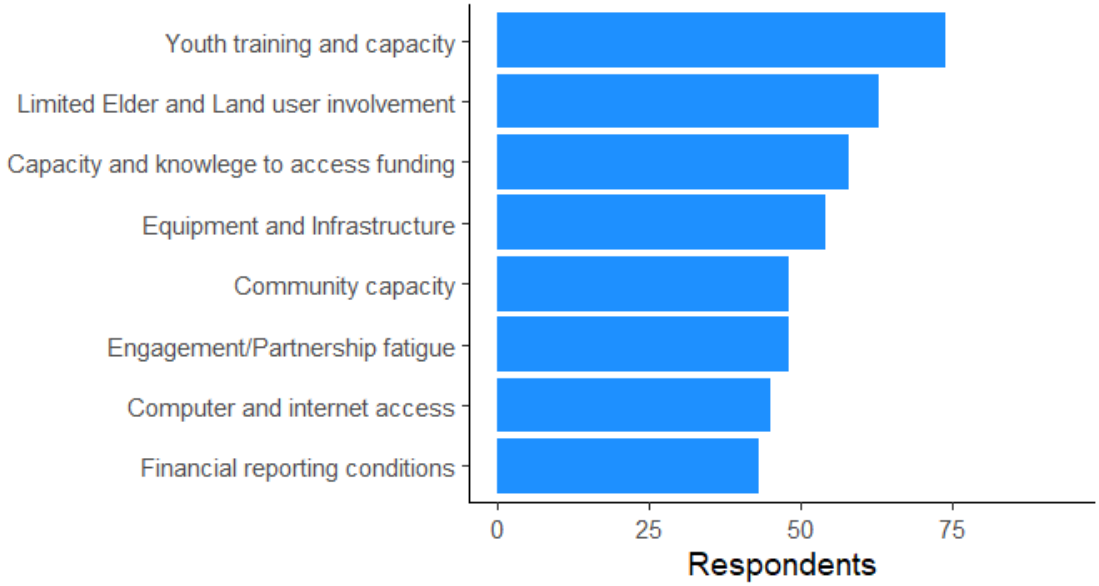

Figure 3-27: What are the barriers to your community being able to fully participate and partner on research and monitoring?

3.12 Program Success

Survey participants identified several ways in which they would consider research and monitoring on Great Slave Lake to be successful (Fig. 3-28). The most prioritized indicators of program success are:

- Several monitoring programs with community Guardians.
- Improved food security.
- Capacity building for youth and community government staff.
- Longer-term stable employment opportunities.
- Safeguards to protect ecosystem health.

When viewed collectively, these success indicators tell us the communities want to see a program that provides community-driven monitoring opportunities that continue to grow community capacity and employment while improving food security and protecting the environment. These themes were consistent throughout the survey results as being important when developing a research and monitoring program.

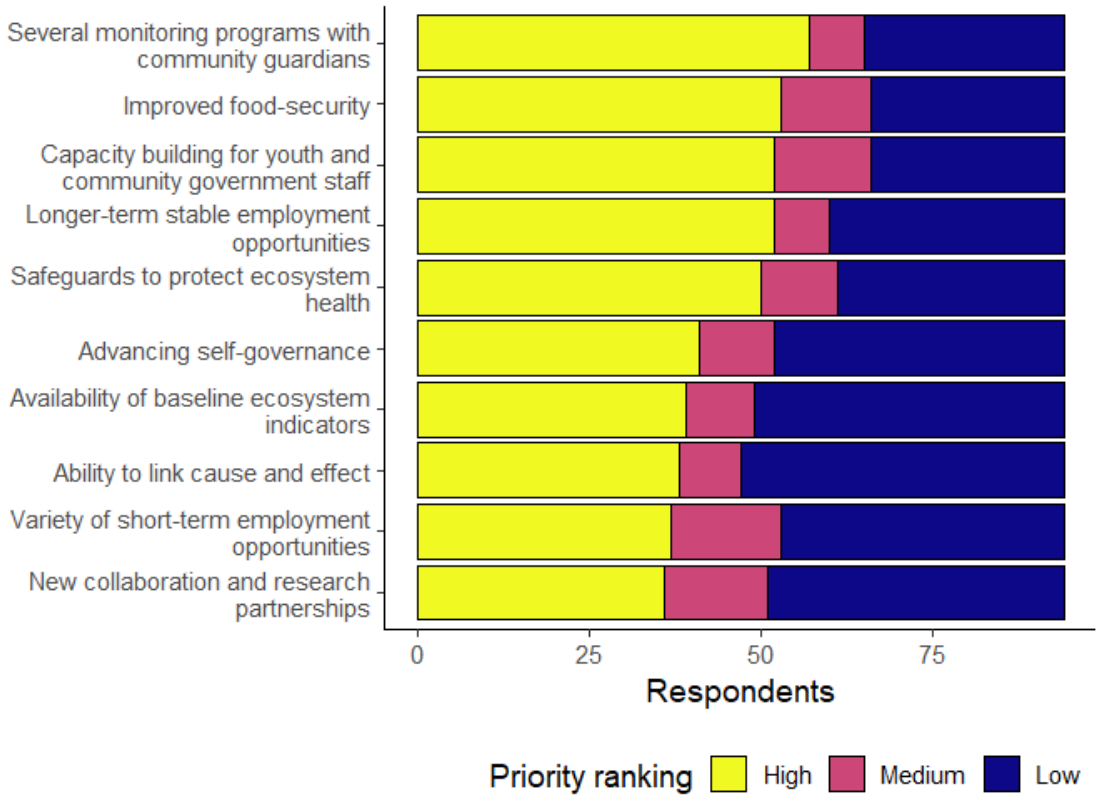

Figure 3-28: How would you determine if research and monitoring on Great Slave Lake is a success?

4 Conclusions

Communities around Great Slave Lake have observed a wide variety of changes occurring related to numerous components of ecosystem health. Survey respondents reported that the overarching cause of these changes was climate change. Respondents noted changes to the temperature, appearance, taste, and smell of the water. They have noticed unusual algae growth in the summer in shallow, nearshore locations. They have noticed changes to water levels, timing of spring thaw and fall freeze-up, and ice quality, with the unpredictability of ice as an overarching concern affecting safety and impacting the ways in which they travel on the land and water. There was high agreement among respondents that the abundance of small fur-bearing animals has decreased as well as some large game species (such as caribou), while other large game species are doing well and have moved into new territories (for example muskox).

Collectively, survey participants communicated observing a cascading series of ecological changes, linked to climate change, and often impacting traditional ways of life. Examples of this are seen throughout this report, where respondents identify an ecological change, commonly identify climate change as the cause of that change and note how it has affected their behavior

as a result (traveling further for harvesting, not drinking water directly from waterbodies, changing diet).

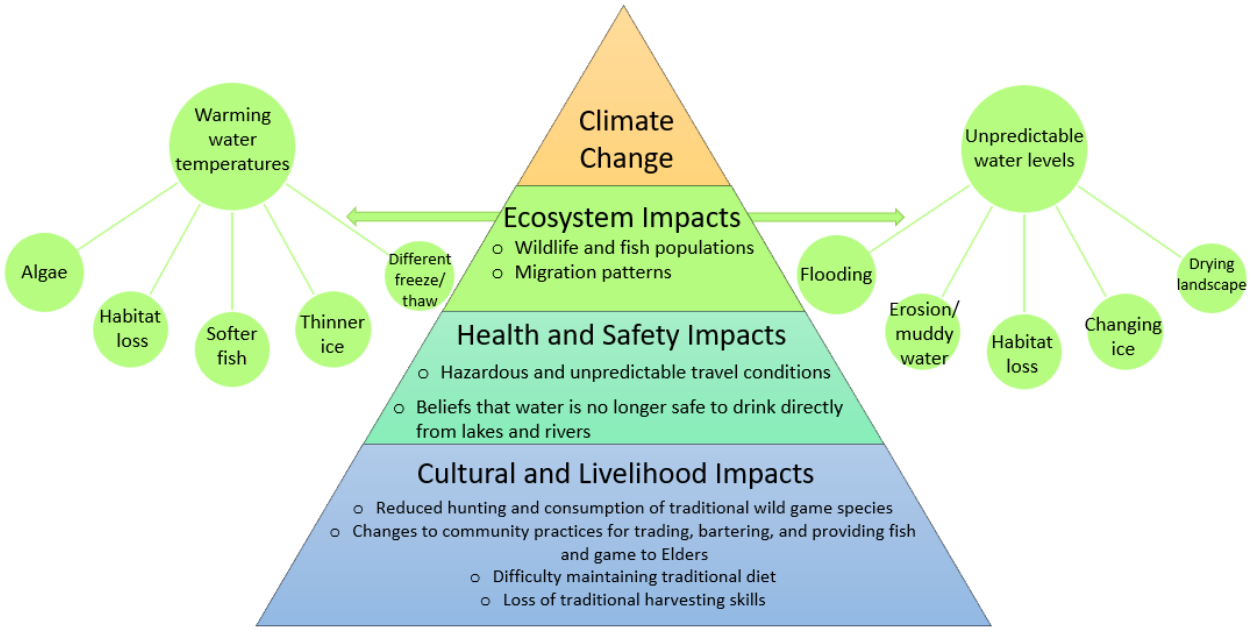

Figure 4-1: Summary of community insights from the Great Slave Lake Community Survey - Cascade of ecosystem, health and safety, and cultural and livelihood impacts originating from climate change, as identified by survey participants.

Survey participants expressed concerns about human pressures within the watershed, highlighting resource extraction activities and climate change as the primary issues. Numerous comments throughout the survey reflect worries about contaminants from industrial activity in the Great Slave Lake basin making their way through the environment and into food people eat.

The observed changes and concerns expressed by survey participants were reflected in the priorities for research and monitoring activities. Specifically, participants prioritized activities related to climate change vulnerabilities, expanding the network of water quality monitoring sites, and monitoring for long-term changes to water temperature. Research and monitoring priorities for the broader watershed included improving understanding toward the health and contaminant levels of fish and wildlife, closely followed by habitat quality and wildlife population changes.

Another dominant theme was the desire to include Elders in all stages of research and monitoring activities, from project inception to planning, conducting sampling, interpreting results, and reporting back. A similar desire to include and support youth involvement was evident, especially from a training and capacity growth perspective. Recognizing the potential that youth hold for their communities, it is clear that growing youth capacity and facilitating

intergenerational collaboration will be critical to addressing the challenges identified in the survey.

It was identified that knowledge regarding previous and ongoing research and monitoring occurring on Great Slave Lake was lacking, highlighting a need to improve community engagement strategies to better suit how community members want to receive information. Respondents said that face-to-face engagement methods were favoured, with numerous comments stating that internet-based engagement was not well suited to the realities of life in small communities.

These observations, concerns and priorities underscore the benefit of collaborative approaches to research and monitoring in the Great Slave Lake watershed. The changes identified highlight the interconnected nature of the Great Slave Lake system and the critical role of both the deep knowledge held by Elders and of robust, long-term scientific data collection to understand future changes.

Engagement with communities around Great Slave Lake has and will continue to play a critical role in shaping and informing the Great Slave Lake Research and Monitoring Program. The results of this survey will be used to prioritize next steps and further refine the program, ensuring that research outcomes are meaningful and directly beneficial to people who use the lake.

5 References

Joanne Barnaby Consulting, Ravensbergen Consulting, and Thorpe Consulting Services Ltd. (2023). *Planning & Engagement for the Proposed Great Slave Lake Research and Monitoring Program: Summary Report of Spring/Summer 2022 Virtual Workshops.* Vancouver.

Thorpe Consulting Services Ltd., Joanne Barnaby Consulting, and Ravensbergen Consulting. (2023). *Summary Report: Great Slave Lake Research and Monitoring Program Development Workshop, October 24-25, 2022.* Vancouver.