PROCEEDINGS of the

ARCTIC RIVERS SUMMIT

Summary of a Three-Day Workshop

Alaska Native Heritage Center
Anchorage, Alaska

December 6-8, 2022

The Arctic Rivers Project *is supported by the National Science Foundation under the Navigating the New Arctic program: Awards 1928189 & 1928078, "The climate impacts on Alaskan and Yukon rivers, fish, and communities as told through co-produced scenarios."*

> ***We always gave something back – to the river, to the moose, to the salmon.***
> ***– Harold Gatensby***

> *"There are signs that management is not taking our knowledge into consideration. We've adapted to changes, our ancestors adapted to changes, and unfortunately, we are at the point where we may have to change -* ***we're all connected and we can adapt but we need our voices incorporated in management.****" – Serena Fitka*

The Summit organizers thank our project's Indigenous Advisory Council members for providing vision and guidance to develop the Arctic Rivers Summit.

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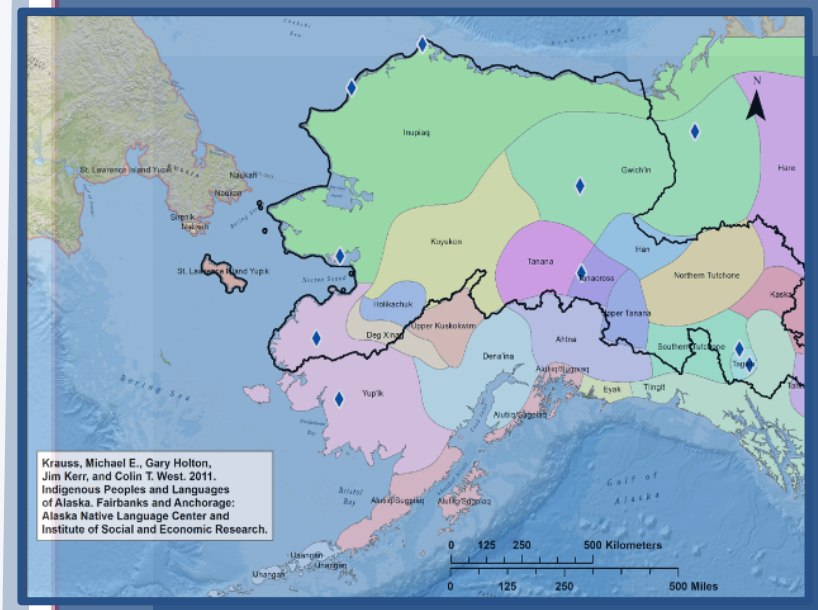


Blue diamonds indicate communities of the Indigenous Advisory Council members. The Arctic Rivers Summit was held in Anchorage, Alaska, which is located on the traditional homelands of the Dena'ina Athabascan people, one of Alaska's many distinct and diverse Indigenous groups (image left; Kraus et al., 2011). The research conducted by the Arctic Rivers Project is focused on Athabascan, Inupiaq, and Yup'ik land.

Proceedings Report Contents

Cover Photo: (right) first day of the Arctic Rivers Summit, Alaska Native Heritage Center, photo by Cassandra Brooks, (left) public domain image

I. Summit Overview

The climate is changing, and Indigenous livelihoods and cultures are being affected. Travel over river ice has become more dangerous. Between 2018 and 2022, 15 fisheries disasters in Alaska were declared, including two on the Yukon River and one on the Kuskokwim River with no subsistence fishing allowed. It is within this context that the Arctic Rivers Summit took place.

The Arctic Rivers Summit brought together nearly 100 participants from diverse backgrounds to discuss the current and potential future states of Alaskan and Yukon rivers and fish and how we can adapt. In addition to the Arctic Rivers Project Research team and Indigenous Advisory Council members, individuals from over 38 Alaska Native Villages and Yukon First Nations, eight federal, state, and tribal organizations, five universities, and seven non-governmental organizations attended. The Summit was held as part of the five-year Arctic Rivers Project funded by the National Science Foundation's Navigating the New Arctic Program.

The Arctic Rivers Project is a collaboration between the University of Colorado-Boulder, the National Center for Atmospheric Research (NCAR), the U.S. Geological Survey (USGS), the Institute for Tribal Environmental Professionals at Northern Arizona University, the Yukon River Inter-Tribal Watershed Council, the University of Saskatchewan, and the University of Waterloo. Both the project and Summit are guided by an 11-member Indigenous Advisory Council. The project began on January 1, 2020, and runs through September TK 2025. The multidisciplinary project team of approximately 30 people is working to weave together Indigenous Knowledge with information on climate, river, and fish to develop Narratives of Change across the Arctic landscape to support resource sustainability and community adaptation. In preparation for the Summit, Arctic Rivers Project investigators participated in a virtual decolonization training offered by NativeMovement. A decolonizing practice requires recognition of the history of colonization and its current manifestations. The training covered a spectrum of decolonizing strategies; from various personal, institutional, and systemic pathways forward.

Alaska Native Heritage Center (Source: Public Domain)

Goals of the Summit

The Summit had several goals. The first goal was to exchange knowledge across Indigenous communities and with western-trained scientists about current and potential future conditions of Alaskan and Yukon rivers, fish, people and current and future adaptation practices. A second goal was to inform the Arctic Rivers Project's modeling of climate, river flows, river ice, and fish to make the data generated as accessible and useful as possible for communities. This included participatory mapping exercises around important fishing areas and dangerous ice conditions for communities. A third goal was to draw on the collective wisdom of the diverse groups of Summit participants to develop action plans centered around four topics: **(1) State of Rivers**, **(2) State of Salmon**, **(3) Weaving Together Indigenous Knowledge and Western Science to Inform Management**, and **(4) Youth and Elders: Building a Bridge of Traditional Knowledge**.

The Summit brought together people with varied experiences and perspectives to rekindle old relationships and build new ones, start collaborations, and provide a space to share with one another. In particular, the Summit provided an opportunity for western-trained researchers on the Arctic Rivers Project and beyond to listen to and learn about what is important to Indigenous Peoples of the Alaskan and Yukon region. To meet these goals a variety of knowledge exchange sessions, breakout discussions, and interactive activities took place over the two and a half day meeting. The Summit opened with sharing by Elders (Elder's Share Knowledge Exchange), followed by an overview of the Arctic Rivers Project by the project's Principal Investigator (Arctic Rivers Project Overview Session). Next, Summit attendees broke into several groups to participate in an interactive mapping activity and tour the Alaska Native Heritage Center. The second day of the Summit featured Indigenous scholars, experts, and managers presenting during Knowledge Exchange sessions focused on the State of Arctic Rivers, and Weaving Together Indigenous Knowledge with Western Science and Management. To close the Summit, a banquet dinner was held.

In planning the Summit, the project's Indigenous Advisory Council emphasized the urgency of the situation facing fish and people in the region and the importance of not just research but action. In an effort to develop action plans, gatherings focused on identifying strengths, weaknesses, opportunities, and threats facing Indigenous communities across Alaska and Yukon were held on the topics of (1) State of Rivers, (2) State of Salmon, (3) Partnering Indigenous Knowledge with Western Science to Inform Management, and (4) Youth and Elders: Building a Bridge of Traditional Knowledge. Finally, a key goal of the Arctic Rivers Summit was to hear and learn from community members and Indigenous representatives how to make the data and information produced by the project relevant for Arctic communities. The Arctic Rivers Project team is using computer models to evaluate the past and potential futures of climate, river flows, river ice, and fish. To make the data we produce as useful as possible for communities, we hosted an Inform the Modeling information exchange session on the Tuesday of the Summit.

Source: Alaska Native Heritage Center

II. Knowledge Exchange Sessions

As one of the goals of the Arctic Rivers Summit was to exchange knowledge about current and potential future conditions for Alaskan and Yukon Rivers and ways we can adapt, four knowledge exchange sessions were held. The first of these was the Elders Share session, which was an opportunity for several Elders to share their knowledge, observations, and wisdom with the group. The next session, Arctic Rivers Project Overview, introduced the project goals and objectives. On Day 2 of the Summit, two knowledge exchange sessions were held, State of Arctic Rivers and Weaving Together Indigenous Knowledge with Western Science and Management. The sessions each featured a panel of Indigenous speakers from across Alaska and the Yukon Territory. Our Indigenous speakers were knowledge holders, scholars, and resource management professionals with deep knowledge of the issues facing Arctic rivers, fish, and communities.

Elders Share

The Elder's Share knowledge exchange included contributions by Dr. Reverend Anna Frank, Michael Williams, and Harold Gatensby. It was facilitated by Theresa Clark, Director of the Yukon River Inter-Tribal Watershed Council (YRITWC).

Dr. Reverend Anna Frank provided opening remarks for this session. Theresa then asked each Elder to respond to questions.

The first question, ***"How has winter travel changed during your lifetime, what dangers have you or your community encountered?"*** was answered by Michael Williams. Michael began his answer by expressing his honor to share the stage with Dr. Frank and Harold Gatensby and his appreciation for the opportunity to discuss winter travel. Michael described

his observations of winter travel that have been greatly informed by his experiences traveling by dog team, stating that he has traveled roughly 80,000 miles on dog team across the state of Alaska in his lifetime. Over the last 15 years Michael has observed river travel and spring hunts changing greatly. Michael described the lack of snow, thin ice, and open leads on the river that are being experienced this year and noted that fish nets were not being set or checked on the Kuskokwim River that year.

Arctic Rivers Project Overview

Next, the Arctic Rivers Project Overview plenary session took place. Keith Musselman, the Lead Principal Investigator from the University of Colorado, gave an overview of the project, how it came about, the structure of the team including the 11-member Indigenous Advisory Council, the institutions involved, and the project's research goals. Keith spoke about efforts to conduct community-engaged research to increase collective understanding of the historical and potential future impacts of climate change on rivers, fish, and Indigenous communities. Working in central to northern Alaska and the Yukon Territory in Canada, the project seeks to engage with Indigenous communities in ethical and equitable ways to produces science that is useful, useable, and used. The Arctic Rivers Project's driving research question is:

"How will societally important fish habitat and river-ice transportation corridors along Arctic rivers be impacted by climate change including permafrost degradation, transformed groundwater dynamics, shifts in streamflow, and altered river temperatures?"

Toward this goal, the project recruited 11 members to form an Indigenous Advisory Council as the first step of the project. Together, they developed project-specific knowledge co-production protocols. The Council works to ensure that Indigenous voices are factored into every step of the research process. The Council had a primary role in crafting Summit priorities, objectives, and the final agenda. For more information on the Indigenous Advisory Council, please see a publication co-authored by all Council members and many of the project investigators:

Herman-Mercer, Nicole, et al. "The Arctic Rivers Project: Using an Equitable Co-Production Framework for Integrating Meaningful Community Engagement and Science to Understand Climate Impacts." Community Science 2.4 (2023): e2022CSJ000024. Available Online: https://onlinelibrary.wiley.com/doi/full/10.1029/2022CSJ000024

Keith described that the intent of the Arctic Rivers Summit was to gather community input, inform the modeling for the project, identify human and environmental problems in Alaska and the Yukon, and form action plans for addressing these challenges. Another intent behind the Summit was to adhere to best practices in co-production of knowledge in efforts to conduct truly collaborative research factoring in the knowledge of both western-trained scientists and Indigenous people.

The Arctic Rivers Summit objectives developed by the project's Indigenous Advisory Council were shared:

1. **Facilitate discussions on the current and potential future conditions of Alaskan & Yukon Rivers**
2. **Inform the Arctic Rivers Project's climate, rivers, and fish modeling efforts**
3. **Develop action plans**

It was explained that these objectives were intended to be achieved through a variety of knowledge exchanges, discussions, and breakout sessions held at the Summit over the next few days. The session ended with a question-and-answer session that was facilitated by Nicole Herman-Mercer.

State of Arctic Rivers

The State of Arctic Rivers Knowledge Exchange plenary session took place on the second day of the Summit and featured a panel of four speakers, Dr. Jessica Black, Ben Stevens, Craig Chythlook, and Stanley Njootli Sr. (please see appendix for speaker biographies). The Knowledge Exchange was 90 minutes with a 15–20-minute presentation given by each speaker. The presentations were followed by a question-and-answer session facilitated by Nikki Cooley from the Institute of Tribal Environmental Professionals (ITEP).

The first speaker, Dr. Black gave the presentation "Salmon is Wellness". Dr. Black began by sharing a visualization of a child in a small boat filled with supplies on the Yukon River. When they pull up to the fish camp the scene is peaceful with several species of birds and their offspring. Children help their grandfather set up camp. The grandfather sets up the fishing equipment and the fish immediately give themselves to the family…fast forward to present day and the family connection does not feel the same because the salmon are not there.

"What is the problem? We have been disconnected from our way of life. We do not have an equitable seat at the table. Our voices often fall on deaf ears who don't understand that relationship. We've been removed from something that is at the core of our spiritual and emotional wellbeing." - Dr. Black

The next speaker, Craig Chythlook, spoke first of Bristol Bay and his family ties there and then of the tension he feels as a commercial fisherman, saying, ***"One thing that is tough for me in this space is that I am a commercial fisherman. It is a struggle."*** Craig talked about the changes in how fish are managed in a short amount of time with the commodification of fish.

"What has changed? The commodification of these resources [fish]. And that is the first step to losing our Indigenous sovereignty."

Like Dr. Black, Ben Stevens also opened his presentation, "Our River, Our People, Our Fish" with a remembrance of fish camp where every individual, young or old, had a specific role. Mr. Stevens shared that their fish camp, with a 100-foot gill net, previously fed seven families, but today feeds zero families. Keeping with the theme of change, Mr. Stevens said,

"What's changed? We can't go to those places where we used to harvest those animals. We can't get there anymore. So our whole spring diet has changed considerably."

The last speaker in this session, Stanley Njootli Sr., opened by stating he can remember lobbying since 1988 and "talking" has brought them very little. Mr. Njootli stressed the need for action - sitting on boards and teams doesn't change anything unless you are collecting data and taking actions. Mr. Njootli discussed declining numbers of Chum and Chinook salmon, upstream water pollution, and the difficulty of identifying the origin of ocean pollution, posing the question, ***"How do you quantify a carbon footprint in the ocean? How to address plastic particles and other pollution occurring in the ocean that end up in the river?"***. Mr. Njootli closed by highlighting the cultural importance of fishing and fish camp and sharing that in Canada, often youth fishing camps get first access to salmon to preserve the culture. Mr. Njootli stressed that we must find ways to harness traditional knowledge for use in management systems recognizing that trauma and loss of knowledge lingers from residential schools.

Speakers for the State of the Arctic River knowledge exchange session (from left to right: Stanley Njootli Sr., Dr. Jessica Black, Ben Stevens, and Craig Chythlookcamp, source: Cassandra Brooks)

Weaving Together Indigenous Knowledge with Western Science & Management

The Weaving Together Indigenous Knowledge with Western Science and Management Knowledge Exchange also took place on the second day of the Summit and featured a panel of three speakers, Serena Fitka, Director of the Yukon River Drainage Fisheries Association (YRDFA), Kevin Whitworth, Executive Director of the Kuskokwim River Inter-Tribal Fish Commission, and Esther Ashton-Reese, Vice-Chair of the Southeast Alaska Indigenous Transboundary Commission. Esther participated virtually as the large amount of snow that had fallen overnight made it difficult to get around Anchorage.

Serena was the first presenter, as director of YRDFA Serena oversees efforts to conserve salmon in the Yukon River and give a voice to the people who have managed the resource for thousands of years, her organization is an essential part of communication between fishers and fishery managers in the Yukon. Serena began by recognizing the tremendous knowledge within the communities of the Yukon River Basin that has been passed down from generation to generation. She highlighted that the first catch of the season goes to the community because the community gave the knowledge. Serena spoke about fishery managers asking how to incorporate Indigenous Knowledge into management, her response was to live with the seasons, saying, ***"Maybe it's as simple as that, we know when the fish come...with the windows that management have created for us they sometimes don't align with the weather and our windows."*** If the open window for fishing doesn't align with the right weather pattern for drying fish, the fish will spoil and doesn't follow the community's way of fishing. Serena closed her presentation by stressing that we need to work together to find solutions and that working together is the only way the salmon will come back.

"Fish populations have been depleting so we end up with empty racks" - Serena Fitka

Two in-person speakers for Weaving Together Indigenous Knowledge with Western Science and Management knowledge exchange session. Our third speaker, Esther Ashton-Reese attended virtually (from left to right: Kevin Whitworth and Serena Fitka, source: Cassandra Brooks)

The next speaker was Kevin Whitworth, whose presentation highlighted the Kuskokwim River Inter-Tribal Fish Commission's co-management activities with the U.S. Fish & Wildlife Service (USFWS) with whom they have a Memorandum of Understanding (MOU) to manage salmon populations in the Kuskokwim River.

Kevin posed the question, ***"How have we gone from fish camp life to management?"*** Kevin spoke about how young people learn from Elders, about the environment, how to fish, the anatomy of fish, and the weather, among other things and stressed the importance of keeping that culture in place. However, Kevin stated, that culture is threatened with the decline of salmon, which is the largest resource of the people of the Kuskokwim River. Twenty-seven Tribes of the Kuskokwim River are represented on the Kuskokwim Inter-Tribal Fish Commission. When the Chinook salmon declined so quickly people became very concerned and wanted to get involved in protecting and managing the fish. This desire to be involved in the management of the fisheries led to the MOU with USFWS.

Kevin described one of the key ways they achieve co-management of the fishery is through in season management based on both western data and local knowledge with inter-tribal members observing the conditions throughout the fishing season, ***"In season, every week we are looking at western data and local knowledge and incorporating all of it and try to get a picture of what's going on..."*** People from the Kuskokwim River get involved by participating in and conducting interviews with knowledge holders and leading projects all financed by the Inter-Tribal Fish Commission. Finally, Kevin again emphasized the importance of teaching youth because they are the future saying, ***"the best thing for them is to be at fish camp, learning the culture, reading a river, and driving a boat."***

Fish on a Drying rack (source: National Park Service)

"Local people making decisions and managing their resources, the way it should be because our river is our lifeline" - Megan Leary (in-season manager - quoted in Kevin's presentation)

Esther's presentation focused on the connections between mining impacts, salmon, and food security. She discussed how the community of Wrangell used COVID funds to provide smokehouses for every household, provided training for gardening and purchased industrial compost, and compost systems to go into gardens. She detailed how they work to provide education for Tribal citizens through culture camps to bring a lot of knowledge back. Esther then spoke about their efforts to combat transboundary mines and fight for more transparency of mining operations. One of the ways they are fighting is by supporting a call for banning toxic waste from mines and halt processes that are a danger to salmon. To do this they are working with Indigenous Peoples across the colonial border. Esther described the sub-lethal effects mines can have on salmon by affecting their ability to find spawning locations, affecting genetics, and salmon eggs dying. Esther said, the answer to these impacts is Indigenous land management, which includes, Indigenous co-management, Indigenous guardians, and Indigenous stewardship, stating that Knowledge is critical.

"Salmon have been a part of our culture since time immemorial" *- Esther*

The Knowledge Exchange ended with a question-and-answer session facilitated by Nikki Cooley of ITEP. The first question, posed by Nikki was ***"What are some ways to improve co-management of the fisheries?"*** Serena responded by saying, ***"Our knowledge and culture is in a format that western scientists don't use, we need to be at the table for the decisions to be made with us."*** Kevin added that it is important to, ***"bring a river wide approach, there are jurisdictional differences because of migratory patterns of the salmon. Try to cut boundaries, Tribes do this best because Tribes don't have these boundaries and fish don't, Tribes think ecosystem."***

Next Valerie asked about the siloed nature of land management saying there are underlying concerns of water security and food security as well as a lot of structural violence, acknowledging that a lot of entities are trying to figure this out Valerie asked, ***"How is it that there is no one body working to that end, why are all these entities out there like limbs of an octopus, not figuring out what the heck is going on?"*** Serena's response to this question was that she testified to the fact that we need to break down these silos, emphasizing that we cannot fix the problem in one area, we need to come together as one. Kevin responded to this question with an example of how they are trying to get the National Oceanic and Atmospheric Administration (NOAA), who manages offshore fishing and the Department of the Interior (DOI) who manages in-stream fishing through USFWS to work together to address by-catch and conservation concerns.

The last question of the session came from Anton who asked that since they haven't gotten salmon for a long time if communities should begin changing their ways and their diet and culture or, ***"should we keep crossing our fingers and hoping it gets better?"*** Kevin and

Serena both stated that there are a lot of environmental factors impacting the salmon and why they are not coming back to the Yukon and Kuskokwim Rivers, emphasizing that we can control some of those factors and others we cannot. Kevin stressed that if climate change considerations are not included in NOAA and USFWS' management plans that needs to be added. Serena stressed that Indigenous Knowledge is missing and that there are signs that management agencies are not taking Indigenous Knowledge into consideration.

"We've adapted through the changes, our ancestors have adapted to changes, and unfortunately we are at the point where we may have to change - we're all connected, and we can adapt but we need our voices incorporated in management." - Serena Fitka

Summary of the Knowledge Exchange

The Knowledge Exchange session had three major themes touched on by each speaker:

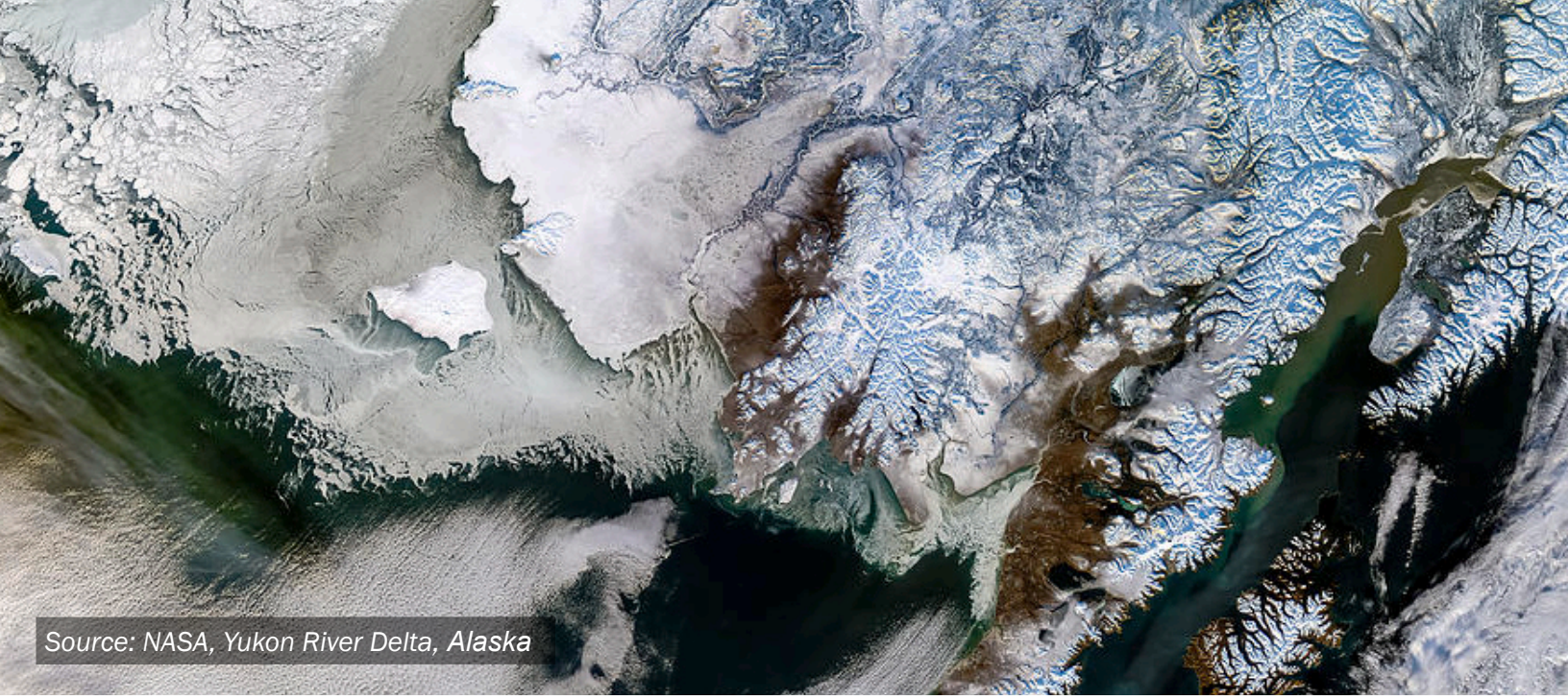
1. A gap exists where Indigenous Knowledge should be represented - The people sitting at the decision-making tables are often part of the problem. Not all exclusions of Indigenous People are malicious, rather, we need to consciously include those people in the conversations.

2. The importance of fishing is hard to convey to those who have no lived experience - Language and culture are connected to the rivers and fish.

3. Working together - To ensure river viability we must work in conjunction with all stakeholders.

Knowledge Exchange session

Inside the Alaska Native Heritage Center



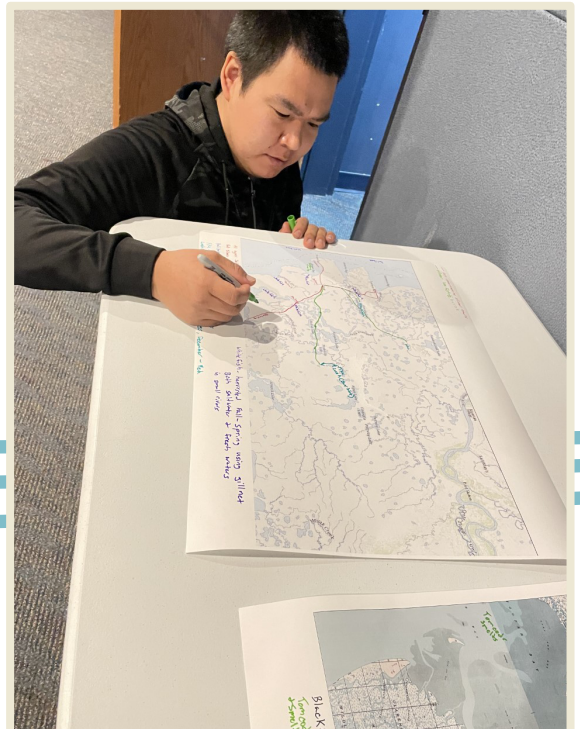
Source: NASA, Yukon River Delta, Alaska

III. Inform the Project Modeling

The Arctic Rivers Project is engaged in a variety of modeling activities with the goal of informing regional and local adaptation planning. The Summit was used as a venue to learn more about regional and local concerns and observations to tailor the fish, river, and climate model development and delivery as much as possible to create useful and usable information and products. To inform the river and fish modeling focused discussions and mapping activities were held.

Focused Discussions and Mapping Activities

During the afternoon of the first day of the Summit attendees were split into several groups based on the location of communities or regions they represented by either living or working in that region. These regional groupings were the Kuskokwim River, Lower Yukon River and Yukon Delta, Southern Alaska, Canada, the Yukon Flats, Middle Yukon River, Bering Strait & North Slope. The groups were rotated through two 45-minute focused discussions on fish and rivers that included a mapping activity.



Reggie Tuluk from Chevak, Alaska doing participatory mapping exercise (source: Joshua Koch)

Fish Through the Seasons

During the Fish Through the Seasons session participants identified priority fish species in their region and identified key locations of fish habitat and spawning. Following introductions, facilitators guided a 35-minute discussion according to the prompts in Table 1.

Table 1. Facilitator prompts for the "Fish through the Seasons" session

Knowledge of Fish Species and Timing	Fish Location and Habitat Knowledge	Knowledge of Changes in Fish Health
Species harvested in communities across Alaska	Type of rivers in which species are found	Indicators of fish health
Timing of harvest for fish	Important locations for different fish life stages	Changes in fish health
Timing of harvest by species	Why these locations are important for fish survival	Change in juvenile and nest abundance
Change in timing of fish harvest	Changes in timing of spawning and migration	Differences in age or size of harvested fish
If fish are harvested based on age or size	If particular fish species are found together	
	Changes in where fishes are found	

Images from left to right: sockeye salmon spawning (source: Chris Zimmerman, USGS); Lake Clark tributary (source: Christian Zimmerman, USGS); adult Pacific salmon (source: USGS, Alaska CASC)

River Transport Through the Seasons

During the "River Transport Through the Seasons" session participants were asked to share knowledge and information about winter trails along rivers and river ice quality. This information was intended to inform the river ice modeling efforts by Arctic Rivers Project investigators. During these sessions, group members introduced themselves and then facilitators prompted a 35-minute discussion according to the prompts outlined in Table 2.

Table 2. Prompts for river transport through the seasons

Winter Trail Knowledge	Ice Quality Knowledge
Species harvested in communities across Alaska	Type of rivers in which species are found
Timing of harvest for fish	Important locations for different fish life stages
Timing of harvest by species	Why these locations are important for fish survival
Change in timing of fish harvest	Changes in timing of spawning and migration
If fish are harvested based on age or size	If particular fish species are found together
	Changes in where fishes are found

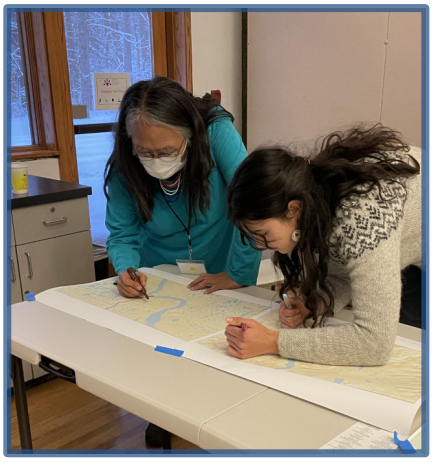
Images from left to right: Unuk River, AK (source: Randy Host); sea ice block (source: USGS)

Climate Modeling Information Session

During this session, a brief presentation was given by the Principal Investigators of the Arctic Rivers Project, Keith Musselman, University of Colorado and Andrew Newman, National Center for Atmospheric Research, regarding the climate modeling being undertaken by the project. First, the presentation gave an overview of anthropogenic climate change. The presentation then outlined the goal of the project to provide targeted climate and river information for Alaska and the Yukon River Basin. The presenters compared the proposed modeling effort to what was widely available at the time: low-resolution climate models that did not resolve conditions at the community-level or high-resolution atmospheric models that did not produce accurate information about how river flow or water temperatures may change.

Facilitators then prompted discussion to ask attendees how they would use the type of information that was generated by the modeling, and how it could best be presented and provided to communities. The questions asked are included in Table 3.

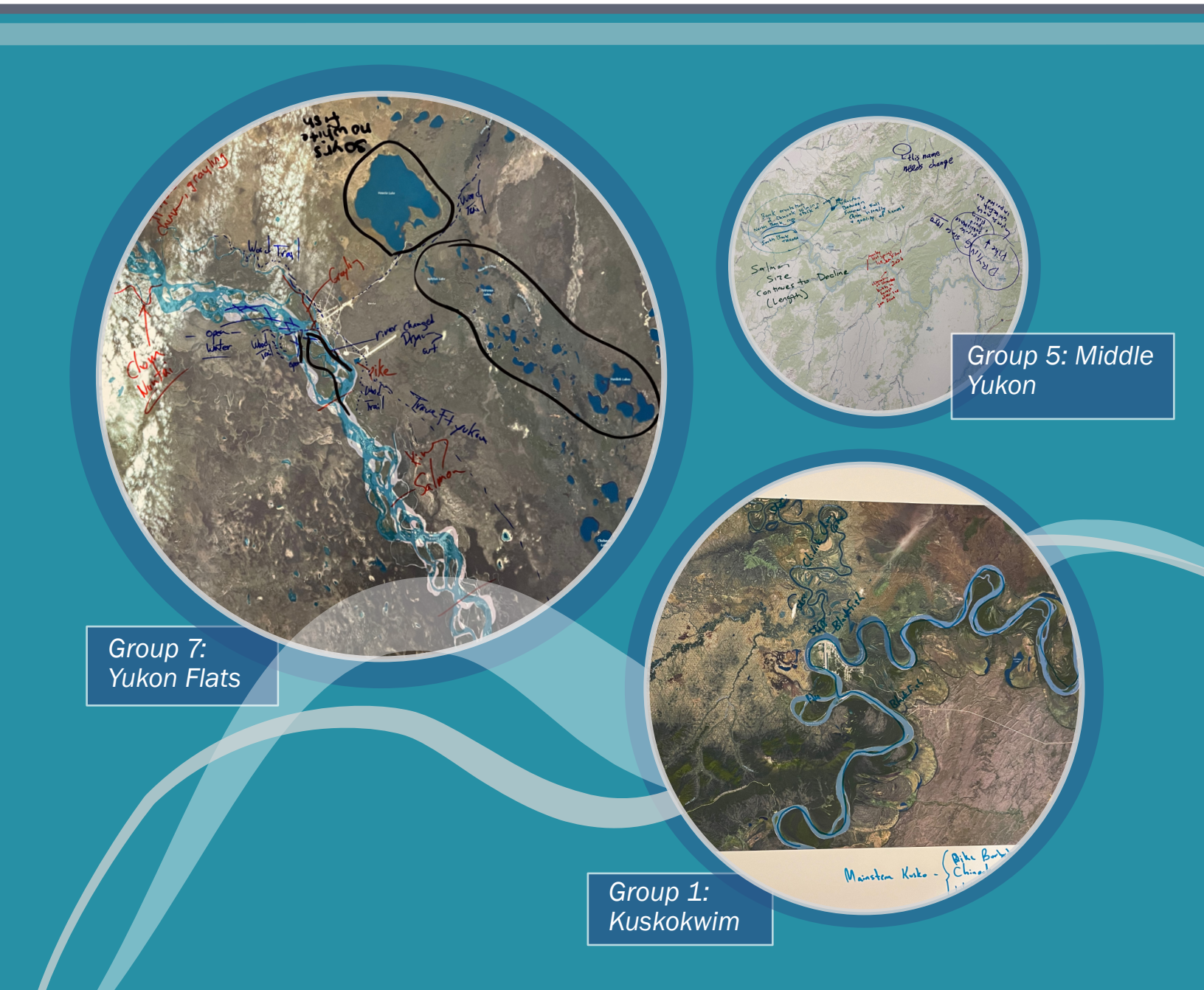
Table 3. Prompts for the climate modeling session

What are your questions for the climate modelers?		***Existing climate products are freely available on websites to view and for download. Is this the best way to provide data?***
	***How will you use estimates of future climate, river, and fish information?***	
Is it helpful to have a range of possibilities, or is it best to have a single "best guess" or average?		***Usefulness and Communication of Climate Data***

Images from participatory mapping exercises

The session participants stated that the information provided by the models could be useful to support planning decisions regarding land-use, transportation, future hazards, and community adaptation. Participants also noted that the model and data should be locally focused as much as possible, and to consider formats that are accessible to community members such as maps, data through phone apps, or an existing climate data website with which decision-makers are readily familiar, such as Northern Climate Reports hosted by the University of Alaska, Fairbanks and the USGS Alaska Climate Adaptation Science Center.

Finally, the modeling team described that they intended to use the feedback from this session to inform decisions about the modeling and to guide how information is formatted to produce useful and usable information about changing climate, rivers, ice, and fish at community scales.



Source: Paxson Woelber

IV. Taking Action

One of the key goals of the Summit was to develop action plans centered around four topics: **(1) State of Rivers**, **(2) State of Salmon**, **(3) Weaving Together Indigenous Knowledge and Western Science to Inform Management**, and **(4) Youth and Elders: Building a Bridge of Traditional Knowledge**.

To facilitate the development of action plans breakout sessions focused on each topic were held over the course of two days. Participants ranked their interest in each topic beforehand and were placed into groups based on this ranking. Apart from topic 4, Youth and Elders: Building a Bridge of Traditional Knowledge, each breakout session consisted of three steps completed during two separate breakout sessions at the Summit. The steps consisted of:

1. Developing a collective vision of a desired future for topic (i.e., the State of Rivers in Alaska and the Yukon, the State of Salmon in Alaska and the Yukon, and Partnering Indigenous Knowledge and Western Science).

2. Engaging in a Strengths, Weaknesses, Opportunities, Threats (SWOT) activity that considered the desired future.

3. Identifying potential actions to work towards the desired future based on the SWOT activity.

The Action Plans have been developed as separate documents. A summary of actions identified for each topic is provided below.

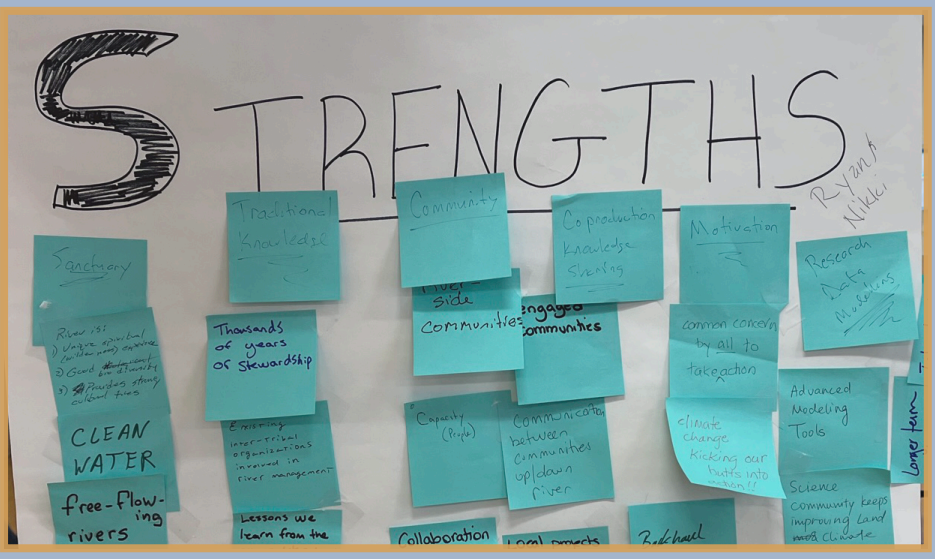
Taking Action

1. The State of Rivers

Source: Public Domain (Pixabay)

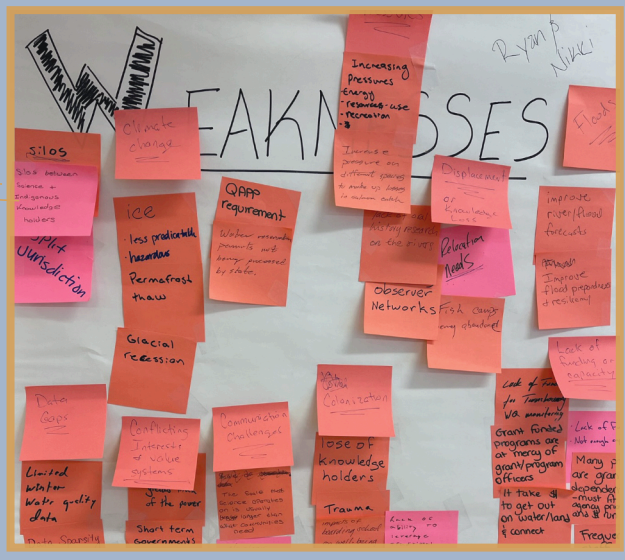
During the first breakout session, participants in the State of Rivers group summarized the discussion of their future vision for rivers in Alaska and the Yukon into two statements, We have beautiful, pristine, sanctuary rivers; we have a lot of strengths and opportunities and at least a little bit of time. In addition to developing a shared vision for rivers during the first breakout session, participants also identified and discussed strengths, weaknesses, opportunities, and threats that could further or hinder their desired vision of beautiful, pristine, sanctuary rivers.

The second day of breakout sessions was focused on developing actions based on the previous day's SWOT activity. During this session people discussed actions to support the collective vision of beautiful, pristine, sanctuary rivers.



Strengths

- Traditional Knowledge
- Rivers as sanctuaries
- Monitoring, modeling, and research
- Engaged communities
- Motivation to act
- Knowledge sharing and co-production



Weaknesses

- Displacement, loss, and siloing of traditional knowledge
- Colonization
- Data gaps and mismatched pace of science
- Challenges related to the regulatory environment
- Lack of funding and capacity
- Climate change
- Increasing pressures on rivers

Opportunities

- Promoting Tribal sovereignty
- Collaborating on joint TK, Western Science studies, knowledge co-production
- Making the most of the momentum of this time to drive action
- Bolstering youth education
- Supporting workforce development
- Advancing an Indigenous, holistic approach to wellness

Threats

- Climate change
- Resource extraction, development, and contamination
- Degradation of fisheries
- Regulatory and funding related challenges
- Procrastination and lack of action due to the complexity of threats
- Misuse of TK or lack of proper attribution

The second day of breakout sessions was focused on developing actions based on the previous day's SWOT activity. During this session people discussed actions to support the collective vision of beautiful, pristine, sanctuary rivers.

Table 3. Developing actions from State of Rivers SWOT activity

Category	Examples
Collaboration	• Collaboration on monitoring • Co-drafting legislation • Establishing interagency working groups
Community planning and resiliency	• Improve community flood preparedness and resiliency • Improve river/flood forecasts
Technology	• Draw more on remote sensing to fill in data gaps
Traditional Knowledge	• Reconstructing river hydrology and TK • Oral history research within the TK protection context
Training and outreach	• Building the capacity of watershed councils and conservation districts
Workforce development	• Training Tribal community members as a local workforce for monitoring projects • Employment opportunity taking river level or ice thickness measurements for National Weather Service
Yukon River	• Form a Yukon River Women's Council • Designate the Yukon River as a world heritage river

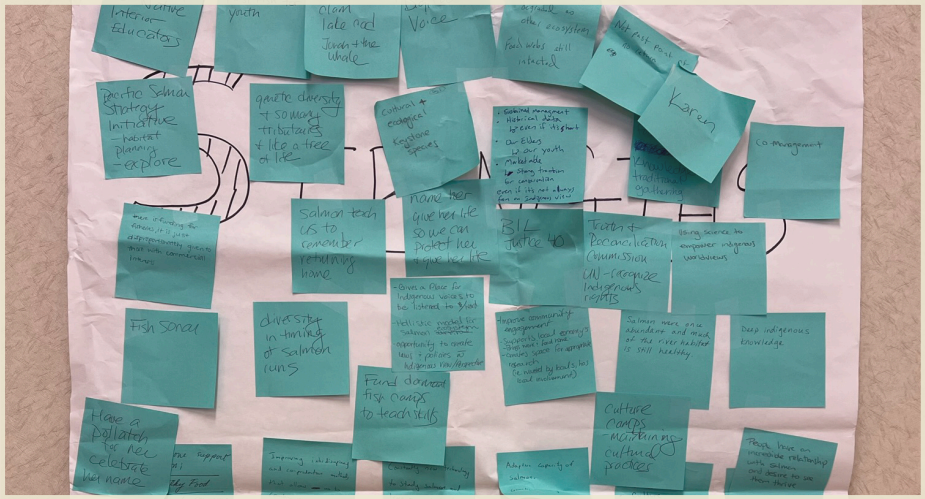
Matanuska River (source: Public Domain)

2. The State of Salmon

Chinook Salmon (source: Public Domain)

A main element of the State of Salmon vision is continuing a cultural way of life in which salmon are a livelihood and one of the main food groups for Indigenous peoples and in which salmon return to regenerate communities and ecosystems.

Participants also identified and discussed strengths, weaknesses, opportunities, and threats that could further or hinder their desired vision for the state of salmon.

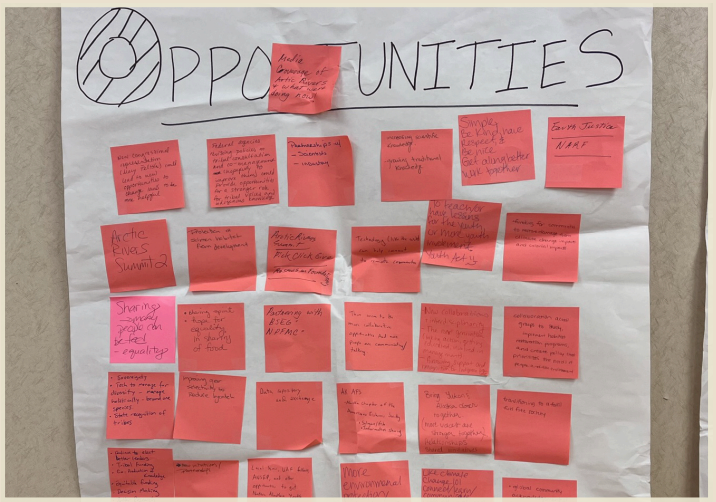


Strengths

- People care about salmon
- Salmon are adaptive and resilient
- Deep Indigenous Knowledge and Salmon as teachers
- Ability to study and understand salmon
- Increasing opportunities to create laws and policies with Indigenous views and perspectives.

Weaknesses

- Management
- Limited data
- Environmental and biological factors
- Development related pressures
- Connection between people and salmon is being lost
- Climate change is leading to warmer rivers and oceans
- Lack of action to address climate change and the need for action at a global scale.
- Achievability of ideas brought up

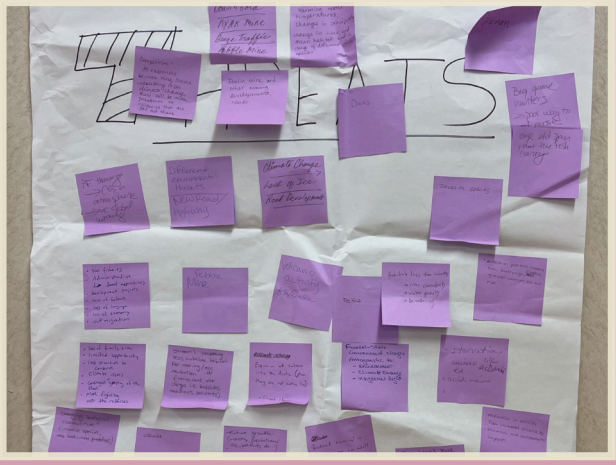


Opportunities

- Partnerships and convenings
- Fisheries management
- Youth engagement
- Traditional knowledge and values
- Research and monitoring
- New Congressional representation
- Funding for communities to restore damage from climate change and colonial impacts
- Transition to a fossil fuel free society

Threats

- Climate change
- Development related pressures
- Loss of culture and community
- Federal and state government changes leading to a regulatory environment antagonistic to the environment, climate change, and Indigenous rights.
- Apathy
- Volcanic activity



During the second breakout session for this group, participants discussed actions to support the collective vision for healthy, sustainable salmon.

Table 4. Developing actions from State of Salmon SWOT activity

Category	Examples
Cultural resiliency and ceremony	• Have a potlach for salmon, celebrate her name • Fund dormant fish camps to teach skills
Management	• Manage for a balanced ecosystem rather than for single species • Manage salmon to ensure that they are returning to spawn rather than for yield or profit • Protect important fish habitats from development or pollution • Maintain habitat connectivity • Manage invasive species • Conserve genetic diversity • Reduce salmon bycatch from trawling • Decrease farmed salmon
Partnerships and convenings	• Arctic Rivers Summit 2

Research and monitoring	• Increase community engagement in research
	  • "Supports local economies"
	  • "Brings work and food home"
	  • "Creates space for appropriate research (i.e., wanted by locals, has local involvement)"
	• Create a centralized data repository and exchange to facilitate greater information sharing and address challenges related to not being able to find and/or access data.
	• Identify salmon families and the routes they travel.
	• Need to find out why crashes are happening in some areas and booms in other areas.

Youth engagement	• Pass a youth Act to encourage youth involvement in management, fishing activities, fisheries meetings, and data collection.

3. Partnering Indigenous Knowledge and Western Science for Management

Source: Public Domain

During the first breakout session, the group had many ideas regarding their vision for the future of partnering Indigenous Knowledge with Western Science. Key components of this vision included:

- **Respect for Indigenous Knowledge (IK) and Western Science (WS)**
- **Removal of barriers to knowledge co-production and co-management**
- **Braided knowledge systems working together for decisions, management, and research**
- **Investment in Indigenous youth – providing both IK and WS experiences**
- **Data sovereignty and Tribal sovereignty**
- **Accountability of research and researchers**
- **Understanding the difference between Indigenous Knowledge and diversity, equity, inclusion, and access**
- **Indigenizing science to Tribal standards**

Strengths

- Increased recognition of a colonial legacy and awareness of the need to decolonize processes
- The rise of Indigenous leaders in positions of power within government and resource management agencies
- Creating safe spaces and proper protocols to include, share, and protect IK
- Growing native youth leadership
- Resurgence of ceremonial practices and the potential for their inclusion in spaces where IK and WS are shared
- Rise and support for 'Land Back' campaigns
- Restoration of salmon rights
- Removal of dams
- "Not all is lost just yet"

Weaknesses

- Lack of Indigenous authorship including not giving credit where credit is due
- Extractive nature of western science and the structure of grants and institutions
- Institutional reluctance to include IK in decision-making and other processes
- Lack of communication by western research institutions and inaccessibility of scientific language
- Misunderstanding positionalities
- Continued suppression of Indigenous voices through lack of access and opportunity
- Challenges of studying and managing a large geographical area with many different regions

Opportunities

- Development of Indigenous-led research questions based on community needs
- Respectful knowledge co-production
- Cultural humility and IK training for western scientists
- Establishing Indigenous Advisory Councils (with a living wage) for research projects
- Electing Elders and Knowledge Holders for governing boards
- Engaging Native Youth
- Educating about and applying free, prior, and informed consent principles
- Tribal Consultation on a timeline determined by communities
- Funding for co-production and co-management

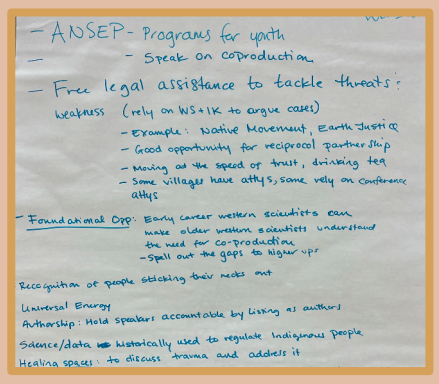
Threats

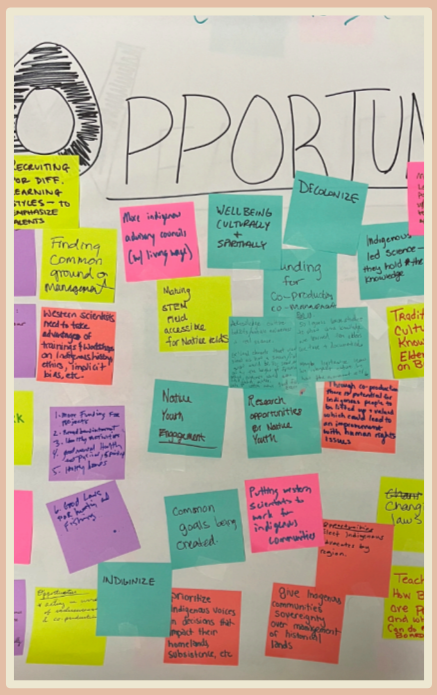
- The extraction and mining that are inherent within renewable energy development and electric vehicle technologies
- Misinterpretation of Indigenous Knowledge
- Lack of funding opportunities for Tribal communities
- Deadline driven engagement as opposed to relationship development
- Overburdening communities by asking for too much Indigenous Knowledge
- Ego of western scientists unwilling to share accreditations
- Ambiguity around who has the power to change institutions and institutions resistant to change and inclusion of IK
- Frustration with the system – Indigenous communities giving up and walking away from co-production
- Shifting political support for IK-WS collaborations

In addition to identifying actions during the second breakout session, in some cases, participants identified actions during the Strength, Weaknesses, Opportunities, and Threats activity that took place during the first session. Actions identified during both gatherings are listed below.

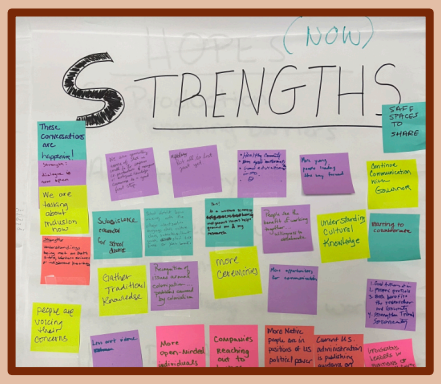
Four overarching action themes emerged, including:

Community Engagement in Indigenous Knowledge and Western Science Collaborations

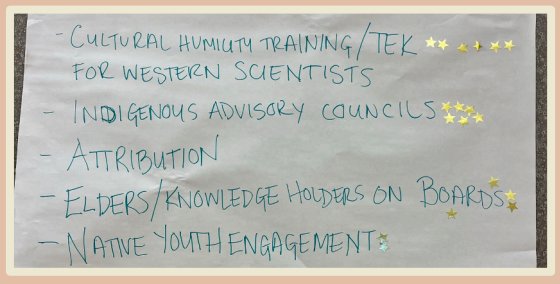




Inclusion of Indigenous Knowledge in resource management

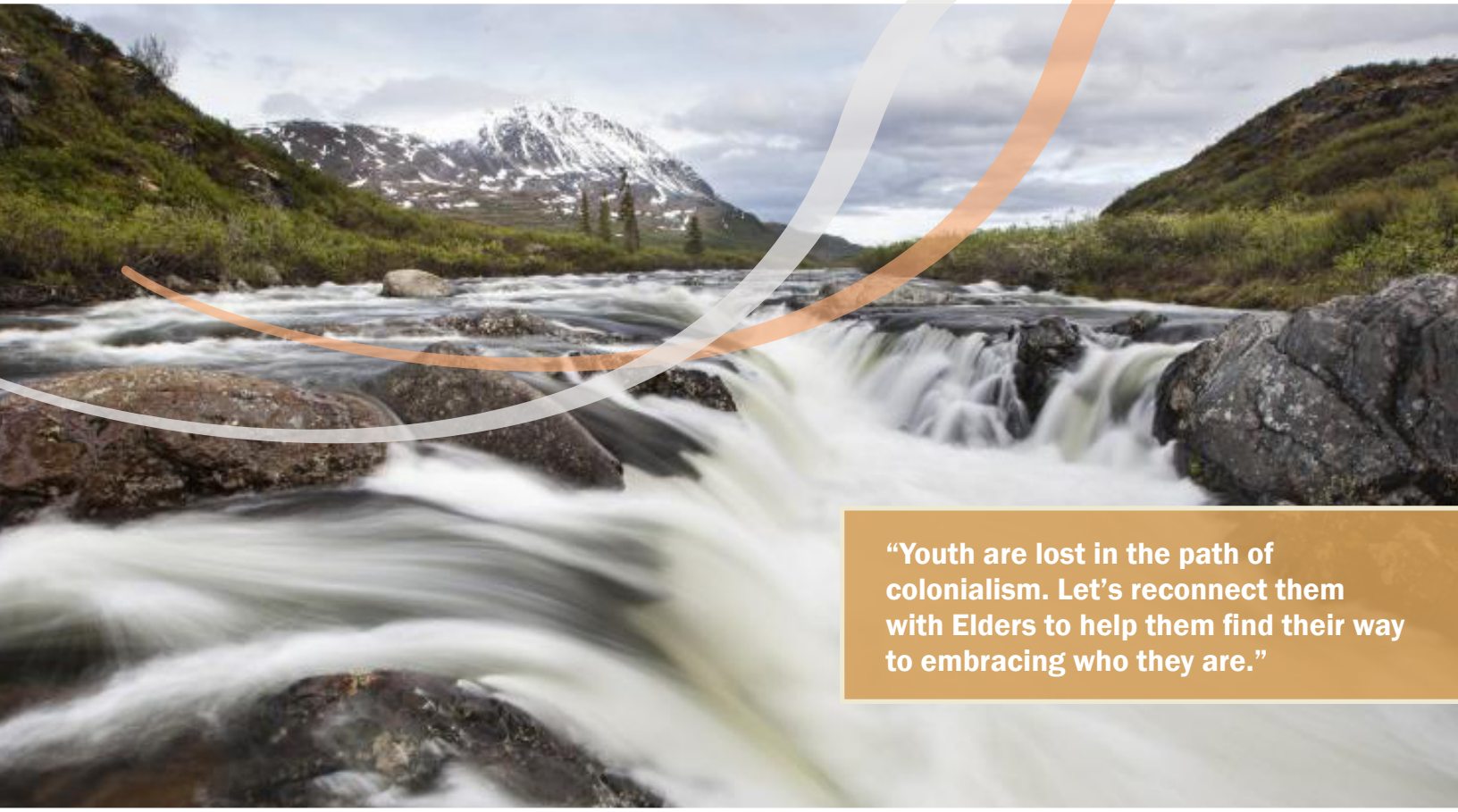


Learning Opportunities for Early Career Researchers



Youth Capacity Building

4. Youth and Elders: Building a Bridge of Traditional Knowledge



"Youth are lost in the path of colonialism. Let's reconnect them with Elders to help them find their way to embracing who they are."

Delta WSR (source: BLM)

To develop the Youth and Elders action plan, two small group discussions were held. During the first discussion, group members first shared stories and got to know one another. Afterwards, they did an activity in which they used their five senses to describe the relationship between youth and elders. The group then moved into creating a collective vision for how to revitalize youth-elder relationships. During the second discussion, the group reviewed notes on the sensory activity and the vision and then concentrated on actions to support the vision.

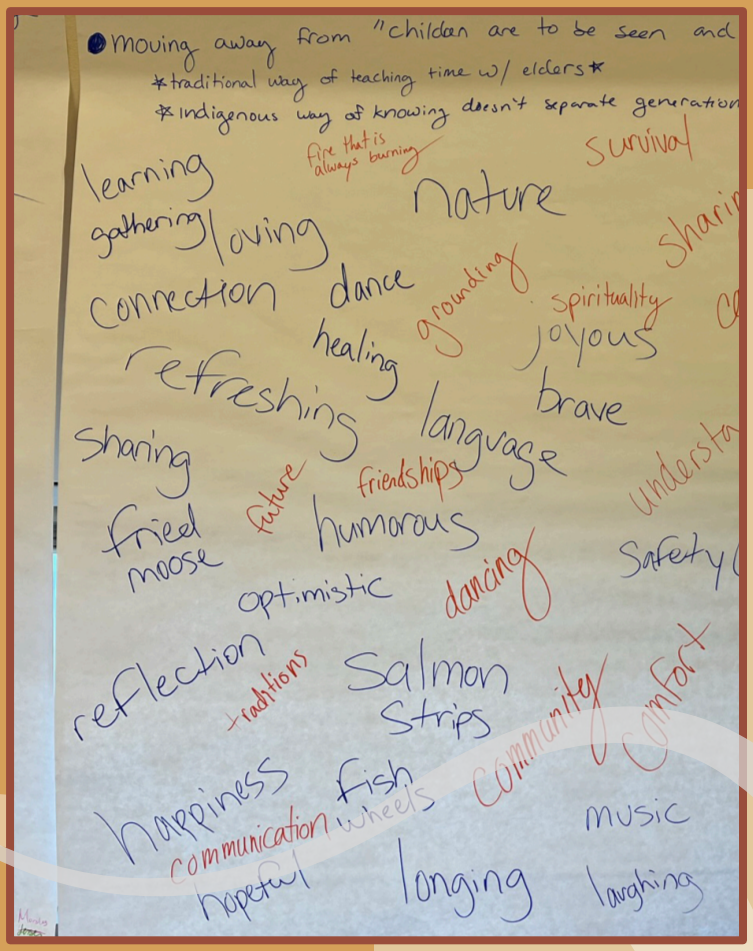
During the first gathering on this topic, group members chose to focus on sharing stories and relationship building. They also developed a vision that included ***Share stories, songs, dance, laughter, language, and wisdom intergenerationally, which is love***. During the second breakout session, the group chose to focus on culture camps.

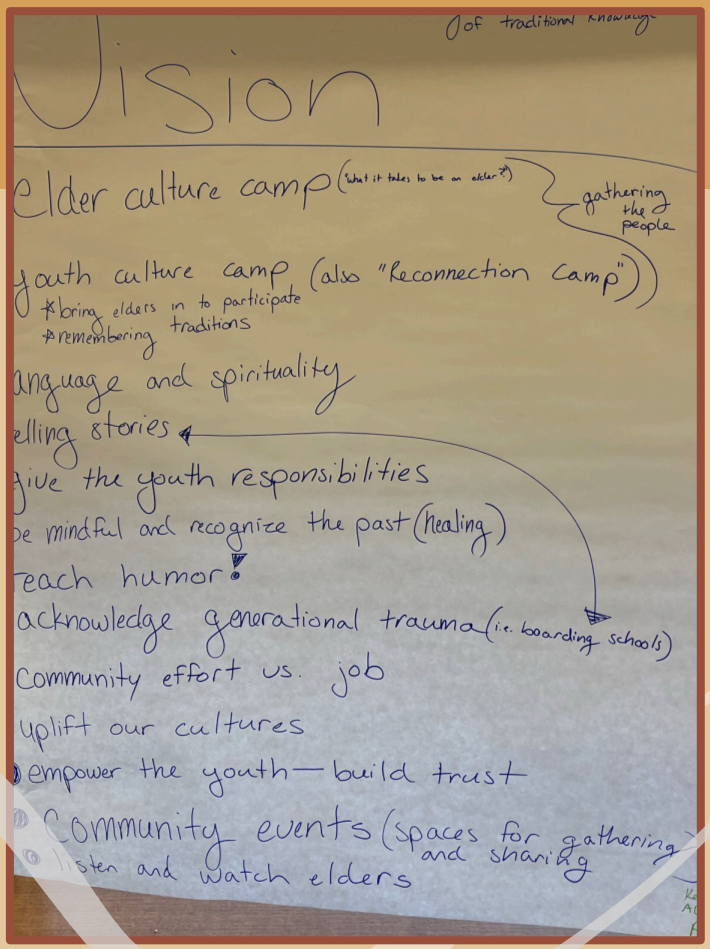
Key Action: Create a Network of Culture Camps to Learn From One Another

The group considered culture camps to be key to providing a space for youth to get out on the rivers and lands and learn traditional ways, language, stories, and spirituality from elders. Additional actions identified by participants to support this key action were:

- **Supporting and connecting culture camps**
- **Developing and using place-based cultural curriculum in schools**
- **Hosting community events that build bridges between youth and elders**
- **Encouraging youth to reconnect with their villages.**

The Arctic Rivers Summit brought together a diverse array of people to share ideas around intergenerational knowledge sharing and connecting Indigenous youth and elders. This knowledge sharing has been an integral part of Indigenous cultures for thousands of years, sustaining Indigenous Peoples through many changes and upheavals.





Glacier Bay, AK (source: Public Domain)

V. Summit Evaluation Results and Insights

A pre-summit evaluation was given to participants as part of their welcome package and was completed by the end of the first day of the summit. The post-evaluation summit was handed out to participants during the banquet on the final night of the summit. No participants were required to submit evaluations, but participants were encouraged to submit evaluations as another way to voice their input as to how the Arctic River Summit went.

Arctic Rivers Summit group photo

Summit Participants

At the Arctic Rivers Summit, there were over 85 total participants from different communities in Alaska and Canada (Fig 1). Six of the Indigenous Advisory Council members were able to attend the summit. As shown in Figure 1c, we had 56 participants that identified as community members from 38 different First Nation and Alaska Native communities that largely overlayed the study area (Fig 1a). In addition to these participants, representatives from five universities, seven non-profit organizations, and eight federal, state and Tribal agencies also attended the summit (Fig 1b).

Evaluations submitted by:

We received 33 pre-summit evaluations (38% response rate). For the post-summit evaluation, 31 evaluations were submitted for a response rate of 36%. Almost 50% of participants that completed the pre-summit evaluation were from Alaska Native villages (Figure 1c). While First Nation communities participated in the Arctic Rivers summit, none of the First Nation members completed the pre-summit evaluation. Non-profit organizations had the second highest completion rate for the pre-summit evaluation at 27%. Evaluation responses were less than or equal to 15% for Tribal or Aboriginal non-profit organizations, academic institutions and federal, state or provincial agencies. For participants that came from a rural or aboriginal community, 35% identified as a community member (Figure 1b) with around 3% identifying as an Elder and 6% identifying as a youth participant. About 15% of respondents identified as an employee of a First Nation or Tribal Government with less than 10% of respondents being a Tribal Council or First Nation government member, city employee, Alaska Village Corporation employee, Alaska Regional Corporation employee, or an Indigenous Organization employee (Figure 1b).

What are your goals for attending the summit?

Almost 70% of respondents listed learning from and networking with other communities as top goals for the Summit (Fig 1d). Cross-community learning about adaptation strategies and funding opportunities were also important goals for respondents. Sharing personal knowledge and experiences (42%) along with learning more about climate science (52%) were important goals to respondents. Getting involved with and guiding the science of the Arctic Rivers projects were identified by less than 35% of respondents as goals for attending summit. Additional comments from the survey included learning from each other about needs, actions, and strategies for adapting to climate change were all included in survey responses.

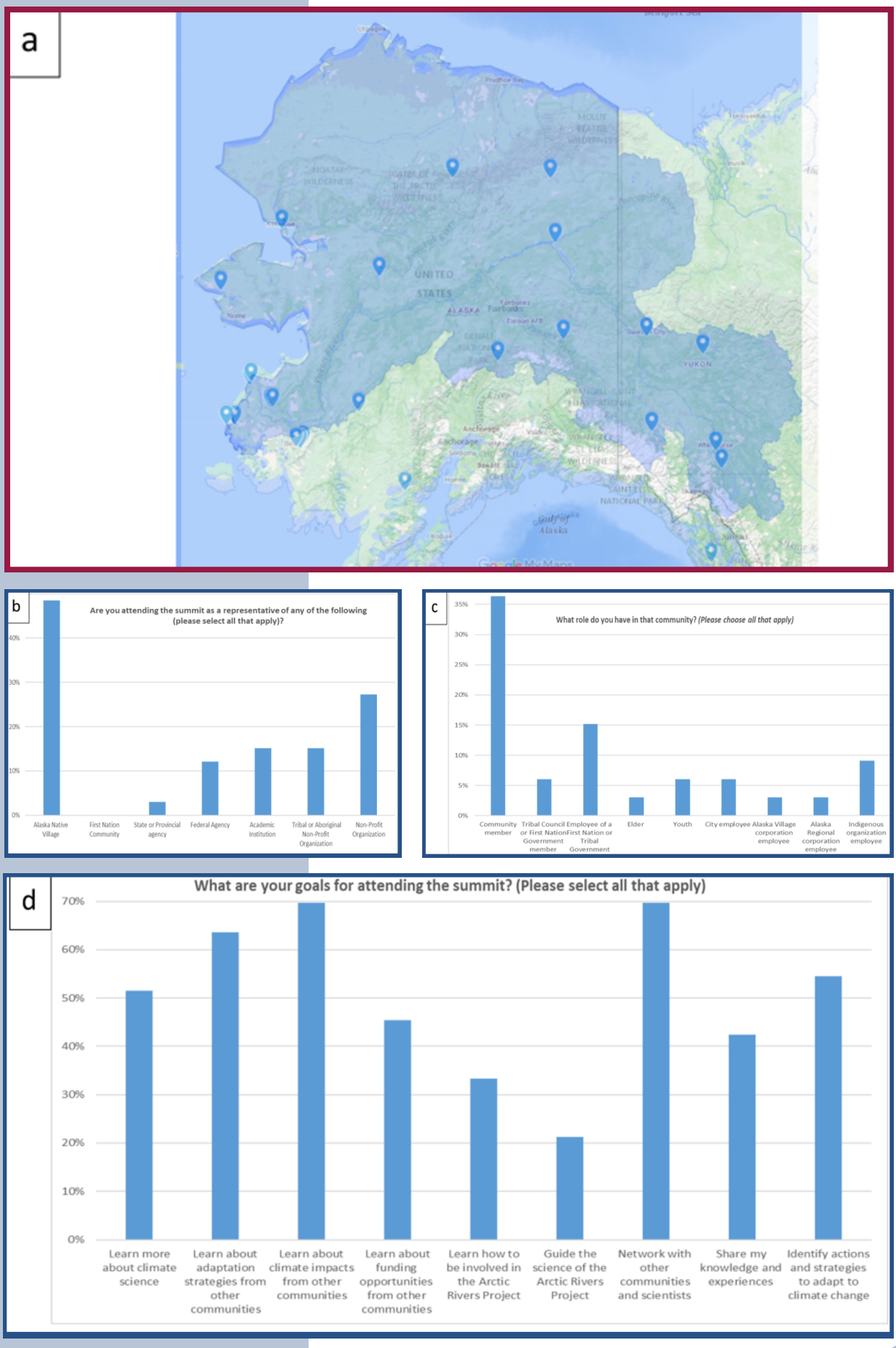


Figure 1. Summit evaluation participants locations, roles and goals.

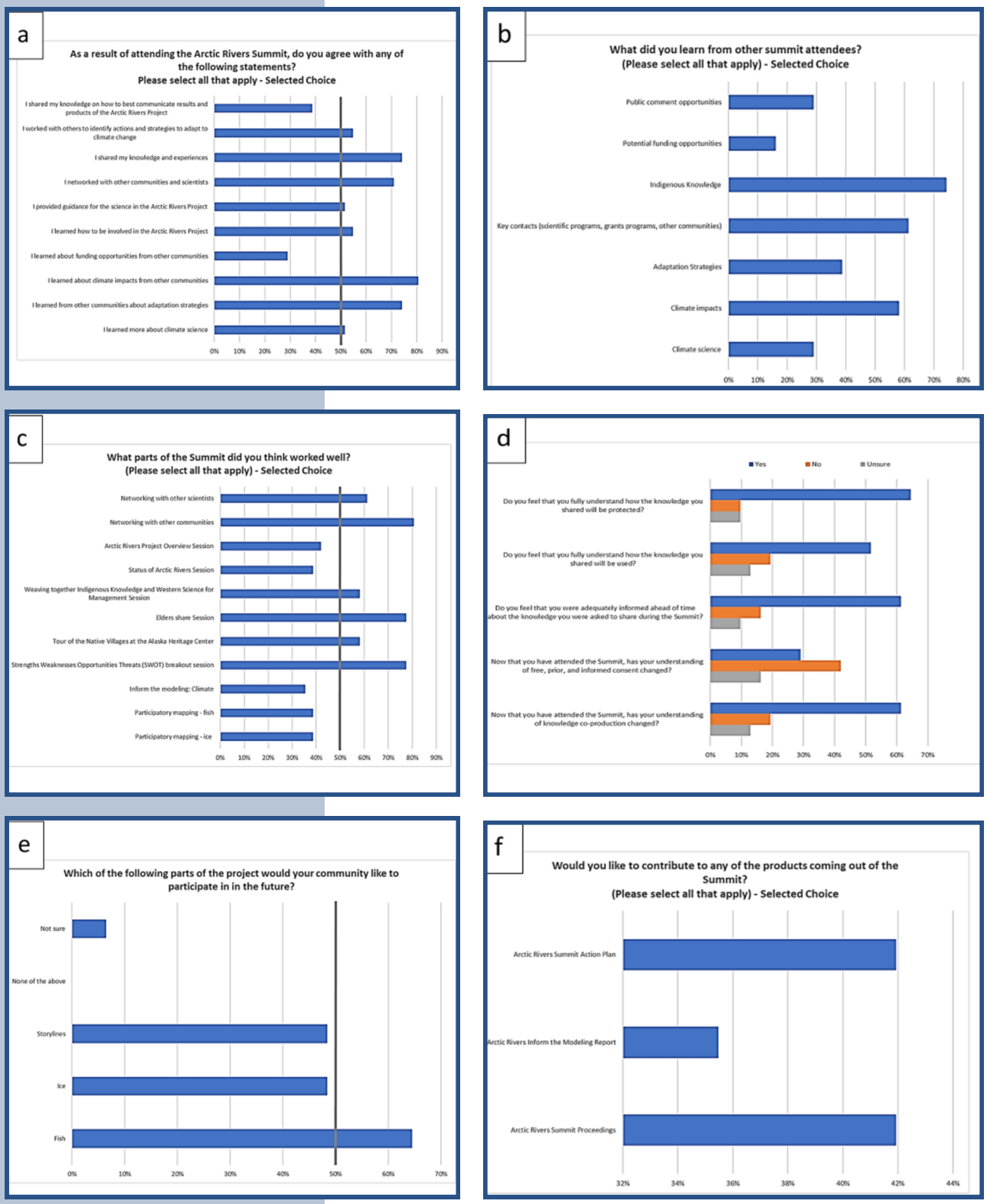


Figure 2. Summit evaluation participants engagement and co-production results.

Post-Summit

A little more than 50% of respondents stated that they wanted to learn more about climate science (Figure 1d). While potentially not the same respondents, a similar number of respondents to the post-summit evaluation indicated they learned more about climate science (Figure 2a). When looking at the pre-summit evaluation, 70% of respondents wanted to network with other communities and scientists and learn about climate impacts from other communities (Figure 1d). After the summit, 71% of respondents felt they were able to network with other communities and scientists because of attending the Arctic Rivers summit (Fig 2a). A large majority (74%) of participants felt that they learned about climate impacts from other communities during the summit (Fig 2a). Two other prominent goals of pre-summit evaluation respondents included learning about adaptation strategies (64%) and actions (55%) to adapt to climate change (Fig 1d). Post-summit respondents indicated they learned about adaptation strategies from other summit attendees (74%) and 55% of participants felt they worked with others to identify actions and strategies to adapt to climate change (Fig 2b). A little less than half (45%) of pre-summit respondents wanted to learn about funding opportunities from other communities, while 42% wanted to share their knowledge or experiences during the summit (Fig 1d). While 74% of post-summit attendees felt that they were able to have shared their knowledge and experiences during the summit, only 29% learned about funding opportunities from other communities. Unfortunately, we did not have a specific session devoted to funding opportunities. Summit planners assumed funding discussions would come up during side conversations or during the other sessions. Finally, the least selected goals of the pre-summit attendees were to learn how to be involved with the Arctic Rivers Project (33%) and to guide the science of the ARP (21%) (Fig 1d). Fortunately, over 50% of post-summit respondents indicated they felt they accomplished these two goals (Fig 2a).

A little more than 40% of respondents indicated that their understanding of free, prior and informed consent has not changed since attending the Summit (Fig 2d). This response likely indicates that participants had a more consistent knowledge base with what was presented at the Summit. Over 60% of respondents indicated they felt they had adequate preparation for the major topics of Indigenous knowledge with an understanding of how this knowledge will be protected. Over 50% indicated they understood how the Indigenous Knowledge collected during the Summit would be used. Interestingly, over 60% of respondents' understanding of knowledge co-production had changed.

Figure 2c examines parts of the Summit that respondents felt worked well. Over 80% of respondents felt they were able to network with other communities during the summit. Over 60% of respondents felt that they were able to network with scientists. Respondents seemed to really like the Elders Share Session (77%) and the SWOT breakout sessions (77%). The tour of the Alaska Heritage Center replica Native Villages and the Weaving together Indigenous Knowledge and Western Science for Management session were both popular sessions (58%). Many of the more Western Science oriented sessions were less popular that included the Arctic Rivers Project Overview Session (42%), Status of Arctic Rivers Session (38%) and the Inform the modeling: Climate (35%). Finally, several respondents indicated

that participatory mapping for both fish (38%) and ice (45%) could have been improved or needed extra attention.

Continuing to work with the Arctic Rivers Project
While there was some uncertainty (2 respondents) about community participation, no respondents indicated that they were not interested in participating further through the upcoming storylines, ice and fish interviews and activities (Fig 2e). While 20 participants wanted their community to participate in the upcoming fish activities, 15 participants wanted their communities to participate in the storylines and/or ice activities.

In an exciting development from the Arctic Rivers Summit, 13 participants indicated they would like to continue to work on the Arctic Rivers summit Action Plan and the Arctic Rivers Summit Proceedings (Fig 2f). There was slightly less interest in working on the Arctic Rivers Inform the Modeling Report, however, 11 participants were still interested on working on that together with the project team. This is one of the most encouraging results from this evaluation that Summit participants wanted to maintain engagement and work on these documents together.

How Summit participants impacted the project

The information shared during the Summit has been integral to project success. The project has completed the computer modeling of climate, streamflow, river temperature, and fish for both historical (years 1990-2020) and future (2035-2065) climate scenarios. We are now in the process of sharing and publishing the outcomes. The proposed modeling effort included high resolution regional climate model simulations of historical and future conditions with a model system that was tuned to local observations, addressed uncertainty, and included hydrological simulations of streamflow and river temperatures, fish biological simulations of the effects of warmer river temperatures on habitat suitability.

Better decisions have been made about the project's geographic focus, the fish species we evaluated, and the ways that we report and share results and outcomes of the modeling. Based on the encouragement and networking of attendees and speakers, the geographic focus of the project was expanded to include the Kuskokw im River. This has resulted in ongoing collaboration with the Tribe and City of Aniak. Results from the participatory mapping sessions were used to refine the project's fish and river ice modeling.

Climate, Ice and Fish Modeling Outcomes
The information from the Inform the Climate Modeling session was useful in several ways. The substantial changes in rivers and fish that were reported at the Summit underline an urgent need for scientists to conduct more actionable science. The Advisory Committee on

Climate Change and Natural Resource Science, appointed to advise the Secretary of the Interior, defines Actionable Science as

"Actionable science provides data, analyses, projections, or tools that can support decisions regarding the management of the risks and impacts of climate change."

The Arctic Rivers Project team has specifically focused on enhancing the actionability of the modeling in this study. Results from the Summit confirmed earlier feedback from a climate information survey that the Project Team sent to 226 Tribal decision-makers across Alaska and the Yukon River Basin in 2021 (Herman-Mercer, 2023). Survey responses were received from 23 (10% response rate) Tribal Councils, Traditional Councils, First Nation Governments, City Councils, and Regional Indigenous Organizations. Feedback included that the climate model should be able to resolve rivers and local climate features as much as possible and be focused on near-term changes.

Guidance from the Summit that the model should examine changes in weather patterns and combined seasonality changes to try to relate those to fish, plants, and other food sources was also consistent with results of the climate survey. This information was translated by the research team to the need to explore a variety of futures to understand potential changes in storms across seasons, how seasons transition across one-another, and impacts to subsistence living. The climate modeling team was preparing to explore other climate futures, and the Summit climate modeling discussion confirmed the need to move forward with creating that information. The consensus among Summit attendees, climate survey responses, and concurrence by our Indigenous Advisory Council gave the project team confidence in applying this information to guide the modeling efforts.

The information shared with us at the Summit informed analysis techniques related to key interests communicated by Summit attendees that included: the seasonality of conditions and changes; how temperature, snow, precipitation, and streamflow varies across seasons and years; local changes in river and climate conditions within specific communities and their lands, as well as comparisons between communities. The climate information that we produced includes both historical (1990-2020) and future (2035-2065) air temperature, precipitation, snowfall, snowpack, streamflow, and river temperature.

Using our model chain of climate, streamflow, river temperature, and fish bioenergetics, informed by community participation in the Arctic Rivers Summit, we are working to estimate the historical (1990-2021) and future (2034-2065) young-of-year (YOY) growth potential of Chinook salmon, Dolly Varden, Burbot, and Whitefish for seven river basins in the Arctic-Yukon-Kuskokwim (AYK) region. The seven rivers are the Andreafsky, Koyukuk, Chena, T'ee Drin J'ik, Aniak, Porcupine, and the Tokotna Rivers. These rivers were identified by community representatives and have sufficient observational data for the model simulations. They represent an area of nearly one-quarter million acres, and each basin is diverse in size and ecosystem characteristics. The bioenergetics modeling simulates possible trends in fish growth rates under scenarios of warming. We have been focusing on

two main life stages: Young-of-year and Adult.

As part of the academic review process to assess the quality and validity of our research, the project team has published or is working on the publication of papers that describe our modeling methods and outcomes (See Appendix 3: Arctic Rivers Products). The first paper on the fish bioenergetics work in currently in review.

Making the Data Available

The modeling team is using the feedback on data equity and accessibility to inform how we format and share information and products that are usable by communities. The modeling team is working on synthesizing the modeling results and developing reports, tables, and maps for broader use. To provide an example, we have drafted River & Climate Change Reports for nearly two dozen communities across the region. Here, we've provided the executive summary for the report produced for the community of Aniak, AK. If you would like a similar report produced for your community, please reach out to us by email at arcticrivers@colorado.edu and we will do our best to find that information for you.

DRAFT EXAMPLE:
Regional River & Climate Change Report for Aniak, AK

Summary

This report for the community of Aniak examines future changes to the Kuskokwim River as well as the weather and climate surrounding the community of Aniak. Information in the report was obtained from climate, land, and river models run by the Arctic Rivers Project Team. The climate information includes both historical (1990-2021) and future (2035-2065) air temperature, precipitation, snowfall, snowpack, streamflow, and river temperature. Due to the uncertainty of future conditions, six possible futures with similar greenhouse gas emissions were used in the models. By comparing the historical and future conditions, an average change is reported. Impacts to the local river and the entire watershed upstream of the community are examined for monthly, seasonal, and annual changes. Seasons within this report define Winter as December-February, Spring as March-May, Summer as June-August, and Fall as September-November.

Major Findings

- Air temperatures on average are projected to increase (+4.1° F) with the highest increases in winter (+4.5° F) and lesser increases in fall (+3.2° F).
- Annual precipitation is likely to increase (+8.5%).
- Snowfall may decrease (-14%) and rainfall may increase (+16%).
- Winter snowpack (the amount of snow on the ground at any given time) is projected to decrease (-23%).
- Kuskokwim River discharge is likely to increase (+8.3%)
- Kuskokwim River summer temperatures are projected to increase (+3.5° F).

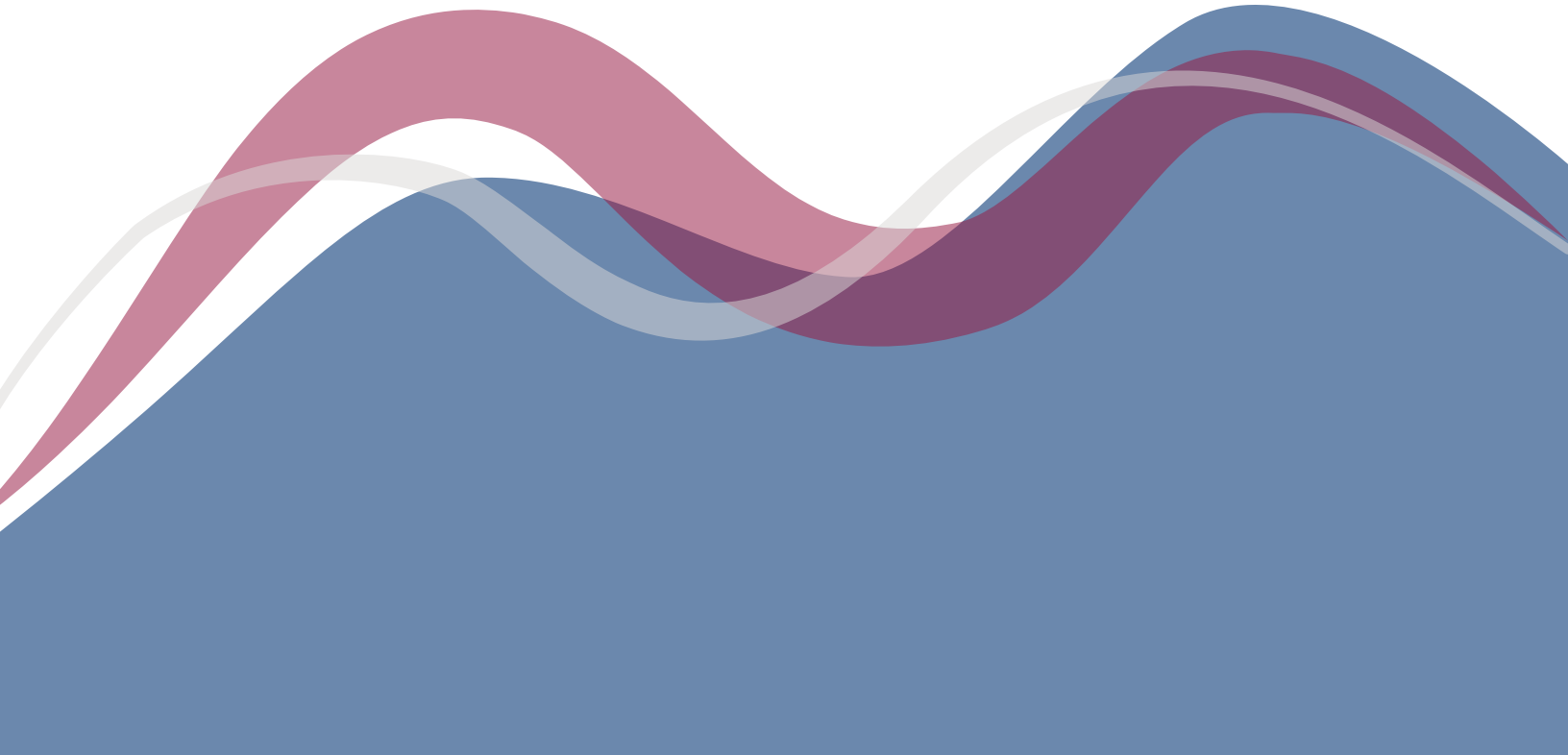
Next Steps

The Arctic Rivers Project team is actively working to communicate our results to communities, decision-makers, and the public. The project Venn diagram (below) illustrates the central aspect of the Summit. We are now expanding to learn more about specific concerns in specific communities (the middle encompassing circle in the diagram). Incorporating all outcomes from the models, the Summit, and the community engagement, over the next year, we will develop community-based Storylines of change (the outermost circle). Storylines are descriptive narratives that help to build a more complete picture of environmental changes and their impacts by combining the results of computer models with the lived experiences of community members.

> *Storylines will weave community knowledge, observations, and priorities with our model results with the goal of creating products that are useful for adaptation planning in communities across the region.*

Storylines will be shared with communities via reports, websites, geonarratives or storymaps such as this one that describes the project: https://geonarrative.usgs.gov/arcticriversproject/. We welcome suggestions and guidance for how best to put this information to use and in the hands of people who could use it.

The Summit brought together people with varied experiences and perspectives, to rekindle old relationships and build new ones, start collaborations, and provide a space to share with one another. It was an opportunity for western-trained researchers on the Arctic Rivers Project and beyond to listen to and learn about what is important to Indigenous Peoples in the Alaskan and Yukon region. We welcome new opportunities to collaborate and share.



Barry Glacier, source: Drake Singleton, USGS

VI. Appendices

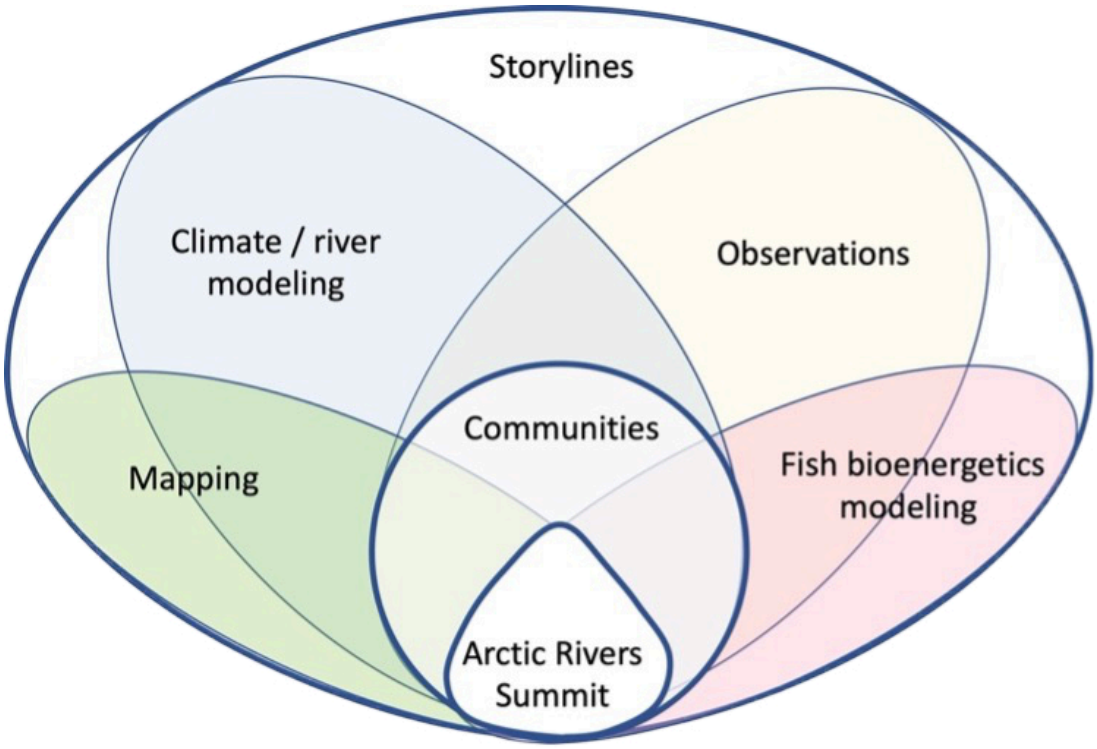


Figure 3. Arctic Rivers Project Scope

Appendix 1: Arctic River Summit Attendees

Name	Region
Michael Williams	Kuskokwim - Mid
Valerie Tony	Yukon Delta
Sharon Alstrom	Yukon Delta
Tiffany Andrew	Yukon Delta
Craig Chythlook	Southwest AK
Antonio Sisto	Interior, Yukon Flats
Charitie Ropati	Interior, Yukon Flats
Kiaira Szmyd	Interior, Yukon Flats
Karli Tyance Hassell	Native Village of Nanwalek
Brandon Garrett	Yukon Flats
Rosalie Kalistook	Yukon Delta
Geneva Kejick	National Canada
Kaitlyn Demonski	Alaska
Johnee Seetot	Bering Strait
Stephanie Quinn-Davidson	Yukon River
Tvetene Carlson	Interior
Amaya Cherian-Hall	Yukon Territory
Harold Gatensby	Yukon Territory
Tyler Obediah	Yukon Territory
John Pingayaq	Yukon Delta
Richard Slats	Yukon Delta
Reggie Tuluk	Yukon Delta
Richard Tuluk	Yukon Delta
Natasha Ayoub	Canada
Danielle Stickman	N/A
Vera Phillip	Yukon Delta
Erik Grafe	Oil and Gas Alaska
Kate Glover	Western and Arctic
Elizabeth Lee	Arctic, Yukon, Kuskokwim
Christopher Baird	North Slope
Katherine Miller	Yukon Delta
Ian Dooley	North Slope
Alexis Wagner	Southeast AK
Janessa Fosi	Yukon Delta
Leonardo Wassilie	Kuskokwim
Catherine Moncrieff	Yukon River
Erin Stockdale	State of Alaska

Name	Region
Chris Arp	North Slope / Kuskokwim
Elizabeth Moses	Canada
Karl-Erich Lindenschmidt	Canada
Mackenzie Sleeman	Yukon Flats
Nicole James	Yukon Flats
Courtney Weiss	Yukon Delta
Barbara Johnson	Kuskokwim - Upper
Alestine Andre	Tsiigehtshik
Jessica Black	Yukon Flats
Evelynn Combs	
Darrell Vent	Yukon - Mid
Megan Behnke	Southeast AK
Jenessa Tlen	Yukon Territory
Brenda Nowatak	Southwest AK
Tina Mann	Southwest AK
Jackie Qatalina Schaeffer	Bering Strait
Kevin Whitworth	Kuskokwim
Tazia Wagner	Southeast AK
Jacqueline Demko	North Dakota
Ed Plumb	Gov't research
Crystal Stiles	
Jane Palmer	Journalist
Keith Ivy	Yukon River
Dan Gilikin	Kuskokwim - Lower
Justin Leon	Bering Strait
Andrew Cyr	Anchorage, Rural AK
Jeff Conaway	Gov't research
Estelle Thomson	Yukon Delta
Ivy Lamont	Yukon Delta
Peter (Ilegvak) Williams	Southeast AK
Charles Cathart	Gov't research
Jessica Garron	N/A
Charlene Mayo	Ruby Tribe
Kendall Cambell	N/A
Marina Milligan	Yukon Territory
Esther Ashton-Reese	Southeast AK
Serena Fitka	Yukon Delta
Stanley Njootli Sr.	Old Crow

Notetakers & Facilitators:
Peyton Thomas
Jackelyn Florman
Nicole Herman-Mercer
Ryan Toohey
Josh Koch
Kyla Christopher-Moody

Indigenous Advisory Council Members (*in attendance):
Michael Williams*
Alestine Andre*
Serena Fitka*
Jenessa Tlen*
Elizabeth Moses*
Emily Murray
Victoria Buschman
Charles Prince
Patricia Salmon
Evelynn Combs

Appendix 2: Speaker Biographies

Harold Gatensby
Harold Gatensby is a member of the Raven Clan of the Inland Tlingit Nation from the Carcross-Tagish First Nation, a community with a population of 400 in the southwest corner of the Yukon Territory, Canada. Harold is a Co-Founder of the Yukon River Inter-Tribal Watershed Council, a Peace-maker, and a leader. Harold has been at the forefront of justice reforms in Canada centered on Traditional peace-making practices and restorative justice since the 1980s. Harold has been honored with a number of accolades including an Individual Merit Award for his community justice work, presented by Her Royal Highness Princess Anne of the United Kingdom. This Award brings recognition to individuals who have developed innovative approaches to reducing crime in their communities. In 2004, Harold and his wife Colleen received the Cultural Volunteers of the Year Award from Carcross Community School. And in 2006, Harold was a finalist for the Ecotrust Indigenous Leadership Award. Harold and his brother Philip currently lead the Restore Circles initiative.

Michael Williams Sr.
Michael Williams Sr. is Chairman of the Kuskokwim Inter-Tribal Fish Commission. Mike is also an educator, musher, and author. Now retired, Mike is a former Behavioral Health Counselor and President of the Yupiit School District. Mike has run 15 Iditarod Sled Dog Races and 29 Kuskokwim 300s. In 2013 Mike was awarded the Mushers' Choice Award and the Iditarod has named Mike the race's Most Inspirational Musher three times for promoting his message of sobriety on the trail. Mike is co-author of the book "Racing Toward Recovery" which details his remarkable life and journey to sobriety. In 2016 Mike was honored by the Calista Corporation for his efforts on sobriety and subsistence rights with the Spirit Award. More recently this spring Mike was honored by the University of Alaska, Fairbanks with an honorary doctorate for his work as an educator. Mike is a member of the Arctic Rivers Project Indigenous Advisory Council.

Dr. Reverend Anna Frank
Reverend Anna Frank was raised in the Old Minto village, where she lived a subsistence lifestyle in a family of 13 children. She began her career as a community health aide and postmistress in Minto, while also serving as a deacon in the Episcopal Church. After moving to Fairbanks, she continued in that role for the church and worked for Tanana Chiefs Conference in the Health Educator Department, becoming the first village traveling counselor in 1976. In 1983, the Episcopal Church ordained Frank as its first female Native American priest. In her various roles, Frank has served as a counselor, confidante and source of spiritual strength. She has served on the boards of numerous organizations, including the Denakkanaaga elders' group and the Alaska Commission on Aging. At the University of Alaska Fairbanks, she has been an elder advisor to the rural human services program. In 2019 Reverend Frank received an honorary Doctor of Law degree and a Meritorious Service Award by the University of Alaska Fairbanks at its 97th commencement ceremony.

Dr. Jessica Black
Dr. Jessica Black is Gwich'in from the villages of Gwichyaa Zhee (Ft. Yukon) and Toghotthele (Nenana), Alaska. Dr. Black currently serves as an Associate Professor in the Department of Alaska Native Studies, Rural Development and Tribal Governance at the University of Alaska Fairbanks. Dr. Black received her bachelor's degree in Social Work (BSW) at UAF and her master's degree and PhD in Social Work at Washington University in St. Louis. Her dissertation and current research examine the relationship between governance and well-being among Alaska Native peoples, especially as it pertains to Tribal Stewardship and Cultural Connectivity. Dr. Black resides in Fairbanks, Alaska with her family, however, she frequently returns home to Gwichyaa Zhee to hunt, fish, gather and engage in other, important cultural practices.

Craig Chythlook
Craig Chythlook is Yup'ik and originally from the Bristol Bay region in southwest Alaska. Craig is finishing up his undergraduate degree at the University of Alaska Fairbanks and spends his summers with his family fishing both commercially and subsistence for salmon out of Dillingham, Alaska. Craig is the Indigenous Liaison for the Food Security Working Group at the International Arctic Research Center, University of Alaska, Fairbanks. The Food Security Working Group is part of the Research Networking Activities for Sustained Coordinated Observations of Arctic Change project.

Stanley Njootli Sr.
Stanley Njootli Sr. is a Vuntut Gwitchin from Old Crow, a village in the Yukon Territory, Canada. Stanley and his son were featured in the film Arctic Son, that broadcast on the PBS program POV in August 2007.

Ben Stevens
Ben Stevens is Koyukon from Stevens Village, Alaska. Ben serves as the Tribal Resource Commission Manager for the Tanana Chief's Conference. Prior to this position Ben was the Director of the Hunting & Fishing Task Force at the Tanana Chiefs Conference. Before joining TCC, Ben served as the Executive Director of the Council of Athabascan Tribal Governments (CATG), the tribal consortium of Tribes located in Yukon Flats. He has also served as CATG's Policy Analyst and Self-Governance Coordinator where he led negotiations to secure the first-ever Self-Governance agreements between the Fish & Wildlife Service and BLM's Alaska Fire Service to bring jobs to the village. Prior to CATG, Ben served the people of Alaska in local, regional and state-wide capacities involving health care and natural resource program development. In his hometown of Stevens Village, he helped the Tribal Council develop a Tribal natural resource program designed to protect and preserve resources the Tribe relies upon. After serving as its Director, Ben moved on to the state-wide level where he worked to facilitate Tribal natural resource management strategic planning. Ben was raised in the village by his Grandma Hilda Stevens and trained by his grandpas and uncles. He graduated from Mt. Edgecumbe High School and Fort Lewis College in Colorado.

Serena Fitka
Serena Cuucitcuar Fitka grew up in St. Mary's, Alaska in the lower Yukon River watershed area. She now lives with her family in Valdez, Alaska. She is the Executive Director of the Yukon River Drainage Fisheries Association (YRDFA) -- a non-profit organization that represents local fishers in 42 communities along the Yukon to ensure that the "voices of fishing communities are heard when management decisions are being made." Serena has a degree in Business Administration with Leadership Distinction from the University of Alaska Fairbanks and previously worked for the Yupiit of Andreafski Tribal Government, Tanana Chiefs Conference, and Alaska Native Tribal Health Consortium. Serena and her family have a strong connection to the Yukon River; both the resources and the people who rely on them. Serena and her husband Chris from Marshall, Alaska enjoy passing on their traditional knowledge to their 3 daughters. Serena is a member of the Arctic Rivers Project Indigenous Advisory Council.

Kevin Whitworth
Kevin is executive director of the Kuskokwim Inter-Tribal Fish Commission. Growing up in McGrath, Kevin learned from his elders to love the land, the river, and the natural world from an early age. He spent many hours exploring, hunting, fishing, and trapping out in the woods and on the rivers. Through high school and college, Kevin spent his summers working as a biological technician at several wildlife refuges across the state. After graduating from University of Alaska Fairbanks, he worked a number of full-time positions for U.S. Fish and Wildlife Service, including Deputy Refuge Manager for the Innoko National Wildlife Refuge in McGrath. Kevin has also worked for the Alaska Department of Natural Resources, and as the Lands and Natural Resources Manager for MTNT Limited, the McGrath village corporation. While working for the U.S. Fish and Wildlife Service, Kevin met his wife, Dara. They have a young son and daughter, and enjoy spending time at their remote cabin, dogsledding with their team of dogs, and being outside as much as possible.

Esther Reese Ashton
Esther is Vice-Chair of the Southeast Alaska Indigenous Transboundary Commission. The commission is a consortium of 15 sovereign Tribal Nations located in Southeast Alaska and a non-profit organization. In addition to serving as vice-chair, Esther represents the Wrangell Cooperative Association as their Tribal Administrator.

Appendix 3: Arctic Rivers Products

Working Together in Co-Production:
Herman-Mercer, N.M., Andre, A., Buschman, V., Blaskey, D., Brooks, C., Cheng, Y., Combs, E., Cozzetto, K., Fitka, S., Koch, J., Lawlor, A., Moses, E., Murray E., Mutter, E., Newman, A.J., Prince, C., Salmon, P., Tlen, J., Toohey, R., Williams, M., and Musselman, K.N., (2023), The Arctic Rivers Project: Using an Equitable Co-Production Framework for Integrating Meaningful Community Engagement and Science to Understand Climate Impacts. Community Science, 2(4), p.e2022CSJ000024. https://onlinelibrary.wiley.com/doi/full/10.1029/2022CSJ000024

The Climate Information Survey Results:
Herman-Mercer, N.M., 2021. Guiding the Arctic Rivers Project Climate Model Development: Results from the Climate Information Survey. Community Report. Available Online: https://www.colorado.edu/research/arctic-rivers/sites/default/files/attached-files/arp_modelsurveyresults_report_final.pdf

Working to Produce More Actionable Climate Information:
Cheng, Y., Musselman, K.N., Swenson, S., Lawrence, D., Hamman, J., Dagon, K., Kennedy, D. and Newman, A.J., 2023. Moving land models toward more actionable science: A novel application of the community terrestrial systems model across Alaska and the Yukon River Basin. Water Resources Research, 59(1), p.e2022WR032204. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2022WR032204

Describing the Climate Modeling for the Historical Period:
Cheng, Y., Craig, A., Musselman, K., Bennett, A., Seefeldt, M., Hamman, J. and Newman, A.J., 2025. Coupled high-resolution land-atmosphere modeling for hydroclimate and terrestrial hydrology in Alaska and the Yukon River basin (1990–2021). Journal of Geophysical Research: Atmospheres, 130(1), p.e2024JD041185. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2024JD041185

Using Observations to Understand Changing River Conditions:
Blaskey, D., Koch, J.C., Gooseff, M.N., Newman, A.J., Cheng, Y., O'Donnell, J.A. and Musselman, K.N., 2023. Increasing Alaskan river discharge during the cold season is driven by recent warming. Environmental Research Letters, 18(2), p.024042. https://iopscience.iop.org/article/10.1088/1748-9326/acb661/meta

Modeling Historical Streamflow and River Temperature:
Blaskey, D., Gooseff, M.N., Cheng, Y., Newman, A.J., Koch, J.C., and Musselman, K.N., 2024, A high-resolution, daily hindcast (1990-2021) of Alaskan river discharge and temperature from coupled and optimized physical models. Water Resources Research, 60(4), e2023WR036217. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2023WR036217

Possible Future Changes in Streamflow and River Temperature by Mid-Century
Blaskey, D. Y. Cheng, A. J. Newman, J. C. Koch, M. N. Gooseff, and K.N. Musselman. Alaskan hydrology in transition: Changing precipitation and evapotranspiration patterns are projected to reshape seasonal streamflow and water temperature by mid-century (2035-2064). In Press, J. Hydrometeorology.

Modeling and Remote Sensing of River Ice Conditions:
Blaskey, D. I. Racine, M. E. Harlan, Y. Cheng, A. J. Newman, K. E. Lindenschmidt, M. N. Gooseff, and K.N. Musselman. Using Remote Sensing, Statistical, and Machine Learning Techniques to Assess Alaskan River Ice Phenology and Thickness. In review, Water Resources Research.

How will Young Chinook and Dolly Varden be Affected by Warming Rivers?
Thomas, P. A., D. Blaskey, Y. Cheng, M. P. Carey, H. K. Swanson, A. J. Newman, C. Brooks, N. M. Herman-Mercer, and K. N. Musselman. Warming Alaskan rivers affect first-year growth in critical northern food fishes. In review, Communications Biology.

Community Water Data Collection
Koch, J.C., Mutter, E., Musselman, K., and Hendon, M.R., 2024, Continuous temperature and specific conductance from the Yukon River and arctic Rivers in Alaska: U.S. Geological Survey data release, https://doi.org/10.5066/P13IAWWA.

Appendix 4: Arctic Rivers Summit Agenda

Arctic Rivers Summit

December 6-8, 2022
Alaska Native Heritage Center, Anchorage, Alaska

Tuesday, December 6			
7:30-8:30 am	**Registration** *Lobby*		
8:30-10:00 am	**Welcome** *Large group, Gathering Room*		
Break 10:00-10:15			
10:15-10:45 am	**Icebreaker**		
10:45-12:00 pm	**Knowledge Exchange: Elders Share** Mike Williams (Kuskokwim River Inter-Tribal Fish Commission) Harold Gatensby (Carcross/Tagish First Nation, co-founder Yukon River Inter-Tribal Watershed Council) Reverend Anna Frank (Fairbanks Native Association) *Facilitator*: Theresa Clark (Yukon River Inter-Tribal Watershed Council) *Large group, Gathering Room*		
Lunch 12:00-1:00pm			
1:00-1:20 pm	**Knowledge exchange: Arctic Rivers Project Overview** Keith Musselman (University of Colorado – Boulder) Nicole Herman-Mercer (U.S. Geological Survey) *Large group, Gathering Room*		
1:20-1:30 pm	**Introduction to the afternoon** Nicole Herman-Mercer (U.S. Geological Survey) *Large group, Gathering Room*		
	Track 1 (Groups 1-3)	*Track 2 (Groups 4-6)*	*Track 3 (Groups 7-9)*
1:45-5:00 pm *(There are 15-minute breaks between sessions.)*	Inform the Modeling: River Transport Through the Seasons *1:45-2:45 pm*	Inform the Modeling: Fish Through the Seasons *1:45-2:45 pm*	Tour: Alaska Native Heritage Center *1:45-3:00 pm*
	Inform the Modeling: Fish Through the Seasons *3:00-3:45 pm*	Tour: Alaska Native Heritage Center *3:00-4:00 pm*	Inform the Modeling: Fish Through the Seasons *3:15-4:00 pm*
	Tour: Alaska Native Heritage Center *4:00-5:00 pm*	Inform the Modeling: Fish Through the Seasons *4:15-5:00 pm*	Inform the Modeling: River Transport Through the Seasons *4:15-5:00 pm*
5:00-5:30 pm	**Report back** - reconvene as a large group to review the day and discuss what's next *Facilitator:* Ryan Toohey (U.S. Geological Survey) *Large group, Gathering Room*		
Adjourn for the day			

Wednesday, December 7

8:30-10:00 am	**Knowledge Exchange: State of Arctic Rivers** Ben Stevens (Tanana Chiefs Conference) Craig Chythlook (Food Security Working Group, International Arctic Research Center) Dr. Jessica Black (University of Alaska - Fairbanks) Stanley Njootli, Sr. (Yukon River Panel) *Facilitator*: Nikki Cooley (Institute for Tribal Environmental Professionals) *Large group, Gathering Room*		
Break 10:00-10:30			
10:30-11:45 pm	**Knowledge Exchange: Weaving Together Indigenous Knowledge and Western Science & Management** Esther Ashton-Reese (Southeast Alaska Indigenous Transboundary Commission) Serena Fitka (Yukon River Drainage Fisheries Association) Kevin Whitworth (Kuskokwim River Inter-Tribal Fish Commission) *Facilitator*: Danielle Stickman (The Wilderness Society) *Large group, Gathering Room*		
Lunch 11:45-12:45pm			
	Track 1 (Groups A-C)	*Track 2 (Groups D-F)*	*Track 3 (Groups G-I)*
12:45-4:45 pm	Taking Action: SWOT Analysis, Topic 1 *12:45-2:45 pm*	Taking Action: SWOT Analysis, Topic 1 *12:45-2:45 pm*	Taking Action: SWOT Analysis, Topic 1 *12:45-2:45 pm*
	Break 2:45-3:00 pm		
	Taking Action: SWOT Analysis, Topic 2 *3:00-4:35 pm*	Taking Action: SWOT Analysis, Topic 2 *3:00-4:45 pm*	Taking Action: SWOT Analysis, Topic 2 *3:00-4:45 pm*
4:45-5:30 pm	Report back - reconvene as a large group to review the day and discuss what's next Working group members will report back on any key themes and ideas emerging from their group discussions, and we'll discuss what's next. *Large group, Gathering Room*		
Adjourn for the day			

Please note

There are four action plan working group topics:

- State of Salmon
- State of Rivers
- Partnering Indigenous Knowledge with Western Science for Management
- Youth and Elders: Building a Bridge of Traditional Knowledge

Everyone will be part of the working groups for two topics. We have done our best to match each person with their top two topic choices as indicated when registering.

SWOT analyses will examine strengths, weaknesses, opportunities, and threats for a particular topic.

Thursday, December8

	Track 1 (Groups A-C)	*Track 2 (Groups D-F)*	*Track 3 (Groups G-I)*
8:30-12:00 pm *(There are 15-minute breaks between sessions.)*	Inform the Modeling: Climate *8:30-9:15 pm*	Taking Action: Translating SWOT analyses to Actions, Topic 1 *12:45-2:45 pm*	Taking Action: Translating SWOT analyses to Actions, Topic 1 *12:45-2:45 pm*
	Taking Action: Translating SWOT analyses to Actions, Topic 1 *9:30-10:45 pm*	Inform the Modeling: Climate *1:45-2:45 pm*	Taking Action: Translating SWOT analyses to Actions, Topic 2 *12:45-2:45 pm*
	Taking Action: Translating SWOT analyses to Actions, Topic 2 *10:45-12:00 pm*	Taking Action: Translating SWOT analyses to Actions, Topic 2 *12:45-2:45 pm*	Inform the Modeling: Climate *1:45-2:45 pm*
Lunch 12:00-1:00			
1:00-2:15 pm	**Report back** and discussion about actions and action plans		
2:15-2:45 pm	**Break/gallery walk** during which people can add notes to the action plans and vote		
2:45-3:00 pm	**Close**		
Break 3:00-6:30			
Banquet 6:30-9:00pm			
Adjourn the summit			

Appendix 5: SWOT Facilitator Guide

Arctic Rivers Summit
Facilitator Guide – Action Plans

Please note: Below are some general guidelines, however, please feel free to adapt as you see fit.

Who is facilitating which topics

Each facilitator will be facilitating two topic areas. The facilitators and groups are:

- ***Ryan*** *(Group A),* ***Karen*** *(Group B)* - State of Salmon, State of Rivers
- ***Nikki*** *(Group C)* - State of Salmon, Partnering Indigenous Knowledge with Western Science for Management
- ***Kelsey*** *(Group D)* - State of Salmon, Youth and Elders: Building a Bridge of Traditional Knowledge
- ***Jackie/Nicole*** *(Group E),* ***McKenzie*** *(Group F)*- Partnering Indigenous Knowledge with Western Science for Management, State of Rivers
  Note: Nicole will help with State of Rivers on Wednesday afternoon
- ***Alexis*** *(Group F)* - Partnering Indigenous Knowledge with Western Science for Management, Youth and Elders: Building a Bridge of Traditional Knowledge

Supplies you will have

- Large post-it pad paper
- Markers and pens
- Sticky notes (4x6)– four colors
- Masking tape
- Scotch tape
- Possibly post-it pad easel (limited number of easels)

Tuesday, December 6, 2022

ITEP Team – Before Session 1

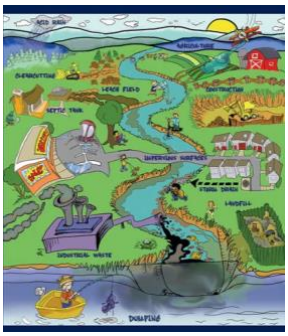
- Prepare action plan group rooms
  - Place markers, masking tape, scotch tape, large post-it pads, smaller post-it notes (four colors), and easels if available in each room
  - Place 2-3 post-it pad pages flat on table for drawing exercise
  - On wall, have large post-it page with PARK questions
  - On wall, have large post-it page with LESTER definitions

Wednesday, December 7, 2022

All - Session 1 – Visioning and Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis

Summary of Session 1

- Introductions
- Collectively develop a vision for what the desired state is for a particular topic (outcomes – (1) drawing and (2) list of key components of vision)



Vision
• Component 1 • Component 2 • Component 3 And so on

- Do a Strengths, Weaknesses, Opportunities, Threats analysis for achieving the vision for a topic (outcome –strengths sheet(s) with post-it notes, weaknesses sheet(s) with post-it notes, and so on)

Approximate timing	Activity
Introductions (~25 minutes)	
12:45-1:00 pm (~15-20 minutes)	Introductions for people in group • Name • Tribe/affiliation • Something someone may not know about you
1:00-1:05 pm (~3-5 minutes)	Introduction to overall activity (developing an action plan) and to specific Wednesday afternoon activity (doing a SWOT analysis) • The overall goal of this session and those tomorrow (Thursday) is to develop an action plan centered around [insert your action plan topic] • Today, we are going to be doing a Strengths, Weaknesses, Opportunities, Threats or SWOT analysis and tomorrow we will be translating those strengths, weaknesses, opportunities, and threats into actions and prioritizing actions. • Strengths and opportunities are factors/actions that are helpful in achieving what we hope for/ vision/desired state • Weaknesses and threats are factors/actions that present challenges in achieving what we hope for/ vision/desired state • We're going to start by talking about what our desired state is and then move into thinking about strengths, weaknesses, opportunities, & threats
1:05-1:10 pm (~2-3 minutes)	Select a person to report back to the larger group • At the end of the day, we are going to reconvene as a large group and report back to them on our group activities. We'll discuss what to report back at the end of the session. Would anyone like to volunteer?
Understanding our vision/desired state/ hopes for [insert topic] (~25 minutes)	
1:10-1:15 pm (~5-10 minutes)	Introduction to activity • In order to develop an action plan, it can be helpful to understand where we would like to go, what are our hopes for [salmon, rivers, weaving knowledges together, youth and elders]? • So, in this portion of our session, we're going to take a little bit of time and start off by drawing our hopes for the future state/conditions of [insert topic]. We have some paper on the tables and markers. If you'd like to write a word or two on the drawing that is fine too. • We'll draw for maybe 5-10 minutes and then discuss our hopes. • Some potential prompts that people could consider o Can think about PARK (CIER, Inc. 2006 and 2020) (could have this on a post it note on easel or wall) o What would you like to Preserve? o What would you like to Add In? o What would you like to Remove? o What would you like to Keep out? o Can consider different perspectives. For example o Point of view of the salmon, of the river, communities who use salmon and the rivers – what species do salmon rely on, who rely on salmon? o How might our ancestors answer this question? Our future generations? o Can consider potential transformations that may need to happen given climate change and changing conditions

1:15-1:25 pm (~10 minutes)	Drawing (potential prompt questions) • What does a healthy, resilient reciprocal interconnected salmon system look like? • What does a healthy, resilient river look like? What are components of a healthy river system? How do communities use rivers (e.g., ice transportation) • What do components of healthy partnerships look like? Healthy resource management? • What do traditional knowledge bridge(s) between youth and elders look like? Note: The rooms will be prepared Tuesday later afternoon/evening so that there are large post-it pads in the rooms as well as markers and pens. We will put some large sheets of paper on the table that people can draw on. We will have a large post-it note with the acronym PARK if you would like to use that.
1:25-1:35 pm (~10 minutes)	Discussion • Could ask people to discuss what they drew • Could use prompt questions above • Please take notes on a large post-it note of key hopes/outcomes for the future of a topic.
Strengths, Weaknesses, Opportunities, Threats Analysis	
	Pre-activity • There will be post it notes of four colors in your room. Decide which color you would like to use for strengths, what color you would like to use for weaknesses, and the colors for opportunities and threats as well.
1:35-1:40 pm (~5 minutes)	Introduction to activity • Now that we have some idea of what we are working towards, we can consider strengths, weaknesses, opportunities, and threats to getting there. • Reminder - strengths & opportunities are factors/actions that are helpful in achieving what we hope for/ our vision/desired state. Weaknesses and threats are factors/ actions that present challenges in achieving what we hope for/ vision/desired state • For the purposes of this activity, we are considering strengths and weaknesses to be in the current time period and opportunities and threats to be in the future. However, don't worry too much about current versus future and exact definitions – the overall point is to just brainstorm • We are going to take some time to write our ideas on post-it notes. Ultimately, the post-it notes will be clustered into themes. Note: The room will be prepared with 3-inch by 3-inch post-it notes in four different colors, and with large post it sheets on the walls designated for strengths, weaknesses, opportunities, and threats.
1:40-1:50 pm (~10 minutes)	Write strengths on post-it notes • Let's start with strengths. Could ask for someone to suggest a strength to get the brainstorm started • Potential prompt. Can refer to LESTER (ITEP 2019) (will be written on large post-it note on wall) o Laws and policies o Environmental and biological factors o Social factors and Indigenous Knowledge o Technology and infrastructure o Economic factors o Research, monitoring

	• Potential prompts, can consider different perspectives (for example, strengths of salmon, strengths of rivers, strengths of individuals, communities) • Ask group members to spend 5 to 10-minutes writing strengths on [insert color] 3-inch x 3-inch post-it notes • Ask to write one strength per note • Can collect sticky notes periodically and put them on the larger post it note pages that will be hung on a wall. People can also walk up to the wall to look at what others have writing and get inspiration. If people put two (or more) ideas on one sticky note, that is okay but write the other ideas on separate sticky notes. • Can start to cluster similar post-it notes to see if themes emerge • After ~5-10 minutes, play song from Spotify playlist to transition to thinking about weaknesses. Examples of strengths could be: genetic diversity of salmon, drones to monitor river ice conditions, National Coastal Resilience fund, Considerations for Considering Traditional Knowledgs in Climate Change Initiatives, Photo Voice, Alaska Native language cell phone apps, Association of Interior Native Educator Curriculum Units, summer culture camps, Native American Fish and Wildlife Society, Alaska Tribal Resilience Learning Network
1:50-2:00 pm (~10 minutes)	Write weaknesses on post-it notes • Let's move to weaknesses. Could ask for someone to suggest a weakness to get the brainstorm started • Ask group members to write weaknesses on [insert color] 3-inch x 3-inch post-it notes • Follow above process. Examples of weaknesses/challenges could be: bycatch, marine heat waves, fresh water mold disease, mining, permafrost thaw and erosion into rivers, poor understanding on the part of western scientists of responsibilities associated with the sharing of traditional knowledge and protections of Indigenous knowledge, poor understanding of Tribal history among western scientists, cell phone distraction, young people moving away because of lack of economic opportunities in villages, lack of grant writing expertise, spotty internet connectivity in some places, smart phone apps for fish and wildlife observations
2:00-2:10 pm (~10 minutes)	Write opportunities on post-it notes • Let's move to weaknesses. Could ask for someone to suggest a weakness to get the brainstorm started • Ask group members to write weaknesses on [insert color] 3-inch x 3-inch post-it notes • Follow above process. Examples of opportunities could be: Bipartisan Infrastructure Law funding coming out for Clean Water projects and broadband expansion, future National Science Foundation Navigating the New Arctic research – how to connect to Indigenous priorities, Justice 40 Initiative, likely improved drone technology for monitoring conditions

2:10-2:20 pm (~10 minutes)	Write threats on post-it notes • Lets move to weaknesses. Could ask for someone to suggest a weakness to get the brainstorm started • Ask group members to write weaknesses on [insert color] 3-inch x 3-inch post-it notes • Follow above process. Examples of threats could be: climate change – rising river temperatures, ocean acidification, possibly increasing storm intensities, increasing wildfire, future mining, political administrations not receptive to Traditional Knowledge; increasing uncertainty in fish populations, migratory routes, timing making management more difficult; young people moving away from villages, increasing climate disasters with less recovery time between them, changing ecosystems with ecosystems not looking the same as in the past
2:20-2:35 pm (~15 minutes)	Discussion of SWOT • Invite people to look at what others have written and discuss if any of the strengths, weaknesses, opportunities, and threats appear to be priorities • Put an asterisk next the SWOT factors that the group considers to be priorities
2:35-2:45 pm (~10 minutes)	Discussion of 2 key points from this session to report back to larger group

15-minute break

For Topic 2, repeat the above with the exception of asking people to introduce themselves (rough timeline below)

Approximate timing	Activity
Introductions (~5 minutes)	
3:00-3:05 pm (~5 minutes)	Introduction to overall activity (developing an action plan) and to specific Wednesday afternoon activity (doing a SWOT analysis)
	Select a person to report back to the larger group
Understanding our vision/desired state/ hopes for [insert topic] (~25 minutes)	
3:05-3:10 pm (~5 minutes)	Introduction to activity (refresher)
3:10-3:20 pm (~10 minutes)	Drawing (potential prompt questions)
3:20-3:30 pm (~10 minutes)	Discussion
Strengths, Weaknesses, Opportunities, Threats Analysis	
3:30-3:35 pm (~5 minutes)	Introduction to activity
3:35-3:45 pm (~10 minutes)	Write strengths on post-it notes
3:45-3:55 pm (~10 minutes)	Write weaknesses on post-it notes
3:55-4:05 pm (~10 minutes)	Write opportunities on post-it notes
4:05-4:15 pm (~10 minutes)	Write threats on post-it notes
4:15-4:30 pm (~15 minutes)	Discussion of SWOT
4:30-4:40 pm (~10 minutes)	Discussion of 2 key points from this session to report back to larger group (will have a total of ~ 5 minutes for both topics)

All – After Session 1 at Alaska Native Heritage Center

- Number and date the pages, add in facilitator initials, and add in working group title if not already on the page (can abbreviate title)
- Meet for 15-minute debrief near Gathering Room stage at ~5:30

ITEP Team – After Session 1 at Alaska Native Heritage Center

- Go to each room and take photos of pages and sticky notes
- Tape post-it notes at the bottom (non-sticky part of the note) to the larger pages so don't lose them in transit
- Transport pages to hotel

ITEP Team – After Session 1 at Lakefront Anchorage

- Background
  - There are four groups each working on State of Salmon, State of Rivers, and Partnering Indigenous Knowledge with Western Science for Management
  - There are two groups working on Youth and Elders: Building a Bridge of Traditional Knowledge
- Summary
  - Creating a collective vision of the topic

Components of Desired State Across all Four Groups
• Component 1 • Component 2 • Component 3 And so on

  - Creating SWOT theme charts to translate into actions (utilize strengths and opportunities to achieve desired state, address weaknesses and threats)

STRENGTHS	
Consideration/ Theme	Actions (left blank)
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	

WEAKNESSES	
Consideration/ Theme	Actions (left blank)
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	

OPPORTUNITIES	
Consideration/ Theme	Actions (left blank)
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	

THREATS	
Consideration/ Theme	Actions (left blank)
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	

- State of Salmon
  - Develop a summary of key components of the desired state across all four groups
  - Develop chart like the dark blue chart above (four charts – one for each of the four groups working on the State of Salmon)

- We will consider the strengths, weaknesses, opportunities, and threats identified across all four groups together and cluster post-it notes together according to similarities
- We will also consider "outliers" as these can be important as well – someone may be thinking of something that others are not thinking of.
- We will decide on ~6-10 strengths, ~6-10 weaknesses, ~6-10, opportunities, & ~6-10 threats across all four working groups that we will present on Thursday to translate into actions.
  - Criteria for what to present on Thursday could include: how many people brought that particular factor up, ensuring that the factors included are diverse and different from one another, how people prioritized SWOTs within a group, judgement calls the importance of a factor in achieving the hoped-for state, other criteria that may come up
  - We don't need to have the same number of strengths, weaknesses, opportunities, threats on the charts.
- Once we identify these factors, we will create charts like the ones noted above for each of the four groups - so four strengths charts (all the same), four weaknesses charts (all the same), four opportunities charts (all the same), and four threats charts (all the same)

- State of Rivers
  - Similar to the above
- Partnering Indigenous Knowledge with Western Science for Management
  - Similar to the above
- Youth and Elders: Building a Bridge of Traditional Knowledge
  - Similar to the above except only across two groups
- If any of the facilitators would like to join us as we do this, you are welcome to do so! However, also please feel free to relax.

Thursday, December 8, 2022

ITEP Team - Prior to Session 2

- Hang a chart with components of the combined vision in each working group room
- Hang the 4 SWOT charts prepared the night before in each of the appropriate working group rooms
- Make sure enough smaller post-it notes and makers in each room

All - Session 2 – Translating SWOT Analyses into Actions

Summary of Session 2

- Brainstorm actions that use strengths & opportunities and address weaknesses & threats to achieve the desired state

STRENGTHS	
Consideration/ Theme	Actions (filled in by group)
Filled in before	
Filled in before	
Filled in before	
Filled in before	
Filled in before	

WEAKNESSES	
Consideration/ Theme	Actions (filled in by group)
Filled in before	
Filled in before	
Filled in before	
Filled in before	
Filled in before	

OPPORTUNITIES	
Consideration/ Theme	Actions (filled in by group)
Filled in before	
Filled in before	
Filled in before	
Filled in before	
Filled in before	

THREATS	
Consideration/ Theme	Actions (filled in by group)
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	
Will be filled in	

- Decide on top three actions to present to the larger group

Approximate timing	Activity
Review (~25 minutes)	
~5 minutes	Session overview • Reminder of goal → to develop an action plan • Will review combined vision of all four (two) working groups • SWOT gallery walk to identify actions Identify someone to report back to the larger group
~10 minutes	Review combined vision from all four (two) working groups
~30 minutes	SWOT gallery walk • Introduce the four charts and gallery walk activity. Note that the tables include input from all four (two) groups working on the particular topic • Subgroup 1 will start with Strengths chart, Subgroup 2 will start with Weaknesses chart, Subgroup 3 will start with Opportunities chart, Subgroup 4 will start with Threats chart • Each group will review their particular SWOT category and brainstorm actions that either utilize strengths or opportunities to achieve the desired state or actions that address weaknesses and threats o Write one action per sticky note – if possible, identify groups) to do the action and a timeframe for the action to be completed o Don't have to write actions for every single consideration/theme • After ~5-10 minutes, play a song from Spotify play list to transition subgroups to next category – people can move clockwise • Repeat this until each group has done each subcategory • Provide time for group members to either take a break or do one last walk through to see what has been written by other group members
~25 minutes	Discussion of actions and decision of top 3 actions to present to larger group • Invite people to look at what others have written and decide on three actions to present to the larger group during the report back. • Criteria could include: what actions might have the most impact, low hanging fruit – easy to implement, flexibility in the face of increasing uncertainty with climate change

Citations

Centre for Indigenous Environmental Resources (CIER), Inc. (2006 and 2020) Indigenous Climate Change Adaptation Planning Guidebooks for Indigenous Communities, Guidebook 3: Identifying Community Sustainability and Climate Change Vulnerabilities.

Institute for Tribal Environmental Professionals (ITEP) (2019) Developing a Plan for Completing/Updating a Climate Change Adaptation Plan – Steps and Resources.

Appendix 6: Mapping Protocol

Arctic Rivers Summit Participatory Mapping Protocol - ICE

Thank you for being willing to facilitate the participatory mapping breakout sessions at the Arctic Rivers Summit!

Objectives:
There are four goals of the participatory mapping sessions:

1. Build relationships, make people feel heard, witness and respect people's experiences with climate change.
2. Learn any Indigenous and Local Knowledge, metrics, or indicators of river ice quality
3. Locate and map major and alternative river ice transportation trails
4. Map areas of open water, early melt, late freeze.

Overview:

Participatory mapping workshops will be held as breakout sessions during the Arctic Rivers Summit Meeting. Each participatory mapping workshop session will be held with a maximum of 16 participants for 45 minutes. Each workshop session will have a facilitator and a note-taker. There will be no audio or video recorded. Participants will be grouped into breakout sessions together based on the geographic proximity of their place of residence or community they represent to accommodate the mapping.

The breakout session will consist of a short, guided conversation around knowledge and observations of river ice, how and why people travel on river ice, and the consequences of not being able to travel on river ice. After this conversation, participants will identify critical transportation locations or locations where river ice may not form or is thinner than other areas, and changes in ice quality over the season if applicable.

Materials:

- Regional scale map
- Village scale map
- Markers
- Large sticky notes and easel

Procedures:

Start the first session of the afternoon with introductions. After introductions begin the guided discussion. Below is a suggested script (italicized text) and list of questions. You are there to guide the discussion and ensure we get the information we are seeking but let the conversation flow as much as possible. Try not to let one or a few voices dominate the discussion. If you have elders in your breakout, be respectful of their knowledge and place in the community but bring in other voices too. It is fine to call directly on people, saying things like: “we haven’t heard from you/this side of the

room/etc. yet, do you agree/have anything to add/have you observed thin ice/etc.?"

Your goal at the end of the discussion is to have

The formatting for the rest of the document is:

Underlined text organizes the document by activity and questions by topic

Bolded topics are priorities, the minimum amount of information we want to get.

Italicized text is a script you can choose to read or ad lib from.

[instructions for you are in brackets like this]

- Questions are bulleted
  - Prompts are sub-bulleted; these are designed to help you clarify the question or provide examples for the participants

Introductions:

[Spend roughly 15 minutes on introductions]

Before we begin, let's go around and briefly introduce ourselves. Please tell everyone your name, what community you are from, and what are you hoping to get out of the Arctic Rivers Summit. If you would prefer to introduce yourself differently based on any cultural protocols or individual preferences, please feel free to do so.

.....

Thank you all for introducing yourself. You may have noticed that you are all from villages in the same region. This was done on purpose to help facilitate the mapping that we are going to be doing today. The first thing that we are going to do is have a conversation about fish, fish harvesting, fish health, and fish locations in your communities. Then we will move to the maps in the back of the room, and I will ask you to identify important fish habitat locations by drawing on the map with different colored markers.

Before we get started, I want to lay out some ground rules for our work together today. First, let's be accepting of each other and treat everyone with respect. Second, let's be generous in spirit and heart with the experiences and viewpoints of our colleagues and peers in the room today. Finally, let's share the air and be good listeners, we all have something to learn and something to share so let's make sure that all voices can be heard.

Guiding Questions:

[To facilitate a broad discussion where the participant responses are not led by the facilitator start with the top-level bullet point – the next level are probes that can be used if participants need examples of what is being asked.]

To begin, let's talk about travel over river ice.

- What percentage of your community do you think travels over river ice?
- Tell me about how people in your community travel over river ice.
  - Types of vehicles used, e.g., cars, snow machines, atvs, dog sled, etc.
- Where are people going when they travel over river ice?
  - Hunting, fishing, gathering, logging locations? Festivals, Potlatches, basketball games, visiting friends and family, etc.
- How many miles (hours) do you travel on these trips?
- How frequent is travel over river ice?
  - Provide a time frame – daily, weekly, monthly, something else
- What are the typical times of year that one can travel over river ice?
  - What months as opposed to seasons. Have there been changes to this time frame?
- Have you observed any changes in river ice?
  - Onset, quality, thickness, anything else?
- Are there any places where the river never freezes, or the ice is thinner than other areas?
  - Does the winter trail avoid any non-ice areas?
- Are there places that freeze later, or melt earlier? Do these places change the route or trail?
- Have you observed any unusual ice features?
  - For example, air pockets, double ice layers (with water and slush sandwiched between the layers), and/or open water leads?
- What are the indicators that river ice will be unsafe for travel?
- How is information about river ice safety communicated throughout your community and between communities?
  - Word of mouth, facebook, radio, etc
- What are the consequences of not being able to travel over river ice?
  - What other ways can people travel if they can't travel over the ice?

Mapping Activity:
[After the focused discussion, explain the directions for the mapping activity ~5 minutes.]

Things that should have come out of the conversation to be mapped:

- **Trails**
- **Areas of thin ice**
- **Areas of open water**

Directions: the larger group will split into small groups of 4 to 5 individuals and gather around maps of the region they are from – a regional scale and a village or local scale map. Once around the map they will use markers to draw the agreed upon features onto the paper map. Before breaking the group into smaller groups do the following:

1. Agree on features that will be identified on the map based on the conversation you just had
    a. For example, transportation corridors for fall hunting, transportation between villages for social activities, etc.
2. Create a key for those features
    a. For example, fall hunting corridors use a brown marker, social activities use red. Dashes, dots, etc. are all acceptable just make sure everyone agrees and write the key on the white board for everyone to see

Mapping activity ~20 minutes

1. Break the group into their smaller groups. You will be provided with a list of which individuals should be at which maps.
    a. There will be a regional map and a village map, let participants know that they should use whichever map best matches the locations they want to draw.
    b. Ask them to locate the key features agreed upon on their map by drawing directly onto the paper map with the appropriate marker color or pattern (dashes, dots, etc.)
2. Keep everyone on task – remind them the features they should draw, remind them the colors they should use, give time reminders.

Results:

At the end of the mapping breakout session, you should have:

1. A list of key river ice and river ice transportation corridors.
2. Several maps of critical ice transportation corridors and other key river ice locations.
3. Notes of the discussion and observations made by the notetakers during the discussion and mapping.