

Lhù'ààn Mân

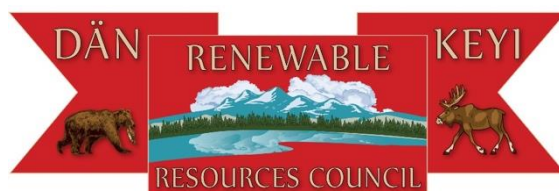
Kluane Lake Research Summit
MAY 4 & 5, 2018

Summary Report



Photo credit Nadaya Johnson

Prepared by: Green Raven Environmental, Inc



PREFACE

This report summarizes the activities and dialogue at the inaugural Lhù'ààn Mân-Kluane Lake Research Summit held at the Jacquot Hall in Burwash Landing, Yukon on May 4 & 5, 2018. The Summit was the result of a partnership between the Dän Keyi Renewable Resources Council (DKRRC) and Kluane First Nation (KFN) with additional support from UAlberta North and the Natural Sciences and Engineering Research Council (NSERC).



Members of the Summit Planning Committee include: Geraldine Pope, Pauly Sias, Kate Ballegooyen, Ellorie McKnight, Colin Asselstine and David Hik. The Planning Committee envisioned an event that would bring together members of all the local Kluane communities (extending from Haines Junction to Beaver Creek) along with the range of researchers actively studying the vast and dynamic landscapes of Kluane. The Summit hosts extended invitations to the neighboring communities and welcomed over 90 participants in total to the event.

ACKNOWLEDGEMENTS

The Summit was made possible through the dedication and commitment of the Planning Committee members: Pauly Sias, Geraldine Pope, Kate Ballegooyen, Colin Asselstine, Ellorie McKnight and David Hik. Taking direction from Elders and community members, they worked to create a safe space for people to come together and explore common research interests and shared values. Working off the sides of their desks and with minimal resources, they had to be creative in hosting a memorable yet cost-effective event. And judging by the evaluations, I believe they succeeded.

We wish to acknowledge the generosity of each speaker: thank you for your willingness to share knowledge and insights throughout the event. We know many of you traveled great distances and at no insignificant cost to join us in a having a new dialogue on research.

We must thank our cooks: Arlin Fukushima, Michelle Scott and Jeffrey Mills, for the delicious meals and giving us an opportunity to keep the conversations going as we went for second (and third) servings.

Special thanks are owed to the community educators who have already started working with the youth of Kluane to know the value of learning two knowledge systems: dän k'e and science.

And to our Elders, thank you for guiding this journey and always offering to share your knowledge, values and wisdom

Mary Easterson	Peter Johnson
Joe Bruneau	Geraldine Pope
Ron Chambers	James Allan
Marsha Flummerfelt	Alyce Johnson
Mary Jane Johnson	Agnes Johnson
Sandy Johnson	Michael Johnson
Gloria Johnson	Kluane Martin
Lena Johnson	Larry Joe
Cecile Sias	Peter Upton

EXECUTIVE SUMMARY

For two windy days in May 2018, community members from the Kluane region and researchers from across Canada came together to share their knowledge of and interests in Lhù'ààn Mân (Kluane Lake). The Summit encouraged two-way learning opportunities among Summit delegates through presentations, dialogue and activities. Researchers active in the area had an opportunity to share their research findings with the community on Day 1 and were invited to learn more about the people and history of the region on the morning of Day 2. The presentations by the research community on Day 1 provided community members with an opportunity to see what kind of research is occurring in their homelands and connect directly with researchers. On the morning of Day 2, while researchers were on a local guided tour of Kluane, community members were invited to a dialogue to begin identifying how research may best serve the community's needs and further the community's interests in research. Following the separate morning sessions, the two groups reconvened and engaged in a cross-cultural dialogue to explore shared research interests and seek out new approaches for better research outcomes. This report summarizes Summit presentations and key learnings shared during the Day 2 discussions.

Key recommendations to advance research in Kluane include:

1. Both researchers and community members need to engage in cross-cultural learning
2. Kluane First Nation develops an introductory course on the history, knowledge and people of Kluane for researchers (ie. KFN 101)
3. Increased communication and opportunities for interaction between research communities and local communities
4. Empirical observations of local ecologies can benefit from more time spent with First Nations and community members
5. Work towards making existing knowledge, data, information more accessible to the community

6. Work on mutually beneficial research projects
7. Kluane First Nation develops policies and guidelines for research with traditional knowledge
8. Research continues to include traditional knowledge
9. Invest in cultural revitalization projects

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INTRODUCTION

BACKGROUND

Lhù'ààn Mân Këyi (Kluane Lake country) and Lhù'ààn Mân Ku Da'n (Kluane Lake People) have always known change. Nestled between the Kluane, Donjek and St. Elias ranges, rests the largest lake in Yukon: Lhù'ààn Mân. Carving out the valleys are glacial fed streams and rivers creating a dynamic landscape that can rapidly, and dramatically, shift. Oral history and geologic records offer similar accounts of dramatic change occurring with both the surging and retreating of neighboring glaciers. The most recent example being the diversion of the A'ay Chù (Slims River) due to glacial recession, the meltwater from Kaskawulsh now draining south into the Alsek watershed and away from Lhù'ààn Mân.

In addition to these glacial and fluvial shifts, the local community and Lhù'ààn Mân Ku Da'n are witnessing changes to lake levels, dust emissions, and degrading permafrost which are raising concerns over valued habitat for fish and wildlife and impacts to traditional lifestyles and livelihoods. With less snow, more rain on snow events, and lower lake levels, climate change is also affecting the local communities' ability to access key areas for trapping, fishing and harvesting plants and animals. Local community members and First Nations have begun to identify the need for focused research to help address some of these more practical concerns and an active research community nearby might be well positioned to support.

Due to the relatively easy access to the Kaskawulsh glacier, the St. Elias mountain range, and Canada's northern boreal forests, the area has a long history of attracting southern-based researchers. The Arctic Institute of North America established a base at the southern end of Lhù'ààn Mân in 1961: the Kluane Lake Research Station. The station became the field base for scientists and graduate students working in glaciology, meteorology, climatology, geophysics and glacial

geology and quickly expanded its programming into 14 different research fields.¹ The facility has since become a center point for ecological research on Canada's boreal forests and the Kluane region more broadly hosts government researchers who "descend on the village to find out about local wildlife use, energy consumption, diet and a whole array of other topics."² Yet, in spite of the long-standing and wide-ranging research interests in the area, to date, only a limited amount of interest has been shown in working directly with the local communities to build on the knowledge of the local communities and First Nations and work towards addressing some of the key concerns relating to climate change. As noted by Nadasdy, another researcher to the area, "Kluane people complain that the vast majority of these researchers come in the summer, stay only a short time and are never heard from again³."

KLUANE RESEARCH SUMMIT

HUMBLE BEGINNINGS

The diversion of the A'ay Chù in 2016 prompted discussion and interest in the local communities, was followed by significant media coverage, and attracted even greater attention to the region by various research interests. The idea to host a research Summit emerged during discussions between Kluane First Nations' councillors, citizens, staff; members of the Dän Keyi Renewable Resources Council; and two select researchers. The Research Summit was intended as an initial step towards improving communication and relationships between researchers and local communities and identifying shared interests that may begin to address concerns community members have over their lands and waters.

A voluntary Planning Committee formed early in 2018 and sketched out preliminary Summit objectives, budget and work plan in order to bring these two

¹ MacDonald, R. (2005). Challenges and accomplishments: The Arctic Institute of North America. *Infonorth. Arctic*. Vol. 58, no. 4, pp. 445.

² Nadasdy, P. (2003). *Hunters and Bureaucrats: Power, knowledge and Aboriginal state-relations in the southwest Yukon*. UBC Press: Vancouver. P. 22.

³ Ibid.

groups together to engage in dialogue and explore shared interests. Working under firm budget and resource constraints, the Planning Committee creatively pooled resources to engage the Summit Facilitator and identify additional resourcing needs through in-kind contributions and donations from community and academic partners. These pooled resources enabled the Planning Committee to announce their decision to host the inaugural Kluane Lake Research Summit early in the spring of 2018.

To maximize participation from and benefits to the local communities, the Planning Committee gave careful consideration to the Summit venue, meals, dates, format, and presenters. Hosting the event on a Friday and Saturday encouraged greater participation by local community members. Creating space for community-members-only dialogue was intended to encourage local voices in comfortable and open expression. Invitations were made to all regional communities with no limit placed on the number of community members who wished to attend.

In addition, recognizing the diverse range of research interests in the Kluane region, the Planning Committee also made some difficult decisions to prioritize Summit presentations relating specifically to Kluane Lake research. This seemed most relevant, given that the conversations and research interests resulting from the A'ay Chù diversion were focused on direct and indirect impacts to the lake and watershed. Invitations were made to known researchers – from both academia and government – who are active in this field of research. Firmly committed to hosting a non-technical research Summit that would encourage community participation, presenters were asked for plain-language abstracts and presentations. The Planning Committee also reached out to key individuals involved in relevant research initiatives who were invited to set-up an information booth for the duration of the Summit. Requests to present at the Summit exceeded the time available for presentations. Given the interest to present on research projects, an expanded scope of research topics might be considered for future events.

SUMMIT OBJECTIVES

The *Lhù'ààn Mân-Kluane Lake Research Summit* brought together Yukon and First Nations' leaders, researchers from both government and academia, and members of the local communities and First Nations to build relationships and engage in two-way knowledge sharing over the region's land- and water-scapes. The Summit's goals were to:

1. Promote relationship building and 2-way knowledge sharing between researchers & community members about lake-related interests and research;
2. Invite researchers to learn about and visit Kluane communities;
3. Identify community-based research priorities & community expectations of researchers working and studying in Äsi Keyi (our grandfather's land).

SUMMIT PARTICIPANTS

Invitations were sent out to all neighboring communities with a request to register prior to the event. The responses resulted in a broad range of Summit Participants representing many communities across the Kluane Region and beyond including residents from: Atlin Lake, Burwash Landing, Destruction Bay, Haines Junction, and Silver Creek. Strong representation of citizens and staff of Kluane First Nation was evident. As well, a number of Champagne and Aishihik First Nations members attended the event. The event also drew one member from White River First Nation.

A number of residents and local experts traveled from Whitehorse to participate. Presenters included local knowledge holders, scientists from across Canada, and researchers and managers from federal and territorial government departments including Parks Canada, Environment Canada, and Environment Yukon to name a few (See Appendix A for complete list of participants and affiliations).

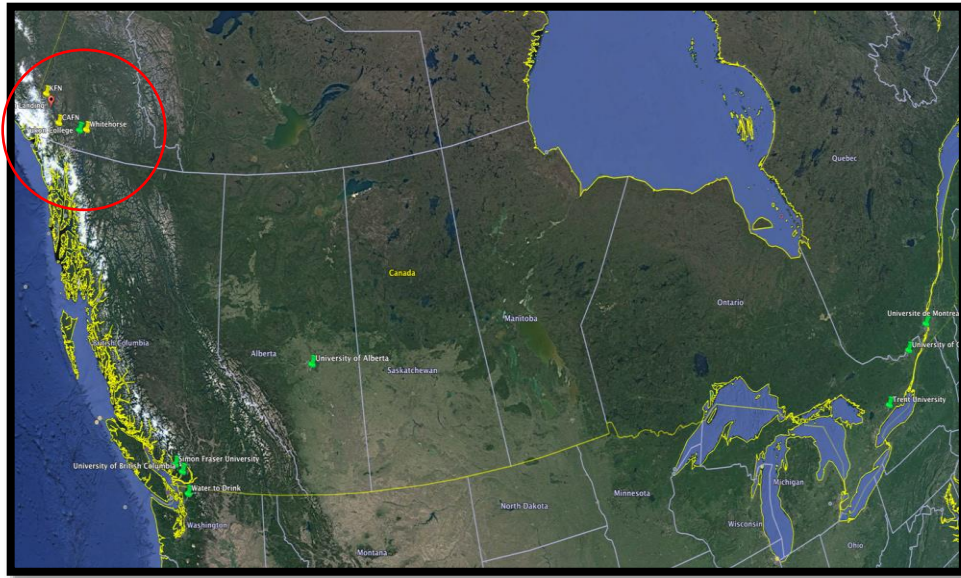


Figure 1. *Geographical extent of communities and universities attending the Summit.*

SUMMIT PRESENTATIONS

WELCOME TO LHÙ'ÀÀN MÂN

As a Summit host and Chief of Kluane First Nation, Chief Bob Dickson welcomed Summit participants and reminded attendees of the immense changes the community is witnessing including changes to fish and fish habitat, lake levels, dust emissions, and shifting permafrost. Chief Dickson also noted how climate change is affecting the community and saw an important role for research in better understanding and preparing communities to manage for the effects linked to climate change.



Chief Bob Dickson welcoming participants.

Also a Summit host, Colin Asselstine – of the Dän Keyi Renewable Resources Council (DKRRC) – spoke of significance of Lhù'ààn Mân as the “lifeblood of the area,” as it provides everything necessary to sustain local livelihoods and needs to be protected for future generations. Colin encouraged Summit participants to share their stories and knowledge of the Lake because “we need to listen and understand to work together and ensure that the Lake will be the same for generations to come.”

Following a welcome from the Summit hosts, the Kluane MLA, Wade Istchencko, remarked on the value of sharing knowledge throughout the Summit. While the Yukon is leading the way in permafrost and climate change research, Istchencko invited community members to inform him of any research items that need greater attention from the territorial government.

COMMUNITY PERSPECTIVES

To orient Summit participants to the area, its history and people, three community members and citizens of Kluane First Nation – Mary Jane Johnson, Pauly Sias and Mary Easterson – all shared their perspectives not only on the history of the Kluane region but also on the significance of this event.

ÄSI KEYI - MARY JANE JOHNSON

Born and raised in Äsi keyi (grandfather's land), for Mary Jane what has always been important is coming home to the community to spend time, sing songs, and share stories. Mary Jane explained that through these songs and stories, we celebrate our love of the land. Mary Jane invited Summit participants to enjoy their stay in Äsi keyi and all the blessings this area provides. Mary Jane highlighted the desire to ensure the next generations follow in our steps, and that current work and research re-shapes way that we look at this land as a homeland and as a place that we love. She reminded us that, "we are a part of the water and part of the land."

THE LAKE IS THE LIFEBLOOD - PAULY SIAS

Pauly grew up at the southern end of the Lake at Silver City and, together with her family, has seen many changes. From a historical perspective, the Lake was primarily a means of transportation to access hunting and fishing grounds. In many ways, the Lake was the heart of this area. Pauly made special note of the respect that local people show for the lake and for water itself. She acknowledged the connection made by First Nations between water and its link to their spirituality. She also recognized the potential challenge that this perspective presents to science. Yet, in spite of this (potential) incongruency between Indigenous knowledge and science, Pauly expressed great interest in blending both worlds emphasizing the intention for this gathering is to share worldviews. Finally, regarding recent shifts occurring in the region, Pauly knows the area is no stranger to change. The winds are dramatic and the conditions change rapidly here with dramatic changes to Kluane Lake occurring several times in the last few hundred years.



Pauly Sias welcoming participants.

FINDING A SHARED PATH - MARY EASTERSON

As an Elder and educator in the community, Mary Easterson, spoke of the critical need to ensure that science research and First Nations come together. This is particularly important because, over the years, the communities have witnessed so much research occurring in the region yet haven't been included,

"In the past we have been left behind, we have been ignored, our traditional knowledge has not been incorporated."

Mary reminded participants that the youth are a part of this land and will be here for future generations. Therefore, it is critical to try to build their resources in this



Pauly Sias and students from Kluane Lake School.

community and encourage First Nations youth in the field of science, whether that's through summer jobs or long-term employment. **A key message from Mary: it is important to have local people involved in research.** Addressing the researchers directly, Mary further emphasized the need to embrace First Nations' knowledge of the land and invited researchers

to join forces with local communities and move forward on a path that benefits all parties. Today, she sees an opportunity to "walk on a different journey" which is critical to all of us.

RESEARCH PRESENTATIONS

Eight (8) researchers, two (2) collaborative research partnerships, and one (1) elementary school group were invited to share plain-language presentations on their research initiatives to help build a shared understanding of the range of lake-related research projects underway in the Kluane area.

BASELINE AND MONITORING OF LHÙ'ÀÀN MÂN – E. MCKNIGHT, UNIVERSITY OF ALBERTA

Ellorie discovered the Kluane region as an undergraduate student during a glaciology field course in 2012. With a desire to return to Kluane and a passion in

climate change science and water, she returned to Kluane in 2014 to see if the community shared these research interests. After talking to local people, she identified common key issues and concerns and took some initial steps in investigating if and how the lake may be impacted by change. She conducted a baseline study of the physical, chemical, and biological properties of Kluane Lake in 2015 which involved monitoring that took place throughout the length of the lake, across all four seasons, and throughout the water column.

Once the baseline study was completed, she received funding from DKRRC and support from KFN to establish long-term monitoring at Kluane. With advice from colleagues at the Department of Fisheries and Oceans (DFO), Ellorie worked to design, build and deploy moorings in spring 2017 that were equipped with data loggers to record water temperature and conductivity on an hourly basis, thus monitoring the thermal and conductivity dynamics of Kluane over time. These data loggers are built to last up to five years. Ellorie shared two time-lapse videos with Summit Participants showing her monitoring activities during her field season.

In the midst of this monitoring program, the A'ay Chù shift occurred. This dramatic change reinforced the value of long-term datasets to detect change in impacted, or potentially impacted, sites due to the fluvial shift.

Q&A: Are there different habitats that are more predominant in different areas and depths of the lake? Yes, the habitat in Brooks Arm is quite different than in Talbot or the rest of the lake. Brooks is shallower, warmer, more productive, the south end is deep, cold, and silty (glacier influenced).

Q&A: Are we just monitoring to monitor? What will we do with this information? There are research questions that can be answered in a short amount of time and for a specific purposes. There are more exploratory research questions that take more time to answer. In this case, we need to monitor for enough time to account for yearly variability (~15 years typically for this kind of data) to detect change. If we detect change, we can let management bodies know of this change and how this could impact species/people, and they can make decisions according to the best available information.

A'AY CHÙ SHIFT – C. SCHOOF, UNIVERSITY OF BRITISH COLUMBIA

With a background in science and a lot of time spent in the icefields, Dr. Christian Schoof focused his research interests on understanding how melt in the icefields flows out of the glaciers and the A'ay Chù. Christian offered some background information on glacial retreat which is a phenomenon seen in all mountain landscapes. He remarked that while glaciers fluctuate back and forth, the long-term trend is toward glacial retreat. The most recent and localized example of this phenomenon, of course, is the retreat of the Kaskawulsh glacier that once flowed into Lhù'ààn Mân and now flows into the Alsek. Christian shared photos comparing 2015 (pre-retreat) and 2016 (post-retreat) images illustrating the resulting shifts at the toe of the Kaskawulsh glacier where all the water that used to drain into Lhù'ààn Mân has since been diverted toward the Alsek river. He noted that the glacial meltwater is unlikely to be rediverted back to Lhù'ààn Mân anytime soon.

Basing much of the following information on the research of Dan Shugar, Christian offered an overview of the geological history of the Lake which shows that it used to be much smaller 5000 years ago and this was the state of the lake for a long time. Several hundred years ago, the glaciers surged and the Kaskawulsh advanced, blocking the valley that drained the water down the Alsek resulting in a dramatic rise in Kluane Lake levels. During that period, the lake level was about 10m above the current lake level which led to the Kluane River flowing the in the opposite direction, north towards the Yukon River. Today (2018), the Kluane River continues to drain north while all of the Kaskawulsh meltwater now flows into the Alsek watershed and A'ay Chù is only fed by tributaries receiving about 20% of the previous flow.

As for future effects of the A'ay Chù shift, water levels have dropped in Kluane Lake and the outflow for the Kluane River is much lower. There is a risk that the lake outflow could become blocked off, isolating the Lake. Over time, the Kaskawulsh River could erode the A'ay Chù valley and re-route other tributaries

(like Canada creek) south down the Alsek. In a few centuries, the Kluane Lake could even flow south again.

In response to a question from the audience, Dr. Schoof offered a brief introduction to Glaciology 101: Glaciers are essentially large rivers, they carry the snow from the icefields down into the valley bottoms, and if it is accumulating less snow, then it is essentially retreating. The ice is still flowing from the interior to the exterior.

Q&A: Why did the glacier shift and water now going down the Alsek? Was it the permafrost thawing? Was it the inclination of the ground? The Kaskawulsh retreated to a point where, yes, the inclination (angle) of the ground is now causing the water to flow down the Alsek.

KLUANE FISH ECOLOGY AND HEALTH – R. PERRY, YUKON GOVERNMENT

As a new Senior Fisheries Biologist with Yukon Government (YG), Robert Perry provided a summary of the 2013 studies on the health of Kluane Lake Trout and Whitefish populations. The study measured i) the productivity (nutrients, lake shape and size) of Kluane Lake; ii) abundance (population of the fish in the Lake) and iii) harvest levels (frequency and amount of fishing).

Kluane Lake is characterized as being nutrient poor meaning that growth takes a long time and a disturbance to the population will take a long time to rebuild. Based on these conditions of the Lake, the study determined that to maintain a healthy fish population, Kluane Lake could sustain the loss of 3109 kg of fish.

Robert described the methods employed in the 2013 SPIN survey. Nets were set randomly throughout the lake (129 nets were set, for 2 hours at a time) and then the fish in the nets are counted. If the fish die, the researchers take the otoliths (a small bone in the fish head) to determine the age. Throughout the study, 152 lake trout (an average of 1.2 fish/net) and 471 whitefish (an average of 24 fish/net) were caught indicating a healthy lake (ie. 1 fish/net is a healthy ratio).

Robert noted that, in comparison to other Yukon Lakes, Kluane is in good shape and doesn't experience the same level of impacts/harvest rates as other lakes. This may be due to wind (keeps people off the lake and less fishing occurs), lake size

(offers a lot of habitat), distance to travel to the Lake, and no gold rush effects (smaller population harvesting in the region). However, these studies were carried out prior to the A'ay Chù shift and changes to the lake trout population would take at least 8 years to detect. This is because the average age and growth of Kluane lake trout is between 12-38 years old. Lake trout grow slowly, reach sexual maturity at 9-10 years old and then spawn only once every 2-3 years.

So while the lake trout and whitefish populations are currently healthy, Robert cautioned that Kluane is low in nutrients so we should be conservative with our harvest. Further, we don't know what influence climate change will have on the Lake and fish populations and any change to populations will take at least 8 years to notice.

In conclusion, Robert offered the following recommendations:

- Keep fish harvest pressure at sustainable levels
- Minimize fish harvest where possible and consider sunseting the commercial quota
- Continue monitoring the lake trout population (Creel survey planned for sometime in the next two years)

Comment: What about the whitefish, the suckers, and monitoring other fish? From a cultural perspective, it's not just trout that is important. There is a cultural component to what the fish mean to us. Lake trout are valued for sport fishing, but historically, we mostly fished whitefish so there needs to be consideration for culturally significant species. Sport fishing needs to be considered differently as well and there is a need for sport fishing businesses to monitor the harvest rates. We have to keep in mind the changes to the lake are going to affect fish spawning habitat. Local people should be watching for this.

Q&A: *All fish learn to live together, we need all of them to have a healthy system – so why do we focus on the trout instead of salmon, whitefish? Why always one fish?* Lake trout is a sensitive (keystone) species, so if we keep that species healthy, it's likely that the other species remain healthy.

Q&A: *There was a study on the mineral content of fish and they found diseased fish at the time. A sample was sent out that determined it was a type of worm which wasn't harmful*

to people. Response: If fish get older, you tend to see more parasites and ulcers. YG doesn't know if there is more or less parasites in Kluane Lake and loads in this lake relative to other places.

RIPARIAN ECOSYSTEMS: WATER THAT CONNECTS – LOGAN MOORE, GRADE 5, KLUANE LAKE SCHOOL

Logan Moore, a Grade 5 student at Kluane Lake School, presented an animated powerpoint he developed on the value and characteristics of the riparian ecosystem. Logan noted the value of the riparian ecosystem as a place to support the growth of plants, animals, fish, insects and birds. These areas can also provide important spawning and/or nesting habitat.



Logan Moore, Grade 5 student at Kluane Lake School.

Logan also noted that the changes occurring to the A'ay Chù will affect the riparian ecosystem around Kluane and ended his presentation with three important questions:

- What would happen to the underwater streams?
- What will happen to the fish and mammals?
- What will happen to the fish if the water is too hot?

KLUANE LAKE GROUNDWATER PROJECT – J. SPOELSTRA, G. BICKERTON, J. MILLER, T. TANNER, K. BALLEGOOYEN

A collaborative research initiative is underway through a partnership between Kluane First Nation, Environment and Climate Change Canada, Department of Fisheries and Oceans, and Environment Yukon. In an effort to better understand how climate change will affect groundwater in Canada's northern regions, a new study is being undertaken to identify groundwater discharges and characterize groundwater quality around Kluane Lake. This study will help scientists and the community better understand the impacts of changes in Kluane Lake and River following the A'ay Chù shift and the potential effects on salmon spawning habitat.

The first objective is to identify and characterize the groundwater discharges into Kluane Lake. This is important to understand as certain fish species, such as chum salmon, rely on sites of groundwater discharge for spawning habitat. Monitoring has begun with data collection (at Silver City) and sampling starting last August and October (2017). During the summer, groundwater is colder than the lake water and therefore researchers were able to use thermal imaging to identify discharge locations around the Lake. A total of 43 sites were identified as possible groundwater discharge locations that require verification by visiting the sites. Verified sites will be sampled to determine the groundwater chemistry. The water chemistry is important because suitability of the habitat for chum salmon depends on both the chemistry and temperature of the water. The goal for August 2018 is to visit and sample each of these sites.

Going forward, the team proposes to monitor select sites more intensively for groundwater temperature and chemistry, and estimate the aerial extent of these discharge zones. This information can help us estimate how salmon spawning habitat might be affected by declining lake levels.

A parallel cooperative project, led by the Department of Fisheries and Oceans (DFO), is the Kluane Chum Salmon monitoring study. The study is looking at the impact of hydrologic change of the Kluane system on chum salmon that spawn in the Kluane River. Trix Tanner presented an overview of the Yukon River Chum salmon life cycle. Chum salmon migrate up the Yukon River and arrive at their spawning grounds between Sept-November, with peak spawning at the Kluane River occurring in mid to late October. Females lay their eggs in the gravel, males fertilize them, eggs are nourished by yolk sac, they hatch (and become alevins) then migrate through the gravel. The alevins need water and oxygen (supplied by the water). Once the yolk sac is consumed (in spring), they swim out of the gravel into the water column. Chum salmon then migrate quickly downstream to the ocean feeding as they go.

Again, water temperature is a key factor in the lifecycle of a salmon as it controls rate of development, survival and growth. Groundwater temperatures are relatively stable throughout the year. At Kluane Lake, some groundwater seeps

had temperatures close to 6 degrees Celsius. Using temperature data and an Accumulated Thermal Unit (ATU) model, researchers can predict when salmon will emerge from the gravel.

Various survey methods are being used to assess the population of spawning chum salmon. The joint DFO and Alaska Department of Fish and Game Eagle Sonar Project, located downstream of the Alaska/Yukon border, has been used to estimate the total number of salmon swimming upstream to Canada since 2006. The project also conducts a test fishery to determine the species, age and genetic stock composition (gsi) of the salmon they count. In 2017, the highest recorded number of chum salmon migrated past the sonar (419 000 chum); gsi indicated that 45% of these were White River stock, including Kluane chum salmon. DFO and KFN also conducted a Kluane-aerial survey in 2017. They flew over the Kluane River index area that had been surveyed annually prior to 2006 (at which time sonar and gsi replaced the survey) to count and assess the distribution of chum salmon on these spawning grounds. Approximately 16,265 salmon were counted in that area, the fourth highest count in over 30 years of surveys. Chum salmon were proportional distribution was found to be very similar to the distribution mapped in 1982, although the counts in 2017 were much higher.

In 2017 Kluane chum salmon carcasses (including many tossed from the water onto the river bank by bears) were also sampled. Researchers recorded age, sex and length of approximately 200 chum salmon samples collected between Swede Johnson Slough and Glacier Creek to determine the age composition of the spawning fish.

Trix acknowledged the various groups contributing to this monitoring effort. She also noted that while some data loggers have yet to be retrieved, DFO technicians observed successful emergence of chum fry when retrieving loggers at Glacier Creek. In sum, this project is looking at chum salmon distribution and at both water levels, to determine where the chum salmon can access, and water temperatures, to see if the conditions are met for salmon to grow.

Q&A: Has anyone done genetic analysis of the fish at Silver Creek to see if they are fish from Yukon River or from the Alsek system? There has been genetic analysis done on Kluane Lake and Kluane River chum, and they are close relatives, so there is likely a strain from the lake to the river. But there hasn't been an analysis on Alsek vs. Yukon River genetic differences.

Q&A: How did this collaboration come about and what are the challenges in working in a multi agency group? Previous connections existed, for example, between KFN & WRB and community-based monitoring, as well as funding opportunities (via INAC for climate change monitoring and adaptation for four years, is funding this project). The challenges are logistical as Lake access is limited in October. Benefits to the partnership include the efficient use of resources and sharing knowledge, especially local knowledge as it yields insight to conditions at site locations and information as to how to reach them. Additional benefits to KFN are capacity building, the opportunity to have youth involved, and the community interest in the Salmon Patch and its historical importance to families. Benefits also accrue from federal leadership support for climate change research.

DUST CLIMATOLOGY OF THE A'AY CHÙ VALLEY – J. KING, UNIVERSITÉ DE MONTRÉAL

Dr. James King recently returned to Canada and picked up where his supervisor left off in the 1970s: studying dust in the A'ay Chù Valley. James' research looks at the mechanisms that produce dust emissions. What are climatic factors that increase or decrease dust? What is specific to this mountainous area? As a lot of dust research is not in northern areas, studying dust in the north is a relatively new field. Finally, his research explores the impacts of the dust on the aquatic and terrestrial systems of the area and how will it affect the people living in the region?

There are a number of factors that contribute to the movement of dust. James explained that wind is needed for the production of dust. Air is a weak force, as opposed to water, for moving dust. Salt and biotic matter can hold soil together, creating a larger particle and making it harder for wind to move the larger dust particle along. James remarked that the groundwater here is quite saline, and that also plays a role in how easily the wind can move dust around.

One very important element that can protect the soil from moving is vegetation. It can absorb wind by decreasing the speed of it at surface. Vegetation also affects wind erosion and its severity, leading us to the following questions: how much vegetation is needed to help limit the wind erosion? And how much encroachment of grasses is needed before the dust is reduced?

While there is a lot of research on this, there is not a lot of research that addresses how quickly vegetation can encroach because it depends on so many other things, such as nutrient availability, salinity, etc. The wind, of course, is also an important component when determining wind erosion. There is a seasonal component to the wind as well as a longer-term component. If the soil is available to be eroded, then there are “dust seasons” or a seasonality in the dust production. Generally, research at high latitudes has shown two dust seasons: 1) in the spring when snow has melted but rivers and lakes haven’t yet risen, and 2) in the fall, before the snow but lakes/rivers have decreased.

In the A’ay Chù Valley, the dust season is traditionally in the spring. However, due to the recent hydrologic changes at the A’ay Chù, there is no longer water covering the delta. Prior to 2016, the delta was covered with water during the summer and so the dust season goes right from spring through until fall and increases the mass of dust available to be blown. In Kluane country, there are catabatic winds (thermal differences between inland ice and water bodies) and other types of winds which can produce different types of dust events (ie. smaller vs. larger events). One of the goals of James’ research is to understand how much dust is being produced and how important is the difference between catabatic wind events vs. more extreme events for dust production?

The research by Dr. King will look at the impacts attributed to the dust. Most research in this field has been in subtropical regions, not high latitudes, so the effects of dust on northern boreal lake ecosystems is not well known. This study is an opportunity to look at the interactions between the dust and the lake ecosystems. For oceans, the relationship is almost entirely positive since dust provides more soluble nutrients to the aquatic environment than sediments resulting in greater productivity in marine habitats. For terrestrial water bodies,

there are also benefits from the deposition of dust since it has soluble minerals. However, there is also a negative effect that occurs when dust is deposited on vegetation and can block or absorb solar radiation both resulting in a negative impact. Finally, from a health perspective, the watersheds drain large areas and concentrate in sediment basins, so there is generally a higher concentration of heavy metals (selenium and arsenic).

FROGS, FISH, WATER: MONITORING FRESHWATER IN KLUANE NATIONAL PARK AND RESERVE – C. WONG, PARKS CANADA

Adjacent to Kluane Lake is Kluane National Park and Reserve (KNPR) where monitoring has occurred for decades. By example, the first sheep survey of Thechàl dhâl happened in 1974. Following changes to the Parks Act in early 2000, a management priority has been to monitor the ecological integrity of the park and in KNPR, current monitoring frameworks include monitoring freshwater, forests, and tundra. The freshwater monitoring programmes at Kluane involve wood frogs, kokanee, lake trout, areas covered by glaciers and water quality. Park ecologist, Dr. Carmen Wong shared her research experience in KNPR through three freshwater monitoring tales:

1) The influence of [Indigenous customary law] on selected monitoring methods

Carmen explained that 10 years ago there was no Park measure for monitoring wetlands. Her first thought was to use frogs to monitor wetlands, because they spend most of their time in the water and are sensitive to changes to the water and pollution. Initially, the study wanted to understand how many frogs are there in the Park and do they have a certain fungus which is tested by a genital swab



Mary Jane Johnson working with Parks Canada.

followed by lab analysis? Unfortunately, this method is highly invasive which went against local First Nations customary law. These laws provide guidance on how people are to respect and behave on the land. According to local First Nations' Elders, there are specific customs, or rules, that prohibit people from handling frogs. Guided by the words and wisdom of her

colleague, Mary Jane Johnson, Carmen employed another, less invasive, method of monitoring frogs that relied on both call and egg surveys. Using this method, Parks has identified 17 ponds which they visit during calling period to determine if they are habited or not by frogs. Between 2009 and 2012, 90% of the ponds were occupied. In 2016, three of the ponds were dry but in 2017, there was a frog presence observed at these three ponds indicating we don't fully understand frog dynamics well yet.

2) Understanding the boom and bust on kokanee populations

Carmen described the monitoring of Kokanee salmon in the Kathleen Lake system. Kokanee are freshwater fish (salmon that don't return to the ocean) that spawn near the lake. Again, water temperature and water quality affect spawning. Annual spawning counts for Kokanee have been ongoing since 1976. From 2005 – 2012, the numbers of fish were very low but experienced a huge rise in 2015-2016 (ie. an increase of 5000 spawners). The rise was followed by another drop, in 2017 they decreased to 1000 spawners, similar to counts in 2005-2012. There is still no clear answer on what is causing the population boom and bust. Carmen emphasized the value of having a long-term dataset to better understand what is driving the changes and what relationships might be influencing factors (ie. climate).

3) Monitoring Kathleen Lake

Carmen provided an overview of the monitoring programme at Kathleen Lake involving: recording the Lake surface temperature 2m below surface during open water season; gill net surveys for lake trout populations (2010-now); and angler surveys completed in 1999, 2004, 2015.

Key lessons learned:

- You can't anticipate change in your monitoring program (ie. we did not anticipate A'ay Chù shift)
- There is value in carrying out long-term monitoring to help detect change



Toe of Kaskawulsh Glacier, photos provided by Carmen Wong.

Q&A: Was there a historical presence of frogs around Kluane and current populations?
We're not sure because there is no monitoring of frogs in this area.

KLUANE LAKE BOAT ACCESS UPDATE – G. EARLE, YUKON GOVERNMENT

Gareth Earl, Yukon Government projected manager, presented an update on the current status of work completed on the Destruction Bay marina and lake access. The marina in Destruction Bay is currently unusable due to current lake levels, there is no boat launch in Burwash Landing and upgrades to the Sheep Mountain boat launch are planned for this summer (2018).

Stantec was retained by Yukon Government in 2017 to review the current status of the Destruction Bay marina, estimate sediment transport and loading, and to provide recommendations for temporary upgrades until a long-term solution could be implemented. Stantec recommended dredging the marina to an extent approximately 50 m beyond the breakwater heads and was estimated to cost \$300K. Yukon Government decided not to pursue a temporary solution due to the high cost for the anticipated duration of the benefit (e.g. boat access for one season). Yukon Government has since retained the University of Saskatchewan to complete a lake level study. Once the study is complete this winter, Yukon

Government will have a better understanding of future lake levels for design of long-term lake access solutions.

Q&A: *How are they monitoring the depth, are there markers out there?* Water Survey Canada has a monitoring station but I'm uncertain of location.

BRINGING RESEARCH HOME: RECLAIMING RESEARCH TO TELL THE STORY OF CLIMATE CHANGE IN THE KLUANE FIRST NATION TRADITIONAL TERRITORY – S. WESCHE, UNIVERSITY OF OTTAWA; B. HORTON, YUKON COLLEGE; K. BALLEGOOYEN, KLUANE FIRST NATION

Through a collaborative research partnership, this project supports KFN as a self-governing First Nation to enhance its ability to actively engage with research in its Traditional Territory, with a focus on climate change as the integrating theme. The goal is for KFN drive the research agenda and create the necessary protocols, tools (ie. maps and databases), and processes (ie. youth and community engagement) to support relevant and culturally-appropriate research in its Traditional Territory. The resulting protocols and/or research agreements and tools may serve as models for other First Nation communities. This Project was conceived in response to a long history of dialogue about how to develop research protocols and priorities for KFN. In these early stages, the research team is seeking community feedback to help guide project development.

EXPLORING THE IDEA OF A YUKON RESEARCH VESSEL – A. SCHIMNOWSKI, ARCTIC RESEARCH FOUNDATION

Adrian Schimnowski of the Arctic Research Foundation (ARF) introduced the potential for a Yukon-based research vessel. A not-for-profit founded in 2011, the ARF has been working to provide innovative infrastructure to support science and cultural research and economic benefit for all collaborative partners. Adrian recounted the foundations' beginnings that involved a research vessel stationed in Cambridge Bay, Nunavut, to support the Franklin expedition. This ship (the Martin Bergman) not only handled overwintering in the ice, it also facilitated relations with the local community enabling the ARF time to meet the community. An important aspect of providing infrastructure was not just to interact with

science teams but also to interacting with the local community and identify collaborative projects. Student training on the research vessel has become one way to grow community support and ownership over the project.

Adrian acknowledged the value of including local knowledge in these projects and that research projects in the north need to be collaborative. Through this work he's learned that the more time that is spent on the land, the more information is shared among all parties, and traditional knowledge and science blend.

Blending traditional knowledge and science to support economic issues is a key question for ARF. ARF collaborates with scientists to build a vessel that has tools for quality and safe research. ARF also works with the communities to refit and crew vessels, they also have mobile science labs that can support a variety of projects. All of these opportunities provide opportunities to share knowledge. A key learning from these projects: Sometimes by placing infrastructure in a location, it can become a catalyst for collaboration. Finally, by focusing on co-designing the Project from the start, with local communities and governments, you can have interesting synergies that can happen.

Question to the audience: *How might a research vessel facilitate research in Yukon?*

Responses: 1) From a safety and capacity perspective this would be useful in the Yukon. 2) Current research projects could definitely benefit from having a properly equipped vessel.

TOUR OF ÄSI KEYI

On the morning of Day 2, researchers and visitors joined Ron Chambers, a CAFN citizens with long roots to Kluane country and also a knowledgeable community guide, on a tour of the community. Colin Asselstine, Co-Chair of the DKRRC supported Ron in delivering the community tour. Ron described the history of Burwash Landing and Kluane Lake making note of



Ron Chambers on the community tour. Photo credit David Hik.

traditional place names and the significance of these names. He brought researchers to see the new housing units where the community is making investments into sustainable energy and the First Nations is promoting energy self-sufficiency. An important message from Ron was that new developments are built in line with First Nations principles: to only develop as much as is needed.

Ron also pointed out areas where people are directly feeling the effects of climate change. Areas of permafrost thaw are impacting infrastructure, including personal property. To gain a greater appreciation of both the history and the effects of change, the group visited Congdon Creek, Dutch Harbour and the Kluane lakeshore.

While the community is witnessing dramatic change, Ron remarked on the need for blending research and First Nations knowledge not only to create opportunities for local people but to create local solutions to local challenges.

EXPLORING THE ROLE OF RESEARCH IN KLUANE

While the research community was enjoying a guided tour with Ron Chambers, community members from Kluane First Nations and Champagne and Aishihik First Nations were joined by local residents from Burwash Landing, Destruction Bay, Silver Creek and Haines Junction. Approximately 20 people in total participated in the morning round-table discussions to talk about:

1. The history of research in our communities and the role for respectful research today; and
2. The communities' research interests and priorities.

LOOKING AT RESEARCH THEN AND NOW

In planning how research in Kluane should be or could be done, and avoid making the same mistakes of our predecessors, we wanted to better understand the role that research has played historically in the Kluane region. We invited four (4) community members to share their experience with research in the region to help prompt the roundtable discussion on planning to engage with research.

WHAT IS YOUR RELATIONSHIP WITH RESEARCH?

The Kluane region has a long history of research dating back to 1940s. The speaker's first experience with research was growing up across from the Kluane Lake Research Station (KLRS) and learning that research was happening, meeting young people and students coming in for the summer, but not necessarily understanding what research entailed. Later in life, she realized that most local people (including herself) didn't really know what was going on at the KLRS. They had to go and ask to be a part of what was going on and there was not much community connection or involvement. As an adult, working with KFN and Kluane National Park and Reserve (KNPR) on the Healing Broken Connections (HBC) project, the local barriers to research grew apparent.

Through the HBC project, the Park worked hard to try and bring culture and people back into KNRP and connect researchers and communities. However, this

was met with limited success. During a meeting in Haines Junction, Elders were brought from KFN and CAFN together with Park ecologists. While it represented a good first attempt, their “languages” were completely different. It was as though a translator was needed to help these groups communicate. Also, not understanding the culture in which he was working, the Park ecologist presented an example of his study looking at mice and owls and the predation relationship. He did not understand that he selected one of the most spiritual figures (an owl) in the local First Nations’ culture, which elevated the need for sensitivity surrounding the experiment. Finally, after he explained the experiment, including the study design, methods and results, the Elders patiently listened but then gently pointed out the redundancy of his work because through years of life lived on the land observing the relationships between animals, “we could have told you that!” The Elders reminded the researchers that through careful observation, which has the added benefit of not interfering with nature, we can learn about our world and our place in it. The Elders viewed science as “messing with” nature, and in this example handling a very spiritual animal, rather than simply taking the time needed to observe what is happening in the environment.

This example highlighted some of the challenges of incorporating traditional knowledge into a science framework. Spirituality and much of our traditional knowledge, which includes values and principles like *Dulı*, doesn’t fit into a box, yet science fits everything into boxes. There is a growing interest now from both parties into doing this, blending science and traditional knowledge. And while the attitude is improving, we still have a long ways to go.

WHAT HAPPENS WHEN A RESEARCHER WANTS TO STUDY IN THE AREA?

Often the first point of entry for developing a research relationship between Kluane First Nations and researchers occurs as part of the permit application to conduct research in Kluane.



The only fixed interaction between KFN and the researcher(s) occurs when KFN invites researchers to meet and see if there are any potential collaborations and opportunities to hire local assistants. Some research teams have done this well. For other teams who haven't hired locals, there is still the opportunity for researchers to involve the local community by inviting them to observe their research activities. The current application and permitting process, however, relies on the individual research team to engage with the community.

At the end of a research project, KFN requests a copy of the final report and/or any publications to be shared with KFN (the government). At present, there is no requirement to communicate the outcomes of the studies with the KFN community. Furthermore, the volume of research in Kluane has made knowledge and data management a challenge as there is currently no policy or procedure in place to store publications on site and make publications available in a searchable database.

In spite of the long presence of the Arctic Institute for North America (AINA) in Kluane region, there was very little contact between AINA and KFN. More recently, there are early signals of greater engagement between the parties as KFN has been invited to sit on the Research and Education Advisory Committee (REAC).

Q&A: *Do researchers come back and present or is there just piles of publications that get sent back?* Some researchers come back, typically those who have been involved since the beginning.

Q&A: *What is the relationship with AINA?* It's changing with the recent advisory committee (historically very little, now a little more).

Q&A: *Do we know how many dissertations and thesis there are about the Kluane region and do we have them?* No.

WHAT IS VALUE OF RESEARCH IN KLUANE?

While the speaker realized early on that she wasn't going to be a scientist, she certainly valued the work that was being done. Spending a lot of time in research camps, there was sometimes a disconnect between the research community and local community. At times you might encounter scientists with discouraging attitudes who would always say to camp support, "you should leave that to the professionals!" Though these attitudes were the exception rather than the rule, as the majority of the researchers really valued their connections to local people. Today, there seems to be a really positive attitude as communities are coming together and we seem to be entering a wonderful pathway forward.

This area has always attracted researchers due to the ability to witness and experience natural processes. This is common interest between people who live here and researchers. Having the time and space to connect with the natural environment and observing it means that you don't actually have to go and manipulate natural environments. We have the luxury of living in this unfragmented landscape where we see all these natural processes happening that aren't influenced very much by humans and the locals appreciate that.

The real opportunity is just in valuing this place we all live in. This means valuing the people and respecting people's views.

WHAT DO YOU SEE AS THE OPPORTUNITIES FOR RESEARCH IN THIS REGION?

The speaker shared her early experience with research when working for Parks Canada which suited her natural curiosity of always asking questions. She found the Parks researchers were always more than happy to talk about their research and share their knowledge. Though she's never been to squirrel camp or "bunny" camp, she is grateful for being part of the Parks community and the Burwash community. And she is grateful for this weekend to bring together researchers and local communities.

ROUNDTABLE REFLECTIONS ON RESEARCH IN KLUANE

Following the personal perspectives of the four (4) community members on their experiences with research, we opened up the discussion for comments and reflections. This open format allowed participants to voice their interests and concerns related to research in the Kluane region. A number of important themes emerged that are captured in the following section.

CHALLENGES, IMPACTS AND LIMITATIONS WITH RESEARCH

NOTE REGARDING KEY ASSUMPTIONS

In bringing together researchers and community members to initiate a dialogue around shared research interests, there are some underlying assumptions related to the value of research such as: i) Community members see value and are interested in encouraging stronger relationships and sharing information between researchers and community members; and ii) Research can offer a range of benefits to the community such as local (notably youth) participation in research activities and a greater understanding of our world through the study of natural phenomena. These were assumptions made by the Summit Planning Committee in designing the dialogue for the roundtable discussions. While these assumptions generally align with the participants' views, during the roundtable reflections, we were reminded of the impacts and limitations of research as these not only affect how the community relates to research but also challenged how we think about the value assumptions made relating to research.

CHALLENGES WITH RESEARCH

Bridging science and traditional knowledge. The core challenge for many participants remains the challenge of bridging science and traditional knowledge in a meaningful way. Traditional knowledge is learned from living on the land and spending time with a knowledgeable elder. These lessons and lived experiences can't be easily shared through short interactions between the knowledge holders and researchers and so some questioned the utility of even trying to teach traditional knowledge. Many noted the difficulty of including traditional knowledge that is captured within stories and legends and not easily extracted. Others commented on the challenge of translating meaning from Southern Tutchone into English.

Finally, a sensitive but important statement was raised on the internal challenges with sharing cultural knowledge and/or historic information. The legacy of residential schools and Canada's assimilation policies has left a lot of First Nations without knowledge of their own laws and traditions. An elder commented that our youth aren't aware of First Nations laws, traditions, or knowledge. An important first step in sharing knowledge of the land needs to happen with the youth: they need to be taught about traditional protocols. (One example offered related to requesting permission to monitor salmon on a family's trapline.)

Information is available but inaccessible. Currently, the final step in KFN's involvement in a research project is the receipt of a document or report. When KFN receives the research report, it is physically stored in a file drawer in the office. There is no searchable database or filing system that members can use to find or access them. KFN staff noted this as a core vulnerability for information loss as the current system depends solely on the corporate memory of key individuals. However, the capacity to manage information systems in-house is limited and introducing a new system without added resources would simply create more burden to an already taxed system.

Knowledge and data information sharing and ownership. A number of concerns were expressed related to sharing of sensitive or confidential knowledge and

information. Without a clear policy in place to guide principles relating to ownership/control/access/possession of knowledge and information, many of the KFN citizens question ‘who owns the data/knowledge’ that is collected by researchers?

Communication, communication, communication. A clear concern is the lack of communication between both researchers and community members and government(s) and its citizenry. Participants repeatedly expressed that they simply want to know what is happening, when, and how it will affect them. This is as true for research projects as it is for new policy directions or government decisions. An added layer to this particular challenge relates to finding the best means of communicating with a broad range of citizens. It is clear that current efforts to communicate research activities and results to the community may not be reaching all members. Not all community members have regular access to internet services and/or community newsletters. Nor is there a dedicated site, at present, to provide up-to-date information on research in the region.

Increased engagement with researchers can strain existing capacity. Capacity to engage with researchers and ensure community involvement in research projects is limited and additional requests to engage can place additional strain on existing resources.

IMPACTS OF RESEARCH

Though limited to a few voices, an important discussion surfaced around the growing presence of researchers in the area and how it can adversely affect the way that local community members and First Nations relate to their lands. One participant viewed the greater number of researchers out on the land, particularly combined with an increasing presence of ‘critter cams,’ as an invasion of privacy. Another questioned the value of research in telling us ‘what we already know.’ One comment referred to the relatively short-term perspective that researchers have related to many of the changes occurring in the region. For instance, one participant noted that Kluane Lake and the A’ay Chù have changed dramatically in the past and is known through our oral histories. Therefore, this current shift doesn’t represent such a ‘big deal.’

LIMITATIONS WITH RESEARCH

There were several comments on the limitations with research. One notable limitation is it narrowly focuses on a single cause and effect relationship whereas traditional knowledge views everything as connected. Several others noted that many of the observational research projects (ie. squirrel camp) spend relatively short intervals of time studying population/life-cycle changes compared to observations made and passed down through oral history and traditional knowledge.

BREAKING BARRIERS AND CREATING OPPORTUNITIES

BRIDGING TRADITIONAL KNOWLEDGE AND SCIENCE

Science can “Work for Us”. Generally, participants valued the role of science and researchers in supporting community interests as a number of roundtable participants commented on the value of having researchers studying in the region. One participant shared that the Alsek Renewable Resources Council (ARRC) has often invited researchers to attend their meetings and he always found the researchers were willing to listen to community concerns and share their information. As an educator, another participant commented that in the past, she has invited researchers from ‘Squirrel Camp’ to attend KFN youth camp to present their research on squirrels. She valued this contribution and is in further conversations about the role of the Kluane Lake Research Station in local youth involvement in research activities.

Traditional and local knowledge can inform research. Many of the participants felt that science has something to learn from local observations and from the histories of the people living on the land. The approach at many of the research camps is based on observing animal cycles over time. A few participants commented that the researchers could improve their research by talking to Elders and knowledge holders about their observations on and experiences with the wildlife being studied.

Another participant noted that there is a growing interest in re-thinking how research can be carried out in partnership with local communities. He viewed this as a positive step in creating better outcomes both for researchers and community members.

COMMUNITIES CREATING THE CONDITIONS FOR SUCCESSFUL RESEARCH PARTNERSHIPS

FOUNDATIONS FOR RELATIONSHIPS

A necessary condition for any successful partnership, particularly one that involves sharing knowledge, is building trust among parties. A number of suggestions were made that could foster relationship building:

Increased interaction between the communities and more communication available on research activities. One participant commented that the KLRS open houses are great for community members to attend and learn about research in Kluane. Also, it's important to ensure research updates are reaching communities through already established media outlets (ie. social media sites; community, organization and First Nation websites; and newsletters). In addition, First Nations governments and Renewable Resources Councils can work to keep lines of communication flowing between researchers and the community.

Encourage openness and be willing to explore ideas together. One participant suggested we need to be open minded and encourage researchers to make efforts to talk to First Nations peoples when working in the communities. In addition, researchers should take the time to listen to feedback and/or input from the community

Clear communication of research results. Many of the participants were pleased with the research results presented (on Day 1) in plain language summaries. Community members would like to continue to have non-technical language used when communicating research results to the community.

Be aware of cultural values and protocols. When working with First Nations, researchers need to be aware of cultural values such as sacred sites, animals and stories. In addition, there are cultural protocols for sharing certain knowledge and this requires attention.

Create and communicate the benefits of research. Researchers from outside the communities should communicate the opportunities for involvement and consider community research interests or needs. Local members want to ensure that research can and/or will address community concerns and priorities. What is key is that research needs to be of some benefit. It needs to be able to

support/resolve practical concerns. Why research something that is out of our control? Community members also want to ensure that youth will be involved in research activities.

Learning culturally appropriate communication protocols. There are protocols that First Nations have when visiting and receiving guests. Researchers on the land can embrace some of these protocols like more formal invitations (rather than an announcement in a newsletter) to local First Nations to visit the camps or to other events.

ENABLING POLICIES AND GUIDELINES

As a self-governing First Nation, KFN has the authority to create their own policies, guidelines and/or confidentiality agreements to clarify outstanding questions and address members' concerns over ownership, control, access and possession of knowledge acquired from First Nations' knowledge holders. To successfully engage in research partnerships, it became clear that the development of these types of policies would help to enable the relationships between First Nations, in particular, and researchers.

Participants urged the KFN government to create policies and/or guidelines for:

- i) researchers working with knowledge holders (including a framework for inclusion of traditional knowledge); and
- ii) community members sharing traditional knowledge as there are sacred teachings that should not be shared publicly.

A number of First Nations (ie. Vuntut Gwitchin, Nacho Nyak Dun, Teslin Tlingit Council) and territorial (ie. Yukon, NWT, Nunavut) governments have developed policies to guide the inclusion of traditional knowledge in research. Some suggested these might be good models for KFN to consider in creating their own traditional knowledge policies.

PLANNING FOR RESEARCH

An important point was raised on the presence of AINA in Kluane. The Institute has been in the area for 50 years, yet this is the first time researchers and community members are coming together to talk about shared interests. In thinking about how the community wants their relationship with research to evolve in the next 50 or 100 years, the community has a real opportunity to begin planning it out together. Several important interests were raised:

Focus on research that benefits communities and that communities can influence in some way. Research carried out in partnership with communities needs to demonstrate clear benefits to the communities. This could be achieved through: i) focusing our attention on research that can effect change; ii) investing in youth participation; or iii) involving KFN citizens in research and/or dissertation committees.

First Nations are well positioned to lead. First Nations have an opportunity to create better research outcomes and inform how research can be done through a holistic lens. KFN has the expertise to develop an accredited and mandatory course for researchers to learn key principles and protocols when working in Kluane or with KFN citizens. Finally, First Nations youth are uniquely positioned to be learning two distinct but complementary knowledge systems.

Improve communication and accessibility to knowledge and information. There's an opportunity to invest in the development of a searchable database to make knowledge, information and data accessible to communities. Also, when the research ends, it's important that researchers come back to communicate results of research and maintain communication on active research projects.

COMMUNITY RESEARCH PRIORITIES

One of the key objectives for Kluane First Nation in hosting this Summit was to identify an initial set of research interests that could guide the Nation in prioritizing research partnerships and funding opportunities. We invited community members to reflect on community research priorities for the region.

While not everyone agreed on either the value of research or on the research priorities themselves, we did generate a list of potential areas of interest:

Inclusion of traditional knowledge – A common interest was the need for greater inclusion of Indigenous and local knowledge to inform research projects in the region. However, several participants commented on the need for clear guidelines and/or policy frameworks to be developed to ensure knowledge and information is shared appropriately.

Revitalization of cultural research – continue to carry out and complete (transcribe/digitize) oral history projects. Continue to update genealogy charts, invest in Southern Tutchone language projects (ie. place names). Where appropriate, have oral history ‘validate’ research findings.

Governance and Self-determination – Protecting water is a priority and First Nations should be leaders in creating the rules and regulations for water management and governance in the Kluane region. We need to set out whether we will work together or fight over our shared water resources.

Kluane Lake – Cited numerous times and by multiple participants, this was a clear priority for community members. Participants want to monitor changes to lake levels and understand/forecast the effects of melting glaciers on future generations. Concerns were raised over increased algal growth and the ecological effect(s) of that. Greater understanding of water quality of lake water and presence of potential contaminants; is there a baseline for the water quality of Kluane Lake? Is there an inventory (water balance) of water flowing into Kluane Lake from all the tributaries?

Glaciers – monitor the changes and potential to impact regional water bodies, particularly Kluane Lake. One participant inquired about the ‘ash’ located in the glacier.

Gophers – Members have observed changes to the landscape that are affecting changes to the gopher populations. Participants want to understand what is

responsible for these changes: is the higher grass creating poor gopher habitat? Some research projects have transplanted gophers but there hasn't been any follow up on the long-term results

Effects associated with glacial dust – Concerns were raised related to the potential health and socio-cultural effects of dust emissions: are the dust emissions carrying particulate matter that can damage the lungs? What are the health implications of dust emissions? One participant reported that dust emissions have already caused damage to vehicle engines. Another wondered about the potential effect of dust emissions on vegetation and subsequently the food source for animals occupying Thechàl dhâl.

Climate change, global change – Changes to the landscape, including vegetative changes, will affect the animals. We also need to know how we can adapt to the changes (ie. food sustainability; permafrost and related effects to community infrastructure).

Effects of invasive species – One concern was raised regarding the introduction of non-native grass seed along the highway and concerns that will displace other grass. What are the long-term effects of invasive plants on the local ecologies? Human activities are impacting the landscape and ecosystems. There used to be horses in Duke Meadows eating the grass and now there aren't.

Food sustainability – possible to encourage plant growth and determine what types of plants grow in the Delta and would it be possible to encourage specific types of vegetation? We want to see what plants can be harvested for food to help us move away from depending on needing to transport food into the community.

Other considerations. Consider research priorities from other disciplines such as health, governance, etc. Another important issue that was raised multiple times throughout the Summit and during Roundtable discussions related to focusing on the practical application of research.

CEREMONY IN RESEARCH

In the invitations, we requested Summit Participants to bring a jar of water from their local watershed. Upon reconvening the two groups in the afternoon on Day 2, following the separate group activities in the morning, we invited participants from both groups to participate in a ceremony to acknowledge the central role of water not only in our research but in our lives.

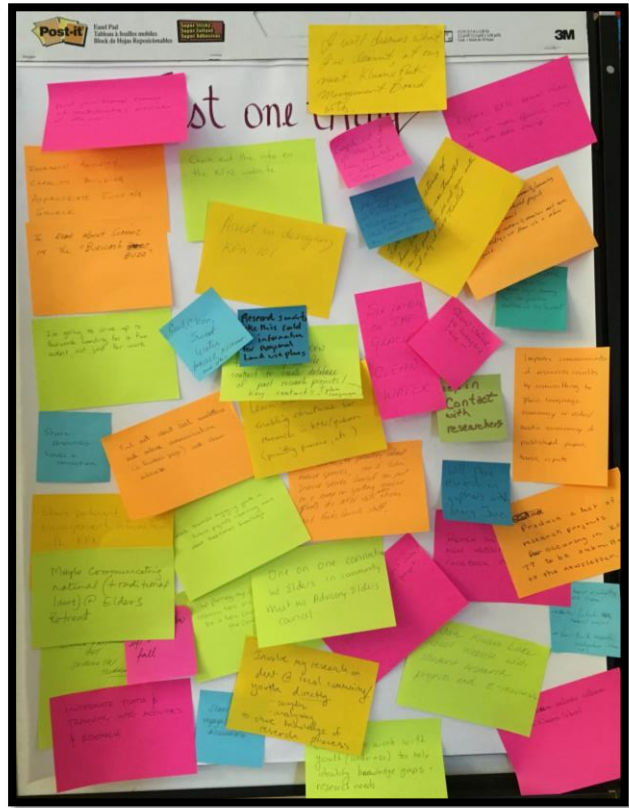


Researchers contributing water from their local watersheds to a communal jar during the water ceremony.

“JUST ONE THING”

Prior to closing the Summit, we asked participants to commit to doing “just one thing” that would help advance the discussions held on Day 2. The activity could be something as simple as following up on social media or as involved as co-developing a new research proposal. Whatever the activity, all that mattered was that it was an action that the participant committed to completing in whatever time frame they could manage. The following is a complete list of the Summit Participants’ commitment to advancing Kluane research:

- ❖ Will share research on gophers with Mary Jane
- ❖ Share resources → make a connection
- ❖ In a week: assist with submitting CMN proposal; In a month: initiate protocol project; in a year: build respectful relationships...show up!
- ❖ Always follow up in the fall
- ❖ Share information, engage more discussions.
- ❖ Cool, clean, sweet water for all KFN members and others
- ❖ Participate in either one or two research projects either this summer or winter
- ❖ Compile list of all research I have conducted in Kluane Traditional Territory
- ❖ Research summits like this could be information for regional land use plans
- ❖ Show value to everyone here
- ❖ Write an article on science and explorers act, bridging TK/science
- ❖ Integrate youth and training into activities and research
- ❖ Stop planning my future Master's research topic and allow it to be a topic chosen/driven by the community
- ❖ Update Kluane Lake School website with student research projects and e-movies
- ❖ Go to chum salmon release with Kluane School
- ❖ Review the KNPMB's new website and facebook page!



- ❖ Visit the community and invite/share/discuss current project, update, etc.
- ❖ Involve my research on dust with local community/youth directly - sampling; analyzing - to share knowledge of research process
- ❖ Continue to work with youth (under 30) to help identify knowledge gaps and research needs
- ❖ One on one connections with Elders in community; meet with advisory Elders council
- ❖ Produce a list of research projects occurring in KFN Traditional Territory to be submitted to the newsletter
- ❖ Improve communication of research results by committing to plain

- language summary or video/audio summary of published papers, theses, reports
- ❖ Work with KFN/DKRRC to develop a new research project stemming from the priorities identified at the Summit
- ❖ CLEAN WATER
- ❖ FIX PROBLEM ON THE GLACIER
- ❖ Keep in contact with researchers
- ❖ To address one of the priorities about invasive species, see if Yukon Invasive Species Council can put on a course on spotting invasive plants for KFN staff and/or citizens and Parks Canada staff
- ❖ Work towards engaging youth in future projects and learning more about traditional knowledge
- ❖ Share pertinent land management information with KFN
- ❖ Maybe communicating natural (traditional laws) at Elders Retreat
- ❖ Find out about local newsletters and online communication (ie. Facebook page) and then subscribe
- ❖ Learn more about enabling structures for research in KFN/Yukon (permitting process, etc)
- ❖ Call DKRRC and KFN to discuss options for contract to create database of past research projects/key contacts (plain language)
- ❖ Check out the info on the KFN website
- ❖ Assist in designing KFN 101
- ❖ I'm going to drive up to Burwash Landing for a fun event, not just for work.
- ❖ Research activity, capacity building, appropriate funding source
- ❖ To read about Summit in the "Burwash Buzz"
- ❖ I will discuss what I've learnt at our next Kluane Park Management Board Mtg
- ❖ Brief plain language summary of results/findings every step of the way
- ❖ Phone/email follow-up with community/researchers about potential/new/refocused projects discussed at this summit; 2) In fall, connect with community members met here to discuss findings on Kluane Lake and refocus if required
- ❖ Listen to Elder stories of how Kluane Lake was travelled in the past over ice and open water and why it was travelled
- ❖ Explore KFN social media; look at more effective ways of Lake data sharing

CONCLUSION

Through the Summit presentations and discussions, we set out to:

1. Promote relationship building and 2-way knowledge sharing between researchers & community members about lake-related interests and research;
2. Invite researchers to learn about and visit Kluane communities;
3. Identify community-based research priorities & community expectations of researchers working and studying in Äsi Keyi (our grandfather's land).

Over the space of two days, it was clear that new connections were made and the majority of participants left with a renewed enthusiasm for the opportunities that lay ahead. While the history of research in Kluane suggests that the local community (most notably First Nations) have been marginalized by research activities in the past, all the participants seemed committed to working together today for better outcomes in the future.

RECOMMENDATIONS FOR ADVANCING RESEARCH IN KLUANE

1. Both researchers and community members need to engage in cross-cultural learning. For researchers, this means understanding the history, including the history of research, in the area. Being aware of these histories can help orient researchers to the local context. For community members, this can mean engaging with research activities and reviewing the results of the published research projects.
2. Kluane First Nation develops an introductory course on the history, knowledge and people of Kluane for researchers (ie. KFN 101)
3. Increased communication and opportunities for interaction between research communities and local communities
4. Empirical observations of local ecologies can benefit from more time spent with First Nations and community members
5. Work towards making existing knowledge, data, information more accessible to the community

6. Work on mutually beneficial research projects
7. Kluane First Nation develops policies and guidelines for research with traditional knowledge
8. Research continues to include traditional knowledge
9. Invest in cultural revitalization projects

NEXT STEPS & WORDS FROM THE PLANNING COMMITTEE

First and foremost, we want to extend a very sincere thank you to all Summit participants. The Summit would not have been possible without you and we are grateful that you took time out of your busy schedule to attend, present, listen, and share your thoughts. Thank you also for coming with an open mind and fostering a welcoming and respectful environment.

Many positive and productive outcomes resulted from the Summit. Although meetings between researchers and community members have occurred in the past, to our knowledge this is the first event of this size which brought both groups together with the collective goals of getting to know each other better, share information and cultures, discuss challenges, identify possible solutions, and move forward together in knowledge sharing. Only good can come out of spending time together to build meaningful relationships and improve communication.

We also really appreciated your feedback on ways to improve future Research Summits, including increased youth involvement and expanding the research focus beyond the lake. Many of you noted it would be great to have research summits at Kluane become a regular event - we agree and will do our best to encourage and support this. **Considering that this Summit was organized voluntarily and with minimal resources, requirements for future summits to occur sustainably include additional individuals or organizations and support. If you or your organization can contribute to (financially or otherwise) or lead future summits, Kluane First Nation and the Dän Keyi Renewable Resources Council would love to hear from you!**

APPENDICES

APPENDIX A – PARTICIPANT LIST

Day 1, May 4, 2018

First Name	Last Name	Organization/Affiliation
Larry	Joe	Alsek Renewable Resources Council
Peter	Johnson	Kluane First Nation
Grant	Zazula	YG Heritage
Kristy	Kennedy	Yukon Geological Survey
Laurent	Mingo	Blue System
Alexandra	Pulwicki	Blue System
James	King	Universite de Montreal
Marie	Cadieux	Universite de Montreal
Christian	Schoof	UBC
Emt	Young	SFU
David	Hik	University of Alberta and SFU
Gwenn	Flowers	SFU
Michael	Riseborough	Kluane National Park Management Board
Sandra	Johnson	Dän Keyi Renewable Resources Council
Wade	Istchenko	Kluane MLA
JP	Pinard	Silver Creek Resident
Sally	Wright	Silver Creek Resident
Sam	Zonnega	Trent University
Stella	Sotorra	UBC
Melanie	Boudreau	Trent University
Ben	Schonewille	EDI
Gerald	Dickson	Kluane National Park Management Board
Gloria	Johnson	Kluane First Nation
Mark	Nassiopoulos	Alsek Renewable Resources Council
Trix	Tanner	Department of Fisheries and Oceans
Al	von Finster	Independent
Finella	Pescott	Consultant - KFN
Peter	Upton	Dän Keyi Renewable Resources Council
Ryan	Drummond	YG Environment
Shawn	Taylor	YG Environment
Cecile	Sias	Burwash Landing Resident
Sheri	Atlin	Kluane First Nation
Robert	Perry	YG Environment
Michael	Schmidt	Arctic Institue of North America
Kluane	Martin	Kluane First Nation
Greg	Bickerton	Environment Canada
John	Spoelstra	Environment Canada
John	Miller	YG Environment
Jaime	Kenyon	Ducks Unlimited
Ellorie	McKnight	University of Alberta
Geraldine	Pope	Kluane First Nation staff
Pauly	Sias	Dän Keyi Renewable Resources Council

Kate	Ballegooyen	Kluane First Nation staff
Agnes	Johnson	Kluane First Nation
Chief Bob	Dickson	Kluane First Nation
Carmen	Wong	Parks Canada
Kate (?)	?	Kluane First Nation
Lance	Goodwin	Outpost Research Station
Suzanne	Flumerfelt	Dän Keyi Renewable Resources Council
Lawrence	Ignace	AICBR
Jared (?)	Bunnedd (?)	
Molly	Pratt	AICBR
Kelly	Pickerill	AICBR
Cecile	Cox	Destruction Bay Resident
Sonia	Wesche	University of Ottawa
Adrian	Schimnowski	Arctic Research Foundation
Katie	Johnson	Kluane First Nation
Marsha	Flumerfelt	Destruction Bay Resident
Mary	Easterson	Kluane First Nation
Janice	Dickson	Kluane First Nation
Grace	Southwick	Kluane First Nation
Colin	Gray	Destruction Bay Resident
Brian	Horton	Yukon College
Ron	Chambers	Champagne Aishihik First Nations
Liz	Johnson	Kluane First Nation
Harry	Penn	AINA
Mary Jane	Johnson	Kluane First Nation
Mike	Butler	Icefield Discovery
Rhianna	Skookum	Kluane First Nation staff
Nina	Dickson	Kluane First Nation staff
Susan	Toch	Water to Drink
Dick	Mahoney	
A. Iris	Point	Kluane First Nation staff
Taylor	Hunter	Kluane First Nation staff
Paul	Hemstridge	Kluane National Park and Reserve
Becky	Miller	Kluane First Nation
Logan	Moore	Kluane Lake School
Rian	Acda	Kluane Lake School
Alyce	Johnson	Kluane Lake School
James	Allan	Champagne Aishihik First Nations
Gareth	Earl	YG
Mike	Crawshay	Haines Junction Resident
Hazel	Skookum	Kluane First Nation staff
Emily	Cohoe	Atlin BC Resident
Eddie	Dodd	Kluane Lake School
Russel	Osborne	YG Conservation Office
Adam	Hicks	Kluane First Nation staff
Kelly	Wroot	KCDLP

Randy	Johnson	Uplands Mining, Kluane First Nation
Russell	Dickson	Kluane First Nation
Shailyn	Drukis	Council of Yukon First Nation
Nichole	Williams	Kluane First Nation staff
Roselie	Neuberger	Kluane First Nation staff

Day 2, May 5, 2018

First Name	Last Name	Organization/Affiliation
Greg	Bickerton	Environment Canada
John	Spoelstra	Environment Canada
John	Miller	YG Environment
Stella	Sotorra	UBC
Marie	Cadieux	Universite de Montreal
David	Hik	University of Alberta and SFU
James	King	Universite de Montreal
Laurent	Mingo	Blue System
Gwenn	Flowers	SFU
Christian	Schoof	UBC
Ent	Young	SFU
Alexandra	Pulwici	Blue System
Adrian	Schimnowski	Arctic Research Foundation
Ben	Schonewille	EDI
Trix	Tanner	Department of Fisheries and Oceans
Carmen	Wong	Parks Canada
Lawrence	Ignace	AICBR
Joe	Bruneau	AICBR
Larry	Joe	Alsek Renewable Resources Council
Kristy	Kennedy	YGS
Grant	Zazula	YG Heritage
Cecile	Sias	Burwash Landing Resident
Alyce	Johnson	Kluane Lake School
Sandy	Johnson	Dän Keyi Renewable Resources Council
Gloria	Johnson	Kluane First Nation
Susan	Toch	Water to Drink
Marsha	Flumerfelt	Destruction Bay Resident
Michael	Riseborough	Kluane National Park Management Board
Fred	Stick	Champagne and Aishihik First Nations
Geraldine	Pope	Kluane First Nation staff
Mary	Easterson	Kluane First Nation
Michael	Johnson	Kluane First Nation
Sian	Williams	Dän Keyi Renewable Resources Council
Gerald	Dickson	Kluane National Park Management Board
Colin	Asselstine	Dän Keyi Renewable Resources Council
Pauly	Sias	Dän Keyi Renewable Resources Council
Ellorie	McKnight	University of Alberta

Peter	Upton	Dän Keyi Renewable Resources Council
Shailyn	Drukis	Council of Yukon First Nation
Brian	Horton	Yukon College
Sharon	Kabanek	Kluane First Nation
Grace	Southwick	Kluane First Nation
Kelly	Pickerill	AICBR
Mike	Johnson	Kluane First Nation
Cecile	Cox	Destruction Bay Resident
Molly	Pratt	AICBR
Charles	Eikland Sr.	Destruction Bay Resident, White River First Nation
Marissa	Mills	Kluane First Nation
Adam	Hicks	Kluane First Nation staff

APPENDIX B – PARTICIPANT AGENDA

DAY 1: Friday, May 4, 2018

Time	Topic	Description
9.00	Arrival and registration	- Summit participants arrive and register - Space available for setting up booths - Tea and coffee available
10.00	Welcome	Welcome and opening remarks - Welcome prayer - Welcoming remarks from Chief Dickson, Kluane First Nation - Welcoming remarks on behalf of Dän Keyi Renewable Resources Council (C. Asselstine) - Welcoming remarks by local MLA (W. Istchenko)
10.15	Summit overview and acknowledgements	Overview of the Summit Agenda (N. Joe) Guest acknowledgements and introductions
10.45	Community perspectives	Dän keyi Community perspectives on the significance of Lhù'ààn Mân over time
11.05	Health break	
11.15	Summit Presentations	Lhù'ààn Mân and A'ay Chù - Baseline and monitoring of Kluane Lake (E. McKnight, University of Alberta) - A'ay Chù (C. Schoof, University of British Columbia) - Kluane Fish Ecology & Health (R. Perry and O. Barker, Yukon Government)
12.00	Lunch break	
13.00	Student monitoring	Community Presentation Student river and lake monitoring program (Kluane Lake Elementary School)
13.15	Panel Presentation	Panel: Collaborative Research Kluane Lake and River Groundwater and Salmon Habitat (J. Spoelstra, G. Bickerton, K. Ballegooyen, J. Miller, Joint Initiative of Environment Canada, Kluane First Nation and Yukon Government)
13.45	Summit Presentations cont.	Research and Monitoring in Kluane

		• Fish, Frogs, Water: Monitoring Freshwater in Kluane National Park and Reserve (C. Wong, Parks Canada) • Dust climatology of the A'ay Chù Valley (J. King, Montreal University)
14.15	Update	Update • Kluane Lake Access (G. Earl, Yukon Government)
14.30	Networking and Opportunity to view Summit Booths	
15.30	Summit Presentations cont.	Researching Prospects and Potential Partnerships • Bringing Research Home: Reclaiming research to tell the story of climate change in Kluane First Nations Traditional Territory (S. Wesche and B. Horton, Partnership of Yukon College, Kluane First Nations and AIBCR) • Creating a Climate Change Preparedness Strategy for Kluane Lake through Morphologic and Environmental Change Models (M. Molone, Arctic Institute) • Exploring the Idea of a Yukon Research Vessel (Arctic Research Foundation)
16.15	Overview of Day 2	Overview of Day 2 (N. Joe) • Announcements
16.30	Networking	Networking and opportunity to visit booths
17.00	Dinner offered to Summit Participants at Jacquot Hall	
18.00	EVENING CAMPFIRE (Weather dependent)	

DAY 2: Saturday, May 5, 2018

Time	Topic	Description
8.00	Breakfast	Hot breakfast provided
9.00	Meet up at locations	Departure points: Summit participants arrive at their meet-up location - Group 1: Researchers will meet outside of Jacquot Hall and depart with local guide to explore community - Group 2: Community members will meet inside Jacquot Hall to participate in facilitated discussions
9.15	Understanding research in our communities	Talking circles: Better understanding research in our communities (Group 2) - Circle of community members discuss the history of research in Kluane - What are different ways of knowing and how can our knowledge be respectfully included in research?
10.05	Health Break	
10.15	Identifying our community's research priorities	Creative brainstorm - What changes are people witnessing on the land? In the community? - What do we want others to learn from us? What do we want to learn from others? - Can research help our community heal, prosper, grow, move us towards self-determination?
11.00	Health Break	
11.10	Identifying benefits and barriers to research	Talking circle: What's our role in research? How do we as a community want to participate in research? What are the benefits and barriers to research? How can we overcome these barriers?
12.00	Water Ceremony	Water Ceremony
12.30	Lunch	
13.00	Reconvening	Morning reflections Highlights from the morning (Rapporteurs)
13.10	Plenary discussions	Roundtable reflections: How do we collectively and individually understand research?

		How may we approach different ways of knowing for better outcomes?
13.30	Matching community priorities with research interests	Co-discovery: Exploring where research interests align with community interests?
14.30	Door prizes	
14.45	Closing reflections	Roundtable Reflections Exploring lessons learned on how we may engage each other for better research outcomes and better community outcomes
15.15	Summary	Summary of next steps (N. Joe)
15.30	Closing circle	Closing the circle - Invite group to a closing circle - Elder to offer closing - Closing remarks from community
16.00	Evaluations	Participants complete an evaluation form
16.15	Departures	

APPENDIX C – PRESENTATION ABSTRACTS

The following abstracts have been prepared by the Summit Presenters and are listed in the order in which the presentations were made on Day 1.

BASELINE AND MONITORING OF KLUANE LAKE WATER PROPERTIES

E. McKnight, PhD candidate, University of Alberta

Water temperature is important in a lake: it plays a big role in determining the ecology of a system, including how much and which species of algae and fish are present. With climate change, we are seeing warmer average air temperatures, longer open water seasons, and more dramatic events such as the change in the A'ay Chù which may cause shifts in the lake water properties (including water temperature) of Lhù'ààn Mǎn. Monitoring lake water properties (such as temperature and conductivity) over time is relatively easy and allows us to see if and how the lake might be changing.

CHANGES IN THE GLACIERS, THE RECENT DRYING UP OF THE A'AY CHÙ (SLIMS RIVER) AND THE PAST AND FUTURE DRAINAGE OF KLUANE LAKE

Dr. C. Schoof, University of British Columbia

Until 2006, Kluane Lake was fed by glacier melt from the Kaskawulsh Glacier. Water from the glacier drained through the A'ay Chù into the Lake. Like many other glaciers in the region, the Kaskawulsh has been shrinking. This shrinkage is very likely due to climate change over the last century, and almost certainly will not be reversed in the near future, or the coming centuries. The shrinkage of the glacier allowed waters draining from it to be rerouted, flowing towards the Alsek River rather than Kluane Lake. I will use geological information about how rivers drained in the Kluane Lake area in the past 5000 years to show how water routing has been changed in the past by glacier advance and retreat, and what changes are likely to occur in the future. These may include Kluane Lake becoming an isolated basin for some period of time, before erosion in the A'ay Chù river valley completely reverses the routing of the river. This could lead, over a few centuries, to Kluane Lake draining south into the Alsek River instead of the Yukon, as it has been for the last four centuries.

HEALTH OF KLUANE LAKE TROUT AND WHITEFISH

R. Perry, Yukon Government

Yukon Fisheries surveyed Kluane in 2013 using the SPIN methodology (Summer Profoundal Index Netting). The 2013 SPIN survey captured 152 lake trout, resulting in a lake-wide numerical CPUE (fish caught per net) of 1.02 lake trout per net. The estimated density for lake trout was 4.2 lake trout per hectare. Lake trout had an average length of 55.2cm (range 24 to 95cm) and an average age 12 years (range 4 to 38 years old). The SPIN survey also captured 471 lake whitefish, resulting in a lake-wide CPUE of 2.44 lake whitefish per net, and a lake wide biomass of 1.94 kg of lake whitefish per net. Kluane Lake has a high relative density of both lake trout and whitefish.

KLUANE LAKE GROUNDWATER PROJECT

K. van Ballegooyen, Kluane First Nation; J. Miller, G. Bickerton, J. Spoelstra, Yukon Government and Environment Canada

Salmonid fish species such as salmon, trout, and grayling rely on groundwater discharge areas in lakes and rivers for spawning. Climate change is affecting the groundwater discharge areas available for fish spawning around Kluane Lake. The goal of this project is to establish baseline information on groundwater discharge around the shoreline of Kluane Lake so that the impacts of climate change and lake level change can be better understood with respect to salmon spawning.

habitat. This project will first map groundwater discharge areas around Kluane Lake using infrared thermal imagery (done in Aug 2017) and select discharge locations will subsequently be sampled and analyzed for water quality parameters. An aerial survey of current salmon spawning locations will also be completed and, combined with traditional knowledge on historical salmon spawning areas, will be compared to the groundwater discharge locations and chemistry. At select sites, more detailed mapping and sampling of groundwater discharge will be done to help estimate the potential loss of spawning habitat as lake level decreases. Another potential product of this research is the identification of areas that are suitable for salmon spawning that KFN and DFO could potentially use to incubate salmon eggs in the event that current spawning areas become unsuitable for use due to water level, chemical, or physical changes.

FISH, FROGS, WATER: MONITORING FRESHWATER IN KLUANE NATIONAL PARK AND RESERVE

Dr. C. Wong, Kluane National Park and Reserve

Fish, frogs, water – Parks Canada has been monitoring these in Kluane National Park and Reserve, some since 1976. These indicators tell us about the health of freshwater ecosystems in and outside of the Park. Three monitoring tales will be told: 1) how Dufj influenced the methods we used to monitor frogs, 2) how long-term monitoring revealed the boom and bust cycle of kokanee salmon, and 3) how monitoring lake trout and water temperature in the Park informs fishing management in the region.

DUST CLIMATOLOGY OF THE A'AY CHÙ VALLEY (SLIMS RIVER VALLEY)

Dr. J. King, McGill

Mineral aerosols (dust produced by wind erosion) in the atmosphere affect the environment of the earth through their direct effect of absorbing or reflecting solar radiation, changing the ways cloud form, and changing how much radiation from the sun reaches the ground. Also, when the dust is then deposition either locally or up to hundreds of kilometres away, it can provide the essential nutrients for aquatic and terrestrial ecosystems. The dust can also cause health problems when in high enough concentrations, related to respiratory illnesses and increased strain on those with poor immune systems or known respiratory problems. This potential drastic reduction in the water flow into Lhù'ààn Mân from a change in the Kaskawalsch glacier behaviour will result in the rapid exposure of the soils deposited by the river, which will extend the periods of wind erosion. Current research is analyzing the connection between wind erosion from valleys with glaciers and the characteristics of the glacier itself. This analysis is conducted by using historic satellite images for the connections between the potential for wind erosion, actual wind erosion, and the changes in the glacier along with the historical and current climate of the valley.

BRINGING RESEARCH HOME: RECLAIMING RESEARCH TO TELL THE STORY OF CLIMATE CHANGE IN THE KLUANE FIRST NATION

Dr. S. Wesche, University of Ottawa and B. Horton, Yukon Research Centre

The aim of this project is to collaboratively study how Kluane First Nation can enhance its ability to actively drive and participate in research in its Traditional Territory, with a focus on climate change as the integrating theme. The project is centred on the values, knowledge and needs of Kluane First Nation (KFN). The main goals of the project are:

1. To compile and return to KFN existing climate change research that has been conducted in their Traditional Territory.
2. To co-develop a process that will empower KFN to have greater control over research in their Traditional Territory.
3. To develop and employ tools to facilitate knowledge mobilization of climate change research in the region, with applicability to other contexts.

KFN Traditional Territory is undergoing rapid climate change, with significant impacts on surrounding ecosystems and inhabitants. While significant research has been conducted, results are not necessarily accessible to KFN for decision-making. At the same time, the Yukon research landscape is undergoing rapid change. While many researchers are interested in developing community-led projects, few resources (e.g. guidelines) exist for developing respectful and effective partnerships. Developing both practical tools and improving methodological approaches for collaborative research will support evidence-based decision making and help reset the relationship between Indigenous and non-Indigenous peoples.

This project is not funded yet, but Yukon College has developed the idea in collaboration with KFN staff, University of Ottawa, Arctic Institute of Community-Based Research and Arctic Institute of North America (University of Calgary). We have applied for funding and hope to learn soon if our proposal is accepted.

EXPLORING THE IDEA OF A YUKON RESEARCH VESSEL

A. Schimnowski, Arctic Research Foundation

1. Success stories rooted in the value of listening to traditional knowledge and co-designed meaningful programs. What does this look like and how can we generate new success stories?
2. Innovative infrastructure that facilitates dynamic avenues in realizing new ways to support sciences, cultural heritage and economic growth.
3. Aligning partners for one common goal - to explore the idea of a Yukon research Vessel.

APPENDIX D – SOUTHERN TUTCHONE WATER AND ICE TERMS

Water and Ice

Chu	Water
Tágà	River
Tágàya	Creek
Mân	Lake
Gẹla	Spring water

Glacier ice	Tanzhì
Glacier	Tanshì
Glacier people	Tanshì kwadân
Glacier water	Tanzhì chu
Glacier crevasse	Tanzhì k'u
Glacier lake	Tanzhì mân

Place Names

Lhù'ààn Mân	Kluane Lake
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Phrases

Ajù dań utth'ât Kwach'e *NO one's the boss of the water*

Ts'âl chu tth'ât ach'ị Kugwan ch'âw chu dań ts'etlaw kuk'ânáta
anjet kwadaây kwats'ân

Even though the people look after the water since long ago

Chu dań ts'ân mbat kale äyet ut'ụ dań nânñje kwach'e kwadây
kwats'ân

Water brings the food to the people for a long time

APPENDIX D – SUMMIT EVALUATIONS

1. How would you rate the overall Research Summit?

Average rating (n = 40): 4.79/5; Highest rating: 5/5; Lowest rating: 3/5

Comments:

- Enjoyed the conference - very good food - loved the facilitator
- The summit was excellent, got to meet lots of scientists and researchers, very informative, I learnt a lot of different views of our ecosystem
- Should be an annual event. Set dates for next event as soon as possible.
- (in reference to rating) because one can always improve
- I am so grateful to have been invited and really appreciated the time, structure and content of the program.
- This was a great way to learn about the community and what research means to and how it involves people from all backgrounds.
- Would be valuable to be able to hold annually; seems like a great vehicle to address some issues regarding communication between researchers and community; right balance of structure and informal interactions
- Kate is the best! Ellorie is the best too! Nadia and Pauly were the best as well
- This is a great event that should be repeated at least every year so everyone can have updates on projects
- For only two days it was very informative
- An excellent experience. I really appreciated hearing so many experiences/perspectives. The tour was a highlight.
- Politics or Big Money does not pay attention to the General Public if Large money is available, companies, etc.
- It was my first experience in a Research Summit and I loved it. People from the community are wonderful, so kind and really aware of the changes in their environment. I'm really grateful to have the chance to participate in this event.
- Thank you! Well organized; great to bring the researchers here and allow communication with our community.
- Was a great first start for what could be yearly opportunity to share and plan.
- Well organized, excellent food and broad constructive conversation.
- The community really went above and beyond in putting together the summit. I felt included and welcome and have gained a much deeper understanding of the community.
- This was a great opportunity for researchers and community members to meet and share information.

- Thank you for hosting the Research Summit. It was really great to have such a different mixture of people from various backgrounds to come together and learn from each other.
- Great opportunity to start the conversation; is there thought of how to incorporate other Yukon First Nations; building more science and TK capacity is critical - is there a role for YG (unsure of word), Federal Gov't and broader communication system
- So delighted to see this important summit (bringing community and researchers together) happen. Great job!
- Well organized; good combination of presentations, tour, sharing, etc.
- This was a great opportunity to bring people together and establish priorities.
- Should be an on-going event.
- Really great format, which gave the local community members and people and scientists/outside to speak and listen to each other.
- Nice to have 2 different parts (presentation Day 1 and interactions Day 2). Amazing food! Great timing, 15 minute presentations is perfect.
- Very pleased to meet with the researchers. Yes, I will try and connect with some of them.
- One of the best summit meetings I've ever been to! Wish we did have more co-learning opportunities - small group discussion.
- Thanks so much planning committee and Nadia.
- Well planned, good presentations, need money managers present when discussions.
- Excellent to bring everyone together in an effort to move forward with research in the region.
- Building relationships and dialogue between community and researchers - applicable to place.
- Summit should be yearly.

2. What did you like about the Research Summit?

- Interaction was good
- I liked hearing the stories on different research projects and hearing what their goals were
- It was well organized with clear objectives. It was nice to see the schedule kept so that we could move through all the business. The community tour and descriptions by Elders were so valuable.
- Great to meet new people from the research community and people of Klane Lake country. And, awesome food!

- Having everyone come together (researchers and community) for 2 whole days. This provided lots of time to have the one-on-one conversations that are so important/essential for building relationships.
- Opportunities to meet and have conversations with members of the community; Ron's stories; Thank you for the great food!
- meeting local people and hearing their perspectives; meeting researchers and hearing about their diverse subjects; the food!; excellent facilitation
- Chance to meet the community members; bus tour of community and insight into community history, priorities and future; getting to know community's research priorities and attitude toward/experience with researchers; opportunity to meet and reconnect with numerous community members and scientists in a structured and coordinated way; fantastic food!
- I got to meet tons of people, to hear about their stories from time spent in the region; at home, on the Lake and beyond. Always great to hear about what matters to people, and what they did and do from growing up to living around here today.
- Opportunity to see what other researchers and community are doing and what issues are important to local community; opportunity to interact with community both to answer questions on what we are doing as researchers and also to get input an new ideas; also food was great! (Sorry Talbot Arms)
- The tour was a highlight to me; would recommend a language lesson to help with First Nations names
- Being able to know the types of research ongoing/planned within the area. Being able to communicate/share knowledge with community members/Elders
- The food was most excellent. Learning a lot about First Nations priorities of interest. Great water here, let's keep it clean, clear, and never forget the true value of a basic such as H₂O.
- Meeting people, hearing the questions; openness and respect; overall, a sense of optimism; the food...so good!
- The people, the talks, the activities in general, but mostly the discussion between the community and the researchers.
- Great chance to be led on a field trip, see local places and hear local stories. Good networking, chance to hear what other researchers are doing, learn about their relationships with local community and chances to collaborate.
- Good balance between presentation and discussion; opportunity to spend time in Burwash with both community members and researchers at one event.

- Just meeting and talking to so many people working in this part of the world.
- Open conversation relating to community interest and how this perspective can fit with-in-to research.
- Great event for networking between all. Great food.
- Tour of Burwash Landing; amazing food; flexible space to interact with people; well structured --> time for formal talks and lots of discussions.
- The opportunity to learn about other research going on around Kluane Lake; meeting some of the community members; the community tour; the food was AMAZING!!
- The food was great and I appreciated immensely the tour around the community. I learned a lot and loved hearing about Ron's family heritage.
- Well organized; great food; looking forward to the next one; how do people help with what's been started here?
- All of it? Loved the community tour, loved learning about the research occurring and I really loved the discussions and opportunities to learn from one another.
- Great opportunity to connect both with other researchers and with community members. Great food!
- Thank you Nadia for keeping things moving and on time!
- How to incorporate FN TK into research.
- Flexible format, respectful atmosphere, opportunity to meet and talk with lots of local and interested people. Excellent facilitator.
- A way of connecting with the community. There is a long way to go but it's a good start - hearing everyone speak about their hopes and perspectives.
- Connections between scientific world and First Nation culture.
- The pecan squares!
- The passion of the community members who participated.
- Mingling, powerful discussions, learning from so many different perspectives.
- Super to see such great participation from the community and the researchers.
- The attendance of research people, need the Dana' people to fully address climate issues!!
- Really appreciated the opportunity to interact with community members to hear their perspectives and concerns. The great food!!
- Having the students present their local knowledge; bringing everyone together to dialogue.
- The discussion in Elder's Room; more problem solving (permafrost); youth should be involved.

3. What didn't you like about the Research Summit?

- Nothing
- Not long enough, need 1 more day
- Felt like a lot of sitting which tired people out late in the day. Windy weather probably didn't help!
- It would be fun to have an evening activity like music and dancing.
- Having to spend 2 days inside! Actually, nothing was wrong with the Summit. But maybe have more youth participating.
- The presentations may be a little too long overall, they should be shorter and less technical (still).
- Nothing comes to mind
- Saturday is difficult for government approval
- There was no community-based projects presented/shared other than within the tour.
- Two days long was somewhat exhausting. Lots of facts to take in. Some folks didn't respect free-speech (spoke while others were speaking). Interrupted others - whatever. Suggestions - follow the program.
- Nothing to improve on...can't wait for the next one
- Nothing, it was great!
- N/a all good
- Should have had more participating high school students in the day to day operation and planning for walks and talks.
- The tour was a nice to learn about place.
- I didn't always know what my role was. Not sure how I fit into the group and how to meaningfully contribute
- Nothing
- There wasn't anything I particularly didn't like, however if there was a way to structure the first day more like the second, I think it could be very useful (although I did learn a lot and enjoy the presentations on the first day too).
- While I loved getting to go on the community tour, I also would have loved to be engaged or hear the discussions on research priorities. This would have been very useful for me in the future as I think about my masters.
- Forgetting my water.
- See question 1. Day 1 had a lot of content; sitting. Wish we could have spread it out between Day 1 and 2; had some discussions to intermingle.
- I couldn't come for both days.
- Going home!!
- Very hot in building, especially Elders room - consider Elders' comfort levels and health.

- There was no time for question.

4. Do you have any suggestions for improving the content or delivery of the Research Summit?

- Use the same facilitator
- No, maybe more time for questions
- Would be nice to include a cross-section of regional scientists (permafrost, vegetation, etc) to give a framework for the other research projects.
- Maybe spend more time on the land. Expand topics beyond the lake - include wildlife, plants, geology, archaeology.
- Perhaps prepare a "roadmap" or overview for all of the day one presentations so that the connections between various topics is more obvious at the beginning.
- Local place names pronunciations in introduction
- Would love to see a future summit with ah broader theme extending out beyond the lake (if this if of interest to the community). It would also be great to see this happen every year or two.
- Perhaps organize the science talks by broader area of interest to the community. Not sure, it was great!
- Probably but we were just told we had 2 minutes to complete this. Nothing major though.
- Language lesson --> encourage researchers to use First Nation place names
- Allow more time for discussion on certain themes. Give more time for Elders/members to share knowledge on given themes.
- More breaks. Include all members of the 2 distinct communities.
- Would it be possible to record and/or broadcast.
- Idea to collate past research and highlight it for the community including plans to highlight existing datasets and repositories (beneficial for community and researchers). Bring youth for short section of weekend (like the youth presentation).
- Involve youth; involve CAFN and WR, maybe in separate event or every 2-3 years
- Using a Southern Tutchone name for the Research Summit.
- Open the summit with a celebration dinner so people are comfortable with each other during summit meetings.
- One of the challenges is that some of the community priorities/concerns we heard were outside of the technical expertise of the attending researchers. For example, permafrost and buildings. Next time, would be good to match community priorities with invited experts. Also heard that Elders had a hard time hearing in the big hall.

- Not sure if the lectures were always effective - they were often quite technical.
- Nothing I can think of
- Longer - 3-4 days! :)
- The first day maybe would have benefitted from some small group discussions/breaking up of presentations.
- More research findings displayed somewhere.
- Arrange the seating tables into a circle so everyone can see each other.
- Run it again, regularly. Let it evolve.
- Try to have simpler vocabulary and graphs for scientists' presentations.
- Perhaps 1 day summits and oftener!
- If there is a next summit, decide on a theme to explore (or two) that the group can really focus on and come up with actionable research agendas.
- More community presentations, less presenters and more time for questions and discussion between community and scientists. Maybe morning of presentations and discussions in afternoon.
- Address issues and link up to people who manage funds!! Need to be present.
- For the research summary components, try to invite presentations to specific themes based on interests from the community. Perhaps invite presentations about potential new projects to guide their development.
- Have another one - involve youth for transfer of knowledge.
- Presentations were very good but discussions should be extended.

5. Do you have any other feedback for the Planning Committee?

- Lets see some action
- Need to identify the next steps, need more meetings, maybe annually
- Wonderful event - I was very impressed with the tone of conversations and the inclusiveness. Hope to see this happen every year!
- Great meeting and awesome job bringing it all together! THANK YOU!
- Food was great!
- no comment
- Hope the presentations will be shared; a contact list of researchers and of residents willing to be contacted with areas of interest/study
- I thought the committee went above and beyond any expectations with the great food, outstanding door prizes, guided tour, well-formulated program. Thank you so much!
- Thanks! (And the food was incredible!)
- Well done! Please try to hold this annually. Thanks.

- The food was great; I appreciate the chance to talk with community members and the Elders and learn more about the land they know
- This was an amazing experience and the first community-led research summit I (or any of my colleagues) have ever heard of - congrats on this great initiative!
- Well done! We can get where we need to go if we can work together. Permafrost, construction, housing, sustainable foods. Prioritize more. All need water.
- Great job! Thank you for having us.
- I would just like to thank them for the organization.
- Good engagement with community; more community members the better.
- Establish/maintain web-site that could link to: community input; links to current research.
- Having an Elder from Burwash and/or Dbay on the Committee.
- Well done and hope this will become an event that continues every year.
- Thank you! I feel honoured and grateful for the opportunity to attend and listen.
- Let's do this annually
- Thanks for hosting such a great event - it was the best conference or workshop I've been to!
- Don't think so. I hope this is an annual event! Maybe useful timing might be in the summer too when more researchers are up, but I know summers can be hard for community involvement.
- Thanks! Great job.
- Great job!
- Congratulations on doing such a fine job in organizing conference.
- A way to contact attendees - maybe a contact list.
- Great idea to have one every year.
- Compliments to the cooks - the food was awesome. Very impressed with Logan's presentation, he did great.
- Delicious food. Excellent facilitator.
- I think there are more people who would be interested in participating but they are not certain they are welcome. Or maybe they are not sure how they would fit into the conversations.
- Get as much info as possible, find the suitable funding agency, more info better!!
- Dän keyi to have/construct a website.
- Meetings to start on time.

Other Feedback

“On behalf of Laurent and myself from Blue System Integration (BSI), I would like to thank you for hosting a fantastic Lhù'ààn Mân Research Summit this past weekend. We appreciated being able to talk with other participants about the potential to continue development of our radar system to measure snow/ice thickness within the Yukon. If there is any interest from the community in the future to measure or monitor ice thickness on Lhù'ààn Mân, please do not hesitate to contact us.

It was an honor to be a part of the discussion about community involvement in research and to build relationships with people at the summit. We look forward to seeing these relationships grow and how they will shape the direction of future research in and around Lhù'ààn Mân.” (Pers. comm. via email, A. Pulwiski, Blue System Integration, May 9, 2018).

“The fact that there was no registration fee for the summit actually made it much easier for Greg and I (and perhaps others from government) to attend. If there was a registration fee, it would be considered a conference by our managers and therefore would have been a lot harder for us to get approval to come. Just something to consider again for future meetings if possible.” Pers. comm. via email, J. Spoelstra, May 8, 2018)