Yukon Water Forum - Workshop Report

September 25-26, 2017

Whitehorse and Haines Junction

Yukon Government

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Cambio

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This report provides a summary of proceedings and is not intended to represent commitments or specific actions by any of the participating parties.

We would like to acknowledge the joint efforts of the members of the Strategic Water Initiatives Group, consisting of the Water Resources Branch, Community Services, Environmental Health, Energy, Mines and Resources, Economic Development and the Yukon Water Board Secretariat, for planning and organizing a successful Water Forum.

We also thank Roger Brown and Nadia Joe and their colleagues of the Champagne and Aishihik First Nations for their efforts in organizing day 2 of the Water Forum and welcoming the participants in beautiful Haines Junction.

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1. CONTEXT - BRINGING TOGETHER DIVERSE PERSPECTIVES

The third annual Yukon Water Forum was held in September of 2017 in Whitehorse and Haines Junction, and was designed in partnership between Yukon government (YG) and Champagne & Aishihik First Nations (CAFN). At the previous forum in 2016, participants indicated they would like to see some focus on the communities outside Whitehorse.

This annual forum is one of the commitments under the Yukon Water Strategy (2014-2018), and provides a unique opportunity to gather people together from all areas of water management. This includes many agencies, both public and private - YG, federal and First Nations governments, municipalities, NGOs, industry, consulting companies and academic institutions. The forum is a place for these parties to explore their roles in water management, and to bring perspectives together - systems operators, regulators, assessors, planners & policy makers, developers, and researchers.

Forum topics and approaches were developed in collaboration between CAFN and YG Water Resources Branch, with input from YG's Strategic Water Initiatives Group (SWIG). This report summarizes the key points and captures the main outcomes for each topic covered. Copies of presentations delivered at the forum are available by contacting Yukon Water Resources Branch.

Water Strategy - Selected Implementation Highlights

Heather Jirousek, Director, YG Water Resources, shared some key achievements and initiatives related to the priorities in the Yukon Water Strategy - more complete implementation details are available at yukonwater.ca/water-and-you/yukon-water-strategy and in Appendix 2 (page 26) of this document.

Note that all presentations from the 2017 Water Forum are available through the Yukon government Water Resources Branch: water.resources@gov.yk.ca or 867-667-3171

2. CO-MANAGING WATER IN CAFN TERRITORY

"Co-Managing" Water: What Does it Mean?

As a co-host of the 2017 Water Forum, CAFN set the stage for the Haines Junction portion by discussing what "co-management" of water means for them. Roger Brown, Lands Manager for CAFN, reviewed the key elements of the CAFN Final Agreement and Self-Government Agreement that provide the foundation for co-management by creating co-governance relationships and structures for Yukon lands (summarized in brief here):

- On Settlement Lands (Category A & B), CAFN has law-making authority and jurisdiction (saving sub-surface on Category B and oil & gas which is not addressed)
- Treaty rights on non-Settlement Land related to susbsistence hunting and fishing, forest resources, heritage resources
- Through Chapter 14, rights of traditional use and the right to have water running through or adjacent to Settlement Lands substantially unaltered in terms of quality and rate of flow
- Rights to a collaborative role in management discussions that affect non-Settlement Lands and CAFN interests therein. These apply to treaty rights in general, as well as to specifically designated sites such as Special Management Areas, Heritage Sites, parks, etc.
- Partnership roles in land use planning, development assessment, and fish & wildlife management through various boards, committees, and commissions

In 2012, CAFN started working on its own water strategy for its territory, entitled "*Chu Äyí Ätl'et - The Water in Me*". This process involved community members, Elders and leaders in discussion about what is important about water to CAFN, and what should be done in stewardship of water. The document provides the basis for CAFN's relations with other governments and stakeholders in managing water together.

CAFN's land claims agreements and water strategy affirm the commitment that CAFN people will be empowered to share their traditional knowledge to guide management processes and decisions, alongside the scientific knowledge of technicians and researchers.

Relicensing of the Aishihik Generating Station

This facility (commonly called the "Aishihik dam") was constructed in the mid-1970s, and substantially altered the flow and levels of Otter Lake and Otter Pond - see figure 1. Review and approval of the water licence occurred in 2002, and is once again under review.

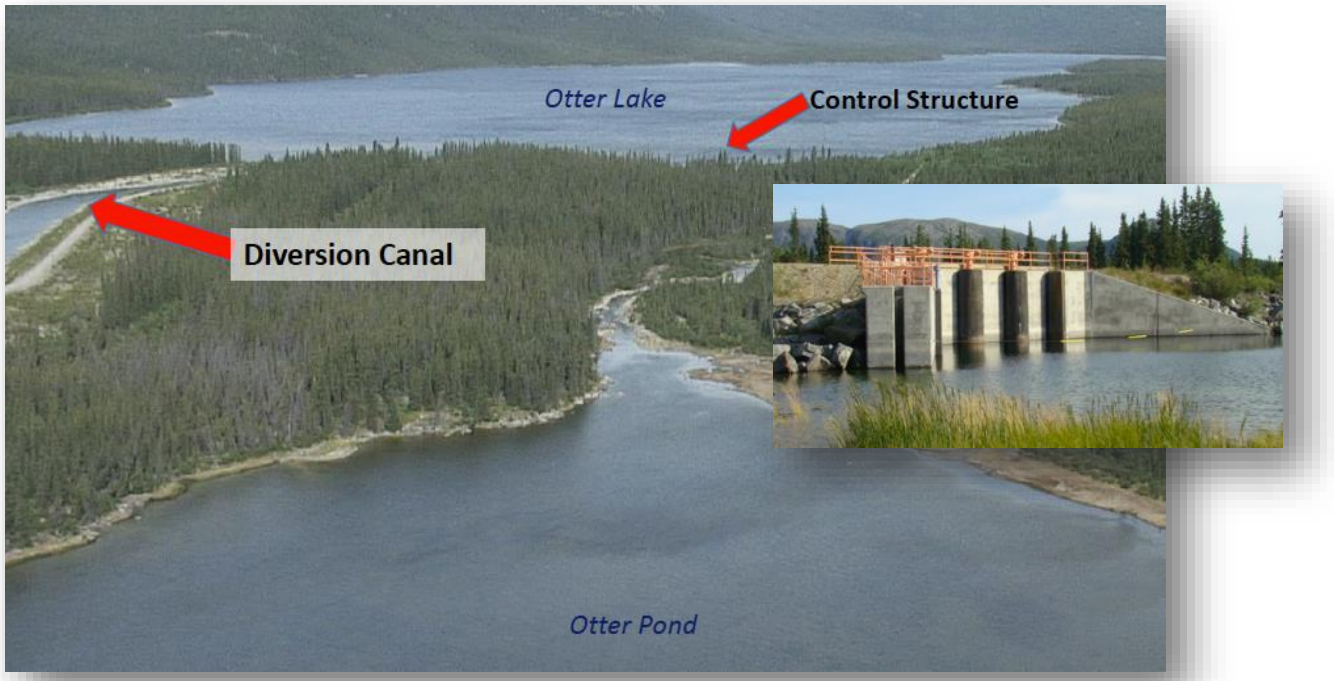


Figure 1: Overview of Aishihik Generating Station features

In contrast with the initial construction and first re-licensing, the current process includes CAFN as a full partner together with Yukon Energy Corporation (YEC). Under a protocol agreement for the project, CAFN and YEC co-chair an overall steering committee, as well as a more technical Aishihik Advisory Committee that includes a broad range of stakeholders. Further, CAFN hosts its own Community Advisory Committee for its citizens to provide input into the process.

The re-licensing process includes a significant study of traditional knowledge about the area, and effects on cultural and land use values. This study has been designed by CAFN with Indigenous research methods in mind - community engagement, honouring of their contribution and generosity, culturally appropriate research principles, and use of ceremony. CAFN citizen and consultant Nadia Joe has played a lead role in this study, and explained its objectives to the forum:

- document the range of effects experienced by CAFN citizens because of the AGS facility
- establish a historic baseline concerning CAFN's cultural use of the area
- identify CAFN's social and cultural values in the area
- determine culturally appropriate indicators of change and significance
- document traditional governance practices and protocols for care and use of the area
- articulate a vision of the future of the area for CAFN citizens

The study included 43 people who participated in a combination of oral history interviews and map biographies. Data validation work has been completed, and analysis is currently underway.

While the whole re-licensing process is a work in progress, some **key lessons learned** so far from CAFN's perspective include:

- Use the **best tools** available to the community - traditional knowledge and science
- Ensure that the **project governance structure** supports equity among the partners
- Don't institutionalize **failure** - challenges are a natural part of the process
- Don't expect colonial institutions to reflect **Indigenous values**
- Take time to reflect on the **big picture**
- **Relationships** and **trust** are the foundation

Collaboration, Partnership, and Knowledge - Panel Discussion

Following CAFN's presentations, a panel discussion was held in a "fishbowl" format in order to further discuss important questions from a variety of perspectives. Participating in the panel were: Heather Jirousek (Director, YG Water Resources), Roger Brown and Nadia Joe (CAFN Lands & Resources), Goran Sreckovic (YEC), Linaya Workman (Parks Canada), Michael Schmidt (Kluane Research Station), and Dr. Amelie Janin (YG Water Resources).

Q: *What contributes towards effective partnerships in water projects and research? What can undermine them?*

- Clear mandate and buy-in from the start. The partnership starts day one of the project - get people in early
- Clear lines of communication, respectful, consistent people, and balance the capacity of those at the table
- The relationship will have ups and downs: change in people along the way, make sure things are handed off well
- Allow enough time: if you are crunched, partnerships will fail
- Trust is the foundation. The relationship is what will or will not allow success
- Understand each other's limitations in the partnership
- Recognize that different parties have different needs and agendas
- Identify the values of the partners, and partnership, and then determine the goals
- Every partner needs to be accountable
- Keep the long-term objective in mind

Q: *What is gained by including traditional knowledge and scientific perspectives, and what is challenging?*

- TK is generational and has a long time frame. Science does not but adds different value. They need to work together.
- As a scientist, I realized we always put things into boxes. I learned from TK to look at the big picture and meaning to a community.
- Science research projects are usually 2-4 years, whereas TK is always being developed.
- Value in different perspectives - e.g. polar bears in Hudson Bay. Bears were congregating in certain areas because of changes to sea ice, and local communities thought the bear population was fine, where landscape-level survey showed they were actually in decline. It is important to understand there are strengths and weaknesses of both ways of knowing.
- I like the idea that science elevates TK. It is about two ways of seeing. We saw this in the MacKenzie Basin Report.
- There isn't always consistency on what is and what is not considered TK.
- The key is when we use both sources of knowledge there needs to be common understanding and respect for both. Maybe you get conflicting information and a specific question, but it all helps explain why things are the way they are at the big picture. It also ties into how people tie into and respect the land.

- We live in a world of western technology. But we know some things are missing, and I do feel that TK can help glue all the narrowly focussed parts of western knowledge. Maybe it's a way of tying the past, present and future together.

Q: *Where might the interests of various players (YG, YFNs, Feds, municipalities, academics) clash? How can this be navigated?*

- We need to recognize that some players are at the table because of interests, while others are there because of mandate.
- This is not limited to water. It comes up where we focus on resources and what we research. Historically, research of the community does not come back to the community. That is changing, but still needs work. We need to modernize the research funding models. Canadian Mountain Network is pushing this, so that funding can also be at the community level and not necessarily be led by academics.
- We also need to recognize that some have higher levels of rights than others - e.g. treaty rights are constitutionally protected, whereas not all stakeholder interests are.
- We need co-management structures, in their truest form. We don't currently have that in the Yukon, as the Minister has the final say. CAFN has a true co-management with B.C. Parks in Tatshenshini Park. Let's not use legislation as an excuse to prevent building these structures.

Observer Questions:

Q: *What is the long term effect of engaging FNs in projects early-on?*

- CAFN has developed guidelines for proponents. We ask people to learn about us early. Some have engaged well, and sometimes we have capacity issues. But it has generally worked well. On the other hand, another company claimed they had engaged the FN when that had not happened. Trust is the foundation.

- Outside research bodies need to invest time and resources into the early stage setting, and doing it right in the first place.

Q: *How do FNs share TK without telling people where the great fishing holes are?*

- The end product might not show a specific site, but a general area on a map.

- There has to be an understanding of what information will and will not be shared / publicized. You need to offer the opportunity for confidentiality.

- You need to be clear on the motive and intended use of the research. Sometimes there is value in developing permission forms and giving people choice how the data is to be used.

3. SOURCE WATER PROTECTION

Protecting Yukoners' source water is a key objective that cuts across many priority areas of the Yukon Water Strategy - groundwater research and management, information sharing, program improvement, and planning for future needs. This portion of the forum included a presentation about a recently completed data compilation project, followed by breakout discussions about forum participants' roles in source water protection.

Source Water Data Compilation Project

Tetra Tech was contracted by YG Community Services to compile information on public drinking water systems. In total, 30 owners/operators were contacted, and Tetra Tech reviewed information for 88 water systems, including 20 Large Public Drinking Water Systems (LPDWS) and other gov't/small public systems.

An associated product is a GIS database that includes key information about each of the drinking water systems reviewed:

- Hydrogeology/Hydrology
- Water Source Structures (wells/water intake structures)
- Source Water Quality
- Water Treatment and Distribution
- Source Water Protection Planning

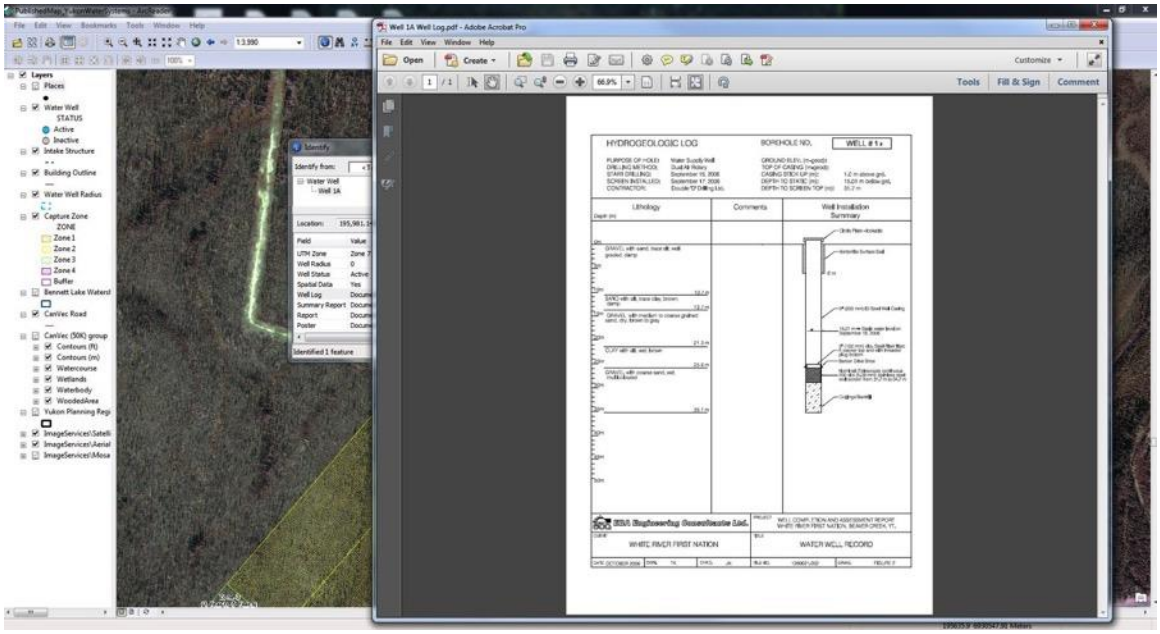


Figure 2: Screenshot of GIS database showing a water well log for one of the water systems reviewed

The data compilation project provides important information baseline, and will be made available by YG Community Services to Yukon water managers and stakeholders once finalized. On the whole:

- Source Water Protection Plans (SWPPs) exist for 15 drinking water systems in Yukon
- Half of the large systems (LPDWS) do not have plans
- 8 of 9 YFN systems that are LPDWS have SWPPs in place
- More than 90% of Yukon population served by community water systems have some form of SWPP in place

In addition, by providing a comprehensive view of Yukon's major water systems, the project can also point to some areas for further attention:

- *Well Guidelines & Regulations* - requirements for well construction, testing, and abandonment for all wells to achieve a consistent first barrier in the source water protection multi barrier approach. (*Note: Guidelines are currently in progress as a Yukon Water Strategy initiative*)

- *Aquifer and Vulnerability Mapping* - to provide valuable information for development of source water protection plans

- *Mandatory Well Logs & Reporting* – to improve the data set for water wells in Yukon and better enable aquifer mapping and vulnerability mapping, and ultimately SWPPs

- *Source Water Protection Standards* – new for standardized approach to SWPSs and clear direction depending on the type of systems or population served

Breakout Discussions - Roles, Opportunities, Priorities

This breakout session asked participants to think about their roles and priorities in source water protection, and to consider those of others. People were organized according to the "sector" in which they work:

- Water systems operators
- Regulators & assessors
- Planners & policy makers
- Industry and land developers
- Researchers & academics

Complete notes from these breakout tables can be found in Appendix 2. Key points raised can be summarized as follows:

- **Consistency** - There are currently no mandated standards for SWPPs in Yukon, nor for data collection requirements. Some of this may be achieved through legislation or regulation, and some through the development of guidelines and outreach with the players involved.

- **Communication** - With the multi-barrier approach to source water protection, there are many players with a variety of roles, and it is critical that they are all on the same page. Further, the public has a large role and is ultimately the key stakeholder ("we are all water users"), and needs a good knowledge of basic facts, key issues, and best practices.
- **Resources & Training -** Compiling water data and using it well require both of these elements. This can include research at an academic level, monitoring at a local level, and use of data for management across all levels of government.

Benton Foster, Manager of Public Health Programs, YG Health & Social Services, summarized the current situation in regards to source water protection in Yukon, and indicated some areas of future opportunities.

There are many human activities that affect our source water, and there is currently no standardized approach for source water protection in the Yukon. Potential next steps include:

- Standardized plans and thorough risk identification
- Implementation plans
- Better baseline data (e.g. aquifer mapping)
- Regulatory tools

4. WATER PROJECTS & INITIATIVES - "Water Works Café"

For this portion of the forum, participants were invited to visit several café-style tables to learn about various water projects and initiatives happening around Yukon. Brief summaries of the table topics and key discussion points are provided here. Participants were invited to leave written comments and questions at each of the tables, which can be found in Appendix 3.

Canada Mountain Network

The Canadian Mountain Network (CMN) is a voluntary alliance of partners from universities, governments, Indigenous communities, and businesses dedicated to the sustainability of mountain environments and communities across the country and around the world. Its administrative centre is hosted at the University of Alberta in the Faculty of Science. Dr. Aynslie Ogden, Senior Science Advisor for YG, hosted this table and discussed CMN's focus on helping researchers determine the key needs from communities, making research more accessible and available, and continuing to incorporate TK into research.

Ta'an Kwäch'än Council Water Monitoring

Deb Fulmer, Fish & Wildlife Coordinator for TKC, described their water monitoring program and demonstrated the devices used. TKC now has 10 years of temperature data for certain streams, and is monitoring the correlation between water temperature and quality. TKC is seeing changes, and wants to dig deeper into causes. Many visitors to this table expressed interest in partnering with TKC, including industry and other First Nations.

Northern Climate ExChange

Brian Horton, Research Programs Coordinator of NCE, hosted this table, and talked about how they contribute to study of climate change in Yukon by (1) promoting and conducting research on impacts and adaptations (2) coordinating the exchange of scientific and local knowledge and expertise, and (3) providing decision-making support, policy alternatives, and climate change

education (see their website for further info). Discussion focused on communication and diverse perspectives; there is definitely a need for NCE to do more outreach with more communities and explore perspectives on changes in our environment. More than science, getting TK and community perspectives into the conversation will lead to a better conversation.

Community Water Monitoring

Heather Jirousek (Director, YG Water Resources) and Ellorie McKnight (PhD student, University of Alberta) co-hosted this table to discuss community monitoring in general (what does it mean?) and presented current community monitoring projects underway in the Water Resources Branch. Discussion focused on sharing information about existing community projects in Yukon and available funding opportunities for community research and monitoring projects. The challenges of compatible/standardized data and how to incorporate data management/use (not just data collection) into community research and monitoring were also explored.

Yukon Groundwater Program

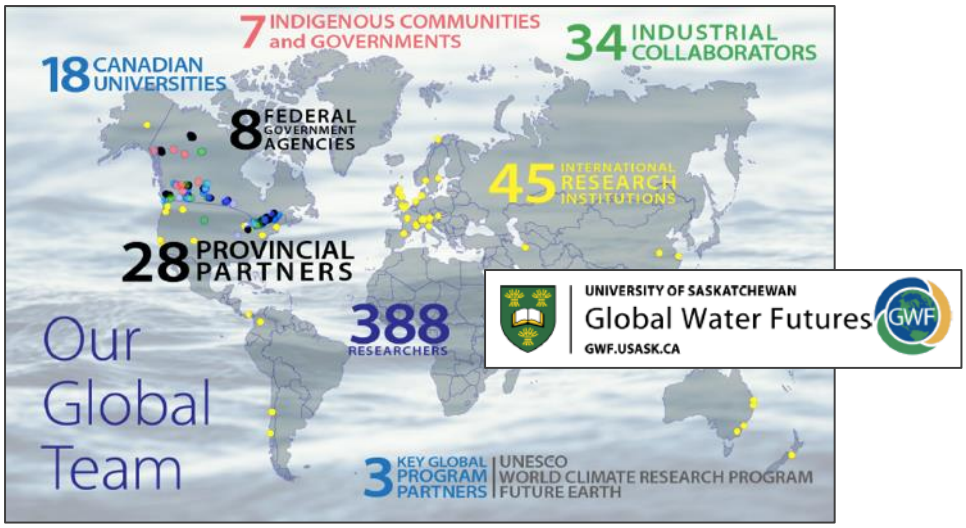
John Miller, Senior Scientist Groundwater, YG Water Resources, hosted this table to discuss the status of YG's groundwater research and monitoring work. Discussion focused on how to expand the existing dataset, and how to make that information accessible to those who should have it - public, managers, developers, and regulators.

Well Construction Guidelines

Dianna Hayden, Environmental Health Officer with YG, reported on recent development of these guidelines. She indicated that good well quality depends to a high degree on personal responsibility of drillers and owners. Visitors to this table were surprised to learn about the lack of legal and regulatory tools available to YG in this area. There is no authority to compel well data logs, and at present no means to regulate drillers. There is a discrepancy between Yukon and southern jurisdictions in this regard.

5. GLOBAL WATER FUTURES

Dr. John Pomeroy (University of Saskatchewan) and Dr. Sean Carey (McMaster University) presented on this worldwide program, which is hosted by the University of Saskatchewan and includes hundreds of researchers and partners (see picture for details).



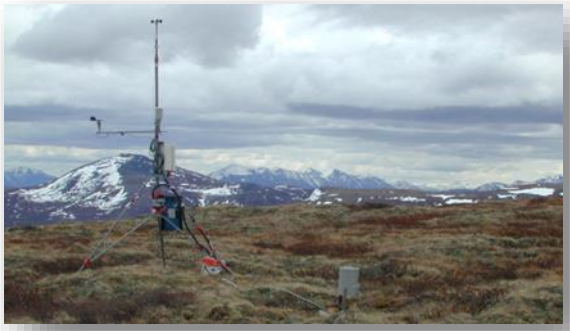
The overall intention of the program is to improve the ability to predict water futures, adapt to change, manage risks and improve disaster warning.

Global Water Futures has three main pillars:

1. *Diagnosing and predicting change* - by measuring hydrometeorology & climate change, hydrology & ecology, water quality & aquatic ecosystems, and human-water systems
2. *Developing big data and decision support systems* - through data sensing, modeling and cloud-based computing, user engagement and info sharing
3. *Designing user solutions* - through specific regional projects

Yukon is involved in a major regional project called Mountain Water Futures, which is intended to:

- Improve our ability to predict future hydrological regimes, and plan appropriate adaptations in Canada's western mountains.
- Provide users and stakeholders with better information, tools and techniques to manage uncertain water futures in Canada's western mountains.



One of the key components of this project is the research and monitoring in the Wolf Creek basin near Whitehorse, which has been ongoing for over 25 years now.

More information on Global Water Futures is available at www.gwf.usask.ca

6. CLIMATE IMPACTS ON RIVER FLOW AND ICE

YG Hydrologist Ric Janowicz presented data and conclusions about how the warming climate is affecting streamflow levels and seasonal ice in Yukon Rivers. Drawing on several decades of data, some key conclusions include:

River Streamflow

- Earlier onset of snowmelt
- Quicker, higher runoff period (see Figure 3)
- Higher minimum streamflow levels during winter
- Higher peak flows due to melting glaciers

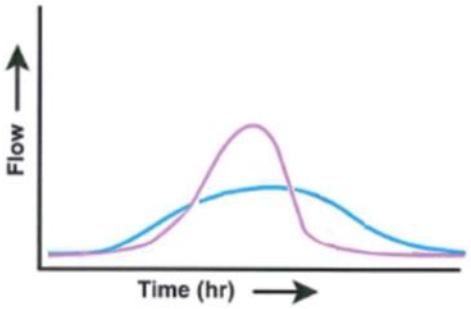


Figure 3: Peak Seasonal River Flows in Yukon - Past (Blue) & Present (Purple)

River Ice

- Later freeze-up (about 30 days in Whitehorse - see figure 4)
- Earlier river ice break-up; for the Yukon River at Dawson, about 6 days earlier since 1920s; for the Porcupine River at Old Crow, about 8 days earlier since the 1960s
- Overlapping river ice breakup and spring snowmelt freshet
- More severe break-up events

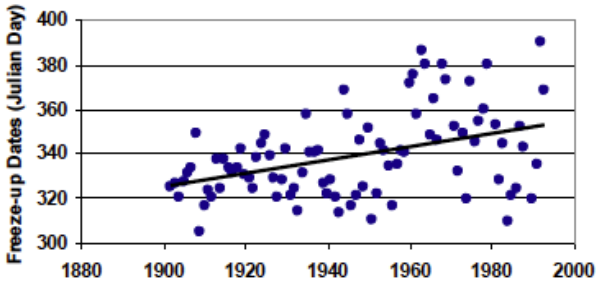


Figure 4: Yukon River Ice Freeze-Up at Whitehorse

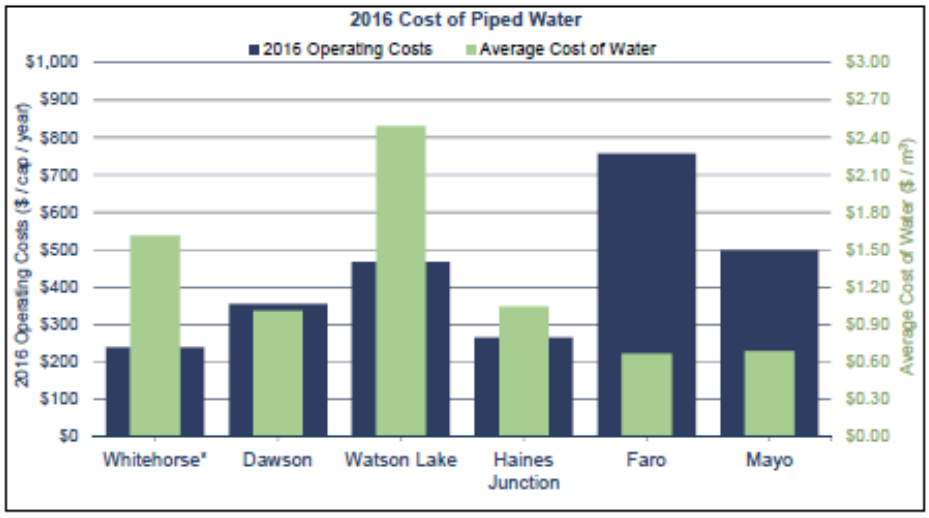

Klondike River ice jam near Dawson, 2003

7. COST OF DRINKING WATER STUDY

One of the key components of the *Yukon Water Strategy: Water for Nature, Water for People* is to "Maintain/Improve Access to Safe Drinking Water". To this end, YG Community Services contracted Morrison Hershfield to do a study on the cost of providing drinking water in the Yukon (including piped systems, delivery and self-serve fill stations). This is essential baseline information to guide future decisions and to ensure that our drinking water systems are sustainable.

Usage Levels and Delivery Costs

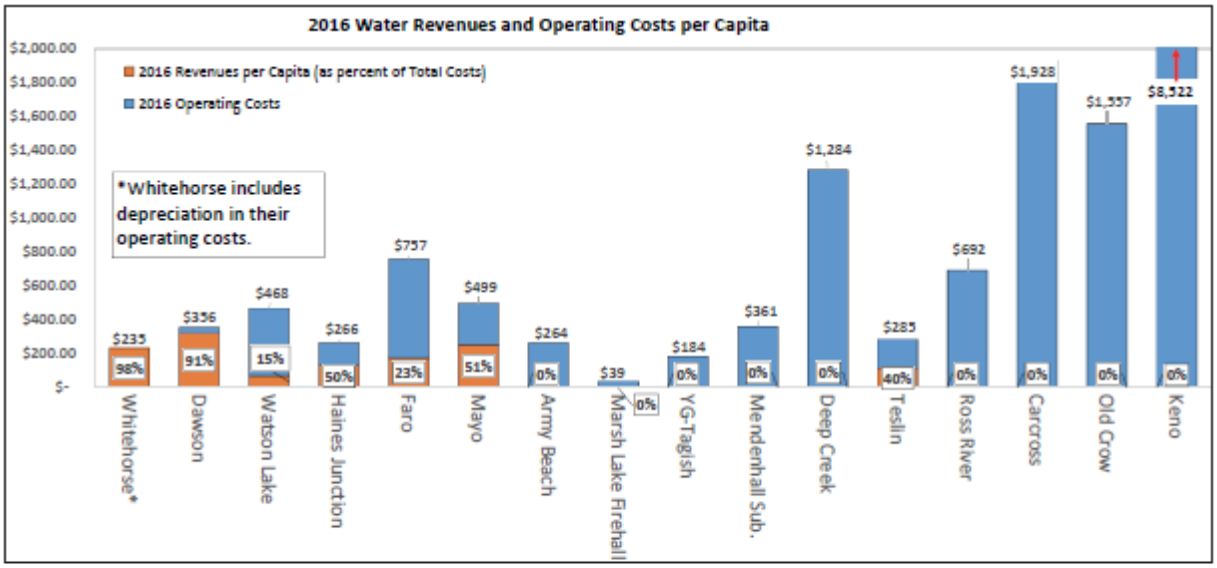
The graph below shows the average operating costs of piped water for 2016 in six systems surveyed (blue bars) and the average cost of $1m^3$ of water in those systems (green bars). Overall, the results show a large variation among communities.



This information was used to compare all of the systems, which were grouped based on the type of water servicing.

Costs of Operating Water Systems

The table below shows the 2016 per capita cost to run each of the water systems surveyed (blue bars). It also shows the revenues for each system through utilities fees (orange bars - for those that have them) as a percentage of overall costs.



The costs presented above do not consider grant funding received by all communities in Yukon to replace aging water infrastructure. The City of Whitehorse is leading by example by including depreciation as part of their operating costs. All communities will develop a better understanding of the true costs of providing water through the development of their asset management programs, and should consider including the cost of replacing their infrastructure as an operating cost.

Study Limits and Next Steps

Several important limitations must be considered when interpreting the study results, and these point towards some potential next steps:

- The costs shown include only O&M, and do NOT include capital costs to build systems or debt servicing costs.
- Only one year's worth of data was available for some systems, which may not accurately reflect the average usage and costs.
- Sometimes cost info on drinking water and wastewater was grouped together in financial statements, and the contractor needed to make some educated assumptions.

The contractor identified several general conclusions and next steps coming from the study:

1. Develop standard water use/cost tracking methods to assist with sustainable water planning.

2. Develop better understanding of the infrastructure replacement costs as part of future water use/cost analysis.
3. Communicate information on the cost of drinking water to the public in accessible ways.
4. Further educate Yukoners about the efforts that go into providing clean water.
5. Support community discussions about the value of drinking water.

Village of Haines Junction Water Conservation

Dave Hatherley, Public Works Foreman, gave an overview of the situation and efforts of the municipal government. There are currently over 12km of water mains and ~300 service connections in the village. Most of the infrastructure was built in the 1970s, with several major additions and upgrades since 2010 (arsenic filtration, new reservoir, wellhead protection, etc.). Haines Junction residents currently use water at a ~30% higher rate than Whitehorse residents, and over triple the national average. To address this, the VoHJ is looking at measures such as:

- funding opportunities for property owners to connect to the recirculation system as a part of conservation efforts.
- undertaking an assessment of all municipal buildings for conservation initiatives.
- updating standards to incorporate new water recirculating lines to properties.
- using new reporting software to assist with a water loss control plan.

Kluane National Park - Monitoring Wastewater Effects

Carmen Wong, Ecologist Team Leader, presented on efforts to monitor the downstream effects of wastewater discharge from Haines Junction's sewage lagoons after it is treated. This work is being done in partnership with the VoHJ and CAFN, and started with a research project with Western and Waterloo Universities to focus on three key questions:

- Where does the discharge go?
- What is the level of pharmaceuticals and personal health care products in the effluent?
- How to monitor the health of the Dezadeash River and wetlands?

Initial results show fairly high pH levels (9.4) in the wastewater effluent immediately after release from the lagoons, with levels dropping to around 7.5 as the water travels through the Dezadeash/Alsek tributary system. So the water system seems to be having a filter effect.

Figure 5: Downstream change in pH levels of Haines Junction wastewater discharge

Monitoring Lhù'ààn Mãn (Kluane Lake)

Lhù'ààn Mãn is of critical importance to the people of the Kluane region as it has a major role in the overall ecology of the area. Starting in 2013, Kluane Fist Nation (KFN) and the Dän Keyi Renewable Resource Council (DKRRC) met with researchers from the University of Alberta to identify common research interests. KFN and the DKRRC were particularly concerned about understanding changes in lake levels, sediment accumulation, flooding and large rain events, and contaminants in water and fish. The research was also intended to help understand and address effects of industrial activities (e.g. mining, hydroelectric diversion) on the lake and on fish spawning habitat.

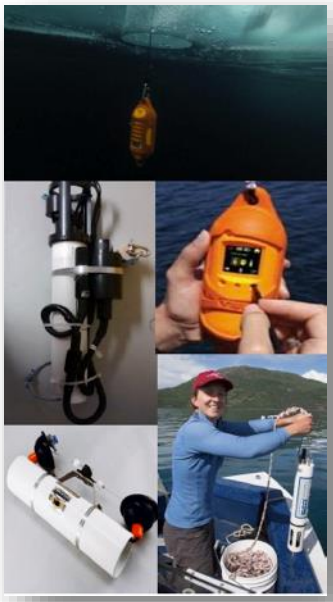


Figure 6: Field work monitoring water temperature and conductivity on Lhù'ààn Män.

This partnership led to a comprehensive baseline study of the water properties at Lhù'ààn Män in 2015/16, and has continued with an ongoing water temperature and conductivity monitoring program. This work provides an essential baseline to help understand future changes and critical partnerships for addressing the interests involved. Through this project, KFN has developed some clear expectations of its research partners:

1. Building capacity by collaborating with community members
2. Incorporating traditional and local knowledge
3. Meaningful dialogue prior to research being conducted

Kluane Watershed Salmon Climate Change Adaption

Reduced flows from A'ay Chü (Slims River) due to the receding of the Kaskawulsh Glacier have lowered the water level of Kluane Lake. This has unknown implications on chum salmon, a keystone species who migrate from the Bering Sea to spawn in Kluane River and Lake. Chum spawn in groundwater discharge areas, and 2017 is the first year where Kluane-bound chum will be returning to a vastly changed situation.

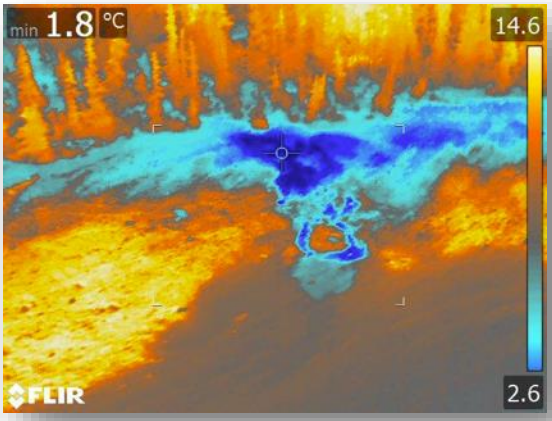


Figure 7: Thermal map of groundwater discharge area on Kluane Lake.

John Miller, Senior Scientist Groundwater, YG Water Resources, outlined a four-year partnership project with YG Environment, KFN, DFO and Environment and Climate Change Canada to monitor groundwater quality in Kluane Lake and River. This four-year study is in keeping with chum salmon's four-year cycle of

birth/spawning. The results will help understand how well chum adapt to the drastic changes in their spawning environment.

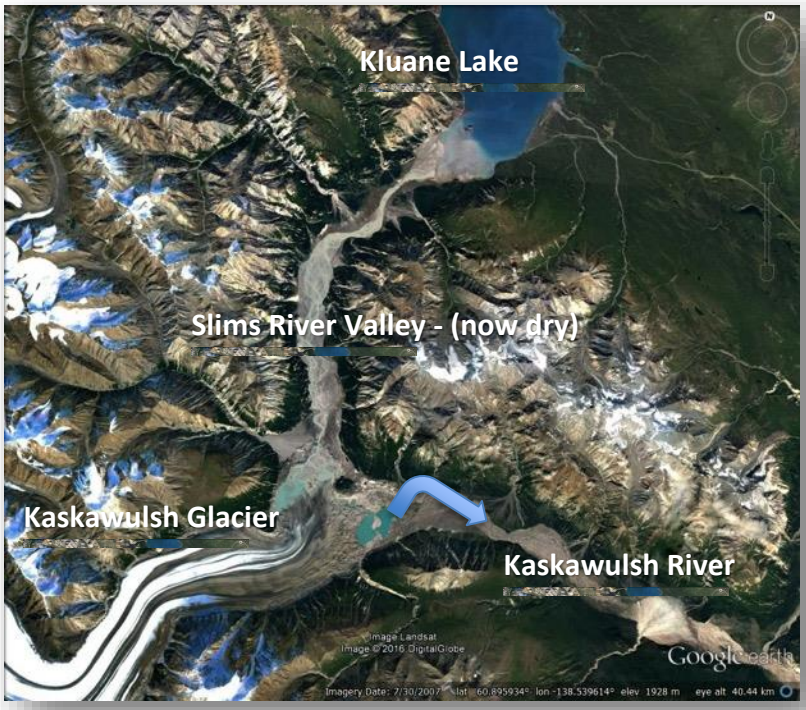
Traditional knowledge and thermal maps are used to identify possible spawning areas, which are then tested for water quality. The project team will also install monitoring wells with water level and temperature loggers in selected spawning locations. KFN and DFO could use this information to locate potential spawning areas for egg incubation in the event of known spawning areas becoming dry or unsuitable for use through chemical or physical changes.

Slims River Diversion

Jeff Bond of the Yukon Geological Survey presented on the recent drying up of the Slims River. This happened because of a change in flow direction of the Kaskawulsh Glacier melt-waters, which found a new channel towards the Kaskawulsh River and into the Alsek, instead of flowing into Kluane Lake as before.

The drainage around Kluane Lake is extremely dynamic, and this change is just one of many of the last few thousand years. For example, until a few hundred years ago, Kluane Lake actually used to drain southward into the Slims Valley and towards the Pacific Ocean.

This recent change in direction of glacial melt-water flow has meant a major decrease in Kluane Lake water levels. The strength of the flow in the new direction is strong enough that it is not expected to reverse in the foreseeable future.



9. "LOOKING DOWNSTREAM": GAPS AND PRIORITY AREAS

The Yukon Water Forum provides a rare opportunity to gather a very diverse audience with a wide range of knowledge and experience to talk about water management. Participants were asked to provide their thoughts about gaps they believe need attention, and priority areas to focus on.

While not a formal strategic planning exercise, the following list provides a snapshot of the interests and priorities of the people who attended the forum. Note that this question was posed both on Day 1 and 2 for the benefit of people who did not attend both days.

Data, Research & Monitoring

- Invest in monitoring of climate change, baseline information (flow, temp.)
- Water quality standards and monitoring
- Data transparency - what is not monitored?
- Understanding our "whole bucket" water uses (agriculture, mining, drinking) - we can be overusing our buckets
- Effects of permafrost melting (2), effects on groundwater
- Glacier melt, consequences
- Lake research and monitoring
- Emerging pollutants
- Monitoring follow-up, clear responsibility
- Issues around hydro-electric generation: flow duration effects, reservoir effects, erosion
- Impacts of low metal concentrations on salmon, migration

Education & Awareness

- Connecting citizens to the importance of water
- Public access to data (2)
- Public awareness and responsibility (conservation and non-pollution)
- Public engagement and dissemination of information (i.e. water forum presentations)
- More education and awareness to users ("you don't know what you don't know")
- Enabling & empowering participation, e.g. different forums for Water Board hearings
- Youth engagement for next generation knowledge and work (start in high school)
- Training new wastewater operators (2) - succession planning, co-op program at College
- Public and gov't official awareness
- Education about industry requirements

Legal, Regulatory & Governance Matters

- Legislation, such as B.C.'s *Water Sustainability Act*
- Modernizing legislation to meet reconcilation
- TK incorporation into governance and regulatory framework, institutions
- Guidance on First Nations' traditional use - Ch.14 of UFA
- Regulatory clarity and consistency (e.g. metal leaching)
- Well drilling regulatory program
- Well logs registry and database
- Contaminant management on public and private lands
- Regulatory terms that account for change over the course of a project
- Enforcement authority and tools
- Wetlands policy and research (2)
- Wetland conservation (2)

Relationships & Partnerships

- Better public participation in water management and assessments
- Regional co-management approaches to water management
- Building partnerships to strategically fit the gaps in knowledge due to lack of capacity and resources
- Collaboration between First Nations - overlapping FNs and RRCs, coming together to share our stories
- Community-based management - FN community people out on the land
- Integration of TK into decisions
- YFN participation in SWIG
- Engaging with communities - outside just project activites (e.g. come to camps, share meals)

Infrastructure

- "Capital rich, O&M poor"; infrastructure for water and wastewater being built with insufficient funding for maintenance, repairs, and operations
- Infrastructure funding sources and conditions (e.g. treatment plants)

APPENDIX 1 – List of Participants

Organization Name	First Name	Last Name	Position	Email
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APPENDIX 2 – Year 3 Water Strategy Implementation Highlights

APPENDIX 3 - Source Water Protection Breakout Notes

Breakout discussions were organized according to the "sectors" below, and people were asked to reflect on their roles in source water protection, plus the opportunities, challenges and priorities they see. The first four "sectors" listed will include various agencies - First Nations governments, Yukon government, municipal and federal governments, NGOs, and universities.

Water Systems Operators

Roles	Opportunities/Challenges	Priorities
• **Who - YG, FNs, Muni.** • Maintain security of plants, wellheads, system • Help develop source water protection plans (SWPPs) • Educate about SWPPs and enforce	• Minimize treatment requirements • Educate about contaminants and pathways • Political willingness to require SWPPs • Treatment system cost and complexity • Public complacency	➢ Education ➢ Regulatory Consistency

Planners & Policy Makers

Roles	Opportunities/Challenges	Priorities
• **Who - YG, FNs, GC, Muni.** • Lead planning processes • Provide technical advice • Advocacy • Work with public • Integrate all other sectors	• SWPP consistency • Legislation - update, comprehensive • Incorporation of TK into plans • Ontario system -reg. framework, funding, resources, capacity • Lack of guidance for SWPPs • Having to prove risk to act - hard to quantify • Turbidity events affecting surface water sources • SWPP scope - risks outside plan area that affect sources under plan • Cost of treatment	➢ Clear guidance and Best Practices for SWPPs ➢ Clear scope for plans ➢ Public education and engagement ➢ Implementation planning

	• Climate change, unpredictable weather (e.g. increased hydro drawdown on lakes - lack of recharge)	

Regulators & Assessors

Roles	Opportunities/Challenges	Priorities
• **Who - YG, FNs, YESAB, YWB, RRCs,** • All - protection & mgmt. of water; UFA Ch.14 obligations • YWB - Licence conditions based on available info • YG - Provide clear standards and guidelines	• Database for water usage • Standardized criteria, guidance • Traditional knowledge • Encouraging interventions • Limited data • Too many projects in one area	➢ Roles & responsibilities of regulators to develop/implement SWPPs ➢ Resources for data collection ➢ Water use cumulative effects ➢ Adaptability in licence process

Researchers & Academics

Roles	Opportunities/Challenges	Priorities
• **Who - Universities, Research institutes** • People in the field • Collecting data, assuring quality • "Knowledge broker" - risk assessment, translation • Social science - decision making structures, governance structures • Training & mentorship • Input on standards, guidelines, indicators • Communication, outreach	• Database creation and management • Yukon is great place to work • Researchers less constrained, able to dig deeply into issues • Public education, info literacy • Community-based risk assessment and system design • Funding • Political will, keeping science as a funding priority	➢ Funding ➢ Public awareness and education

Industry & Land Developers

Roles	Opportunities/Challenges	Priorities
• **Who - consulting firms, private companies** • Understanding baseline conditions and data characterization • Identifying values, pre and post-assessment • Developing mitigations to protect values • Consulting SWPPs, FNs, municipalities about values • Develop mitigations • Abide by licence, prevent contamination	• Adaptive management to deal with uncertainty • Educate Yukoners to reduce risks • Train qualified operators for complex systems - need to profile as career • Legacy issues - patchwork of regs • Acceptance of unknowns involved in adaptive management plans	➢ Education for buy-in (people need to know what source water is) ➢ Consistent approach to data collection ➢ Regulatory consistency

APPENDIX 4: Water Works Café Participant Comments

Northern Climate ExChange

- Developing adaptation measures in areas of highest priority
- How to deal with hydrological mobility in water resource management decisions?
- I don't believe climate change is man-made; the Earth has been evolving since Day 1 - 4.5 billion years
- Have you considered any collaborative projects with industry?
- Do you have any direct collaboration with industry or specific development projects?
- Project selection process - how do we link community needs? Link researchers and grad students
- Project methodology - ability to use in other situations and departments
- What about impacts on water quality? - from melting glaciers and permafrost

Well Construction Guidelines

- Importance of personal responsibility in private well construction
- Offer training and possibly certification to drillers as part of Yukon College's Water and Wastewater Operator Program
- How will antiquated wells be brought into compliance once the new guidelines are implemented?
- Testing of water quality should be met before well is approved for use
- Will there be "funding" available to complete a system as per guidelines?
- Wording to apply guidelines in regulatory language an option?
- Hard to incorporate well construction and well drilling guidelines - need another guideline

Ta'an Kwäch'än Water Monitoring

- This is awesome! I work for industry, and we are interested in partnering on programs like this with FNs and NGOs
- Very exciting research! Looking forward to seeing how this program develops in following years, and what conclusions you find with fish and other organisms.
- Interesting project! Maybe consider doing scenario planning - what management options are available if water temp. or quality changes in future?
- Great program, hope you get to grow and get YG buy-in/investment
- Any plans for more intensive monitoring? Organics, vertebrates/invertebrates, etc?
- Consider how human activities might be influencing water temperature increases

- So…what is causing temp increases? Flow/depth correlation would be interesting

Community Water Monitoring

- Opportunities to combine with other FN land-based activities and projects
- More monitoring done by para-scientists e.g. CABIN (fun and relevant!)
- Can existing community monitors help expand the monitoring network and capacity?
- Important program, training is essential. YG could play a role in coordinating larger F/T community monitoring programs
- Increased community involvement - ownership of local streams and wetlands?
- Compendium for all water data in Yukon
- Need for one government to build a database of all Yukon water data
- Searchable database, publically accessible - one-stop-shop
- Include community monitors in interpretation of observations/data/results
- Be a bit more proactive in how monitoring results may be used

YG Groundwater Program

- Public access to GIS inventory of existing wells
- Important that well records/groundwater monitoring is released to the public
- Wells should be drilled closer to get a better understanding. I live in a subdivision in Mayo where there are huge changes lot to lot. My water is tested and good, but not my neighbour's.
- We need to add ecosystem requirements to the formula and add up ALL users. We may be over-using our bucket in many areas.
- How do we account for who can do what in the future with regards to building wells?
- Cumulative impacts RE: user group, depth of aquifer
- Aquifer monitoring to be incorporated?
- Practical application for infrastructure development and LUP (e.g. private well development if regional/local groundwater conditions known)
- Data gap with water quality - opportunity to add rural well drilling program
- Need education on data requirements and format for voluntary data sharing
- Approach partnerships with industry who are also monitoring - build a base of info

Canadian Mountain Network

- Public awareness of CMN - first time I heard of it
- Do a better job creating awareness of this initiative
- Publish the findings of individual research projects

- No silos - connect researchers so that they're aware of what's already been done
- Identify data gaps, ask the right questions based on those gaps = a network of collaborative processes and consolidated data
- Indigenous research methodologies - considering 15 year lifespan, and Indigenous autonomy to complete projects
- Communicate research products back to communities in a way that they can learn from and get value from
- Interested in CMN facilitating local training opportunities
- Genuine community engagement, not just saying so/ticking the box to get the funding; iterative inquiry ("This is what I heard, is that what you said?")
- Locally driven research answering locally driven questions
- Expand water data - headwaters, quantity, etc.
- Baseline data on quantity and quality of water - partner with FNs on sampling, training
- Community working group identifying research need
- Issues with water quality related to climate change - algae blooms, PH change, evaporation
- Ensure there are opps for implementing research results - otherwise, so what?
- One value add would be finding/providing TK in a format that is accepted and used in process
- Decentered and diverse collaborative Centres of Excellence feeding the work
- Need to collect baseline data in our MANY waterways before we experience change from industry, climate, etc.
- Tie in with research institutions already active in the Yukon
- Public access to research information
- Crowd-sourced data and apps to communicate results
- Informed public that appreciates and values science and TK
- Bridging jurisdictions with Yukon/NWT - FNs have traditionally used travel routes in the mountains that are being lost due to modern road systems - so not follow those routes