· 2020-2021 ·

Working Together

TO MANAGE OUR SHARED WATERS

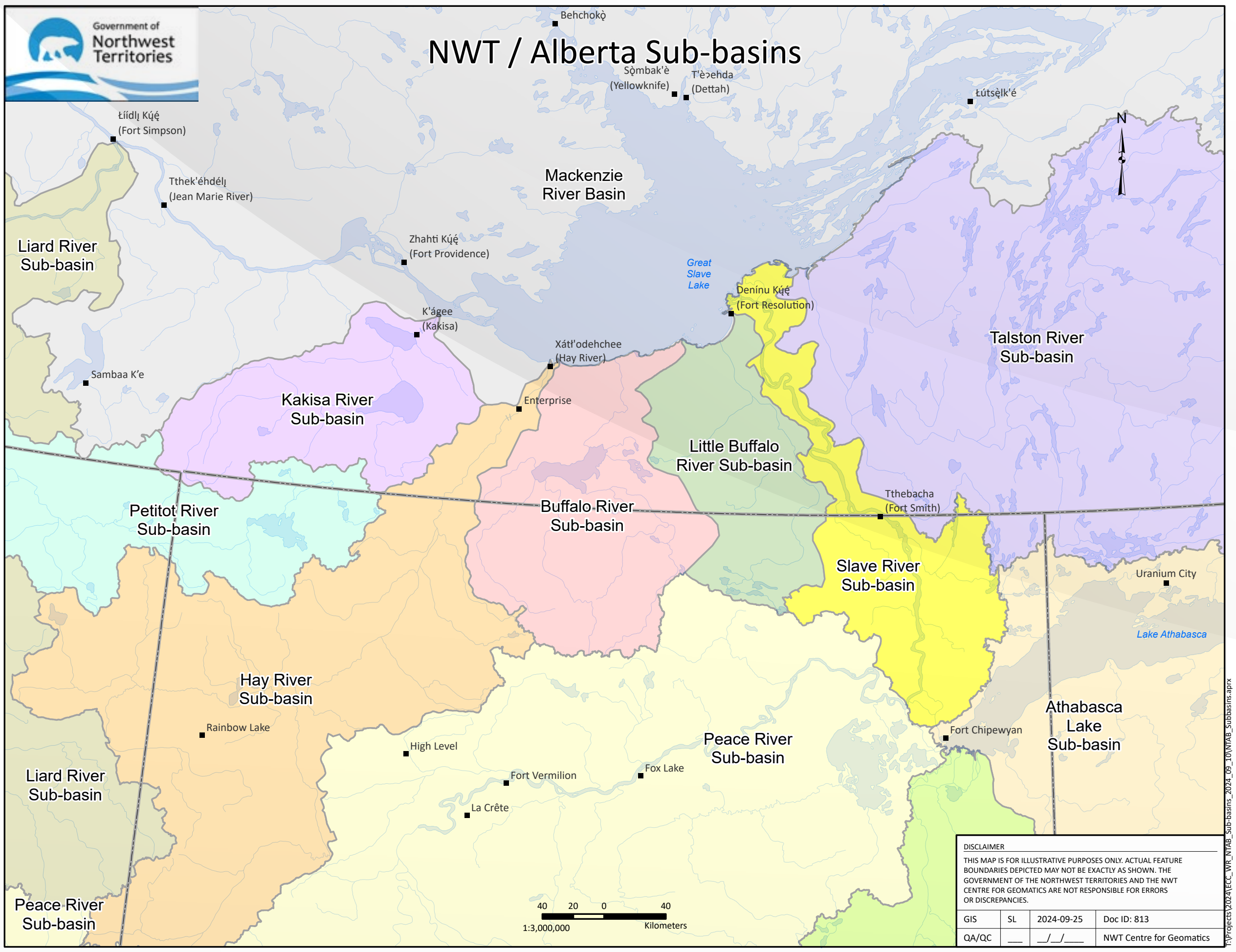
Alberta-Northwest Territories Bilateral Management Committee Annual Report to Ministers

Government of Northwest Territories

Alberta

Preface

This report provides a summary of the work done between April 1, 2018 and March 31, 2020 to meet the commitments of the Alberta-Northwest Territories Bilateral Water Management Agreement. The report is based on technical reports. Links to the full text of the original reports, where available, are provided in Appendix B.



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Executive Summary

The Bilateral Management Committee (BMC) for the Alberta-Northwest Territories (NWT) Bilateral Water Management Agreement (the Agreement), along with Indigenous partners, federal partners, and research associates, continued to advance the work of protecting the aquatic ecosystem shared by Alberta and the NWT. The BMC is responsible for implementing and reporting on the Agreement. This report is the BMC's fifth annual report, for work done between April 1, 2020, and March 31, 2021, and data collected in 2020.

During the reporting period, information was shared between the Government of NWT (GNWT) and Government of Alberta (GOA) on research, sampling programs, policy changes, development decisions, and incidents that have potential impacts on the shared waters.

Groundwater scientists continued their efforts to identify the location, quality, and quantity of our shared groundwater. The Slave River groundwater area was re-classified from Class 1 to Class 2 which prioritizes more learning activities to take place.

Changes in water levels and water quality were documented and assessed. Changes in water levels have been significant over the past few years and are driven by widespread weather patterns. Some substances in water quality were above their respective trigger and have been flagged for further investigation but none currently pose a risk. The impact of permafrost thaw and increased flow between surface water and groundwater are being examined.

Aquatic ecosystem health continues to be assessed at sites near the Alberta-NWT border, through monitoring of water quality and quantity, as well as indicator programs such as the monitoring of benthic invertebrates and selected species of fish. Monitoring will continue.

As data collection under the Agreement continues, our ability to identify changes, examine causes, and recommend protective measures improves.

Sommaire

Le Comité bilatéral de gestion (CBG) de l'Entente bilatérale sur la gestion des eaux entre le gouvernement de l'Alberta et le gouvernement des Territoires du Nord-Ouest (l'Entente), de concert avec les partenaires autochtones, les partenaires fédéraux et les chercheurs associés, poursuit son travail de protection de l'écosystème aquatique partagé par l'Alberta et les Territoires du Nord-Ouest (TNO). Le CBG est responsable de la mise en œuvre de l'Entente et de la production de rapports à ce sujet. Le présent rapport, qui est le cinquième rapport annuel du CBG, porte sur le travail effectué entre le 1er avril 2020 et le 31 mars 2021 ainsi que sur les données recueillies en 2020.

Au cours de la période de référence, des informations ont été échangées entre le gouvernement des Territoires du Nord-Ouest et le gouvernement de l'Alberta sur la recherche, les programmes d'échantillonnage, les changements de politiques, les décisions en matière d'aménagement du territoire et les incidents qui pourraient avoir des répercussions sur la qualité de l'eau.

Les scientifiques spécialistes des eaux souterraines ont poursuivi leurs efforts pour déterminer l'emplacement et la qualité de nos eaux souterraines communes ainsi que leur quantité. La zone des eaux souterraines de la rivière des Esclaves est passée de la classe 1 à la classe 2, ce qui permet de mener davantage d'activités d'apprentissage.

Les changements dans les niveaux d'eau et la qualité de celle-ci ont été documentés et évalués. Les variations des niveaux d'eau, qui ont été importantes au cours des dernières années, ne sont pas imputables aux utilisations prévues par les permis d'utilisation de l'eau. Les effets de la fonte du pergélisol et de l'augmentation des flux entre les eaux de surface et les eaux souterraines font actuellement l'objet d'études.

L'évaluation de la santé des écosystèmes aquatiques se poursuit sur des sites proches de la frontière entre l'Alberta et les Territoires du Nord-Ouest par la prise d'échantillons d'eau et la mise en œuvre de programmes de surveillance d'indicateurs comme certaines espèces d'invertébrés benthiques et de poissons. Les concentrations de certaines substances se sont révélées supérieures à leur seuil respectif et feront l'objet d'un examen plus approfondi, mais aucune d'entre elles ne présente de risque à l'heure actuelle. La surveillance se poursuivra.

Notre capacité à détecter les changements, à en examiner les causes et à recommander des mesures de protection s'améliore au fur et à mesure que la collecte de données se poursuit dans le cadre de cette entente.

Hay River.

Introduction

The governments of Alberta (GOA) and the Northwest Territories (GNWT) signed the Alberta-NWT Bilateral Water Management Agreement (the Agreement) in 2015 to cooperatively manage shared waters. A Bilateral Management Committee (BMC) administers the Agreement. Appendix A of this report lists the 2020-2021 members of the BMC.

Shared waters include the Slave, Hay, Buffalo, Little Buffalo, Whitesand, Yates, Kakisa, Petitot, Salt, and Tethul rivers, their tributaries and groundwater. The BMC publishes a report on each year's activities and data collected to keep citizens and elected officials up to date on the Agreement's implementation.

This report provides an overview of progress made between April 1, 2020, and March 31, 2021. Appendix B of this report provides links to the scientific and technical reports summarized here.

Activities and Progress

Ongoing Information Sharing

Information is regularly shared between the Alberta and NWT governments. This includes research, regulatory activities, development projects, monitoring results, and technical methods. The following is a summary of significant events during the 2020-2021 year.

Suspension of Water Sampling (March 2020)

The Agreement has provisions for the ongoing monitoring of the Slave and Hay rivers as well as monitoring activities on other transboundary rivers that inform bilateral water management. While Environment and Climate Change Canada (ECCC) is specifically responsible for the routine monitoring of the Slave and Hay rivers, the GOA department of Environment and Protected Areas (EPA) and ECCC are responsible for broader monitoring of the region including monitoring of the Peace and Athabasca rivers in Northern Alberta.

In 2020, due to COVID-19 public health restrictions, ECCC had to alter water quality monitoring activities in the Slave and Hay rivers resulting in fewer samples being collected; only 5 (rather than 8) samples were collected from the Slave River and 3 (rather than 4) samples were collected from the Hay River. Sampling efforts were also interrupted in the Peace and Athabasca rivers; however, ECCC, EPA and the GNWT worked together to minimize the disruptions. Note that water quality monitoring associated with regulatory and compliance activities was not affected by the COVID-19 restrictions.

Emergency Release of Wastewater (April 29, 2020)

On April 29, 2020 the Regional Municipality of Wood Buffalo announced that it would be releasing Fort McMurray wastewater and floodwaters from its industrial park into the Athabasca River. These measures were part of its emergency plan to deal with flooding and ice conditions in the Fort McMurray area. As per their regulatory approvals, the municipality monitored water quality in the Athabasca River following the release.

The GNWT also collected Slave River water samples at Fort Smith twice per week from May 1 to mid-June, 2020. The samples were analyzed for more than 80 different parameters, including nutrients, salts, metals, hydrocarbons, and bacteria. Concerns were not identified or expected due to the large volume of water in the Athabasca, Peace, and Slave rivers from spring melt, as well as the distance between Fort McMurray and the Alberta-NWT border.

Environmental Impact Assessments (July and August 2020)

In July 2020, the GNWT was notified by Alberta's Environmental Assessment program that the environmental impact assessment for Canadian Natural Resources Limited's proposed extension of the northeast mine pit at its Horizon oil sands processing plant and mine was complete (under section 53 of Alberta's *Environmental Protection and Enhancement Act*). The proposal was then referred for a decision on whether the project is in the public interest. A positive decision would allow individual applications under the *Water Act*, *Public Lands Act*, and *Oil Sands Conservation Act* to be submitted and assessed.

In August 2020, the GNWT was notified that the Impact Assessment Agency of Canada determined that an impact assessment was required for the Suncor Base Mine Extension Project. This project includes an open pit mining operation. Bitumen froth would be delivered by pipeline to the Base Plant for further processing. The Project was referred to an independent review panel in January 2021. The GNWT submitted comments on the proposed terms of reference in April 2021. The GNWT's main comments were to ensure the geographic scope of the environmental assessment consider potential impacts to water quality in the NWT, including the Slave River and Delta.

Limit for Suspended Solids Exceeded (October 2020)

On October 9, 2020, the Government of Alberta (GOA) notified the GNWT that Alberta Pacific Industries Pulp Mill (Al-Pac) reported that the total suspended solids in the treated wastewater released to the Athabasca River exceeded its approved limit between October 3 and October 8. Al-Pac became aware of the issue and reported it on October 5. The release was not significant enough to trigger an emergency response and is not considered to have any health or public safety impacts.

The GNWT collected daily water samples from the Slave River from October 10 until October 16. No changes in water quality were expected, or detected, given the insignificant volume, distance between the release and the AB-NWT border, and higher than normal water levels on the Peace and Athabasca Rivers.

Accidental Release of Salt Brine (October 2020)

On October 26, 2020, a Husky Oil Operations Ltd. pipeline released 900,000 litres of salt brine into the Hay River basin. The area where the released occurred is a low-lying wetland 15 km southeast of Rainbow Lake, Alberta. The spill was immediately contained and did not reach the Hay River or its tributaries. Cleanup was completed in the following open water season. No impact was observed to the Hay River or its tributaries.

The GNWT and GOA will continue prior notification and consultation between the two governments for developments and activities, as defined in the Agreement. GNWT and GOA are also working with ECCC to ensure continued water quality monitoring at important sites identified in the Agreement.

Joint Work Plan

The Bilateral Management Committee continues to maintain its five-year rolling work plan to set priorities and guide the Alberta and NWT teams' ongoing work. The Committee reviews and approves the plan each year and updates it as needed.

Classification of Waters

The classification of water bodies is based on risk that considers:

- the level of upstream development such as industry, agriculture, and drinking water for upstream communities;
- the extent of traditional use;
- drinking water use in downstream communities;
- observed changes in conditions; and,
- the sensitivity of the related ecosystem.

Class 1 waters are at low risk and the routine monitoring done by Alberta and the NWT is considered adequate. Class 2 water bodies are at moderate risk. Class 2 waters require Learning Plans to better understand the history, current, and potential future of water quality, quantity, and health of the overall aquatic ecosystem. Class 3 water bodies are considered at a higher risk. In addition to Learning Plans, Class 3 waters require developing and monitoring site-specific objectives. Class 4 is only assigned if objectives for a body of water are not being met and corrective action is needed.

Current Status

The Slave and Hay rivers continue to be Class 3 waters because upstream development is present, there is significant traditional use, there have been changes in water quantity and quality over time, and they supply drinking water for downstream communities in the NWT. All other surface bodies of water managed under the Agreement are currently Class 1.

The Slave River groundwater area was re-classified from Class 1 to Class 2 in 2020-2021. The area was mapped based on the surface water sub-basin. The reclassification supports more learning activities to take place. The Hay River groundwater area is also Class 2 (since 2019-20) to allow for more learning activities. All other groundwater remains Class 1.

Public Engagement

Ongoing

Reports completed as part of the implementation of the Agreement are published online. Both jurisdictions have general email addresses for the public to ask questions or provide information. The email address for the GNWT is nwtwaterstrategy@gov.nt.ca, and for the GOA, transboundarywaters@gov.ab.ca.

GNWT staff meet regularly with the NWT Water Strategy Indigenous Steering Committee. The committee provides guidance on the implementation of the NWT Water Stewardship Strategy and the Agreement.

In Alberta, the general public, stakeholders, government partners, and Indigenous communities are engaged through land use, watershed, and water planning processes. Water management plans guide GOA decision makers on water allocation decisions. Land use and watershed management plans guide a broader range of decision makers under other Alberta legislation. Indigenous working groups are engaged throughout the development, implementation, ongoing review, and potential amendment of regional land use plans. Water Planning and Advisory Councils (WPACs) include members from key sectors (e.g. industry, agriculture, municipalities) as well as Indigenous representatives. Watershed-specific WPACs provide the GOA with advice on watershed management plans and water management plans for their watershed.

In northeastern Alberta, Indigenous communities and industry participate in governing the provincial/federal Oil Sands Monitoring Program, directing ambient environmental monitoring of the oil sands region, including water quantity and quality.

Alberta and NWT representatives provide annual updates to the Mackenzie River Basin Board that are published online.

Staff from Alberta and the NWT also attend several meetings with external water partners each year to share information and obtain input on water management.

April 1, 2020, to March 31, 2021

Due to public health and safety restrictions in response to the COVID-19 pandemic, no in-person gatherings related to the Agreement occurred during the 2020-2021 year. However, meetings were conducted virtually.

In June 2020, at a Wood Buffalo National Park (WBNP) Action Plan, Environmental Flows and Hydrology (EFH) Working Group meeting, the GOA and ECCC brought forward information about temporary monitoring suspensions due to the pandemic and plans for their resumption. Three main monitoring programs/areas were covered: regulatory, environmental, and oil sands monitoring. Information from this meeting was shared with the BMC, including the presentation slides, meeting notes, and follow-up questions and answers about the monitoring.

In December 2020, a second WBNP Action Plan, EFH Working Group meeting was held. The GOA and ECCC brought forward information about their early stages of planning, engagement, and consultation for the development of regulations regarding potential treatment and release of oil sands mine water stored in tailings ponds. Information from this meeting was shared with the BMC, including the presentation slides, meeting notes, and follow-up questions and answers.

GNWT staff shared information about the NWT Water Stewardship Strategy and NWT transboundary agreements with students at the Environment and Natural Resources Technology program at Aurora College in November 2020.

Monitoring and Results

To implement the Agreement, the aquatic ecosystem is monitored using a variety of methods including analysis of water uses and water flows, chemical and biological analysis of water, fish and organisms. Comparisons are made to calculated natural flows, historical data, to other similar waterways, or to established standards or guidelines. Since the Agreement is relatively new and the waters it applies to are unique, in some cases appropriate methods are still being developed, and more data are needed for meaningful comparisons.

Progress on research and monitoring activities, the results of analysis in 2020-2021, and planned follow-up activities are summarized below.

Biological Indicators

Biological indicators are living things that can be monitored to help us understand any changes in the water. For the Slave and Hay rivers, biological indicators currently include benthic macroinvertebrates and small and large-bodied fish.

Between April 1, 2020, and March 31, 2021, monitoring included:

- the fourth year of benthic macroinvertebrate monitoring on the Slave River;
- burbot sampling on the Slave River at Fort Smith;
- analysis of tissue chemistry results from large-bodied fish in the Slave River; and,

Smith's Landing First Nation also operated a fish camp on the Slave River in which the GNWT and GOA participated. The data are not part of this report.

Benthic Macroinvertebrate Monitoring

Background

Benthic macroinvertebrates are often used to assess water quality in rivers and lakes. These creatures do not have a backbone (invertebrates); they live on the bottom of a river or lake (benthic) and they are large enough to see with the naked eye (macro).

Most invertebrates in lakes and rivers are larvae or nymphs (young life stages) of land-based insects such as midges and black flies. While many of these insects live for only a short time as adults (some for as little as one day), they can live for years as larvae or nymphs in freshwater.

Benthic macroinvertebrates also include aquatic invertebrates that are not insects, such as worms, clams, and snails.

Many benthic macroinvertebrates are not strong swimmers, which means they can't easily move away from problems like polluted waters or climate change impacts like temperature increases. Changes in the water affect different types of macroinvertebrates in different ways. Some need clean water and high oxygen levels to survive. Others are capable of living in poor water quality or harsh environmental conditions. Many have preferred temperature ranges and as temperatures change, so might the observed species.

For these reasons, benthic macroinvertebrates are an excellent indicator of both water quantity and water quality and are used as one of the biological indicators for the Alberta-NWT transboundary water monitoring program.

Mayfly nymph (Photo: Bob Henricks from Charlottesville, USA, CC BY-SA 2.0 <https://creativecommons.org/licenses/by-sa/2.0>, via Wikipedia Commons).

Stonefly nymph (Photo: Dave Huth, CC BY-SA 2.0, via Flickr).

Midge larva (Photo: Mélissa69770, CC BY-SA 4.0, via Wikipedia Commons).

The goals of this program are to determine the different kinds of benthic macroinvertebrates in each river and to track their abundance over time. Monitoring benthic macroinvertebrates is one way to assess ecosystem health and provide an early sign of change or stress in the aquatic environment.

Sampling Method

A modified version of the Canadian Aquatic Biomonitoring Network (CABIN) for large rivers is used to collect samples in the Slave and Hay rivers. The method consists of kicking and disturbing the riverbed while moving upstream and holding a sampling net downstream to capture disturbed organisms. Water samples and physical measures such as water temperature, pH, and clarity are also recorded at the time of sampling.

Benthic macroinvertebrate monitoring started in 2017 on the Slave and Hay rivers near the Alberta-NWT border. There are 30 sampling locations within six zones on the Hay River and 35 sampling locations within seven zones on the Slave River. Once the range of natural variability in benthic macroinvertebrate communities (including their richness, diversity and abundance) is determined, sampling may occur less frequently (for example, every two or three years) to track change over time.

Range of Natural Variability

It is normal to see changes from year to year due to natural fluctuations in habitat conditions such as flow, timing of the spring freshet, and water temperature not being identical every year. Since habitat conditions are different year to year, benthic macroinvertebrate communities and fish health can be different from year to year. These year-to-year differences are what is referred to as “natural variability”. If a change is observed beyond what appears to be natural variability, additional investigation is triggered under the Agreement. Climate change can affect natural variability due to extremes in water flow and temperature. With regular monitoring and more data the ability to detect climate change impacts and cumulative effects is improved.

Figure 1: Benthic macroinvertebrate sampling sites on the Hay River. (Hay River sample reaches (red points))

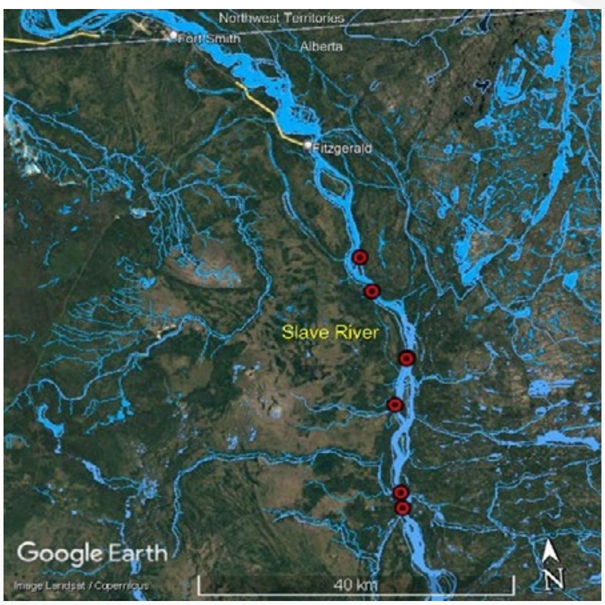


Figure 2: Benthic macroinvertebrate sampling sites on the Slave River. (Slave River sample reaches (red points))

Hay River Results

The Hay River was sampled in 2017, 2018, and 2019. It was not sampled in 2020 due to safety concerns related to high water levels and COVID-19-related concerns. Although no new samples were collected, new data analyses were conducted in 2020 to attempt to directly investigate the effect of flow on benthic macroinvertebrate community structure. Benthic macroinvertebrate community structure is affected by changes in water level between years. On average over the three years sampled, the Hay River is dominated by mayflies and true flies and has high numbers of species that thrive in slow-flowing waters, including dragonflies and bivalve molluscs.

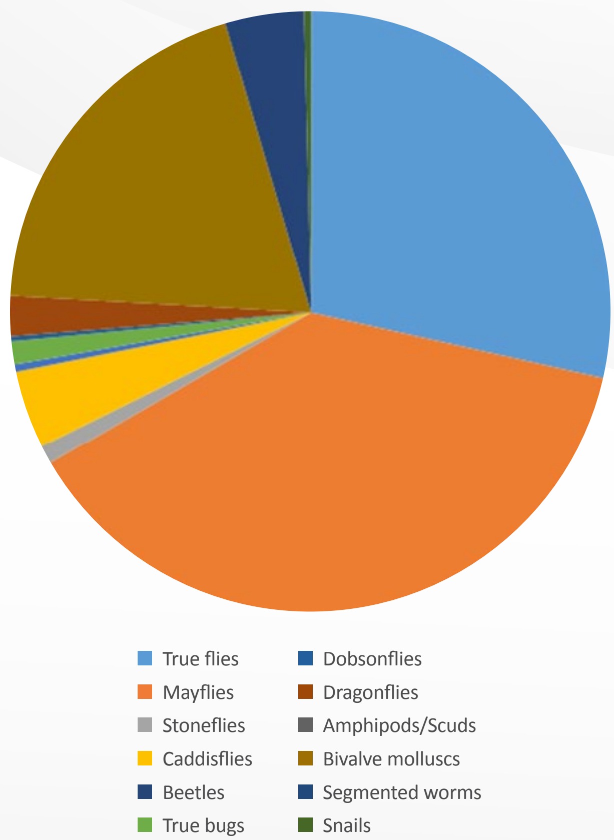


Figure 3: Benthic macroinvertebrates in the Hay River from 2017-2019 (no sampling occurred in 2020 due to high water).

Slave River Results

The Slave River was sampled in 2017, 2018, and 2019 with limited sampling in 2020 due to safety concerns related to very high water. Water levels were quite low in 2017, compared to later years. Water levels appear to have a strong effect on the composition of benthic invertebrate samples.

In 2017, samples were dominated by true flies, primarily midges. There were low counts of caddisflies, mayflies, and stoneflies. In later years, the samples had lower counts of midges and high counts of caddisflies, mayflies, and stoneflies. Caddisflies, mayflies, and stoneflies are tolerant of fast-flowing water or prefer fast flows which may explain the increase after 2017.

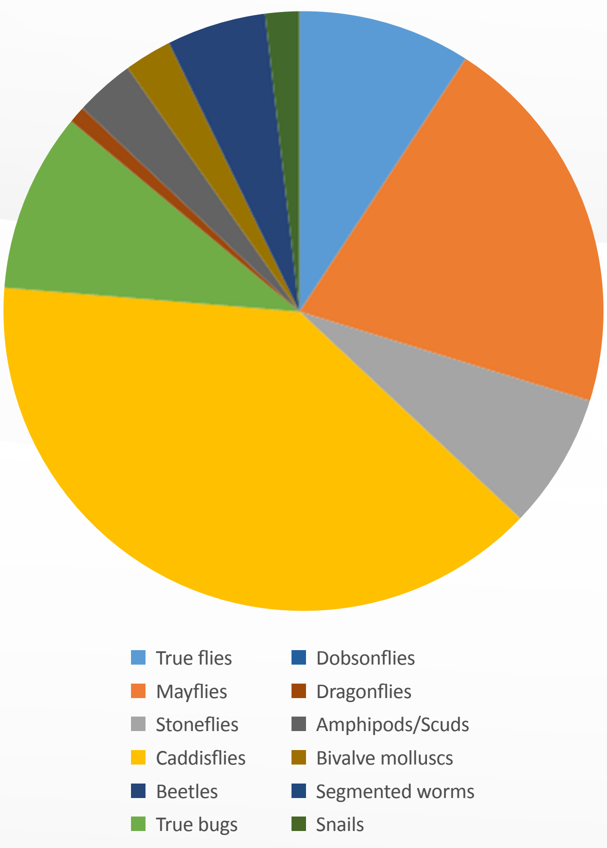


Figure 4: Benthic macroinvertebrates in the Slave River from 2017-2020

Continued Collection of Data

As more sampling is conducted, the effect of high-water and low-water years on natural changes in benthic macroinvertebrates populations will be better understood. Sampling will occur annually until we have enough data to support this method of spotting changes.

Fish Monitoring

Background

The development of monitoring plans for large and small-bodied fish in the Slave and Hay rivers is a priority. Monitoring plans are intended to track the status and condition of fish health over time. This will help to assess ecosystem health and provide an early warning of change or stress in the environment. Like other biological monitoring programs, such as regulatory programs for metal mines and pulp and paper mills, the fish monitoring program in the Agreement includes the analysis of fish condition, liver weight, gonad weight, size-at-age, and contaminant concentrations in fish tissues.

A comparison of historical datasets (1988-2014) of the Slave River suggests that condition factor and liver weights have increased over time. It also shows that fish tissues are still low in contaminant concentrations at Fort Smith. However, these findings are limited by small sample sizes and differences in the timing of sample collections among historical studies. It is important to confirm these findings with regular monitoring and the collection of sufficient data to establish a good baseline to better define natural variability.

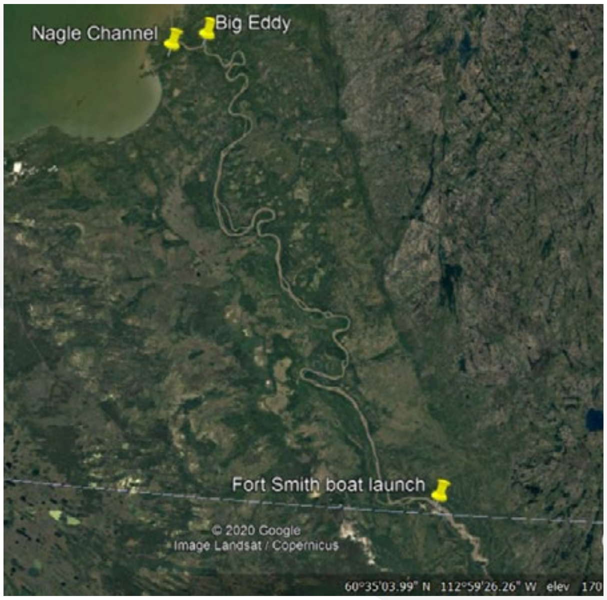


Figure 5: Slave River Fish Sampling Locations Near Fort Smith and Fort Resolution.

Hay River Fish Monitoring

To ensure the monitoring addresses the social, cultural, educational, and economic interests of residents, engagement with local organizations and communities is important in the development of the Hay River fish monitoring plan.

While COVID-19 public health restrictions limited the amount of collaboration, some preliminary information was gathered to help with future planning. Kátł'odeeche First Nation knowledge holders and GNWT staff set gillnets for large-bodied fish and seined for small-bodied fish near the Alberta-NWT border in the fall of 2020. A limited number of large-bodied fish were captured (longnose suckers, white suckers), but a variety of small-bodied fish species were captured (trout-perch, emerald shiner, spottail shiner, flathead chub). Because trout-perch has been selected as a good indicator fish species for environmental monitoring in other watersheds, such as the lower Athabasca River, 40 trout-perch were collected and analyzed for future reference.

Slave River Fish Monitoring

NWT and Alberta have been working with community members in Fort Smith and Fort Resolution, and with researchers from Wilfrid Laurier University, the University of Calgary, and the University of Saskatchewan, to develop a fish monitoring program for the Slave River. Changes in the health and contaminant levels in northern pike (jackfish), lake whitefish, walleye (pickerel), burbot, and trout-perch could provide an early warning of change in the aquatic environment.

Pilot sampling took place in September 2019, where lake whitefish, walleye, burbot, northern pike, and trout-perch were caught in the Slave River near Fort Smith and near Fort Resolution. In January 2021, 40 burbot were collected from the Slave River at Fort Smith and sent for analysis to the University of Saskatchewan.

Samples and information collected include:

- fish length and weight;
- liver, gonad, and spleen weight;
- sex and sexual maturity;
- age of the fish;
- deformities, lesions, tumours, and parasites; and,
- tissues (muscle, liver, and bile) sampled for metals and oil and gas-related chemicals.

The tissue samples can show concentrations of various substances, such as mercury or arsenic, as well as oil and gas-related chemicals, such as polycyclic aromatic hydrocarbons (PAHs). Results from the Slave River transboundary fish monitoring program are compared to results from upstream and historical fish studies to help us determine if changes are occurring.

In Figure 6, points within the blue box are within the range of natural variability. In Figure 7, the level of metals above the blue bar is above the natural range.

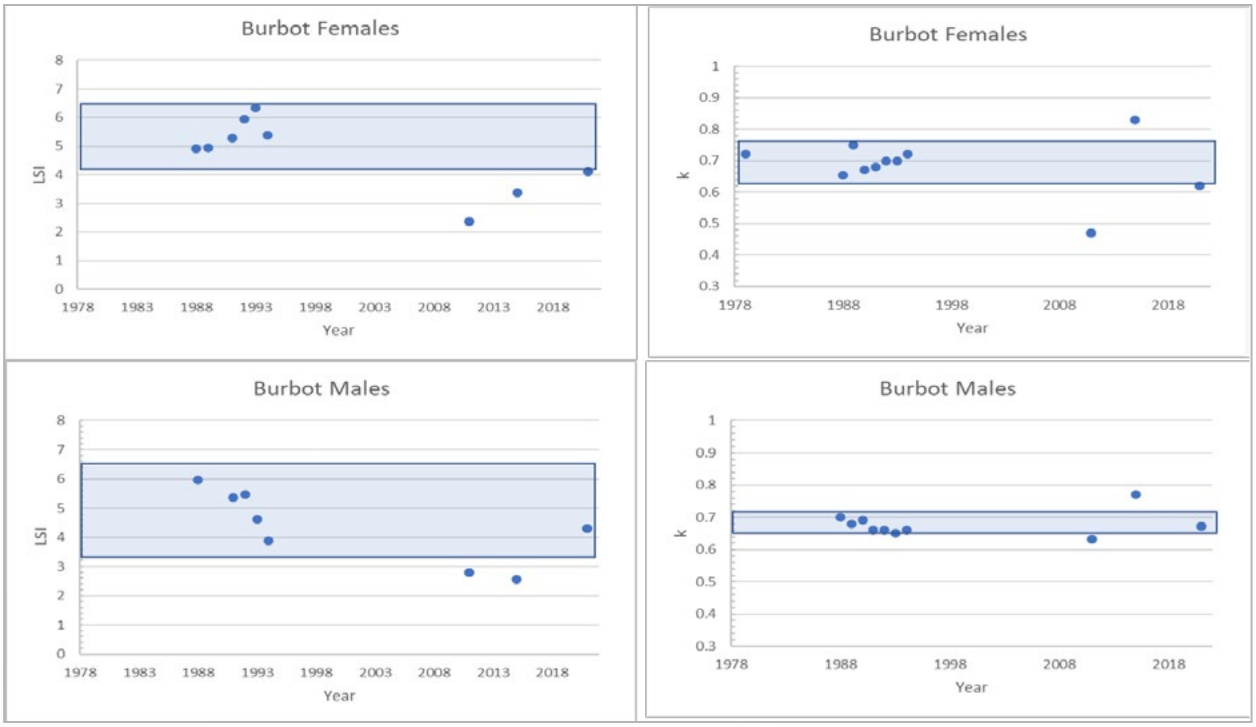


Figure 6: Comparison of average long-term data for burbot at Ft. Smith for relative liver size (LSI) and condition factor (k). The blue boxes (normal range) show the amount of variability in the pre-2011 data. Anything within the boxes can be considered a "normal" observation.

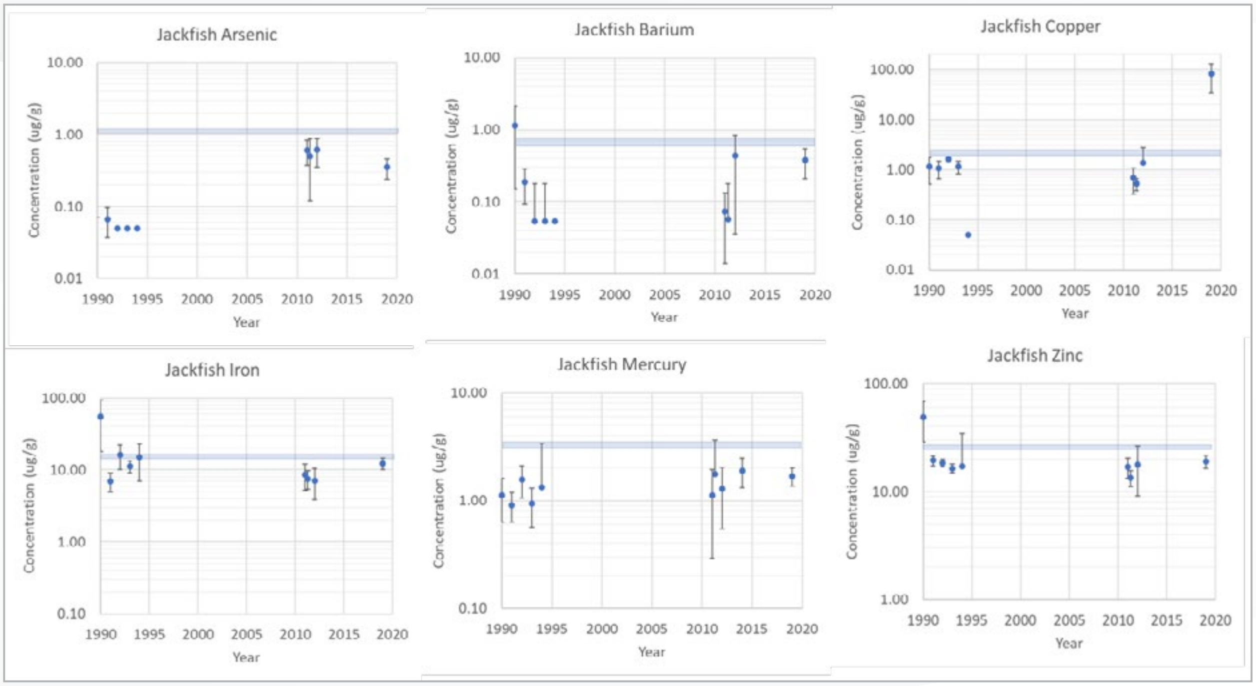


*Figure 7: Levels of metal (mean ± 2*Standard Deviation (SD), dry weight) in jackfish muscle over time. The blue bar represents the normal range (2 SDs from data collected in 2011-2012). Data collected prior to 2011 were not included in calculations due to differences in laboratory methods. Statistical methods to account for historical data in calculations are currently being investigated. Copper appears higher than normal, but other metals appear normal.*

A.Levasseur and M.Palmer seining on the Slave River.

The overall health of fish from the Slave River and Delta appears to be good. Preliminary results from the first round of sampling (fall 2019 and winter 2020/2021) suggest that lake whitefish and burbot female liver sizes appear to be decreasing (Figure 7), and lake whitefish male condition factor (k) also appears to be decreasing. Changes in condition factor and liver size can be related to natural variation in food availability or potentially signal changes in water quality or quantity, where lower condition factor and liver size suggest the fish were feeding less. However, these changes may also show that natural variability is not well understood. More research and monitoring are needed to explain natural variability and improve the ability to detect ecological changes. (Figure 8)

Levels of metals, including mercury, were within Health Canada consumption guidelines and were similar to historical data. Copper was higher than historical data. Traces of PAHs in bile were higher than historical measurements, but levels of PAHs in muscle were lower than those found in the Slave Watershed Environmental Effects Program (SWEEP) study in the early 2010s. Examinations of PAHs in water at Fort Smith have not shown increasing levels since SWEEP, and there is no strong evidence of concern with PAH levels in either water or fish tissue.

SLFN Fish Camp

Smith's Landing First Nation (SLFN) held a fish camp at ʔejëre K'elnı Kuę́ 196I (Hay Camp) to sample fish from the Slave River. The camp was funded through other sources, but GNWT staff were able to attend and provide support. Collaboration is ongoing and may include additional Smith's Landing First Nation fish camps in the spring to monitor longnose sucker in the Salt River, another fall fish camp at Hay Camp, and sharing of western science data to improve understanding of fish health in the Slave River. SLFN is monitoring different species at different locations and time of year than AB-NWT monitoring, therefore monitoring efforts are complementary and not duplicative.

Robin Staples recording information.

Next Steps

Monitoring for benthic macroinvertebrate communities on the Slave and Hay rivers (Year 4)

Due to the variability in the benthic macroinvertebrate during the first three years of sampling (2017-19), additional years of sampling are required to determine what is normal. Sampling is scheduled to take place in the fall of 2021 on both the Slave and Hay rivers. Building a strong baseline is essential to compare future sampling results and be able to detect change over time.

Monitoring for large and small-bodied fish on the Slave and Hay rivers (Year 2)

The latest results will be shared at a Slave River and Delta Partnership meeting in May 2021. Fish monitoring on the Slave River will continue in 2021 to follow up on the results from 2019/2020. Smith's Landing First Nation is planning to host a fish camp on the Slave River near the Alberta-NWT border in the spring and fall of 2021. Next steps for the Hay River include community engagement to discuss program design, such as where to sample, which fish to monitor, and the ideal approach to implement the program.

George Bugghins with gear on the Hay River.

Surface Water Quantity

Alberta and the NWT have committed to developing site-specific objectives that ensure that the needs of the aquatic ecosystem are met before any water is taken for human use. The amount remaining for human use is referred to as “available water” and is shared equally between Alberta and the NWT.

Objectives and Triggers

The amount of water removed from the Slave River basin for human use in Alberta is very small compared to the total amount flowing across the border. The Agreement states that specific objectives for the Slave River are not needed until:

- the annual volume of water from the Slave River basin licensed for use in Alberta reaches two billion cubic metres (m^3);
- two billion cubic metres becomes significantly different from 1.9% of the long-term average annual streamflow; or,
- 50% of the volume licensed for use in Alberta is for use outside of the Mackenzie River basin.

For the Hay River, the amount of water removed from the basin is also very small compared to the total amount flowing across the border. The interim ecosystem need is conservatively assumed to be 90% and the available water for Alberta and NWT is set at 5% each of the natural flow. This results in an interim objective, where 95% of the natural flow of the river is to pass from Alberta to the NWT. Natural flow is the amount of water flowing through a river if no water is stored, removed, or diverted. Natural flow on the Hay River is currently being estimated by adding the volume of water licensed for use, or used, in Alberta to the flow recorded at the Alberta-NWT border.

Two triggers have been developed for the Hay River basin, at values lower than the interim objective. Triggers are specific conditions that require a response, such as further discussion on flow objectives, refinements to calculations, or more detailed work on determining ecosystem needs. Trigger 1 is exceeded if the volume of water licensed for use by Alberta in the Hay River basin is greater than 2.5% of the natural flow at the border in at least one month. If Trigger 1 is exceeded, Trigger 2 is evaluated. Trigger 2 is exceeded if the actual water used is greater than 4% of the monthly natural flow. Both triggers are important to track. Trigger 1 is a conservative first step to keep track and assess allocation of water. The volume of water allocated through water licenses does not consider low flow conditions and associated restrictions that licensees may have. Trigger 2 looks at the actual water use by licensees and is more reflective of actual conditions.

Monitoring and Assessment

Streamflow is the amount of water that moves past a specific location over a certain period of time. It has been measured on the Slave River, near the Alberta-NWT border, since May 1959, and on the Hay River, at the Town of Hay River, since July 1963.

In 2020, the total annual streamflow on both the Hay and Slave Rivers was much higher than average. Streamflow on the Hay River was 37% higher than average (Figure 9). Streamflow on the Slave River was double the average (Figure 10).

On the Slave River, the annual volume of groundwater and surface water licensed for use in Alberta was 1.2 billion m^3. This is well below the 2.0 billion m^3 threshold stated in the Agreement. The threshold remained at 1.9% of the long-term mean annual streamflow. There was no change to the volume of water licensed for transfer outside of the Mackenzie River basin.

The total volume of groundwater and surface water licensed for use in the Hay River basin in Alberta exceeded 2.5% of the natural flows at the border in four months in 2020 (Figure 11 a). This exceeded Trigger 1 and prompted analysis of the actual water use for Trigger 2. The actual water use for all months was below 2.5% of natural flows at the border. This was well below the Trigger 2 threshold of 4% (Figure 11 b).

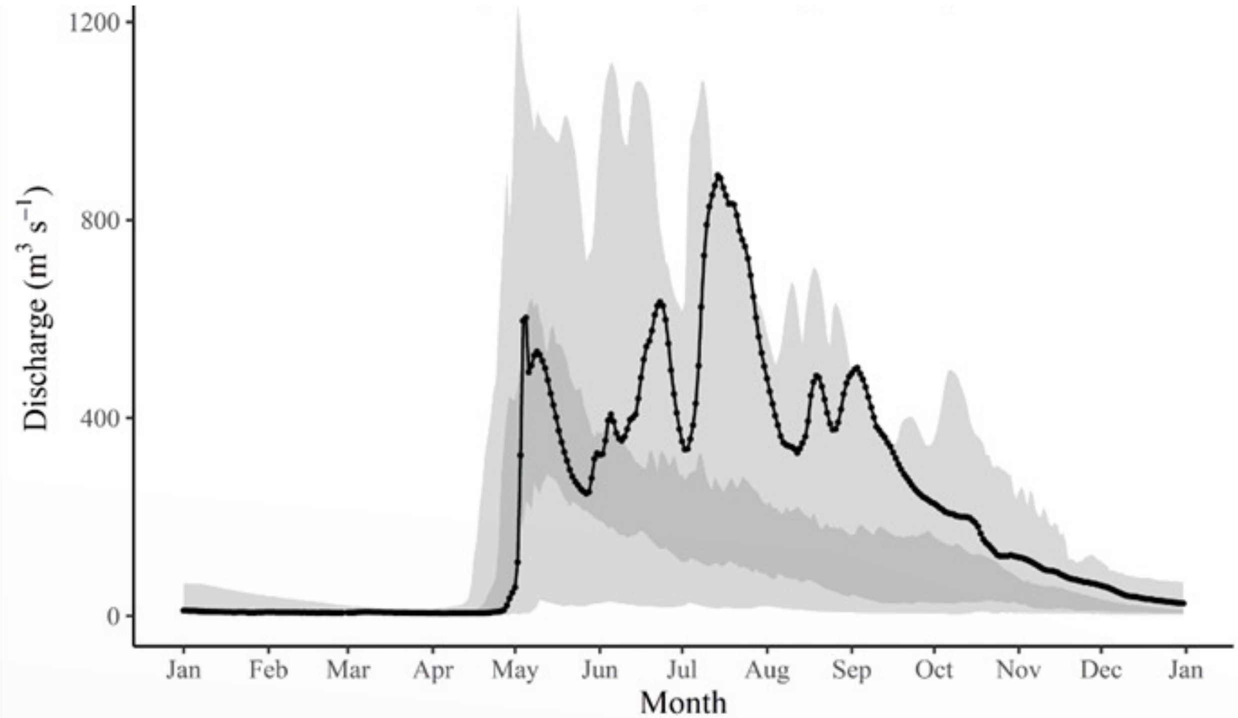


Figure 9: Hay River (07OB001) streamflow for the year 2020 (black line) relative to the historic average normal range (dark grey area), and all-time recorded range (light gray).

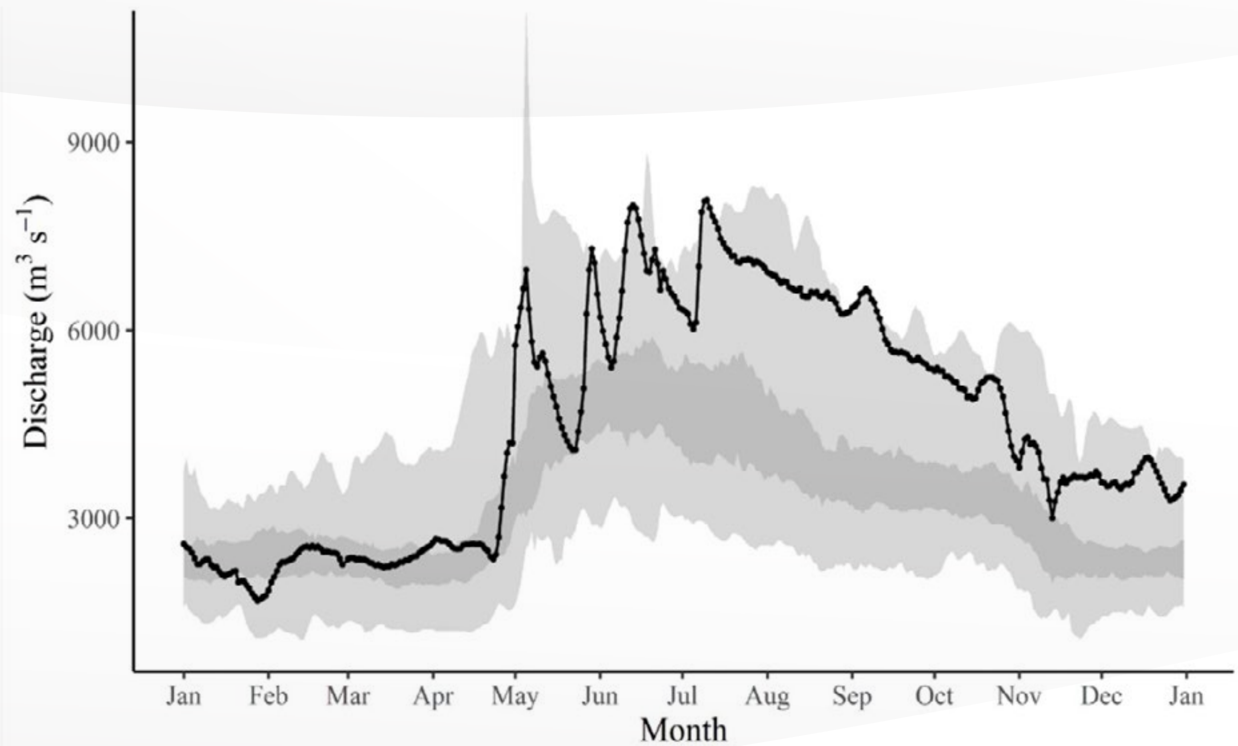


Figure 10: Slave River streamflow for the year 2020 (black line) relative to the historic normal range (dark grey area), and all-time recorded range (light gray). The data include estimated streamflow for the period May 1st – June 23rd, to infill this period of time when the hydrometric gauge was not functioning.

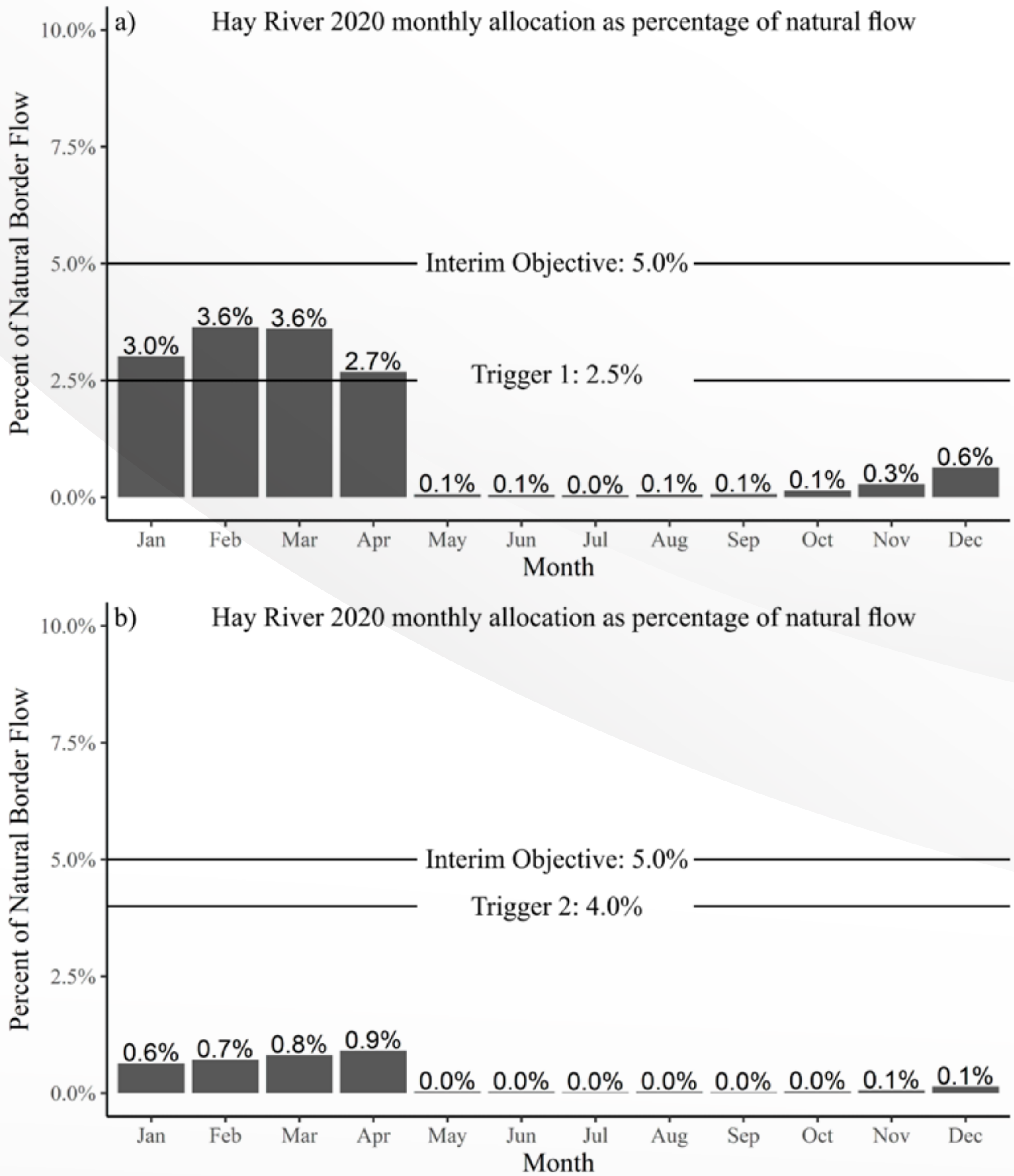


Figure 11: Water use in the Hay River. (a) Trigger 1: Hay River 2020 monthly allocation as a percentage of natural flow and (b) Trigger 2: Hay River 2020 monthly use estimate as a percentage of natural flow

Surface Water Quality

Water quality can be affected by both human activities and natural processes. Surface water quality assessments are typically based on physical, chemical and biological data. Water quality samples are tested for the presence and amount of certain substances. Some of these, such as pesticides associated with agricultural activities, are human-made pollutants. Others, such as lead, can occur from human activities such as mining, but can also occur naturally, due to the weathering of rocks. Negative effects can occur when concentrations reach certain levels.

Water Quality Objectives

A water quality objective is a value that Alberta and the NWT agree to meet for certain water quality parameters monitored in the Slave and Hay rivers. A parameter is a substance we measure in water, such as calcium. While water quality objectives are being explored, triggers based on historical data are being used to determine if the water quality is changing.

Water Quality Triggers

Water quality triggers are values calculated using historical data for a particular parameter. For the Slave and Hay rivers, seasonal, site-specific triggers are based on the 50th and 90th percentiles of the historical data record for a given parameter to identify early changes in water quality conditions.

Two trigger levels are used. Trigger 1 is set at the 50th percentile. This is the central tendency over the long term and is used to assess changes over time. Trigger 2 is set at the 90th percentile. This means that 90% of the data are equal to or lower than the 90th percentile value.

When a value is above a trigger, it is flagged and an action is prompted, such as confirmation of the change and exploring the cause.

Work Completed

Between April 1, 2020, and March 31, 2021, the following tasks were completed:

1. Assessment of the 2020 surface water quality data for the Slave and Hay rivers.
2. Development of site-specific open-water triggers for mercury for the Slave and Hay rivers.
3. Completion of a report that describes various methods to assess water quality trends in transboundary rivers throughout the Mackenzie River basin.
4. Characterization of the different kinds of hydrocarbons present in transboundary rivers.

Data Analysis Results

For more detailed information about the data and their assessment, please refer to the 2020 Alberta-NWT Transboundary Water Quality Technical Report for the Slave and Hay Transboundary Rivers. The following is a summary of the detailed results.

Slave River – January 1 to December 31, 2020

In 2020, samples were collected by ECCC from the Slave River at Fitzgerald on five occasions. Sixty-nine parameters were analyzed in each sample.

Under Trigger 1, 23 of the 69 parameters were flagged for further assessment. Of the parameters flagged, calcium, magnesium, nitrate/nitrite, dissolved nitrogen, sulphate, and dissolved uranium revealed statistically significantly higher concentrations than in the past.

Under Trigger 2, 10 of the 69 parameters were flagged for further assessment. Of the 10 parameters flagged, dissolved magnesium was above its historical seasonal maximum value; and total mercury was above its historical overall maximum value. None of the other eight parameters were above their historical seasonal maximum values.

Hay River – January 1 to December 31, 2020

In 2020, samples were collected by ECCC from the Hay River near the Alberta-NWT border on three occasions and 42 parameters were analyzed in each sample.

Under Trigger 1, 17 of the 42 parameters were flagged for further assessment. Of the 17 parameters flagged, nitrate/nitrite revealed statistically significantly higher concentrations in 2020 than in the past.

Under Trigger 2, 10 of the 42 parameters were flagged for further assessment. Of these, other than sodium and total mercury, none of the parameters flagged were higher than their respective historical seasonal maximum values.

2020 Surface Water Quality Assessment

Slave River ▶ Trigger 1

Under the Trigger 1 assessment, calcium, magnesium, nitrate/nitrite, dissolved nitrogen, sulphate, and dissolved uranium were flagged and assessed for trends. Increasing trends for calcium, magnesium, and sulphate were also found in the Peace River. The increasing trend for nitrate/nitrite in the Slave River was not found in either the Peace or Athabasca rivers, which join to form the Slave River. The increasing trend for dissolved nitrogen in the Slave River was found in the Athabasca River but not in the Peace River. And finally, although no trend was found in the Slave River for dissolved uranium, increasing trends were found in both the Peace and Athabasca rivers.

The concentrations and magnitude of the trends are low. However, calcium, magnesium, and sulphate data will be more closely examined to determine if similar trends exist throughout the Peace River basin and when they may have started to form. All of the nitrogen data require a thorough review, as some of the historical data appears to contain errors. The presence of trends in dissolved uranium for the Peace and Athabasca rivers also warrants additional examination. The BMC will work with ECCC staff to review the data and trends for these parameters.

Slave River ▶ Trigger 2

Over the last few years, dissolved magnesium has repeatedly been above Triggers 1 and 2. The BMC has prioritized magnesium for further evaluation. Although magnesium is not toxic or concerning at present, it is important to know why levels are changing.

The mercury triggers are new and were calculated from data collected between 2013 and 2017, where the maximum value of total mercury measured was 48 nanograms per litre (ng/L). Total mercury includes all of the mercury in a particular sample. A dissolved mercury reading is based on a sample that has been filtered prior to analysis so that only the portion that is dissolved is measured. Both measures are important and provide different information.

In July 2020, a comparatively high total mercury level (100 ng/L) was measured due to record high flows and sediment load as a result of the exceedingly high precipitation throughout the region. The high concentration of total mercury is unlikely to cause harm to aquatic ecosystem given that the dissolved mercury, the more bioavailable form of mercury, measured on the same day remained low at only 2.9 ng/L.

Hay River ▶ Trigger 1

Under the Trigger 1 assessment, nitrate/nitrite was flagged and assessed for trends. Similar to the Slave River, an increasing trend was found in the Hay River. The BMC will work with staff from ECCC to review the nitrogen data for the Hay River alongside the nitrogen data for the Slave River.

Hay River ▶ Trigger 2

All flagged parameters, other than dissolved sodium, were within the historical seasonal range of water quality. In October 2020, sodium (20.1 mg/) was slightly above its open-water seasonal maximum value (18.6 mg/L) but much lower than its overall historical value (35.1 mg/L; Figure 12). Therefore, additional study is not suggested.

Figure 12. Sodium concentrations in the Hay River (near the Alberta/NWT Border) (1988-2020)

Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are a complex group of organic substances that are found throughout the environment, including Canadian waters. PAHs enter the environment through a variety of processes such as oil and gas activities, spills, leaks of municipal wastewater, landfill, and urban runoff. They also exist from natural oil seeps, gas deposits, peatlands, and forest fires.

Due to industrial developments in the southern portion of the Mackenzie River basin, the GNWT has been monitoring PAHs in the Slave River since 1991 and in the Hay River since 2011. With a focus on the data collected since 2013, when the ability to spot very low concentrations of PAHs greatly improved, comparisons are made to water quality guidelines for aquatic life, and to two other major Mackenzie River basin transboundary rivers, the Liard and Peel.

Comparisons to Guidelines

To assess levels of PAHs in the rivers, centrifugate (sediment-free) water was collected from the Slave and Hay rivers. Two sets of guidelines were used: the CCME aquatic life guidelines, and the aquatic life criteria developed by the Government of British Columbia. Presently, aquatic life guidelines exist for nine of 16 parent PAHs (Tables 1 and 2). Maximum levels measured in the Slave and Hay River between 2013 and 2020 are below aquatic life guidelines, indicating that there are no risks to aquatic life.

Parameter	BC Criteria (ng/L)	CCME Guidelines (ng/L)	2013-2020		
			n	Average ± SD	Maximum
Acenaphthene	6000	5800	21	0.3 ± 0.3	0.9
Anthracene	4000	12	21	0.3 ± 0.6	2.7
Benz(a)anthracene	100	18	21	0.5 ± 0.8	3.5
Benzo(a)pyrene	10	15	21	0.5 ± 0.9	3.9
Fluoranthene	4000	40	21	1.1 ± 1.3	5.9
Fluorene	12000	3000	21	0.6 ± 0.7	2.9
Naphthalene	1000	1100	21	5.9 ± 6.9	23.5
Phenanthrene	300	400	21	4.1 ± 4.9	21.0
Pyrene	n/a	25	21	1.8 ± 2.3	10.7

Table 1: PAH Concentrations in Centrifugate Water Samples collected from the Slave River (at Fort Smith) between 2013 and 2020 (Lodestar, 2020)

Parameter	BC Criteria (ng/L)	CCME Guidelines (ng/L)	2013-2020		
			n	Average ± SD	Maximum
Acenaphthene	6000	5800	13	0.2 ± 0.1	0.5
Anthracene	4000	12	13	0.1 ± 0.05	0.2
Benz(a)anthracene	100	18	13	0.1 ± 0.04	0.1
Benzo(a)pyrene	10	15	13	0.1 ± 0.04	0.2
Fluoranthene	4000	40	13	0.5 ± 0.4	1.9
Fluorene	12000	3000	13	0.2 ± 0.1	0.4
Naphthalene	1000	1100	13	5.2 ± 3.7	15
Phenanthrene	300	400	13	0.9 ± 0.5	2.5
Pyrene	n/a	25	13	0.6 ± 0.5	2.0

Table 2: PAH Concentrations in Centrifugate Water Samples collected from the Hay River (near the Alberta-NWT Border) between 2013 and 2020 (Lodestar, 2020)

Spatial Variation of PAHs in Transboundary Rivers

The GNWT has been monitoring PAHs in the Slave, Hay, Liard and Peel rivers. Comparing PAH levels between rivers helps provide context to the Slave and Hay River results. Spatial distributions of PAHs in water and suspended sediment are shown using box plots.

The concentrations of average total PAHs vary widely across these four transboundary rivers.

For the assessment of total PAHs in the Slave, Hay, Liard, Peel and transboundary rivers, total PAHs are represented as the sum of 16 individual priority parent PAHs and 54 individual alkyl-substituted PAHs.

The average levels of PAHs in water and suspended sediment are highest in the Peel River, followed by the Slave and Liard rivers, and lowest in the Hay River.

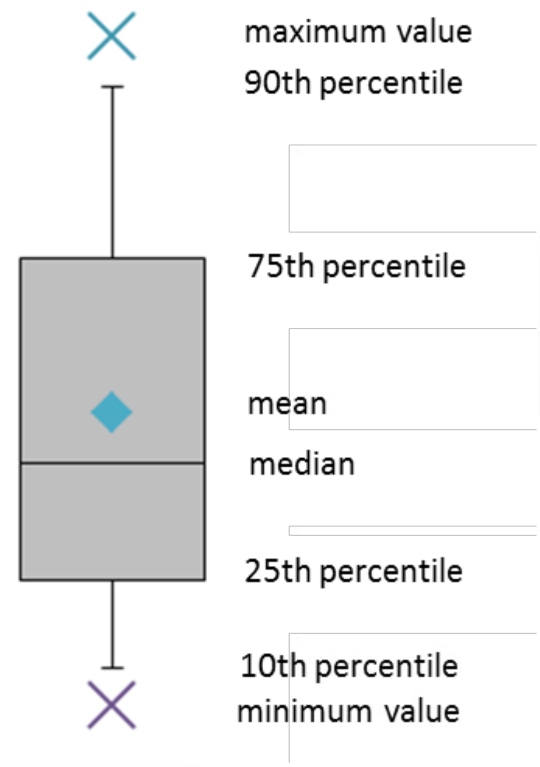
This pattern is likely linked to potential sources of PAHs as well as sediment load. The Peel River Plateau is an area of the basin just upstream of the Peel River sampling location. This area has been dramatically influenced by climate change with enormous amounts of sediment (which can include hydrocarbons) being released from thawing permafrost into receiving water bodies, including the Peel River.

More research is required to understand the differences in PAH concentrations among transboundary rivers, as well as the specific kinds of hydrocarbons present and unique to each river.

In Figures 13 and 14, the Xs show the maximum and minimum values recorded, while the dots show the average value. For example, while the highest value of PAHs in sediment-free water was in a sample from the Slave River, the highest average level was in the Peel River.

About Box Plots

Box plots are useful because they can summarize a lot of data from multiple sources and display the results in a single graph. A box plot can display minimum, maximum, median, mean, and percentile values. They are used to illustrate data variability and compare information between multiple groups.



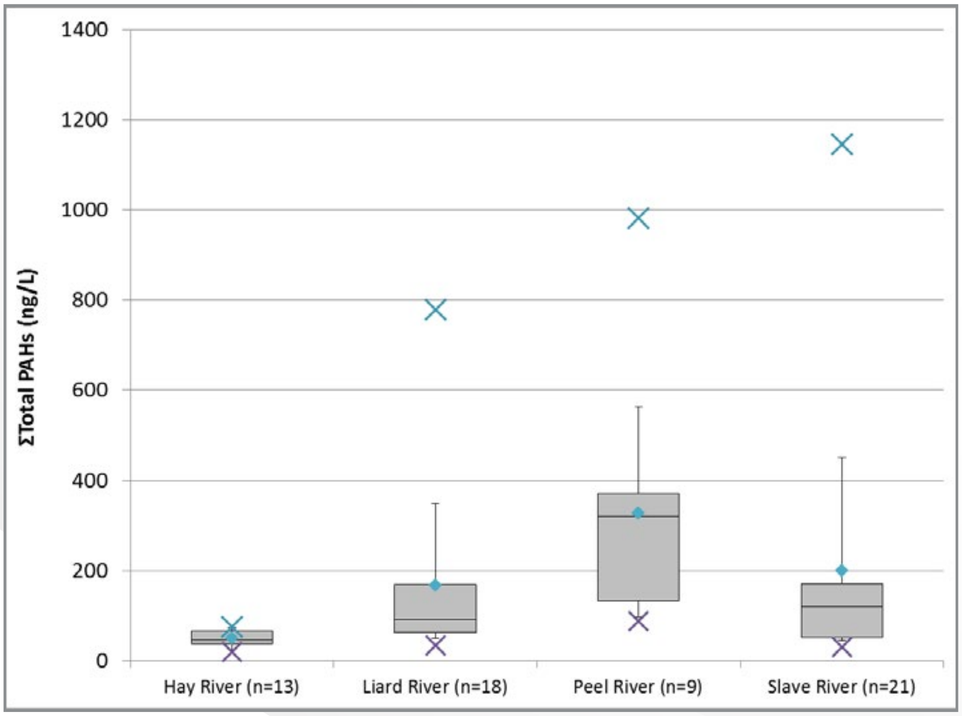


Figure 13: Box plot showing the spatial variation of total PAHs in the transboundary rivers' sediment-free water (2013-2020)

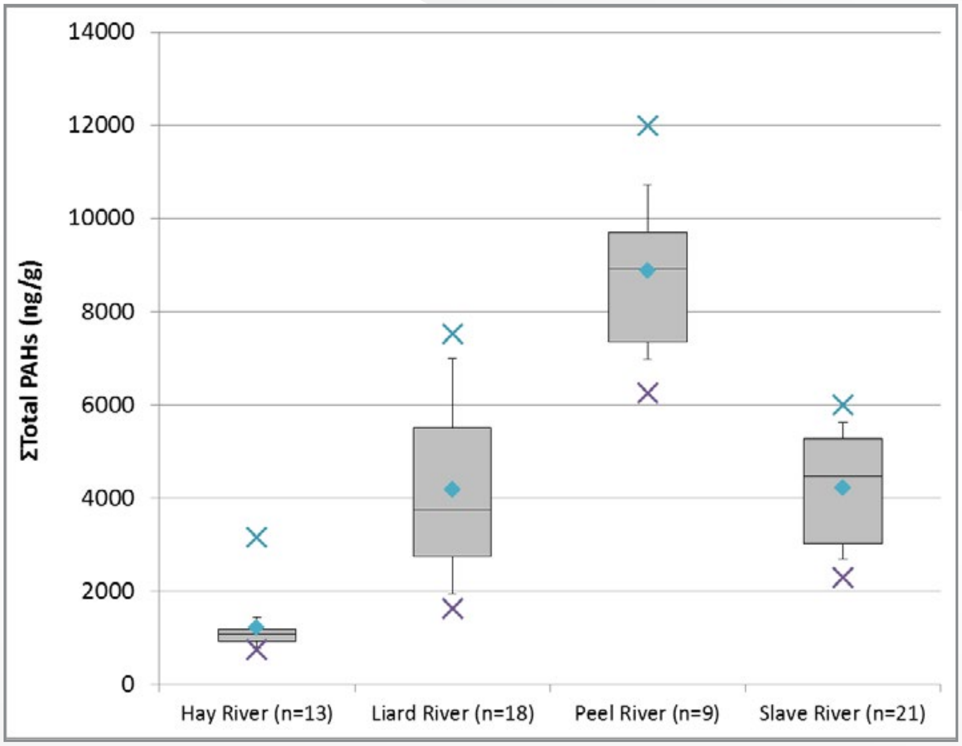


Figure 14: Box plot showing the spatial variation of total PAHs in the transboundary rivers' suspended sediment (2013-2020)

Figure 15. Sampling suspended sediment on the Slave River below Rapids of the Drowned. The centrifuge (pictured here) separates the river water from the suspended sediment in the river.

In addition to water, suspended sediment samples are also collected from the transboundary rivers. Suspended sediment plays a vital role in the cycling of carbon and nutrients and is also an important transport medium for metals and other substances.

Suspended sediment samples are collected using a centrifuge that is deployed in the river for up to 12 hours. Surface water passes through the device at a rate of 6 litre per minute separating the suspended sediment from the water. Following successful collection, both the sediment and sediment-free water samples are sent to the laboratory for the analysis of many different substances, including heavy metals and hydrocarbons. These two types of samples provide a more complete picture of the kinds of substances that are in the river, compared to sampling only the water.

Toxic, Bioaccumulative, and Persistent Substances

Alberta and the NWT are committed to preventing water pollution and are working to identify any substances that are human-made, toxic, bioaccumulative, and persistent. As part of the Transboundary Rivers monitoring program, these types of substances are routinely monitored in the Slave and Hay rivers. These substances do not naturally occur in the water, last a very long time, and build up in living things. Like other provinces in Canada, the monitoring results are shared with Canada's Chemical Management Plan initiative which aims to reduce the risks to human health and the environment that are associated with these chemicals.

These substances fall into three general categories: pesticides, industrial chemicals, and chemical degradation by-products. In 2020, under the GNWT's sampling program, three samples were collected from the Slave River and three from the Hay River. The samples were analyzed for 14 of these kinds of substances[1]. Although some were detected in each river, concentrations were very low and below levels which could be harmful to aquatic life.

Next Steps

Alberta and the NWT will:

1. Review and assess the 2021 water quality data for the Slave and Hay rivers.
2. Work with staff with ECCC to explore data and trends for calcium, magnesium, sulphate, dissolved nitrogen, nitrate/nitrite, and dissolved uranium.
3. Continue to explore hydrocarbons in transboundary rivers to better understand the differences among rivers, as well as the kinds and levels of PAHs unique to each river.

[1] *These substances include aldrin, chlordane, dieldrin, endosulphan, endrin, heptachlor, hexachlorobenzene, hexachlorobutadiene, hexachlorcyclohexane, mirex, DDD, DDE, DDT, total PCBs, pentachlorobenzene and toxaphene.*

Groundwater

The Agreement states that transboundary groundwater between Alberta and the NWT will be protected from pollution and shared equitably. Since groundwater is below the surface, it is more difficult to locate and assess than surface water. Groundwater scientists with the governments of Alberta and the NWT are working to learn more about the location, quality, and quantity of shared groundwater.

Groundwater Monitoring in Alberta

Alberta monitors groundwater in the transboundary region using the provincial Groundwater Observation Well Network (GOWN). The GOWN consists of approximately 300 monitoring wells that were selected to monitor groundwater quality and/or quantity in key aquifers throughout the province. The GOWN was initiated to provide ongoing monitoring of the inventory of available groundwater associated with key water supply aquifers. Additional wells have been added or removed over time based on data needs, logistics, well maintenance and to address specific groundwater concerns as they arise. There are three active GOWN wells at two locations in the transboundary region (Figure 16):

- GOWN #s 387 and 389 at Zama North (Figure 16, west): These observation wells were installed in August 1987 to characterize groundwater conditions, at different depths, in an area of oil and gas development.
- GOWN #381 at Meander River (Figure 16, east): This observation well was installed in August 1987 for the purposes of groundwater exploration, given the expected presence of a buried channel aquifer in this area.

Since installation, these observation wells have been retained in the GOWN because they continue to provide useful information on groundwater conditions for key groundwater-bearing units in the area. There are three inactive GOWN wells located at Meander River (#3092) and Rainbow Lake (#s 3091 and 3094) in the Hay-Kotcho basin ranging in depths from 6 to 8 metres that have not been visited or sampled since the 1990s. Given their shallow depths they are likely representative of shallow, local flow systems that are not relevant for transboundary monitoring, but they could be considered for well remediation and reactivation in the future if there is interest in data from these locations.

Natural groundwater quality will depend on the type of aquifer and can vary from fresh (e.g. in shallow aquifers near where recharge occurs) to more saline than seawater (e.g. in very old aquifers or those originating from marine deposits). Because of this wide range in natural groundwater compositions, there are no groundwater guidelines that can be universally applied to evaluate groundwater quality. Groundwater quality is usually evaluated depending on its intended use (e.g. drinking water, discharge to groundwater dependant ecosystems) or by identifying changes over time. Comparisons of groundwater compositions with Guidelines for Canadian Drinking Water Quality can be useful since drinking water guidelines are a familiar benchmark, and to evaluate whether groundwater could be used for a drinking water source; but it should be emphasized that we do not expect all natural groundwaters to meet the standards for drinking water.

Most parameters in the region are below the criteria in the Guidelines for Canadian Drinking Water Quality. However, results indicated that sodium, chloride, iron, sulphate, manganese, and total dissolved solids were slightly higher than the guidelines. The guidelines for these parameters (except manganese) are not health related. In some regions of Alberta, these parameters tend to be naturally higher in groundwater then surface water.

Alberta will continue to monitor for any changes in groundwater quality and will expand the comparison to include CCME aquatic life guidelines as has been done for surface water quality.

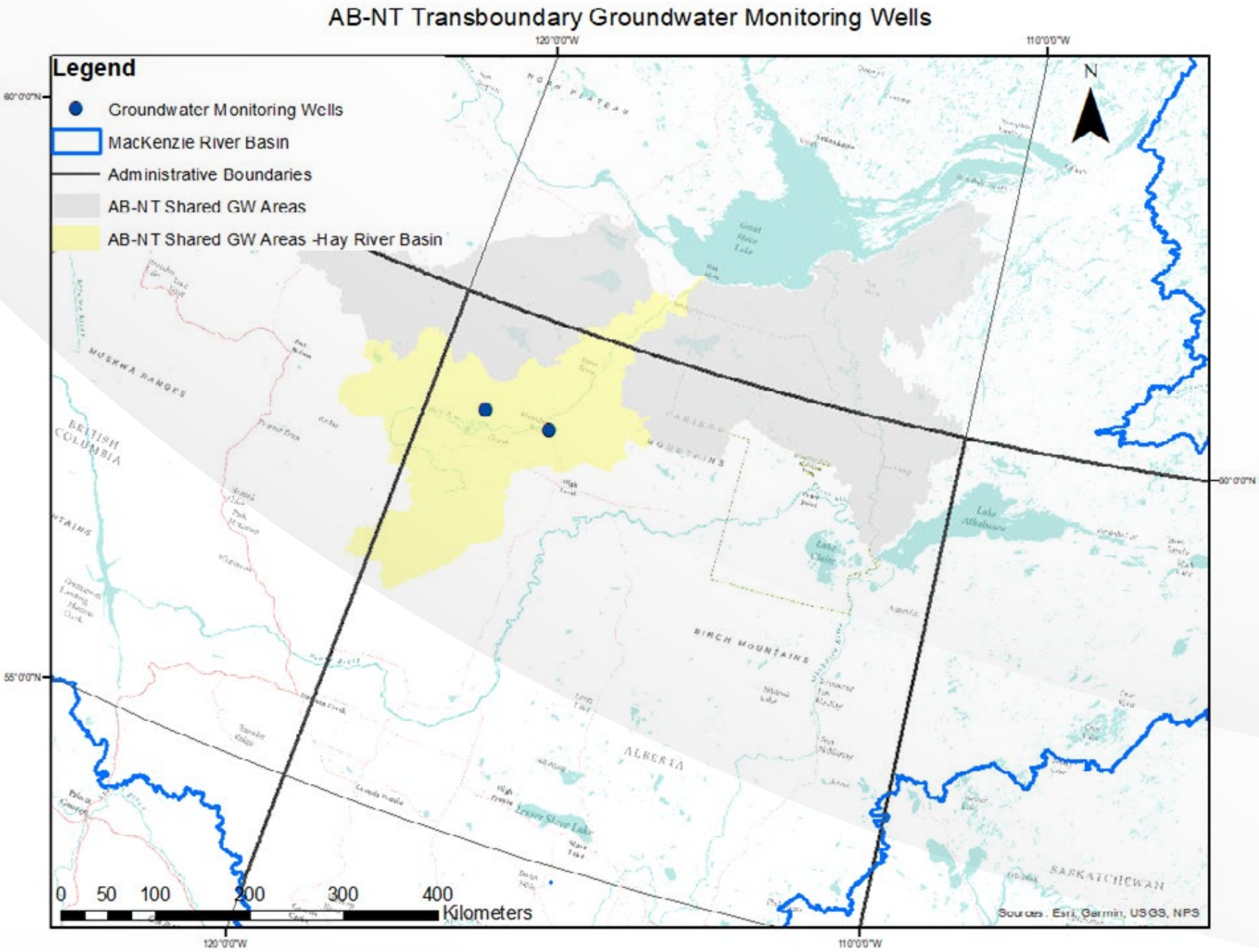


Figure 16: Transboundary Groundwater Monitoring Wells Location

Identifying and Mapping Groundwater Aquifers

Based on the report titled, The State of Subsurface Knowledge to Support Aquifer Mapping Across the Alberta-Northwest Territory Border (June 2020), several activities were recommended for a second phase:

1. Determine potential to map aquifers in the Hay River basin using existing subsurface data.
2. Sample the Hay River during a low flow period for naturally occurring isotopic tracers to gain insight about the hydrogeology of the Hay River Corridor.
3. In the Kakisa-Cameron Hills Area:
    a. Re-evaluate the major buried valleys previously identified and the shallow sediment thickness. This was identified as a priority for future research given the significant difference in sediment thickness that existing mapping has shown. In addition, the depth and shape of the bedrock valley systems is important to identify potential aquifers.
    b. Geological reconnaissance fieldwork to confirm and validate near-surface sediment and bedrock exposures in comparison to geological mapping interpretations.
    c. Investigate feasibility of conducting new geophysical surveys to improve the interpretation of bedrock geological mapping and sediment thickness at the AB-NWT border.
    d. Develop a new map for the top of bedrock using re-interpreted geophysical well logs.

This second phase is expected to be multi-year. Desktop work is underway; however, field activities were delayed due to the COVID-19 pandemic and high flow in the Hay River that prevented sampling.

Permafrost Assessment

A report on the state-of-knowledge of permafrost, permafrost thaw, and associated impacts on water quality and quantity in transboundary basins was completed by researchers from the University of Alberta and Wilfrid Laurier University in 2021. Below is a summary of the gaps in understanding of permafrost and hydrology in transboundary basins, as identified by the report.

Permafrost Characterization and Thaw

There is a good understanding of permafrost for the Taiga Plains ecoregion. It is identified as isolated-sporadic-discontinuous permafrost and is mainly associated with peatlands. The causes of permafrost thaw in the plains are climate change, wildfire, and human disturbances. However, there are major gaps in knowledge of permafrost distribution, ground temperature, and thaw rates in transboundary basins on the Taiga Shield.

Impacts of Thaw on Water Quantity

Permafrost thaw is increasing the interaction between surface water and groundwater. There have been increases in annual flows and winter baseflow in regional rivers.

Groundwater adding to streamflow will likely continue to increase as more permafrost thaws.

However, more research and data are required to better understand these observations and the potential impact of increases in baseflow on things like water chemistry, the development of large sheets of ice on the ground, as well as the impact on infrastructure and public safety.

The impact of permafrost thaw on lakes is unclear. Thaw appears to increase the amount of water that can be stored in the ground in the Taiga Shield, as well as runoff and lake inflow, but further study is required.

There is limited knowledge of ice sheet development and paths, especially in the Taiga Plains.

Additional monitoring of both shallow and deep groundwater systems is needed to better understand changes.

Impacts of Thaw on Water Quality

Permafrost thaw, or other related increases in groundwater interaction with surface water, may change water quality. Parameters such as pH, specific conductance, and the amount of salts, solids, organic carbon, nutrients, metals, and tritium in the water could be affected. Some changes have been observed in transboundary rivers, particularly in the concentrations of salts. More research and data are required to better support and understand these observations.

There are insufficient data on groundwater chemistry. Given the increased surface water–groundwater interaction, further monitoring and assessment is necessary to understand the potential for change to surface waters.

Next Steps

The next steps in understanding the quality, amount, and location of groundwater shared between Alberta and the NWT include:

1. Continuing work to identify and map aquifers in collaboration with the Alberta Geological Survey.
2. Developing a second phase of the permafrost assessment, in collaboration with communities and subject matter experts in climate change.
3. Continuing groundwater monitoring in existing wells in the transboundary region.

Traditional Knowledge

The governments of Alberta and NWT acknowledge the sacredness of water for Indigenous peoples and its importance in sustaining diverse traditional values, practices, and Aboriginal and treaty rights. The Alberta-NWT transboundary water basins have connected Indigenous communities for thousands of years. The BMC recognizes the importance of ongoing dialogue and collaboration with Indigenous communities, as important knowledge holders and traditional users of the waterways, in managing these transboundary waters. Stewardship of the water basins demands the best available knowledge rooted in multiple knowledge systems – scientific, Indigenous, and local. The governments continue to explore meaningful ways to work together with Indigenous communities, their interests and knowledge systems to inform bilateral water management.

Traditional Knowledge Framework

Under the Agreement, a commitment was made to create a Traditional Knowledge Framework to enhance respectful relationships and support meaningful inclusion of traditional and local knowledge in decision making related to Alberta-NWT bilateral water management (see Appendix C2 or the Agreement).

A Traditional Knowledge Working Group (TKWG) was established in 2018 with membership from NWT, Alberta, and Indigenous governments and Indigenous organizations (IGIOs) within the geographic scope of the Agreement. The TKWG members co-created a terms of reference describing the TKWG roles and responsibilities towards the objectives articulated in Appendix C of the Agreement.

The TKWG met regularly in 2020-2021 and worked on exploring processes and tools that support meaningful inclusion and application of traditional knowledge in the implementation of the Agreement. The work of the TKWG is guided by the recommendations provided in the report, A Review of Traditional Knowledge Frameworks for Bilateral Water Agreement Decision Making. In 2020-2021, the TKWG crafted a scope of work to solicit a third party to support the development of a Traditional Knowledge Framework.

Hay River Indigenous Community-Based Monitoring Project

In early June 2020, the BMC approved the addition of an Indigenous Community-based Monitoring Pilot Project for the Hay River Basin (the ICBM Project). The Traditional Knowledge Working Group provides oversight and direction for the project. Through this project, the BMC is committed to co-production and reaffirms the importance of Indigenous, provincial, and territorial governments working collaboratively to prioritize and honour Indigenous Knowledge while respecting cultural practices and Indigenous self-governance.

The ICBM Project aims to explore Indigenous community interests and concerns by co-developing and co-implementing an ICBM Project to address questions about aquatic health in the Hay River basin.

In early February 2021, a letter of invitation to work together on the ICBM Project was sent by the Alberta-NWT TKWG to multiple Indigenous partners including Dene Tha’ First Nation in Alberta, and Kátł’odeeche First Nation, West Point First Nation, and Northwest Territory Métis Nation in the NWT. This letter kickstarted a dialogue to affirm interest and explore opportunities for project co-creation.

During the 2020-21 fiscal year, Indigenous governments and Indigenous organizations and their communities experienced significant negative health challenges as a result of the COVID-19 pandemic. These challenges reduced the communities' capacities to participate in planned ICBM Project activities.

Next Steps

The BMC is committed to drafting a Traditional Knowledge Framework that honours knowledge holders and offers respectful pathways of braiding knowledge systems for the implementation of the Agreement. A contractor will be solicited to assist with this initiative.

The BMC will continue to advance the ICBM project and start building collaborative partnerships among the GOA, GNWT, and Indigenous governments and Indigenous organizations.

Conclusion

The purpose of the Alberta-NWT Bilateral Water Management Agreement is for the two jurisdictions to work collaboratively to protect the shared waters. The Bilateral Management Committee oversees implementation of the Agreement. Scientists from both jurisdictions work together to monitor and assess the information related to transboundary surface and groundwater quantity and quality to ensure that it is sufficient to support all the living things that depend upon it. Projects to advance learning on climate change impacts and to develop a traditional knowledge framework to support inclusion and application of traditional knowledge in the implementation of the Agreement is advancing.

Over the past year, the effort and activities undertaken for the successful implementation of the Alberta-NWT Bilateral Water Management Agreement demonstrate that the intent of the Agreement is being fulfilled.

Acknowledgements

A special thank you to Kátł'odeeche First Nation and members of the Slave River and Delta Partnership (Smith's Landing First Nation, Fort Smith Métis Council, Fort Resolution Métis Government Council, Northwest Territory Métis Nation, Salt River First Nation, and Deninu Kųę́ First Nation) for their assistance with the benthic macroinvertebrates, fish and transboundary water quality monitoring programs. We would also like to thank Environmental and Climate Change Canada for closely working with the BMC to overcome the challenges associated with the COVID-19 pandemic and finding solutions to minimize the gaps in water quality and water quantity monitoring.

Appendix A – Members of the Bilateral Management Committee

April 1, 2020 to March 31, 2021

BMC Members

Northwest Territories

John MacDonald
Assistant Deputy Minister
Environment and Climate Change, Government of the Northwest Territories

Tim Heron
Lands and Resources Manager
Lands and Resources, Northwest Territory Métis Nation
Representing the NWT Water Strategy Indigenous Steering Committee

Nathen Richea
Director, Water Management and Monitoring
Environment and Climate Change, Government of the Northwest Territories

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Stephanie Clarke
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Andrea Czarnecki
Aquatic Quality Scientist

Chris Cunada
Coordinator, Aquatic Research and Monitoring

Isabelle de Grandpre
Hydrogeologist

Annie Levasseur
Water Stewardship Advisor

Alberta

Guy Bayegnak
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Appendix B – Report Links

Alberta-NWT Bilateral Water Management Agreement. 2015
https://www.enr.gov.nt.ca/sites/enr/files/ab-nwt_water_management_agreement_final_signed_2.pdf

Appendices to the Alberta-NWT Bilateral Water Management Agreement. 2015
https://www.enr.gov.nt.ca/sites/enr/files/bwma_ab-nt_appendices_2015-02-24_no_watermark.pdf

Alberta-NWT Transboundary Water Quality Technical Report, 2020
https://www.gov.nt.ca/ecc/en/2020-alberta-nwt-transboundary-water-quality-technical-report

Alberta-NWT Transboundary Water Quantity Technical Report, 2020
https://www.gov.nt.ca/ecc/en/2020-alberta-nwt-transboundary-water-quantity-technical-report

Benthic Macroinvertebrate Monitoring Report, 2020
https://www.gov.nt.ca/ecc/sites/ecc/files/resources/benthic_monitoring_plan_assessment_report_2020.pdf

State of Subsurface Knowledge to Support Aquifer Mapping Across the Alberta–Northwest Territories Border, 2020
https://static.ags.aer.ca/files/document/OFR/OFR_2020_04.pdf

A Review of Traditional Knowledge Frameworks for Bilateral Water Agreement Decision Making, 2020
https://www.gov.nt.ca/ecc/sites/ecc/files/resources/review_of_tk_frameworks_for_bwma_decision_making_barnaby_consulting_march_2020.pdf