A wide river with a rocky shoreline. A person is wading in the water. The background shows a line of trees and a clear sky.

Monitoring the health of rivers shared by Alaska and British Columbia

Chris Sergeant (he/him) christopher.sergeant@umontana.edu
27 April 2021 – State of Alaska House Fisheries Committee Hearing

Photo credit: J. Caldwell



FLATHEAD LAKE
BIO STATION
UNIVERSITY OF MONTANA

Canada's mines pose transboundary risks

Erin K. Sexton^{1*}, Christopher J. Sergeant^{1,2}, Jonathan W. Moore³, Alana R. Westwood⁴, David M. Chambers⁵, Megan V. McPhee², Sonia A. Nagorski⁶, Sarah L. O'Neal⁷, Jill Weitz⁸, Adrienne Berchtold⁹, Marissa Capito¹⁰, Christopher A. Frissell^{11,12}, Jennifer Hamblen¹², F. Richard Hauer¹, Leslie A. Jones¹³, Greg Knox⁹, Randal Macnair¹⁴, Rachel L. Malison¹, Vicki Marlatt¹⁵, Jennifer McIntyre¹⁶, Nikki Skuce¹⁷, Diane C. Whited¹

¹Flathead Lake Biological Station, University of Montana, Polson, MT 59860, USA. ²College of Fisheries and Ocean Sciences, University of Alaska Fairbanks, Juneau, AK 99801, USA. ³Earth2Ocean Research Group, Simon Fraser University, Burnaby, BC V5A 1S6, Canada. ⁴Mitacs Canadian Science Policy Fellow, Ottawa, ON K1P5A9, Canada. ⁵Center for Science in Public Participation, Bozeman, MT 59715, USA. ⁶Environmental Science and Geography Programs, University of Alaska Southeast, Juneau, AK 99801, USA. ⁷School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA 98105, USA. ⁸Salmon Beyond Borders, Juneau, AK 99801, USA. ⁹SkeenaWild Conservation Trust, Terrace, BC V8G 1M9, Canada. ¹⁰Juneau, AK 99801, USA. ¹¹Frissell and Raven Hydrobiological and Landscape Sciences LLC, Polson, MT 59860, USA. ¹²Takshanuk Watershed Council, Haines, AK 99827, USA. ¹³Alaska Center for Conservation Science, University of Alaska, Anchorage, Anchorage, AK 99508, USA. ¹⁴Wildsight, Kimberley, BC V1A 1Z6, Canada. ¹⁵Department of Biological Sciences, Simon Fraser University, BC V5A 1S6 Canada. ¹⁶School of the Environment, Puyallup Research and Extension Center, Washington State University, WA 98371, USA. ¹⁷Northern Confluence Initiative, Smithers, BC V0J 2N0, Canada.

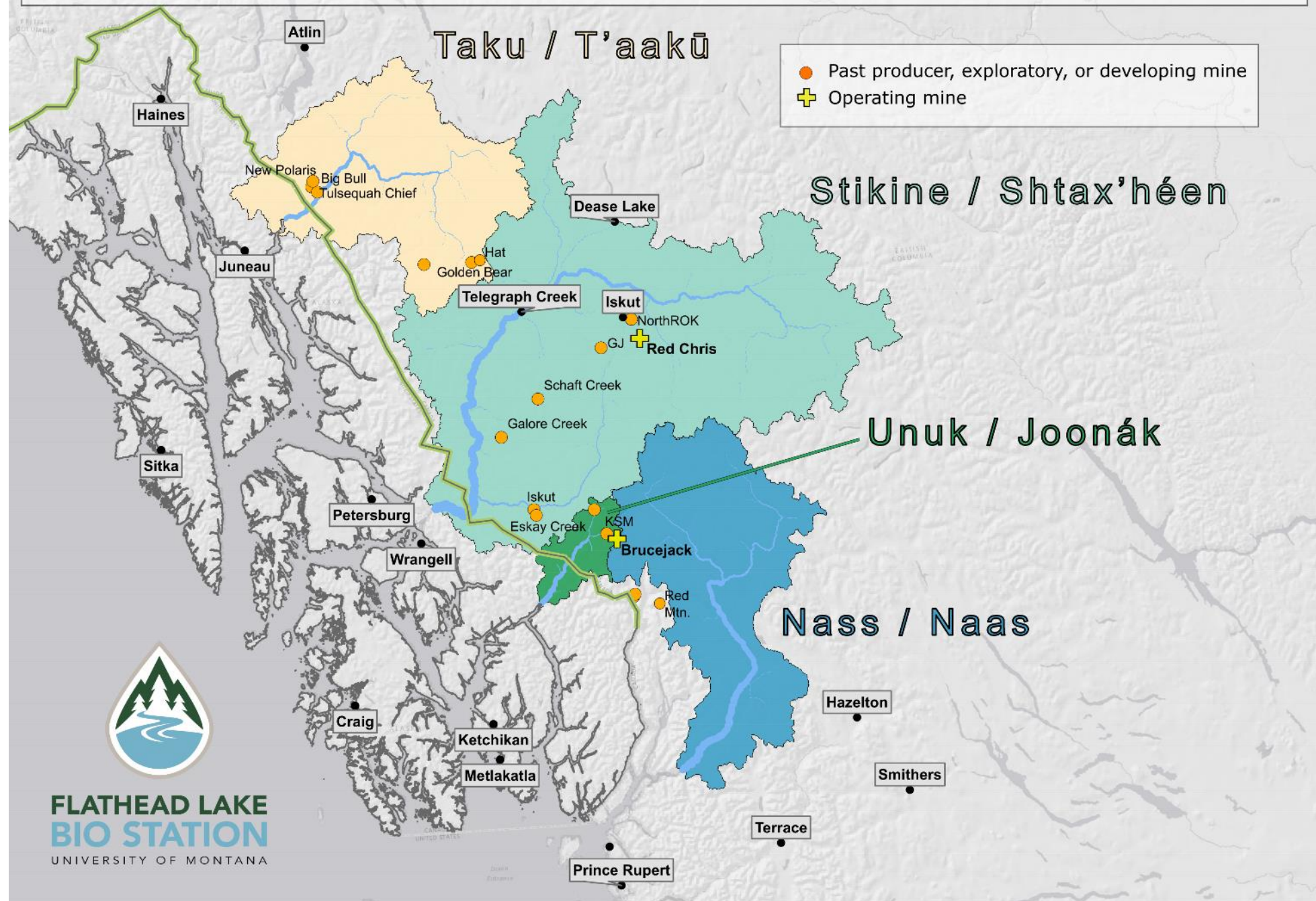
sciencemag.org **SCIENCE**

LETTERS

1. Mine assessments underestimate risk
2. Mine permitting often relies on mitigations that lack verification in the field
3. There is a need for increased independence, transparency, and peer-reviewed science

Insufficiently regulated contamination from the Elk Valley mines in British Columbia, Canada, threatens downstream ecosystems in both Canada and the United States.

Large-scale Mining in Alaska-British Columbia Transboundary Watersheds



Open pits = low-grade ore

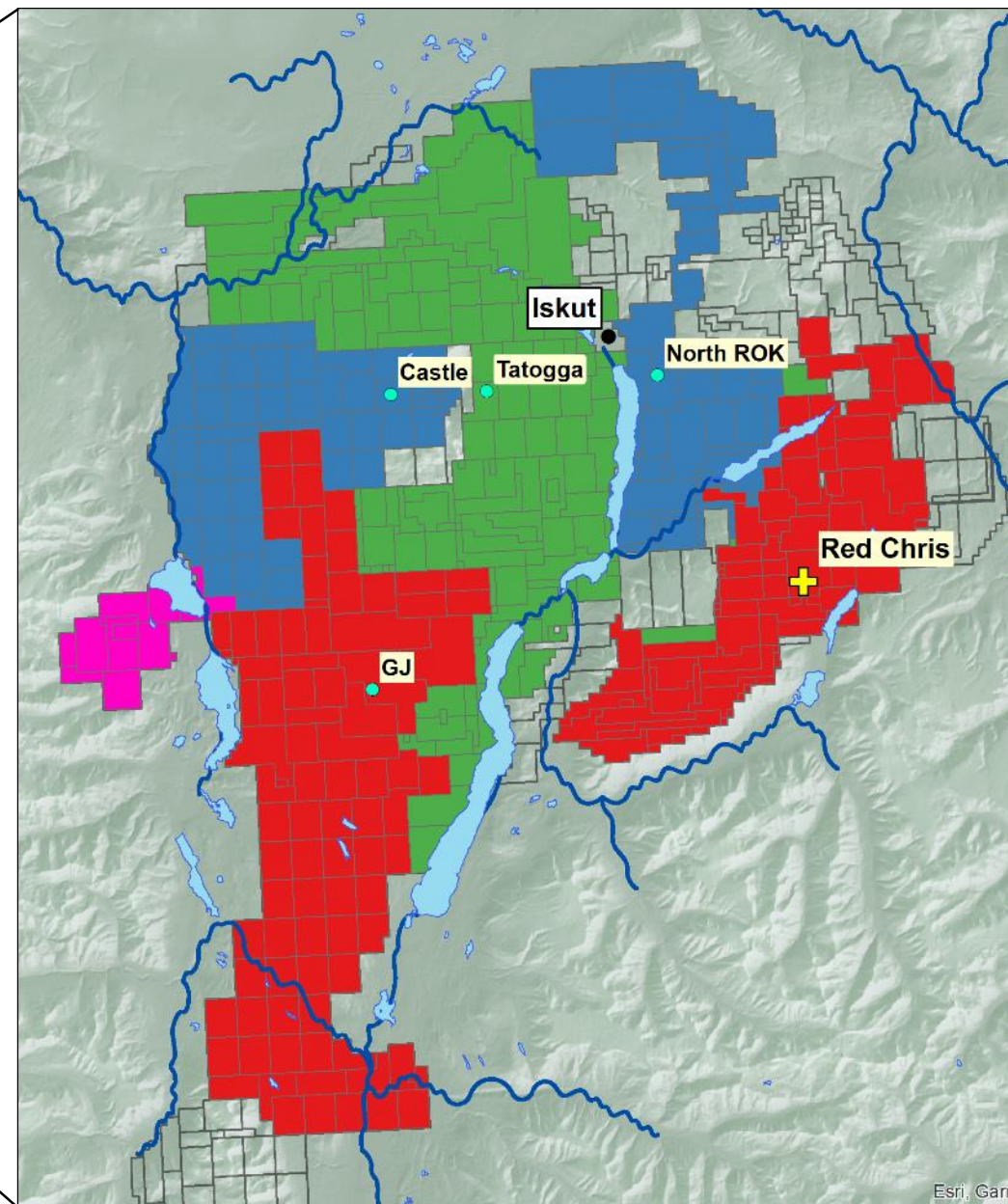
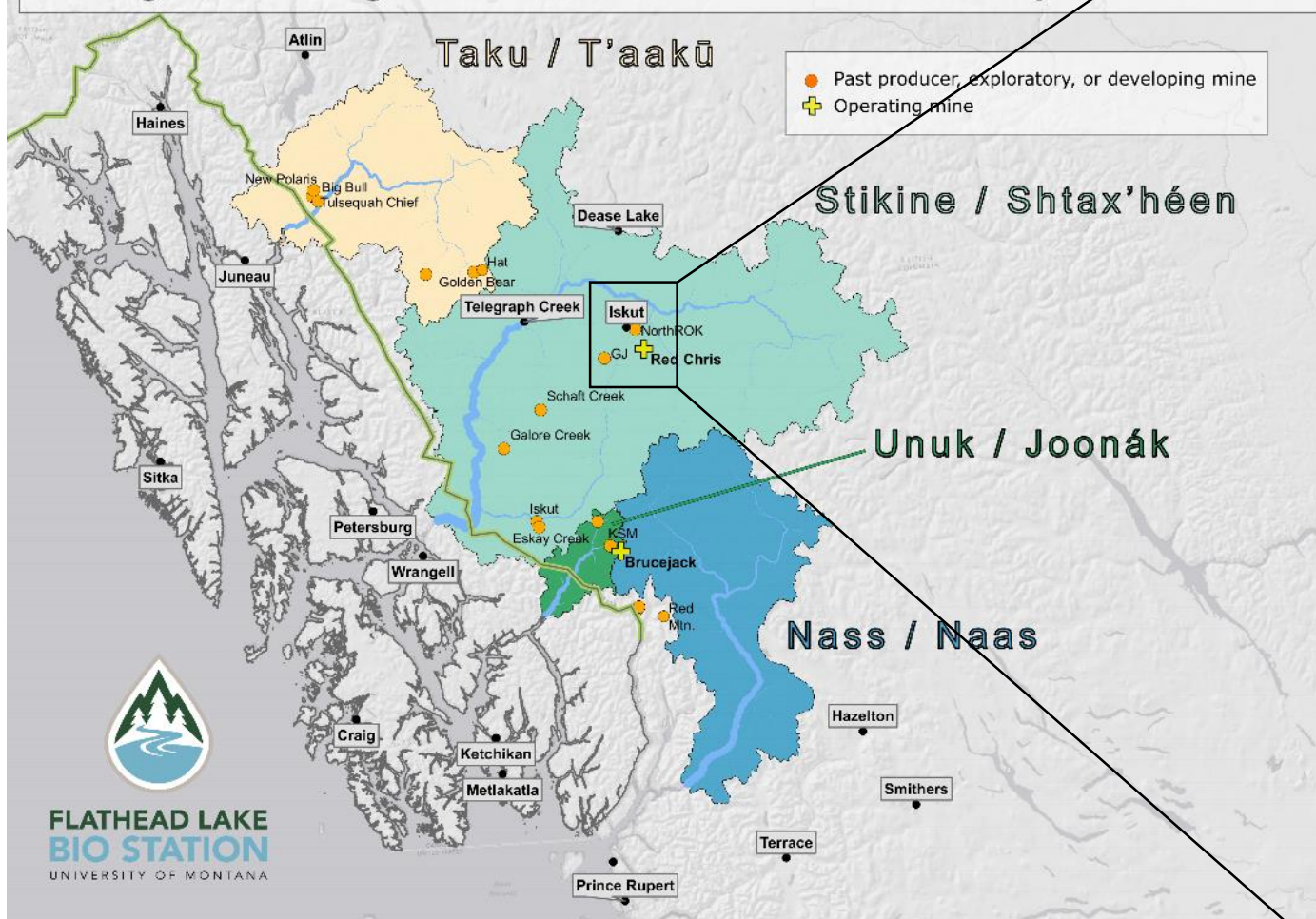


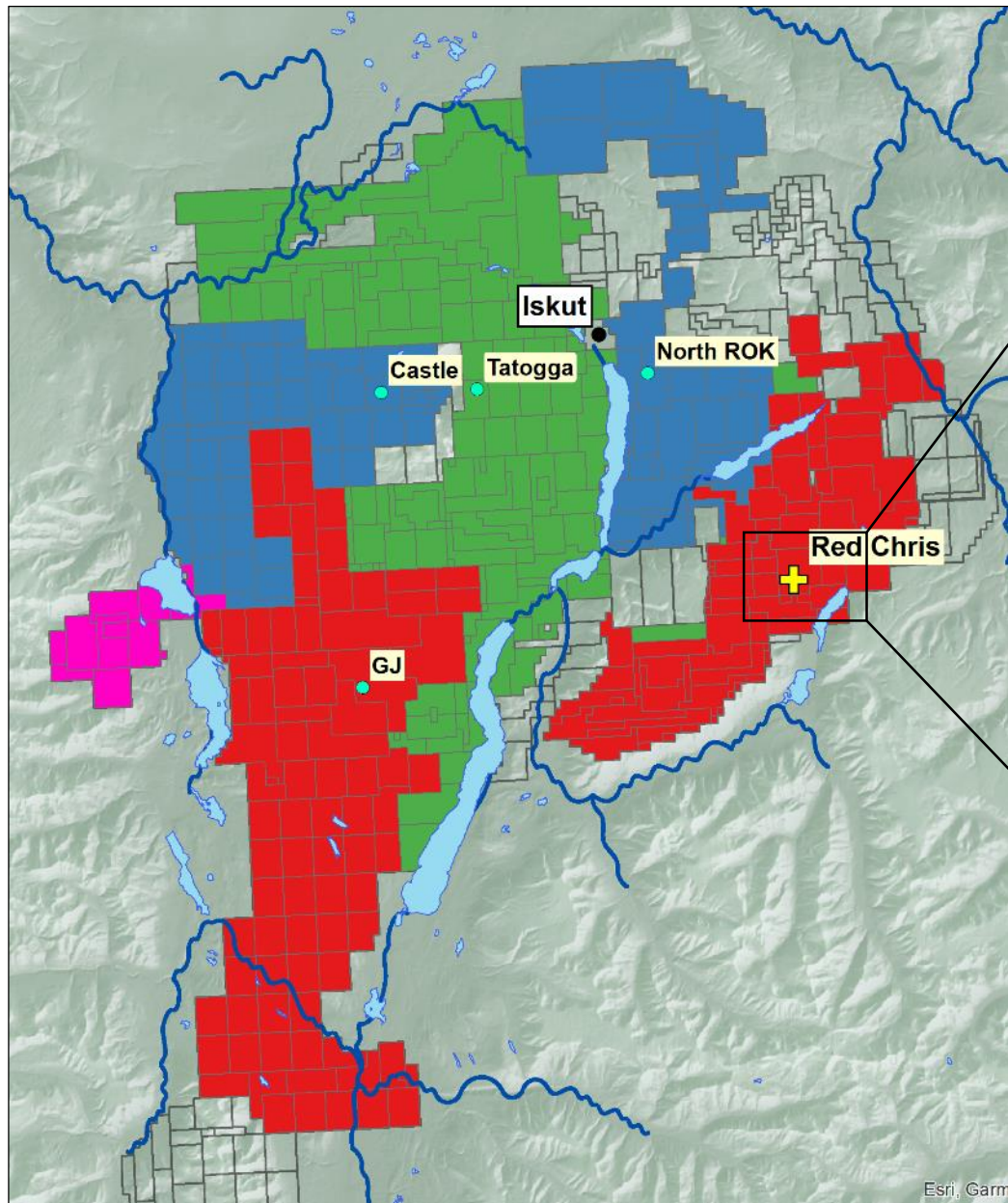
2,200 pounds of mined rock yields about 0.02 ounces of gold



23,520 pounds of rock removed from the earth = my wedding ring

Large-scale Mining in Alaska-British Columbia Transboundary Watersheds

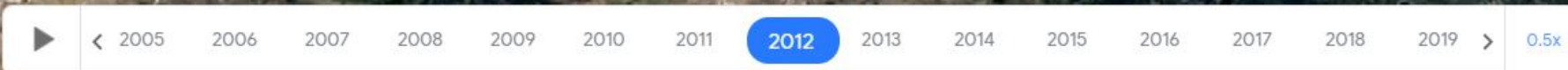




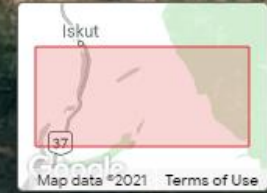
Red Chris Mine, Stikine Region, BC



Construction begins May 2012



Red Chris Mine, Stikine Region, BC



Regular production begins June 2015



Red Chris Mine, Stikine Region, BC

2020

Klappan River

Tailings

Open pits

Canadian Dam Association Consequence classification = "Very High"

- Significant loss or deterioration of critical fish or wildlife habitat
- Restoration or compensation in kind possible but impractical



< 2013

2014

2015

2016

2017

2018

2019

2020



1984

1985

1986

1987

1988

1989



0.5x



The status of environmental monitoring in shared Alaska-British Columbia watersheds

By Christopher Sergeant, research scientist with the University of Montana's Flathead Lake Biological Station

19 October 2020

https://flbs.umt.edu/newflbs/media/2120/xb_monitoring_data_brief_19oct2020.pdf

Objective

"...describe and reference recently collected government data and identify potential information gaps."

Conclusion

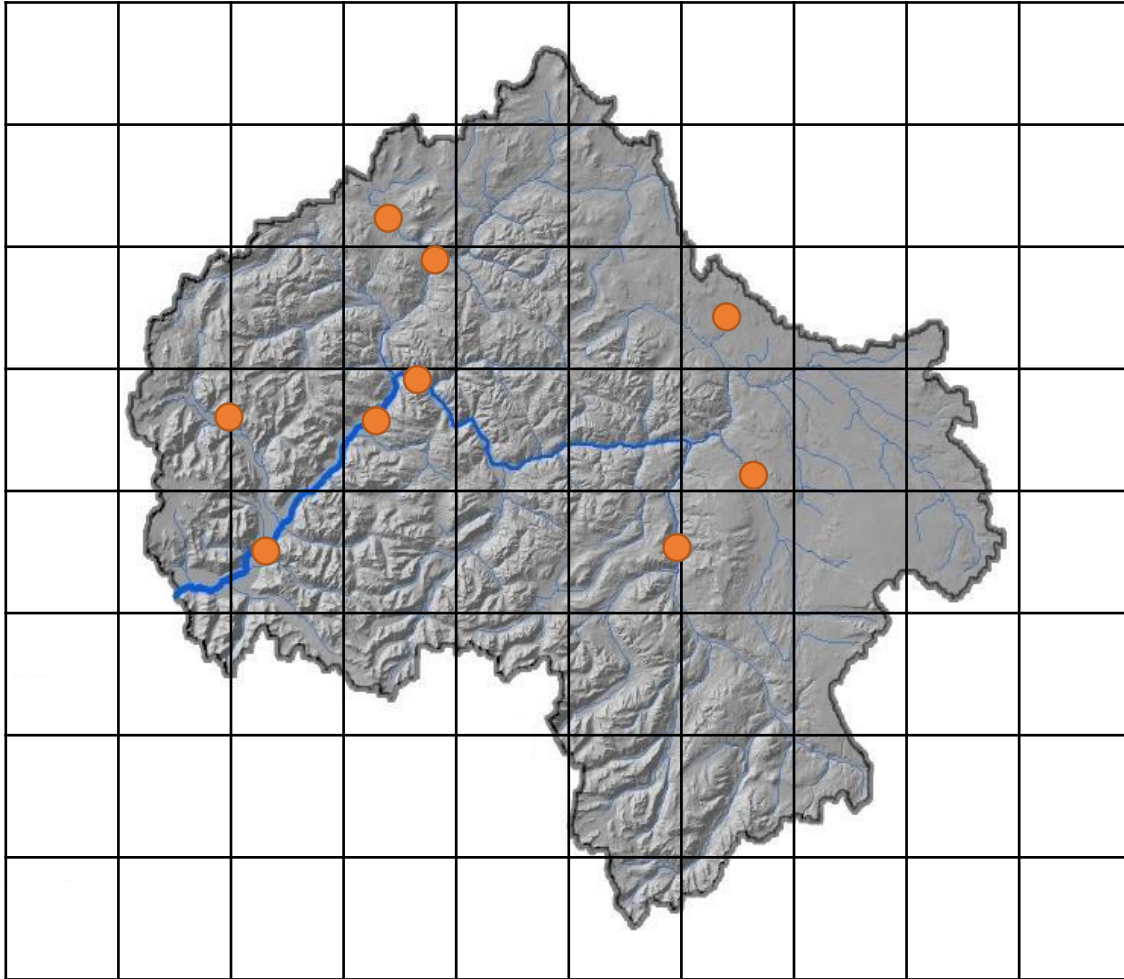
"...monitoring efforts tend to be concentrated in small areas of each watershed or relatively short-term in effort... Therefore, monitoring the environmental health of the AK-BC transboundary region will require a commitment to longer term data collection across a broader number of sites than currently exists."

Government entities conducting monitoring in AK-BC transboundary watersheds include:

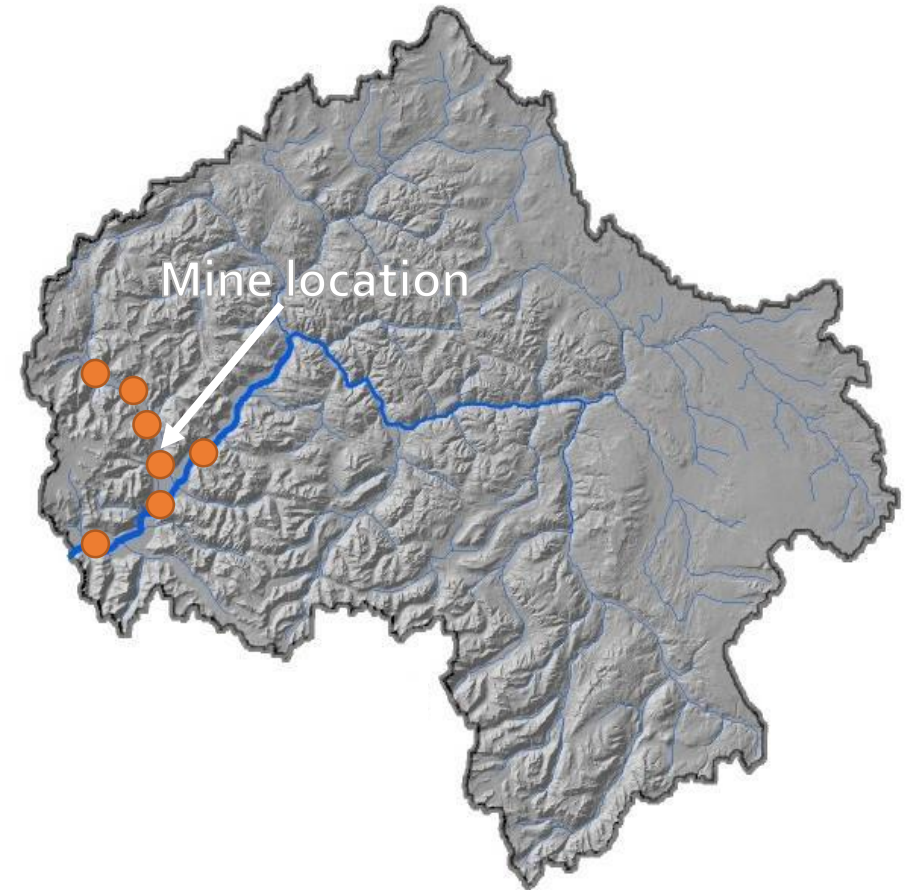
- Alaska Dept. of Env. Con.
- BC Ministry of Env. and CC Strat.
- Taku River Tlingit First Nation
- Alaska Dept. of Fish and Game
- Water Survey of Canada
- Central Council Tlingit Haida
- US Geological Survey

What is the question you want to answer?

What is the overall condition of the watershed?



How does a particular mine impact a watershed?



Consistency is key

- Location in the watershed (headwater vs. mainstem)
- Location in the stream channel (pool vs. riffle)
- Seasons and weather (wet vs. dry periods)
- Time of day
- Flow level
- Long-term trends (glacier retreat, less snow, etc.)

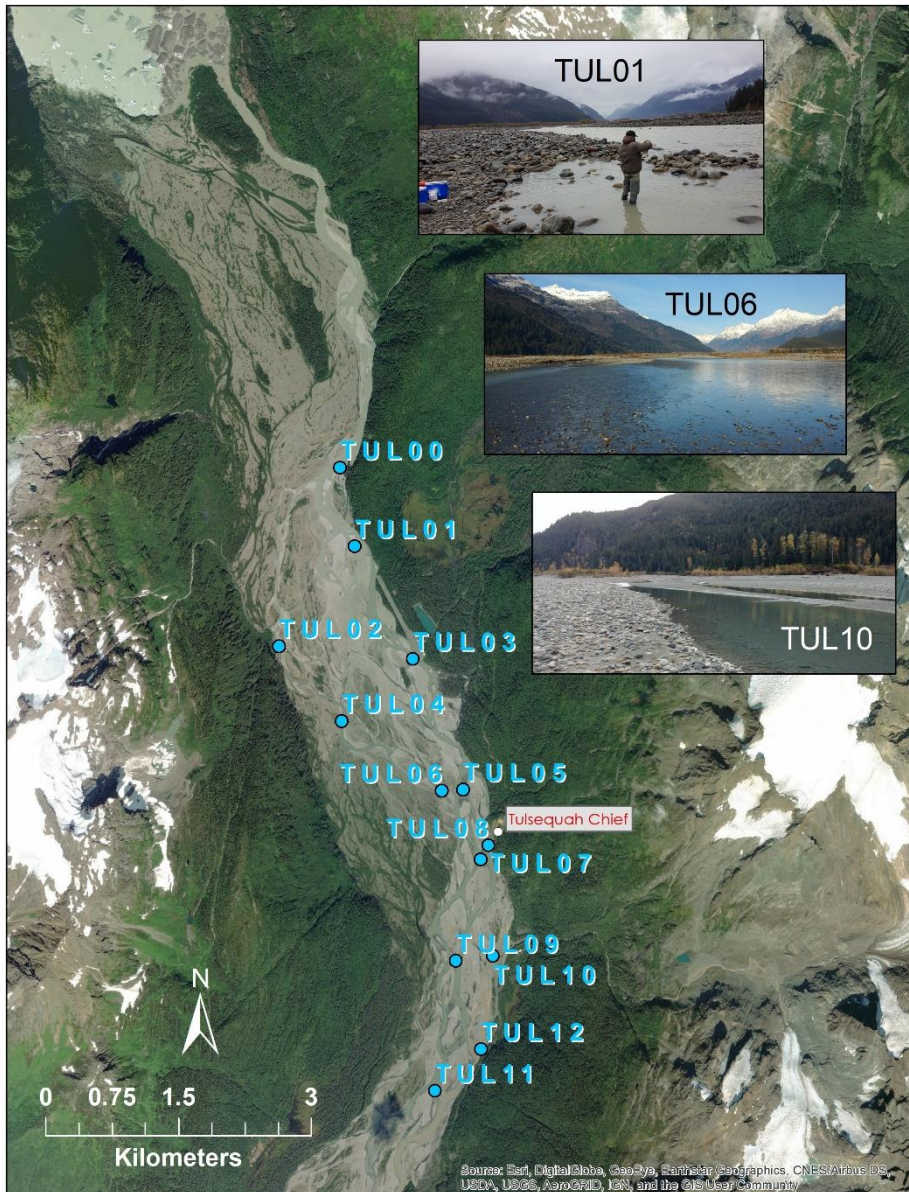
Consistency is key

- Location in the watershed (headwater vs. mainstem)
- Location in the stream channel (pool vs. riffle)
- Seasons and weather (wet vs. dry periods)
- Time of day
- Flow level
- Long-term trends (glacier retreat, less snow, etc.)

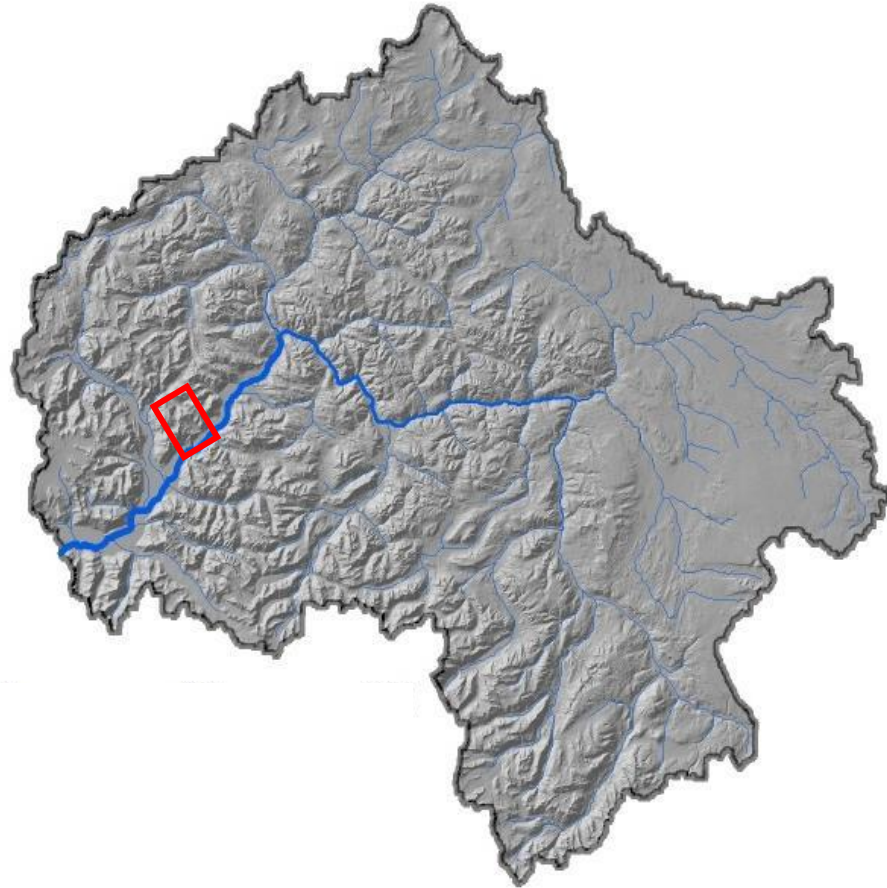
Low flow = high metal concentration

High flow = low metal concentration

Tulsequah River monitoring



- Started by TRTFN in October 2019
- Characterize ecological condition up and downstream of Tulsequah Chief Mine
- Water, sediment, fish, insects



Take-home message:

Considering the complexity of interpreting water quality patterns in this small section of a watershed, the level of effort needed to characterize an entire watershed is a huge challenge requiring focused resources, long-term funding commitment, and strong collaboration across all governments, where all parties agree to the monitoring program goals, objectives, and scientific approach.