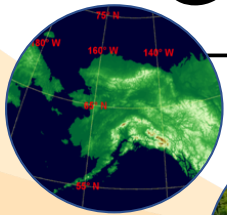


The Sensitivity of Alaskan and Yukon Rivers, Fish, and Communities to Climate

A National Science Foundation Navigating the New Arctic project



The Sensitivity of Alaskan and Yukon Rivers, Fish, and Communities to Climate



Keith Musselman
University of Colorado



Keith Musselman

Project Principle Investigator

Institute of Arctic and Alpine Research (INSTAAR)

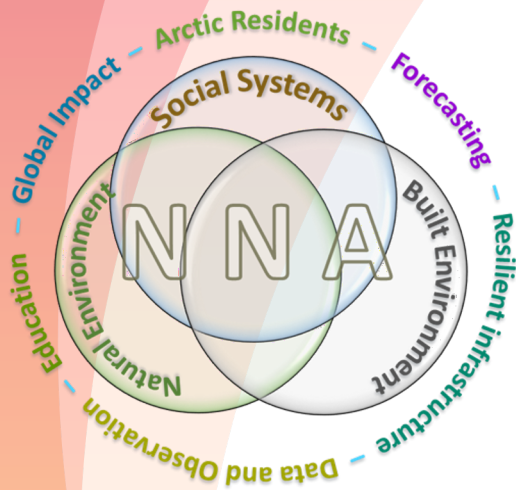
University of Colorado



From a fishing city in New Hampshire.
I grew up navigating and fishing the
Piscataqua River, a strong tidal river.



Lived in Alberta, Canada, where my family
was affected by a flood in 2013 - the most
costly in Canadian history.



Funded by the:
National Science Foundation (NSF)
Navigating the New Arctic program (NNA)

***We introduce a new five-year research project and seek
Community involvement to guide our science.***

Talks in today's webinar:

- *Monitoring and modeling climate, rivers & fish*
- *Ways to Engage*
- *Native Advisory Council*

Problem Identification: The Process

We worked with the Yukon River Inter-Tribal Watershed Council (YRITWC), a non-profit group representing 74 Tribes & First Nations dedicated to the preservation of the Yukon River Watershed.

They helped us to develop **our initial research questions**, guided by their executive board of directors and by Tribal and First Nations representatives.



Problem Identification: The questions

How will indigenous communities reliant on

- *fish habitat*
- *river ice transportation*

be impacted by changes in:

- *Air temperature?*
- *Permafrost?*
- *Precipitation?*
- *Groundwater?*
- *Streamflow?*
- *River temperatures?*



The Sensitivity of Alaskan & Yukon Rivers, Fish, and Communities to Climate

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?

We structured our project team to have diverse experience in water quality monitoring, river ice prediction, streamflow, climate change, fish, and tribal environmental issues.

Project Team

University of Colorado

Keith Musselman
Mike Gooseff
Cassandra Brooks
Noah Molotch
Sabre Duren

U.S. Geological Survey

Nicole Herman-Mercer
Josh Koch
Ryan Toohey
Mike Carey

Yukon River Inter-Tribal Watershed Council

Edda Mutter

National Center for Atmospheric Research

Andy Newman
Joe Hamman
Tony Craig

Institute for Tribal Environmental Professionals

Karen Cozzetto
Ann Marie Chischilly
Nikki Cooley

University of Saskatchewan

Karl-Erich Lindenschmidt

University of Waterloo

Heidi Swanson

THE YUKON RIVER WATERSHED



Sparse northern USGS
River Gage Network

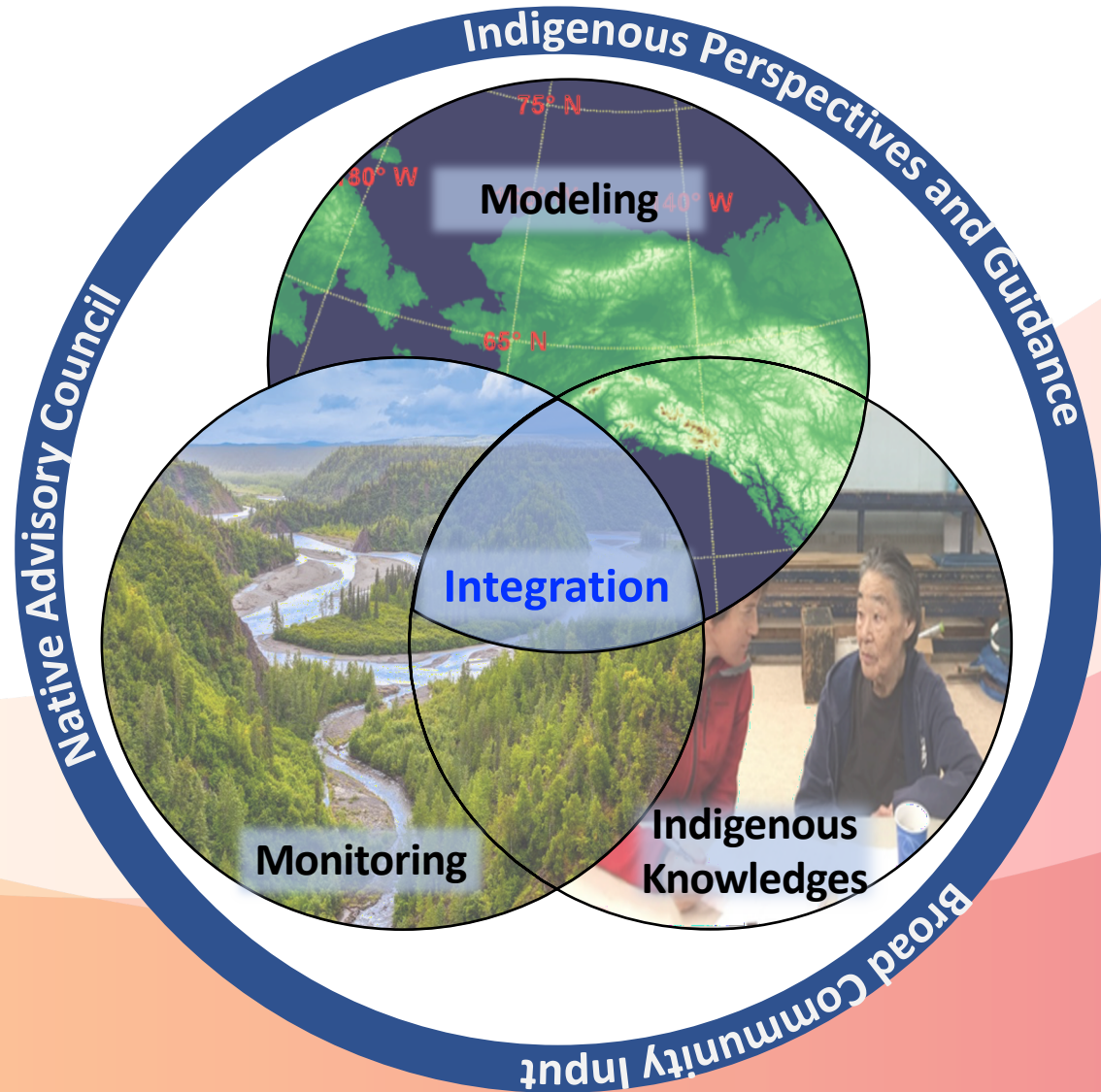
Native Advisory Council

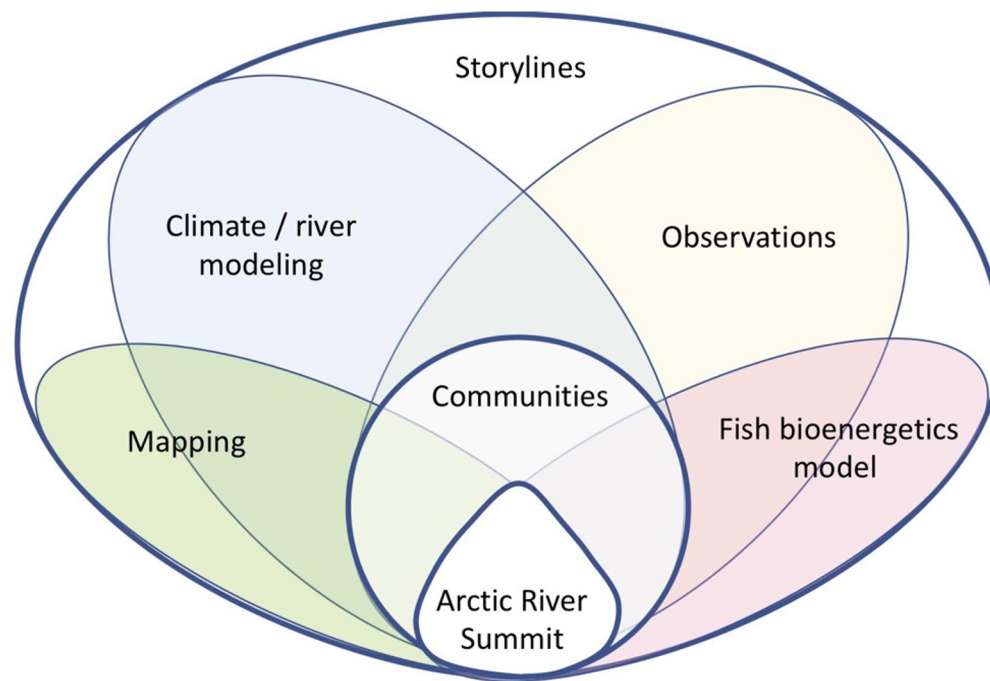
We seek to form an advisory panel of indigenous representatives to ensure equitable co-production of knowledge

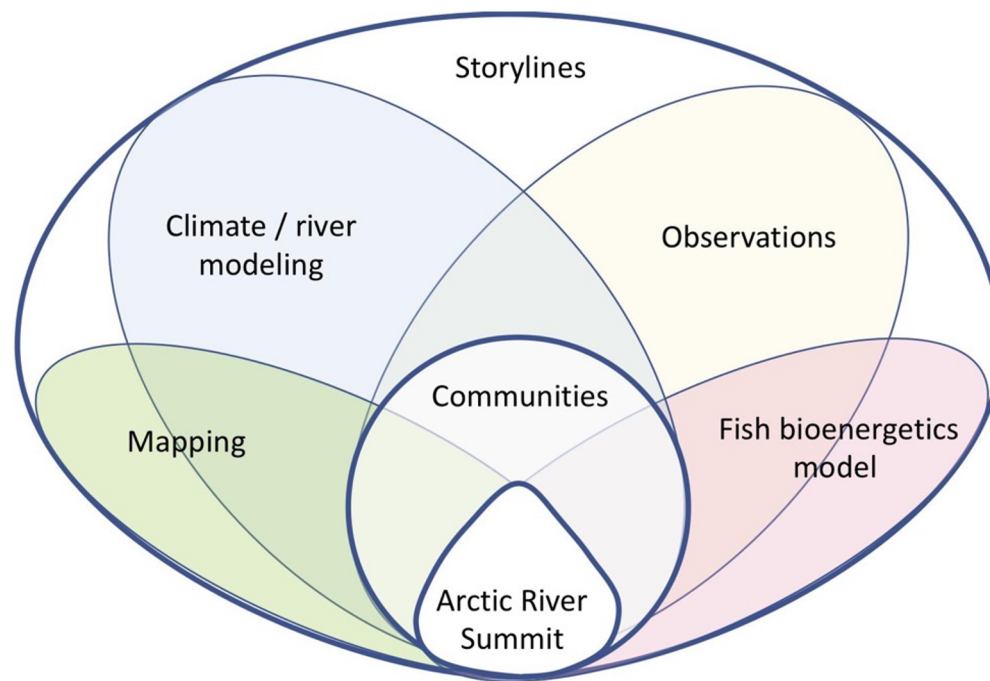
Ensure that Indigenous knowledges & perspectives are valued on an equal basis with western science

Ensure Indigenous perspectives are included throughout the entire project.

Help develop co-production guidelines for the project







Communities –

To ensure meaningful outcomes, we seek to engage Communities to co-produce knowledge of river conditions and climate vulnerabilities.

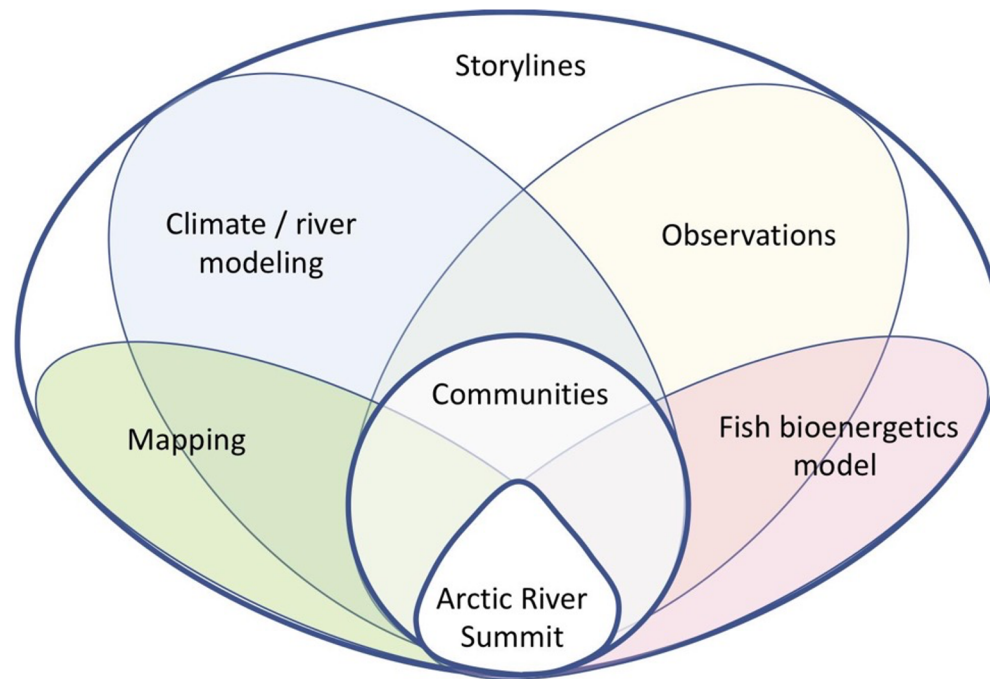
We follow both the *Principles for Conducting Research in the Arctic* (IARPC, 2018) and the *Guidelines for Considering Traditional Knowledges in Climate Change Initiatives* (Chief et al., 2015).

Integrating indigenous knowledge & western science

- Co-Identify vulnerabilities of fish and river ice through
 - Semi-structured interviews
 - Participatory mapping
 - Physically-based modeling



Image Credit – Wall Street Journal



Observations –

New automated river instrumentation will enhance USGS gages and advance and support the Indigenous Observation Network (ION), a community-based water-quality monitoring project facilitated by the USGS and YRITWC.

Sensors may be available to interested communities.



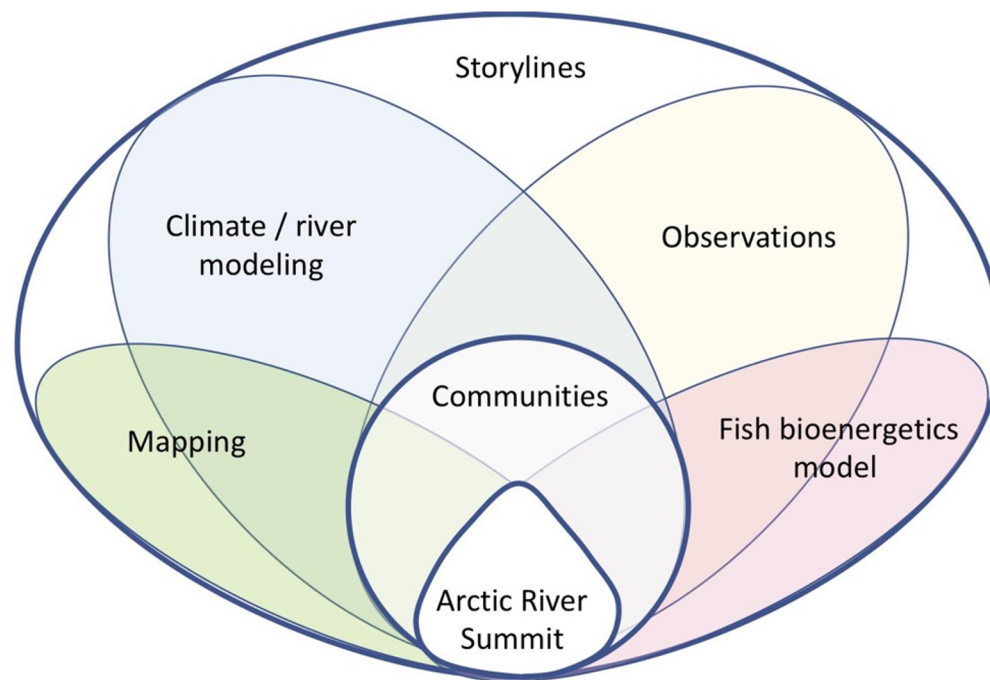
Indigenous Observation Network (ION)

Specific conductance & temperature probe



Automated water quality sensors allow observation of seasonal and annual changes in river temperature and water quality.

Sensors advance community-based monitoring capacity and the USGS gage network.



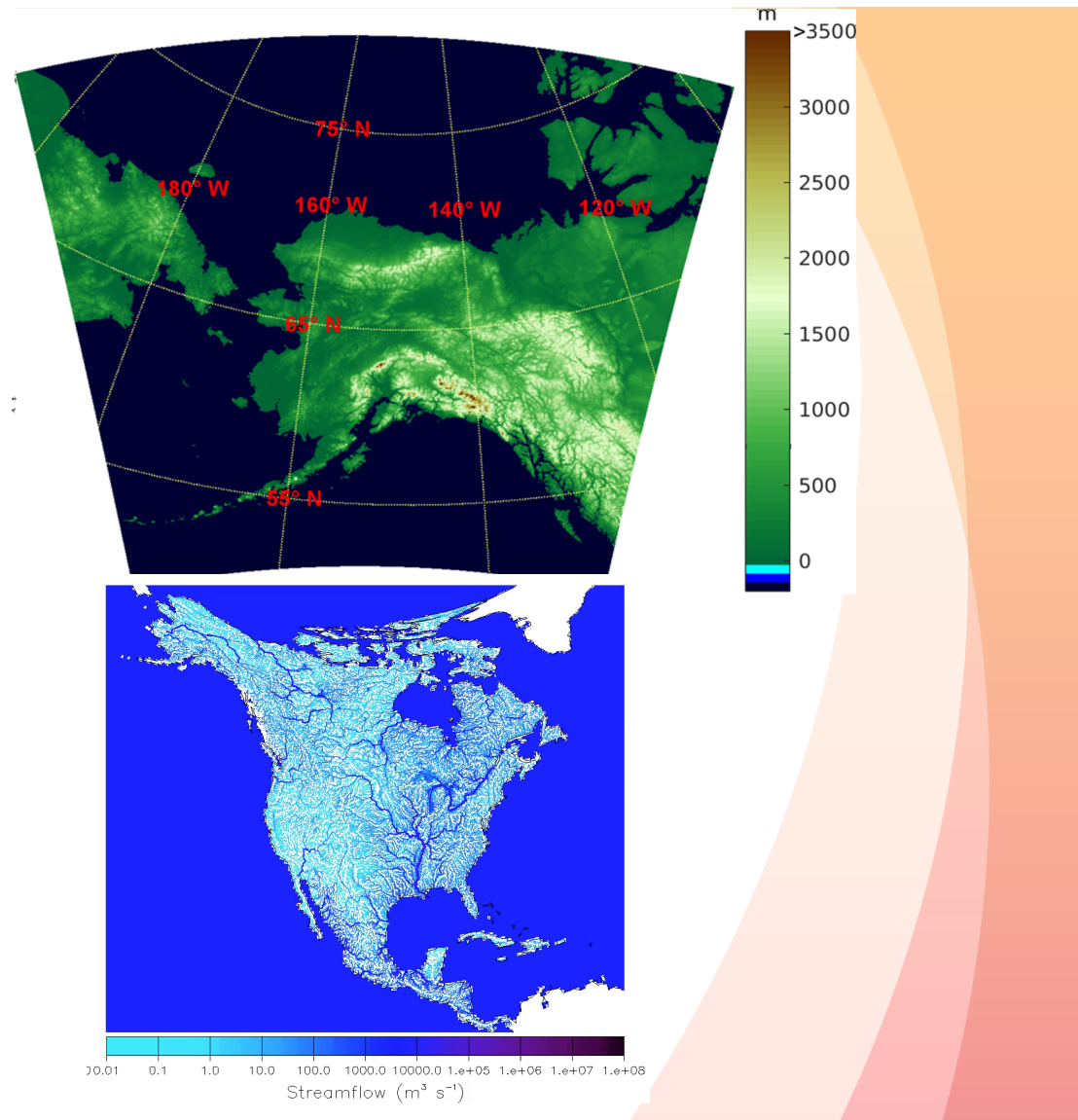
Climate & river modeling –

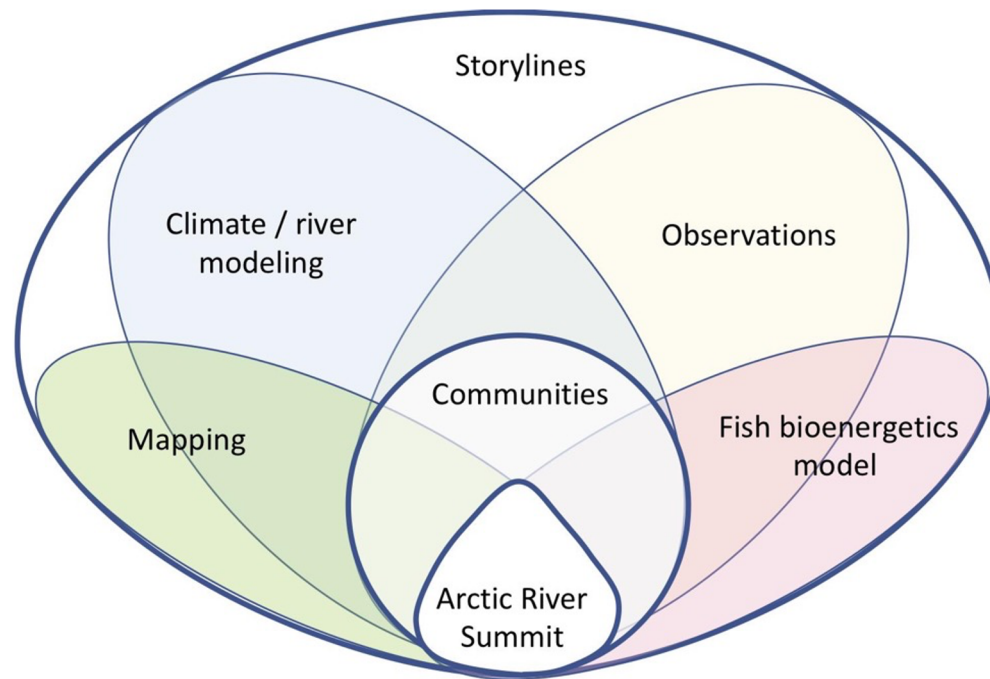
High-resolution (4 km) historical and future weather and climate models, which includes permafrost, snow cover, streamflow, river water temperature, and river ice simulations.

We seek guidance on what information is most useful to Communities.

Modeling Chain

- Climate Model: Regional Arctic System Model (RASAM)
- Hydrologic model: Community Terrestrial Systems Model
- River temperature & ice model
- Fish bioenergetics model

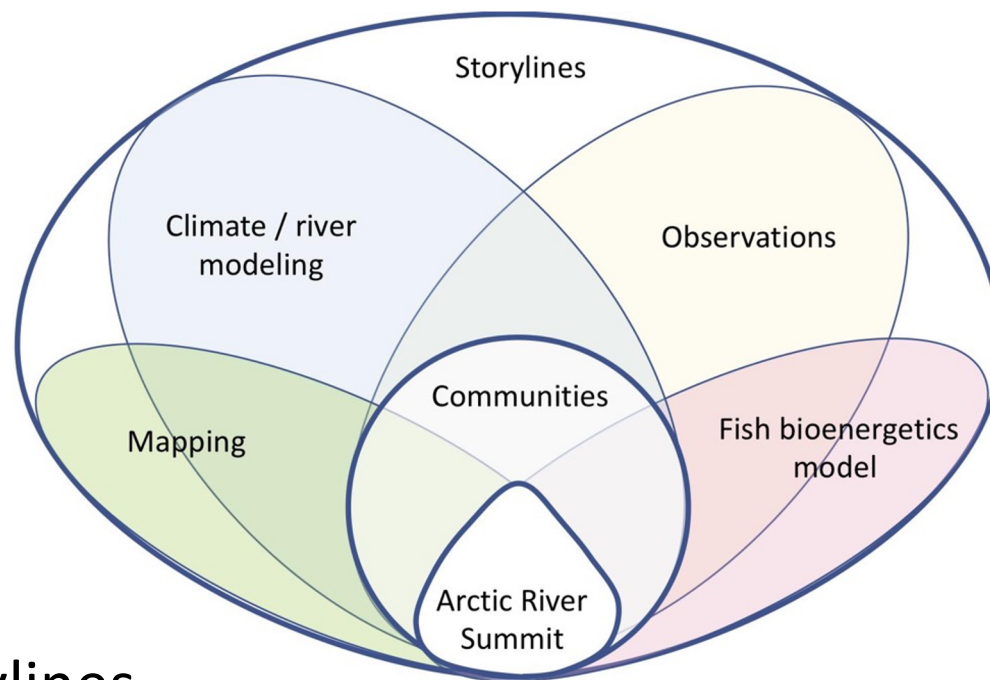




Fish modeling –

Water temperature is a main factor directly regulating the biology of fish, their production and survival. Our team could use “bioenergetic” fish models to test possible impacts of climate change on fish populations for co-identified river reaches.

What species, what river reaches are of interest?

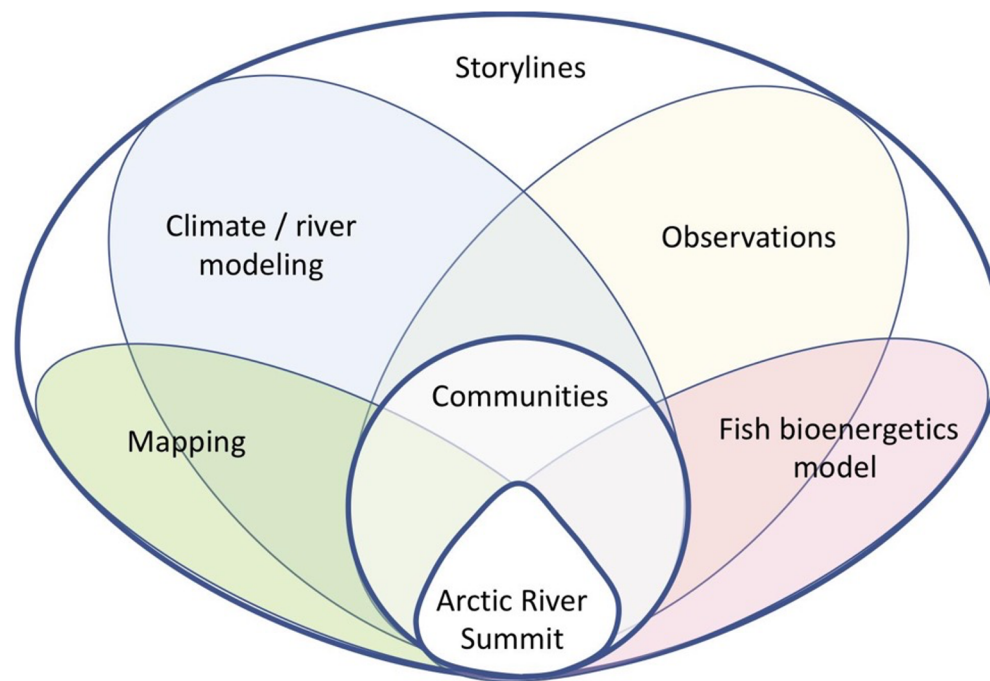


Storylines –

Rather than asking what will happen, which we can't answer with confidence, storylines allow us to ask what would be the effect of different policy or adaptation measures across a range of possible futures. More relevant to society than the “probabilistic” approach.

Shepard et al. (2019)

We seek storytellers: weave indigenous narratives with science stories.



Arctic Rivers Summit –

In 2022, we will host a gathering to bring together Tribal and First Nation resource managers, Arctic and Boreal community members, and academic, federal, state, and provincial researchers. **Forty-two scholarships to support attendance will be provided to members of Alaska Native Villages and First Nation Communities.**

We seek guidance on possible discussion topics, activities, scholarship recipients.



Thanks!

Any questions?

You can also e-mail me at:

- keith.musselman@colorado.edu

Ways to Engage

Nicole Herman-Mercer
US Geological Survey
Water Resources Mission Area

A little about me...

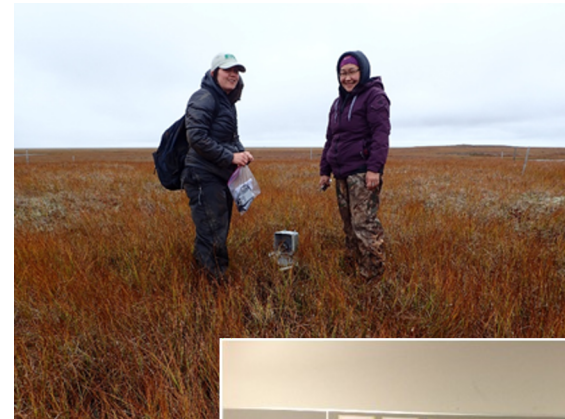
Born & raised in Colorado



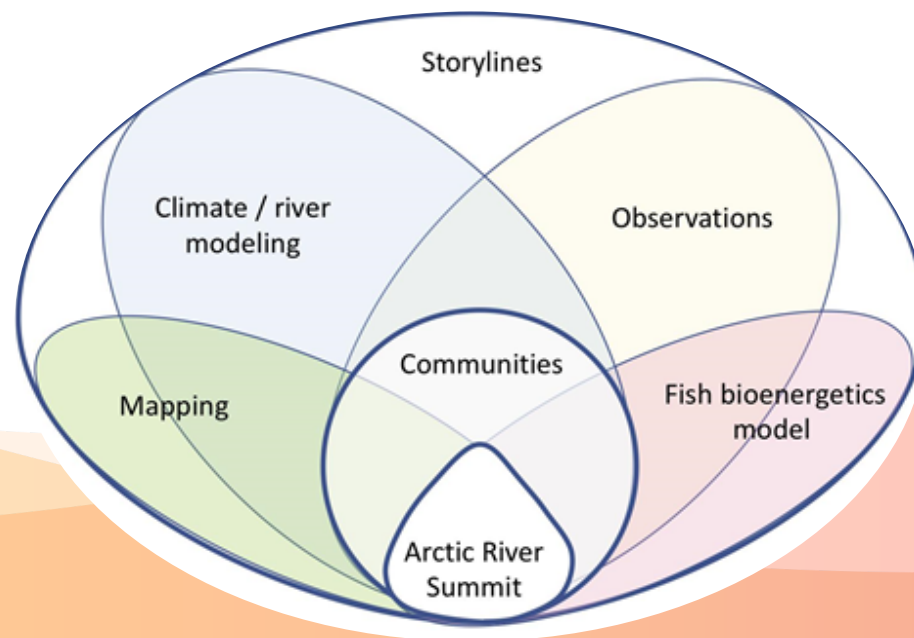
I've been married to my high school sweetheart for 15 years and we have 2 amazing children.



Working with Indigenous Alaskan Communities for 11 years



The climate impacts on Alaskan and Yukon rivers, fish, and communities as told through co-produced scenarios



Co-
Production

Balanced share of power

Partnership

Agreed upon collaboration between stakeholders

Participation

Opportunities to take part in the project process

Consultation

Gather comments, perception, information and experiences of stakeholders

Communication

Make information and data available to other parties.





Participation

Consultation

Communication

Join our *email list*

- Receive project updates & announcements
- Respond to requests for input on project goals and tasks
- Keep up to date on project activities
- Send us your ideas, input, & questions

Contact:

arcticrivers@colorado.edu

Participate in our *Engagement Calls*

Participation

- Hear from project investigators about their work.
- Learn from Indigenous community members, Indigenous Knowledge holders, western science researchers, & more.
- Participate in discussions.
- Help inform our project designs & deliverables.

Consultation

Communication

Contact:

Arcticrivers@Colorado.edu

Join the *Indigenous Observation Network (ION)*



- Collect monthly water samples
- Install and maintain a temperature/conductivity sensor that we provide.

Partnership

Participation



Meet up with us at a *conference*

Consultation

Communication

- National Tribal and Indigenous Climate Conference - St. Paul, Minnesota, Aug. 31-Sep. 4 2020
- Alaska Tribal Conference on Environmental Management, Anchorage, Alaska Fall 2020
- Alaska Forum on the Environment 2021
- American Geophysical Union (AGU) 2020
- Yukon River Inter-Tribal Watershed Council Biennial Meeting (2021)

Alaska Forum on the Environment



Co-
Production

Partnership

Participation

Consultation

Communication

Participate in our *Arctic Rivers Summit* *Winter 2021-22 Anchorage, Alaska*

- Exchange knowledge with others to improve our understanding of current and potential future states of Arctic rivers and fish and identify ways that we can adapt.
- Inform research design & deliverables
- Be a co-author on a summit white paper

Travel Scholarships will be available!

Co-
Production

Partnership

Participation

Consultation

Communication

Apply for an *Indigenous Student Summer Internship*

- Design & conduct Interviews in your region of Alaska or Canada
- Students will be hosted by the Yukon River Inter-Tribal Watershed Council or US Geological Survey.



Co-
Production

Partnership

Participation

Consultation

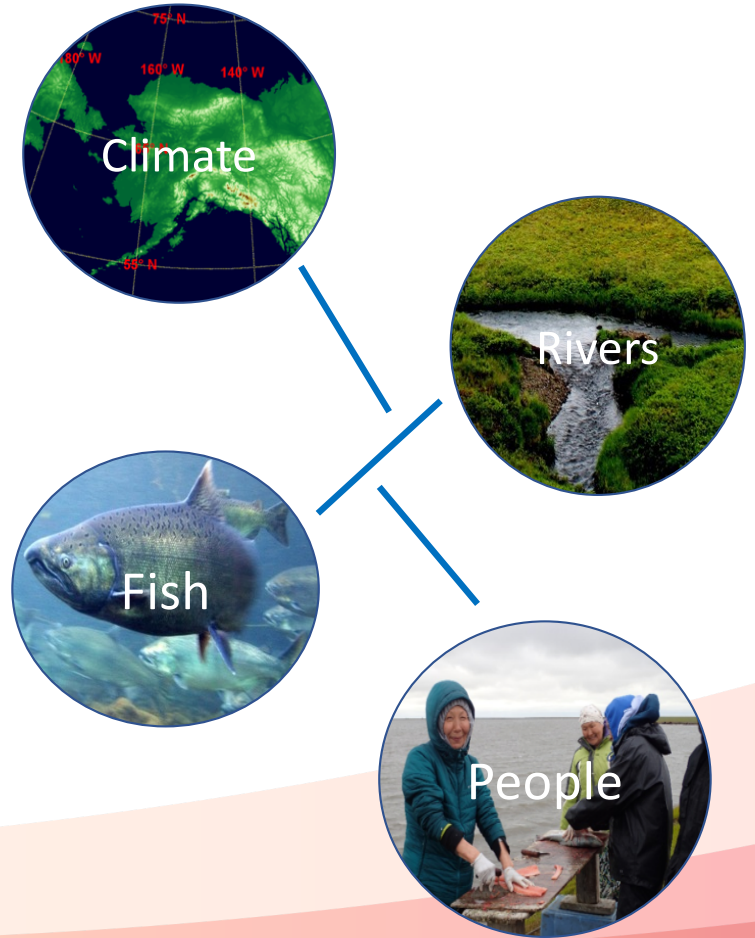
Communication

Become a member of our *Native Advisory Council*

- Open application process
- Help researchers evaluate input from the broader community and make decisions about research designs & deliverables
- Help develop the Arctic Rivers Summit Agenda

Help Inform *Research Design & Deliverables*

- 💧 **Climate:** What kinds of future scenarios would you like to consider? What kinds of output would be most helpful?
- 💧 **Rivers:** What characteristics of river & riverine habitats are important for you &/or for fish? Which river ice corridors are critical for you?
- 💧 **Fish:** What fish play key roles culturally, ecologically, or both that you might want us to model?
- 💧 **People:** How is climate change affecting your subsistence, livelihoods, & cultures? How can we increase our resilience to climate change both now and in the future?



Native Advisory Council

Karen Cozzetto
Institute for Tribal Environmental Professionals
Northern Arizona University

A little about me

Grew up in the Washington, DC area

Moved to Colorado 17 years ago

Play in a Brazilian percussion group



Some basics about the Council

Number of Council Members: 11

Term: 2-year term from July 2020 – July 2022 with the possibility of continuing if desired

Who is eligible to apply: members of Alaska Native Tribes & Yukon First Nations and/or staff of organizations representing/ serving Alaska Native Tribes & Yukon First Nations



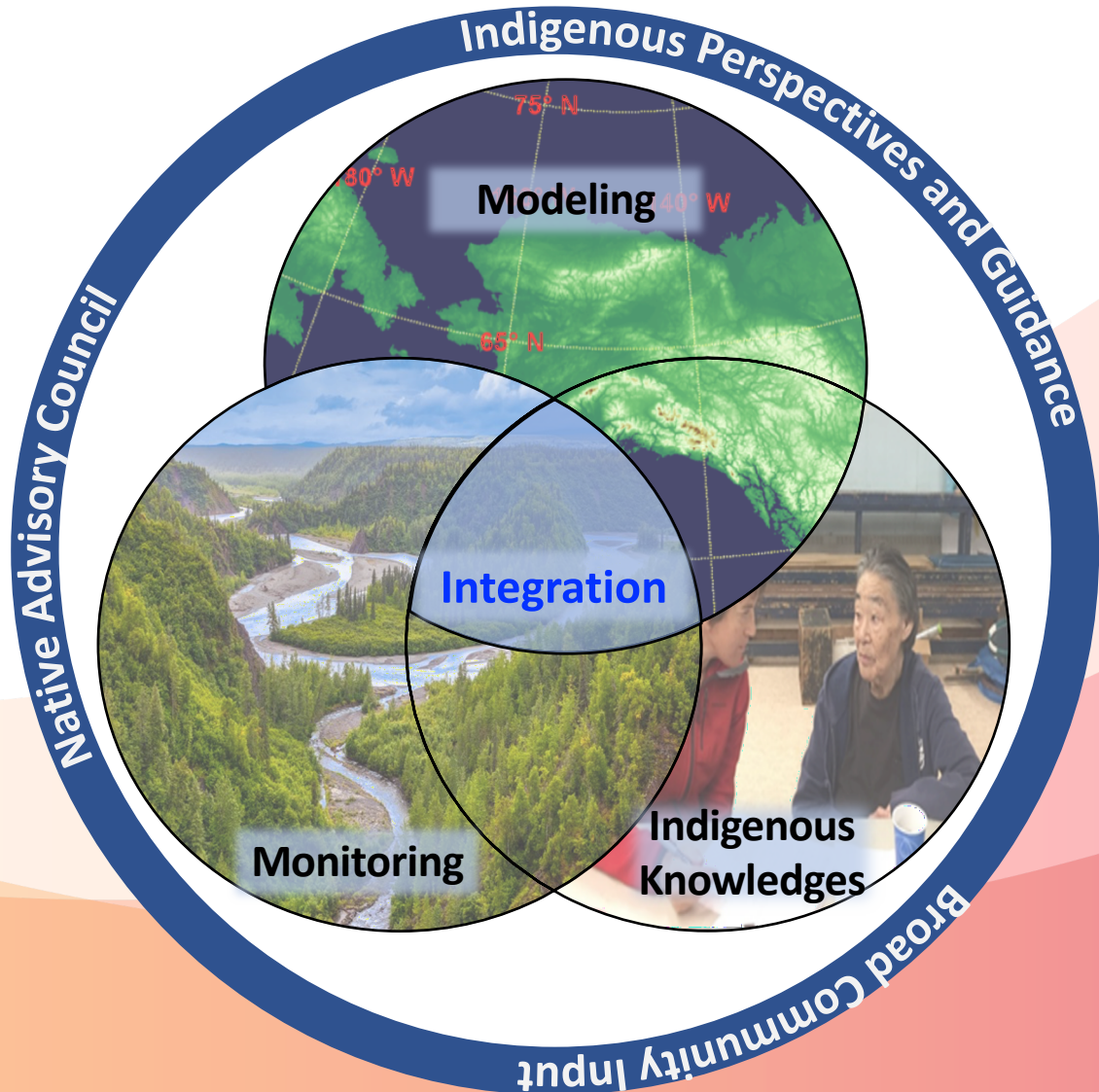
What will the Council do?

Equitable co-production of knowledge

Ensure that Indigenous Knowledges & perspectives are valued on an equal basis with western science

Ensure Indigenous perspectives are included throughout the entire project.

Help develop co-production guidelines for the project



What will the Council do?

Protection of Indigenous Knowledges (IKs)

Promote Indigenous Knowledge (IK) Protection throughout the project

Help the Project Team develop IK protection protocols

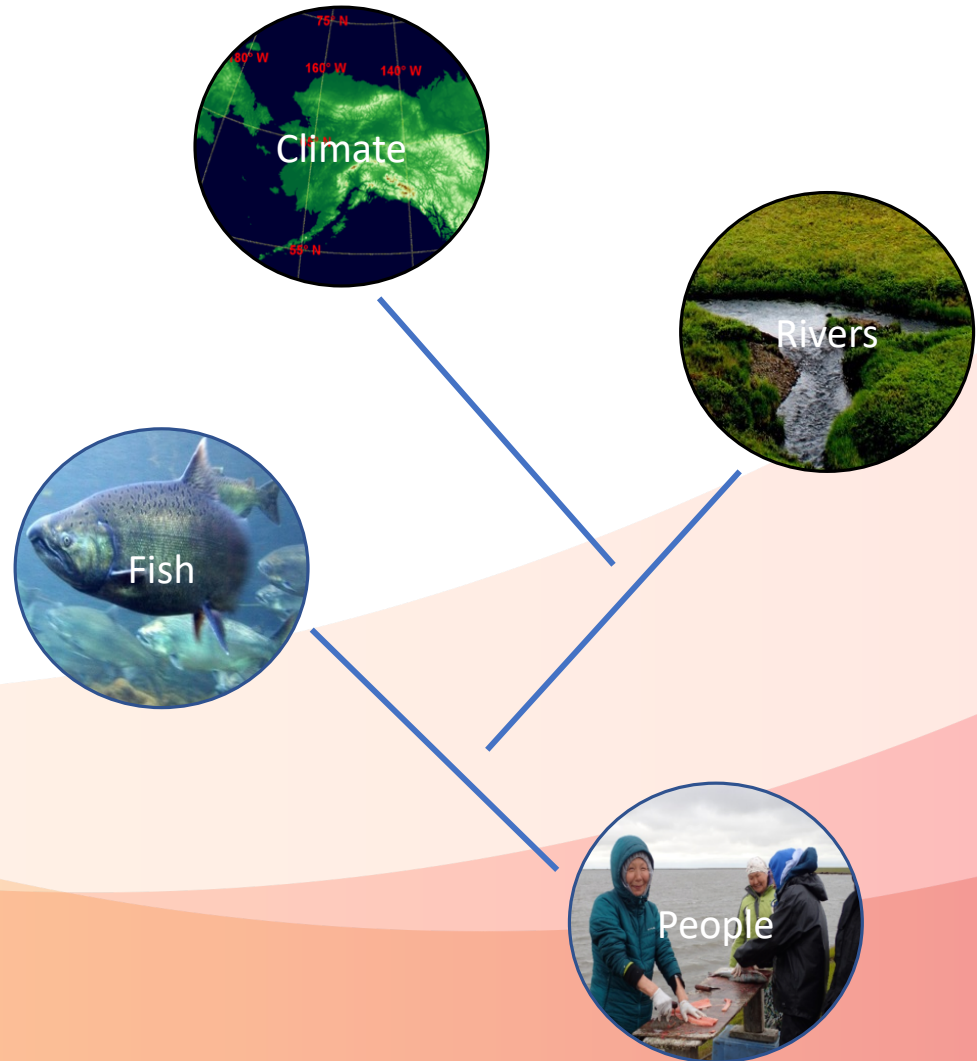


What will the Council do?

Research design, analysis, deliverables

Help Project Team gather & evaluate input from the broader community and make decisions about how to proceed

Provide guidance to ensure that output is relevant, understandable, and useable



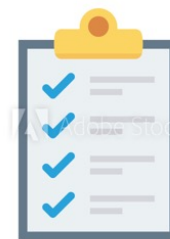
What will the Council do?

Clear, widespread communication

Recommend the best communication pathways and methods for the project to:

- Receive broad community input
- Distribute project information & products

Review materials to improve their understandability and relevancy



What will the Council do?

Arctic Rivers Summit, Anchorage, Winter 2021/22

Lead the design of the Summit agenda

Help host the two-day Summit

Review a paper documenting output from the Summit

If interested, help write the paper



How will the Council work?

Participate in 2-hour monthly/bi-monthly calls

Answer emails/ review documents

Attend the two-day Arctic Rivers Summit (all travel expenses paid)

Consultation fee of \$135 USD/ ~\$188 CAD per call for first term

The Council & Project Team will decide on a decision-making process during the first Council meeting.

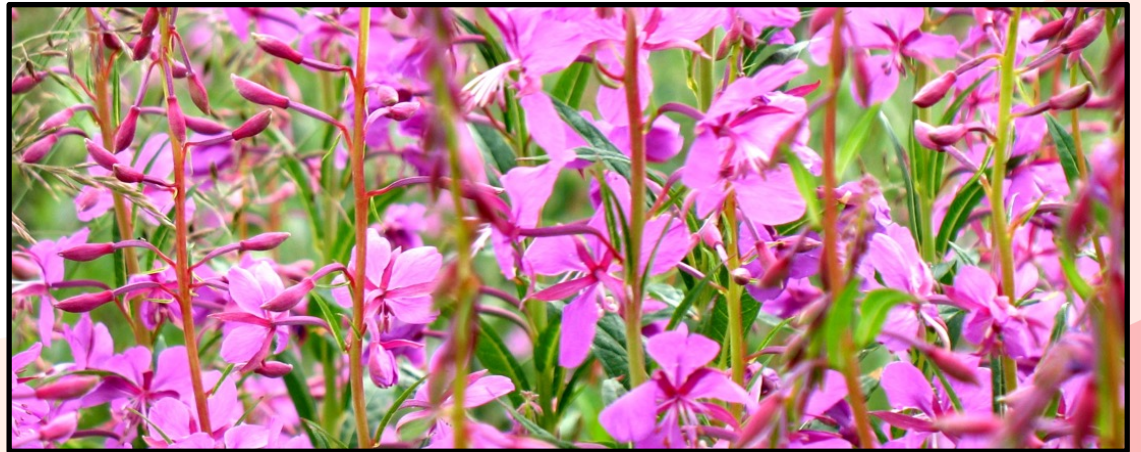


How will Council members be selected?

Selection committee: subset of Project Team plus 3-5 external reviewers

Selection considerations: select members to represent diverse geographic regions, cultural groups, ages, genders, & experiences

Notification: applications due June 24th; applicants will be notified of their selection status by mid-July



How do I apply?

Google form: fill in the application google form (link provided the chat box & will be emailed to webinar registrants)

Email: fill in the Microsoft Word document and email it to me (Karen Cozzetto) at arcticrivers@colorado.edu

Fax: fill in the Microsoft Word document and fax it to Sabre Duren at 303-492-3287.

Applications due June 24th.



Upcoming webinar topics

Equitable co-production of
knowledge

Protection of Indigenous Knowledges

Indigenous planning perspectives

Climate modeling – future scenarios,
pros and cons of different choices



Thank you!

If you have questions or suggestions, please

email us at arcticrivers@colorado.edu

call Karen at 928-523-6758