Monitoring the Effects of Elk River Coal Mining on Lake Koocanusa and Kootenai River





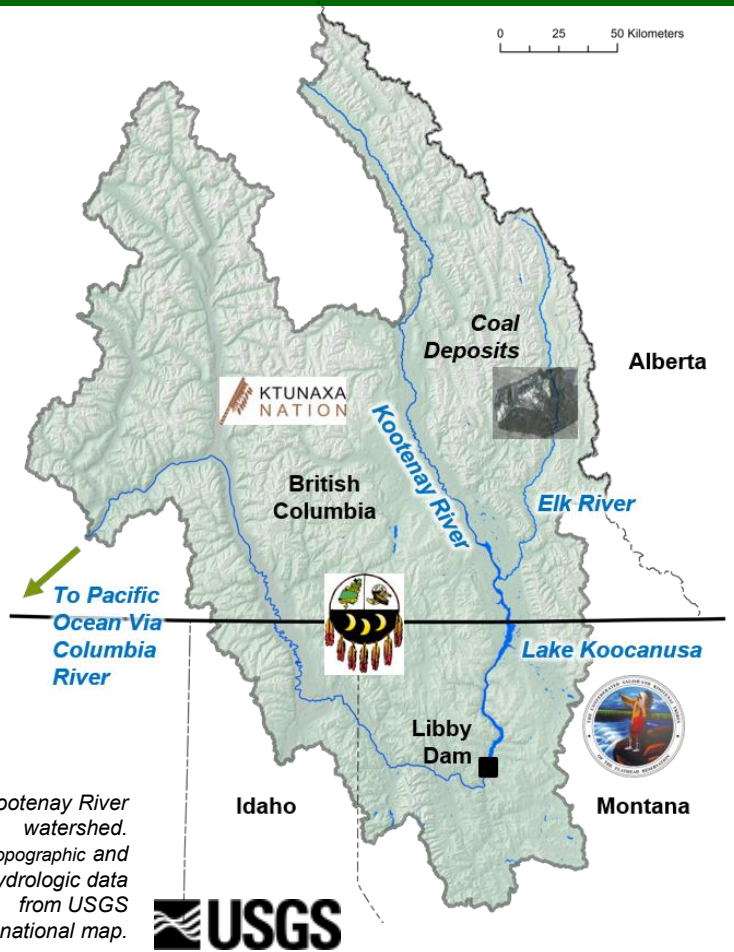

Wyoming-Montana Water Science Center

Presented by John Stevenson
Indigenous-Led Transboundary Mining Conference
Missoula, MT
Sept 15, 2026

USGS

"This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science. The information is provided on the condition that neither the U.S. Geological Survey nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information."

USGS Scientific and Monitoring Efforts

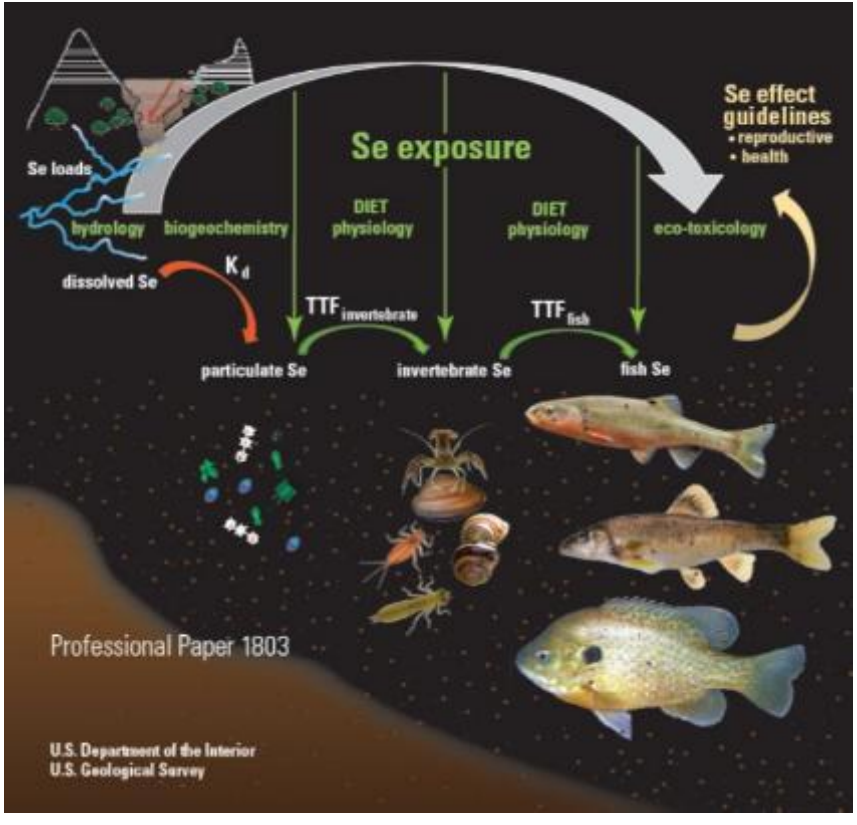


Kootenay River watershed. Topographic and hydrologic data from USGS national map.

- Monitoring Lake Koocanusa (water quality, fish tissues, sediment quality)
- Tracking trends in loads and concentrations throughout the Kootenai River Basin
- Studying selenium effects and bioaccumulation
- Linking all Kootenai/Lake Koocanusa data through Kootenai Basin Watershed Interagency Monitoring Portal

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Risks of Elevated Selenium









Janz, et al.. 2010

USGS science for a changing world

Responding to the Congressional Directive - Monitoring









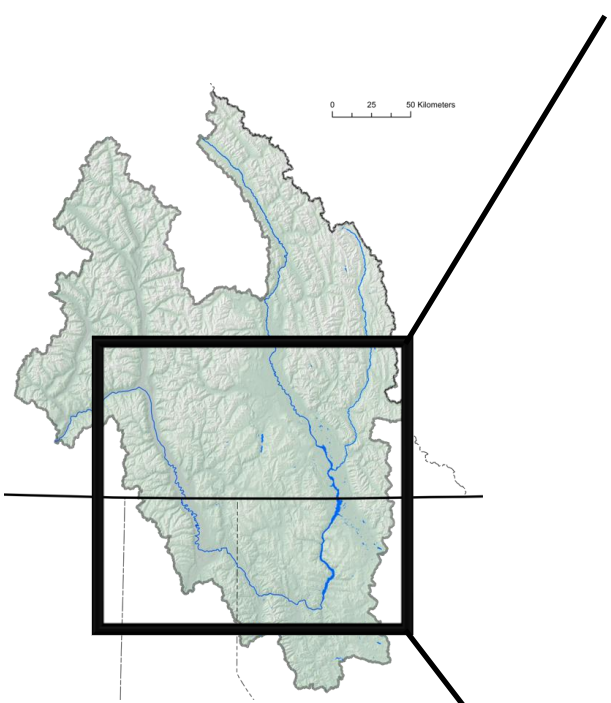
New monitoring since 2019:

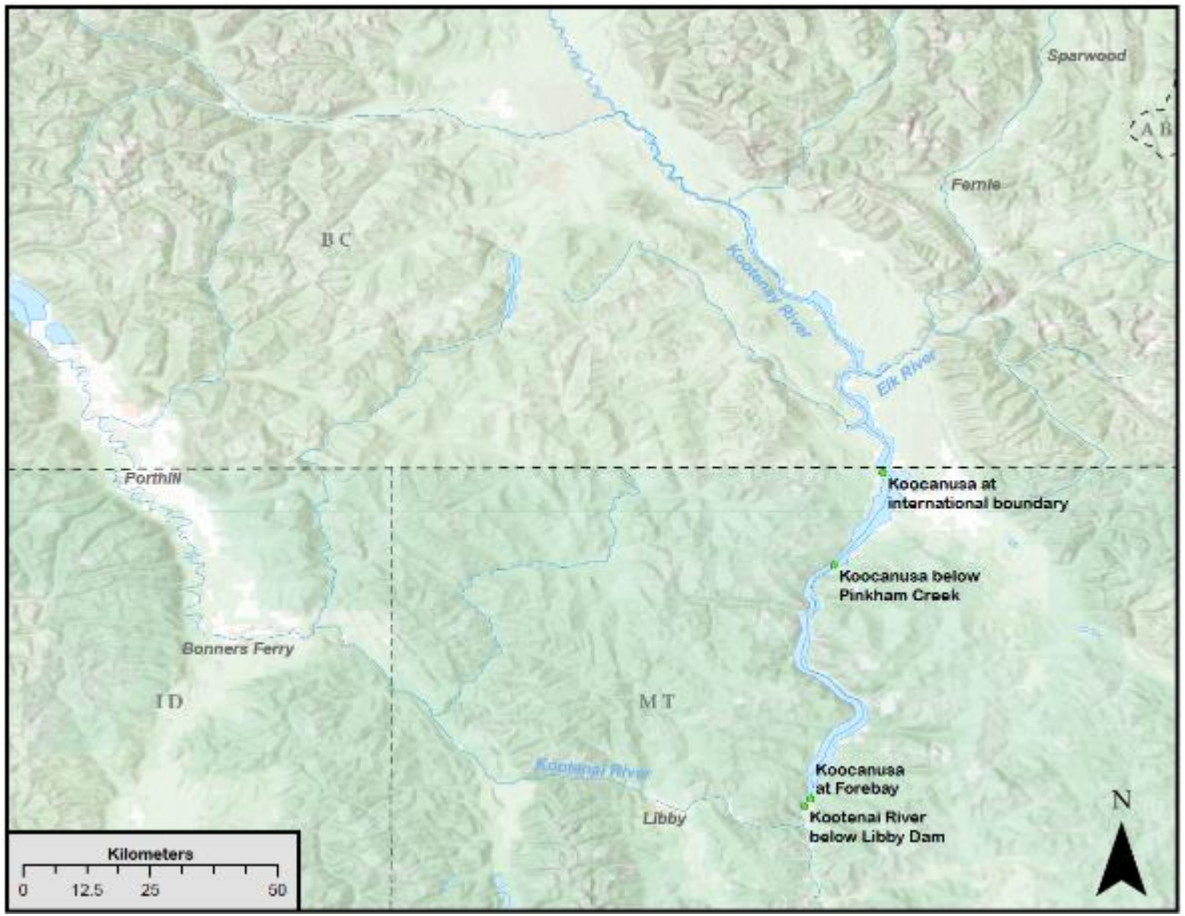
- Expanded sampling stations and enhanced equipment at some existing stations.
- Winter monitoring with new technology for under ice sampling.
- Fish tissue sampling with MT FWP during fall and spring spawning periods.
- Monitor for over 35 unique analytes, including selenium.

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Monitoring Lake Koocanusa - Water

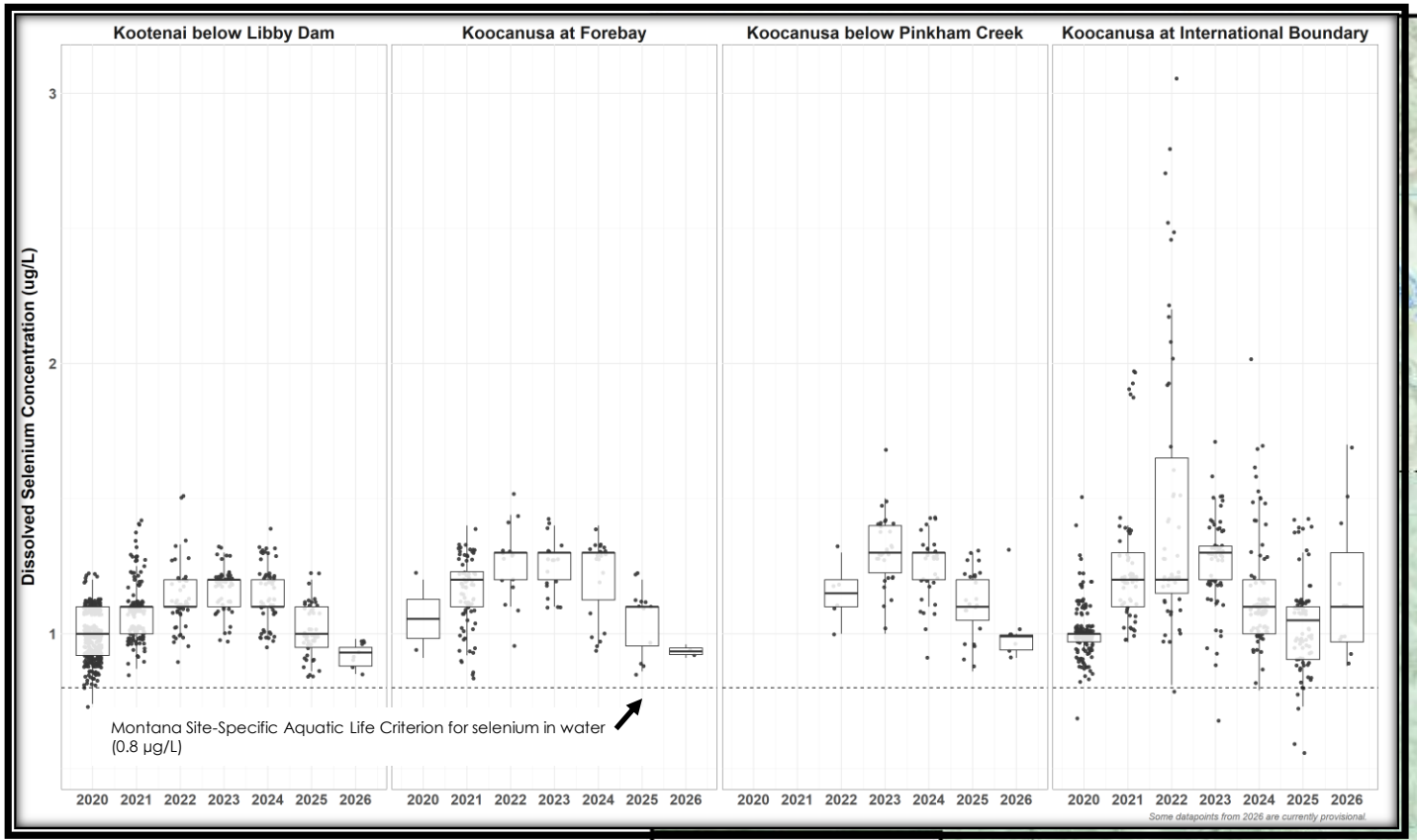




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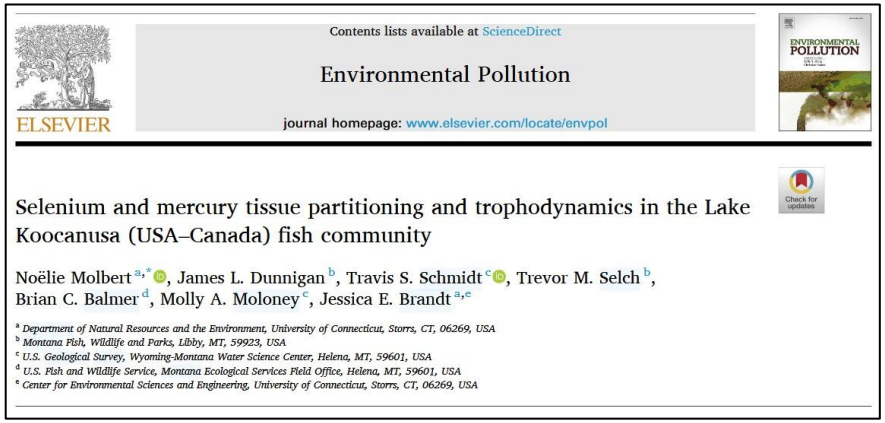
Monitoring Lake Koocanusa - Water



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Monitoring Lake Koocanusa – Fish Tissue

Fish Tissue in Lake Koocanusa



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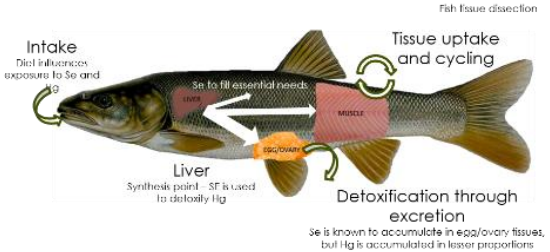
Selenium and mercury tissue partitioning and trophodynamics in the Lake Koocanusa (USA–Canada) fish community

Noëlie Molbert [a,*], James L. Dunnigan [b], Travis S. Schmidt [c], Trevor M. Selch [b], Brian C. Balmer [d], Molly A. Moloney [c], Jessica E. Brandt [a,e]

[a] Department of Natural Resources and the Environment, University of Connecticut, Storrs, CT, 06269, USA
[b] Montana Fish, Wildlife and Parks, Libby, MT, 59923, USA
[c] U.S. Geological Survey, Wyoming-Montana Water Science Center, Helena, MT, 59601, USA
[d] U.S. Fish and Wildlife Service, Montana Ecological Services Field Office, Helena, MT, 59601, USA
[e] Center for Environmental Sciences and Engineering, University of Connecticut, Storrs, CT, 06269, USA



Fish tissue dissection



Key Points:

- Analyzed tissue from 2008, 2013, 2016-2022.
- Egg-ovary Se criteria concentrations (15.1 µg/g dw) exceeded in 3 species.
- Muscle or whole-body Se criteria (11.1 µg/g dw) never exceeded.



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Trends in Selenium Concentrations

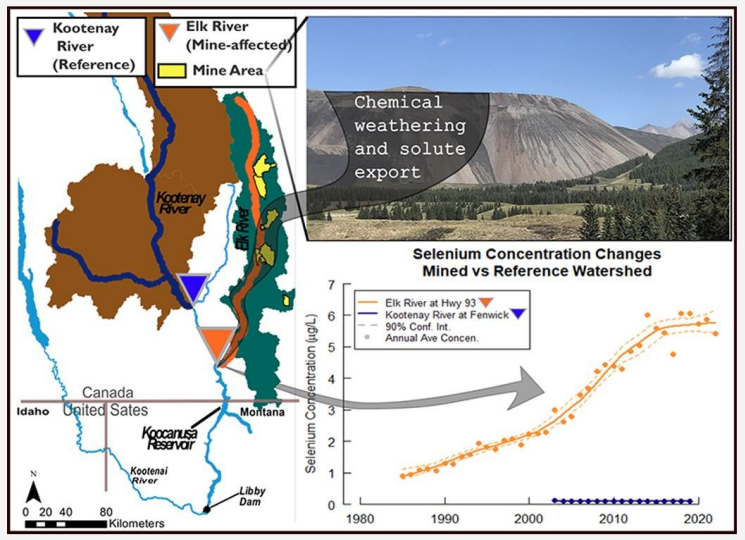
Upstream of Lake Koocanusa

Environmental Science & Technology
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pubs.acs.org/est
Article

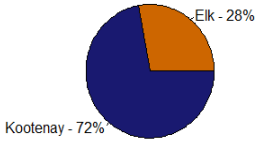
Growth of Coal Mining Operations in the Elk River Valley (Canada) Linked to Increasing Solute Transport of Se, NO_3^-, and SO_4^{2-} into the Transboundary Koocanusa Reservoir (USA–Canada)

Meryl B. Storb,* Ashley M. Bussell, Sara L. Caldwell Eldridge, Robert M. Hirsch, and Travis S. Schmidt

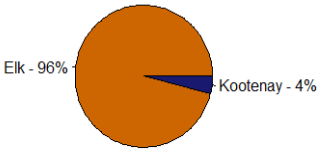
Cite This: Environ. Sci. Technol. 2023, 57, 17465–17480
Read Online



Discharge proportion 2018



Selenium proportion 2018



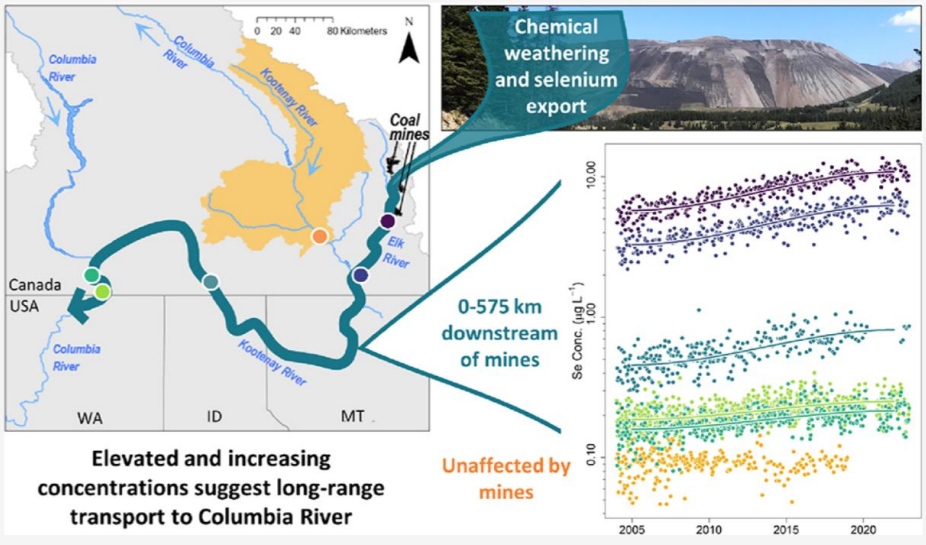
Flow-normalized concentrations of:

- Selenium increased by > 580%
- Nitrate + nitrite increased by > 780%

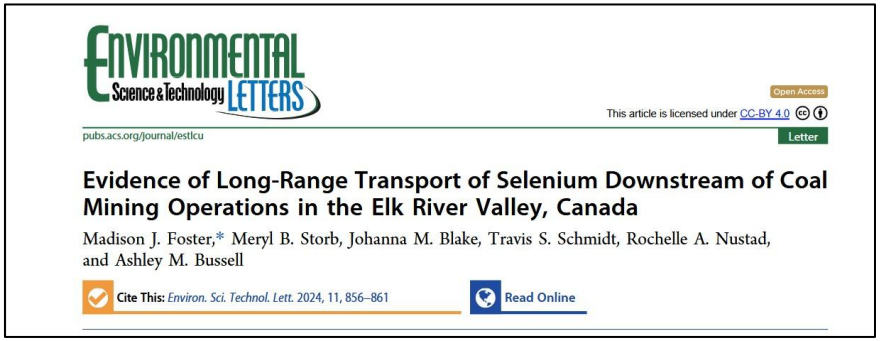
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Trends in Selenium Concentrations



Downstream of Lake Koocanusa



Key points:

- Selenium loads from mines transported 575 river km downstream.

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Monitoring Kootenai River

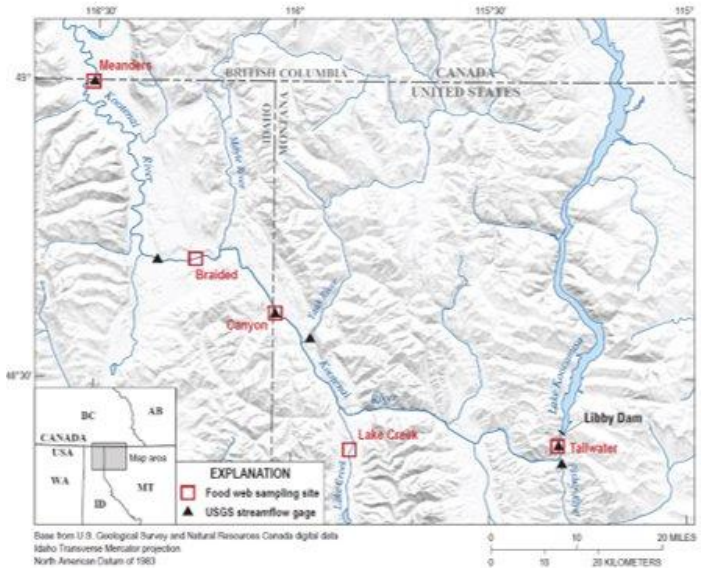
JOURNAL ARTICLE EDITOR'S CHOICE

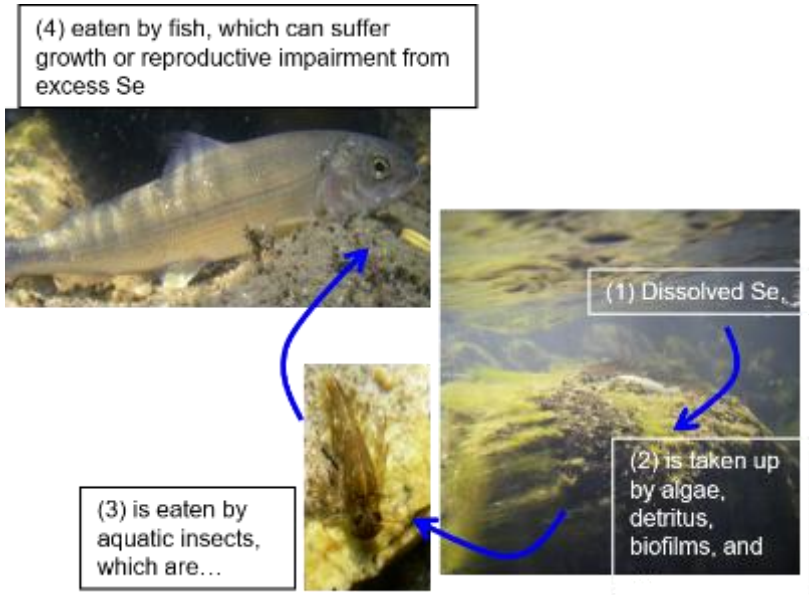
Bioaccumulation and trophic transfer of selenium in a large oligotrophic river

Christopher A Mebane, A Robin Stewart, Erin M Murray, Terry M Short, Veronika A Kocen, Lauren M Zinsser Author Notes

Environmental Toxicology and Chemistry, Volume 44, Issue 10, October 2025, Pages 2864–2888, https://doi.org/10.1093/etojnl/vgaf149

Published: 11 June 2025 **Article history**





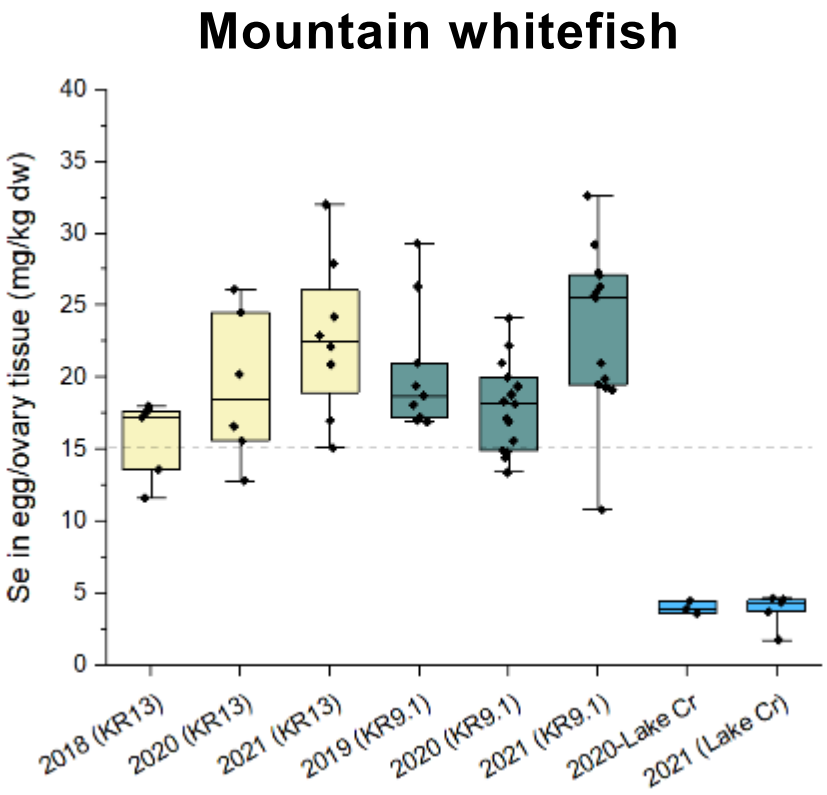
2020-2026 1-2x annually, 5+ sites

- Water
- Periphyton
- Macroinvertebrates
- Fish

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Monitoring Kootenai River





nps.gov

Criteria take home for the flowing ***riverine*** sections:

- Egg-ovary criteria concentrations (15.1 mg/kg dw) usually exceeded in mountain whitefish and in two minnow species
- Muscle or whole-body criteria never exceeded
- Water criteria concentrations never exceeded

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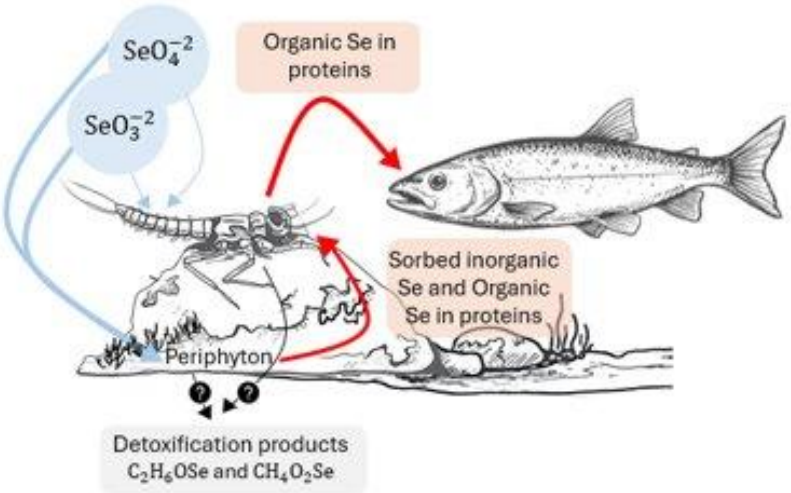
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Forthcoming Work:

Distinguishing the effects of selenium forms and concentrations on bioaccumulation and lethality to aquatic insect communities in stream mesocosms.

MESO

Montana Experimental Stream Observatory







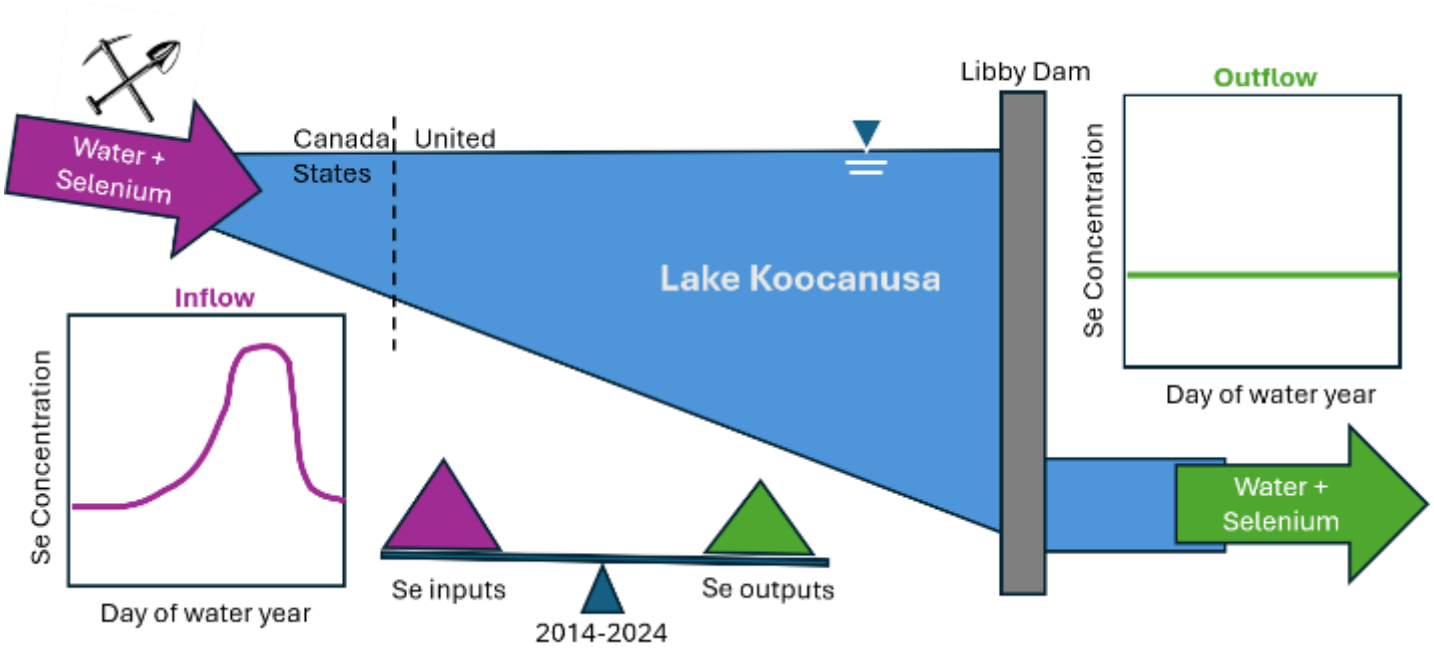
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Forthcoming Work:

Se mass balance model:

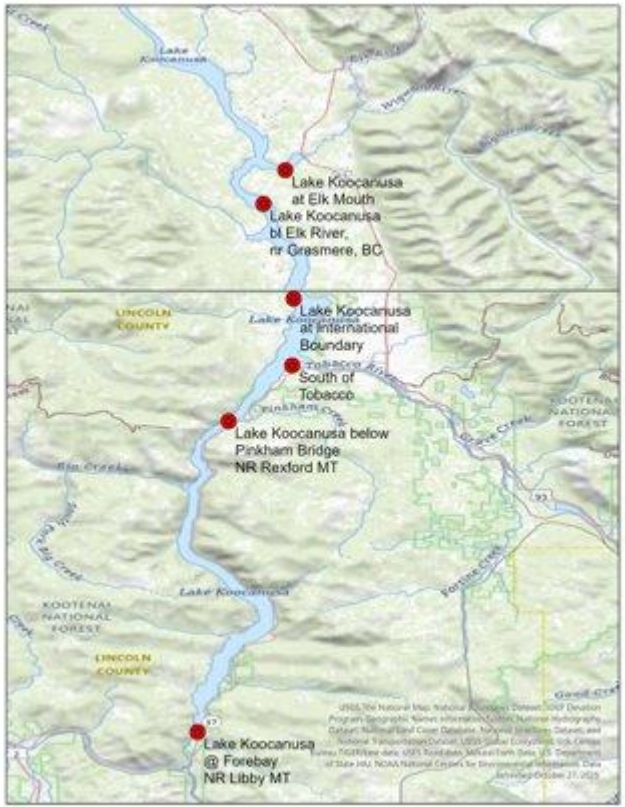
Most Se moves through Lake Koocanusa and mixes before it leaves



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Forthcoming Work:



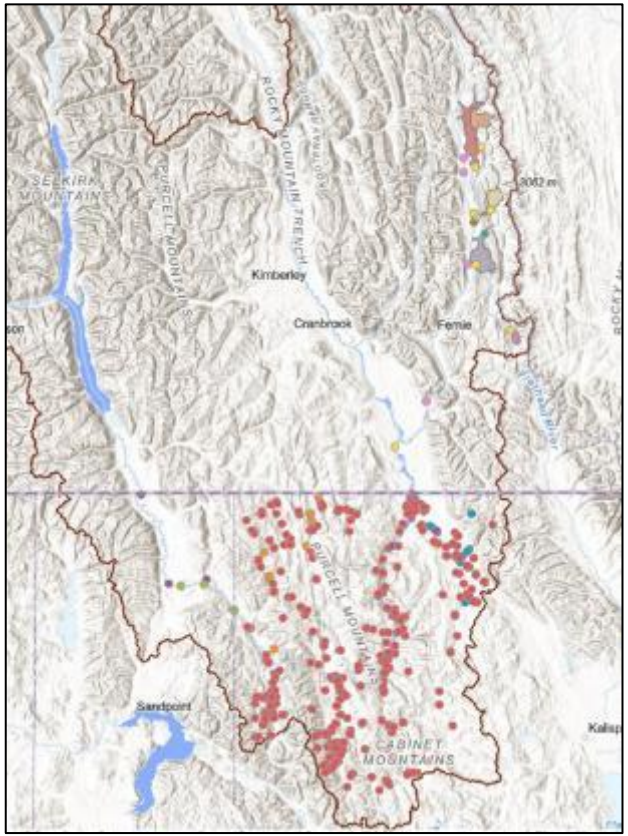
Collected 5 sediment cores to understand geochemical deposition, potential sediment sources, and geochemical mechanisms in the sediment.

- Data release with organic and inorganic chemistry is in USGS review.
- Data analysis and a draft journal article are in progress.
- Selenium concentrations in sediment are generally around 1 mg/kg with some variation.



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Linking All Kootenai-ay Water Quality Data



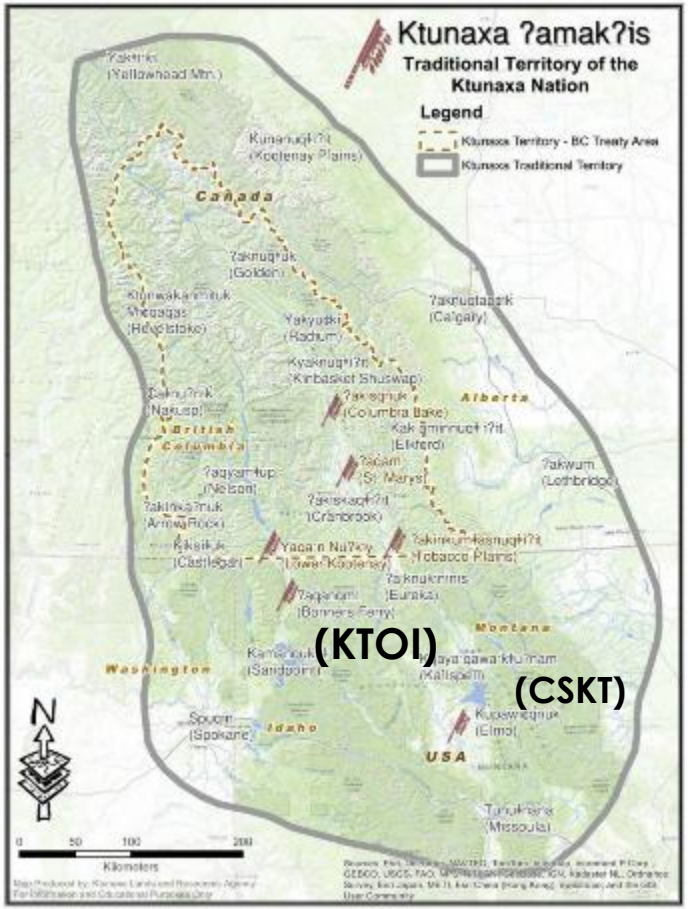


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U.S. Entities With Role or Interest in Water Quality in the Kootenai Watershed – Incomplete List

- Confederated Salish and Kootenai Tribes
- Idaho Department of Environmental Quality
- Kootenai Tribe of Idaho
- Montana Department of Environmental Quality
- Montana Department of Fish, Wildlife and Parks
- U.S. Geological Survey
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Department of State
- U.S. Fish and Wildlife Service
- U.S. Forest Service



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The USGS WY-MT Koocanusa Team

Dan Armstrong
Noah Barbery
Johanna Blake
Ashley Bussell
Thomas Chapin
Greg Clark
Tom Cleasby
Seth Davidson
Sara Eldridge
Chris Ellison
Michelle Fillion
Madison Foster
Danie Frevola
Maddy Goodman
Will Hamilton
Rachel Hughes
Lindsey King
David Lange
Molly Moloney
Dave Naftz
Hannah Nilges
Jonathan O'Connell
Chad Reese
Melissa Schaar
Travis Schmidt
August Schultz
Seth Siefken
John Stevenson
Nicole Stine
Meryl Storb
Alex Walker
Peter Wright



Molly Moloney processing water samples, August 2023. Photo by Seth Siefken.



USGS technician preparing water sampler on Lake Koocanusa bridge, January 2024

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Ongoing monitoring and analysis



Jonathan O'Connell fixing tangled equipment, August 12, 2021. Photo by Seth Siefken.



Chad Reese cleaning snow off boat windshield. Photo by Seth Siefken.



Chad Reese launching monitoring platform, April 18, 2023. Photo by Seth Siefken.

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Questions?



Monitoring platform at international boundary

John Stevenson
jstevenson@usgs.gov

Project Website

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