

Amplifying integrated watershed research in the Nechako River Basin: A progress update from UNBC's Integrated Watershed Research Group (IWRG)

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Nechako Watershed Roundtable
Spring Technical Meeting
3 June 2025



Stuart Lake - Unceded and Traditional Territory of the Nak'azdli Whut'en



The Integrated Watershed Research Group (IWRG) and Timeline

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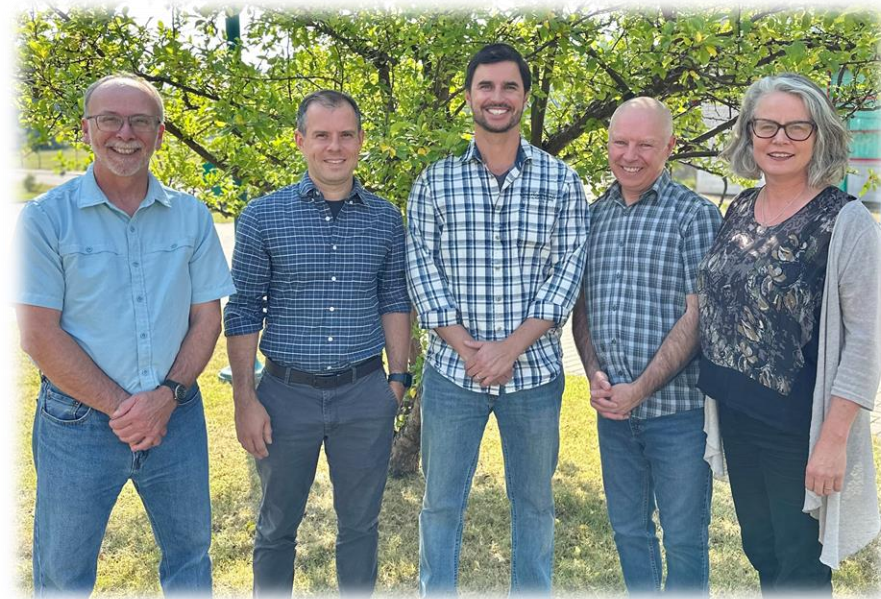
2013: Establishment of the IWRG

Stephen Déry: Climate change and water security

Phil Owens and **Ellen Petticrew:** Sediment sources and sediment quality

Margot Parkes: Tools for integration in watershed management and governance

Barry Booth: Research Manager



Integrated Watershed Research in the Nechako Watershed

2014-2017: Phase 1 (\$0.5M NEEF + \$0.5M matching funds)

2018-2022: Phase 2 (\$0.5M NEEF + \$0.5M matching funds)

2023-2025: Phase 3 (\$0.4M NEEF + \$0.4M matching funds)

Total=
\$2.8M

<https://www.unbc.ca/integrated-watershed-research-group>

2022: **Eduardo Martins** joins the IWRG (Freshwater fish and habitat)

2023: **Bruno Sobral** recruited as Research Manager

2024: **Lucas Macedo Moura** recruited as Research Manager

2024: Additional matching funds secured from ECCC / CWA

2024: Publication of *PLOS Water* article (Parkes et al., 2024)

2025: Conclusion of ECCC/CWA and NEEF Phase 3 projects

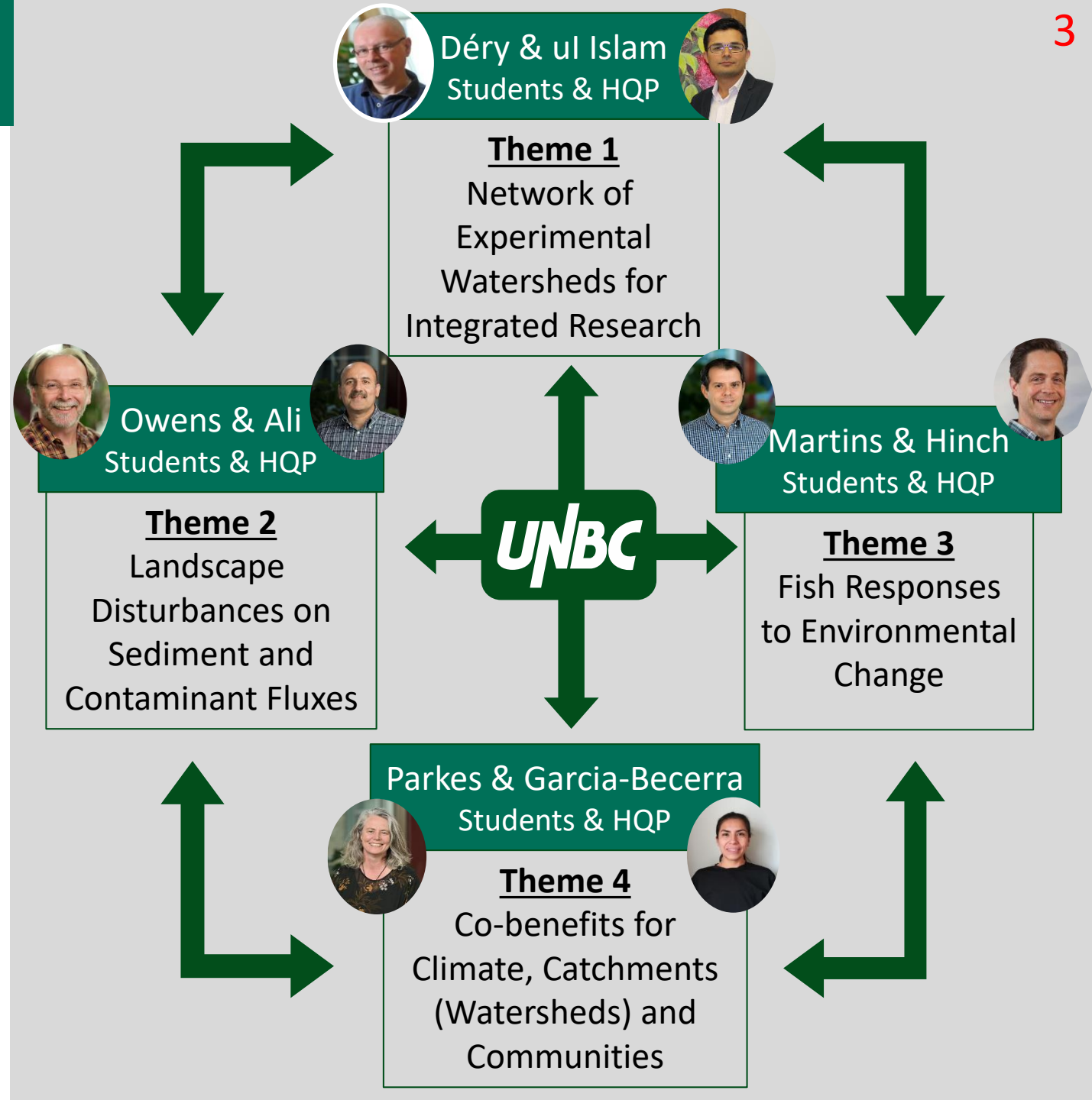


Phase 3 team & themes

Overarching Goal and Theme: The climate crisis as a cross-cutting driver of watershed change in the Nechako: Strengthening preparedness for integrative responses to climate, water and community connections in the Nechako Watershed.

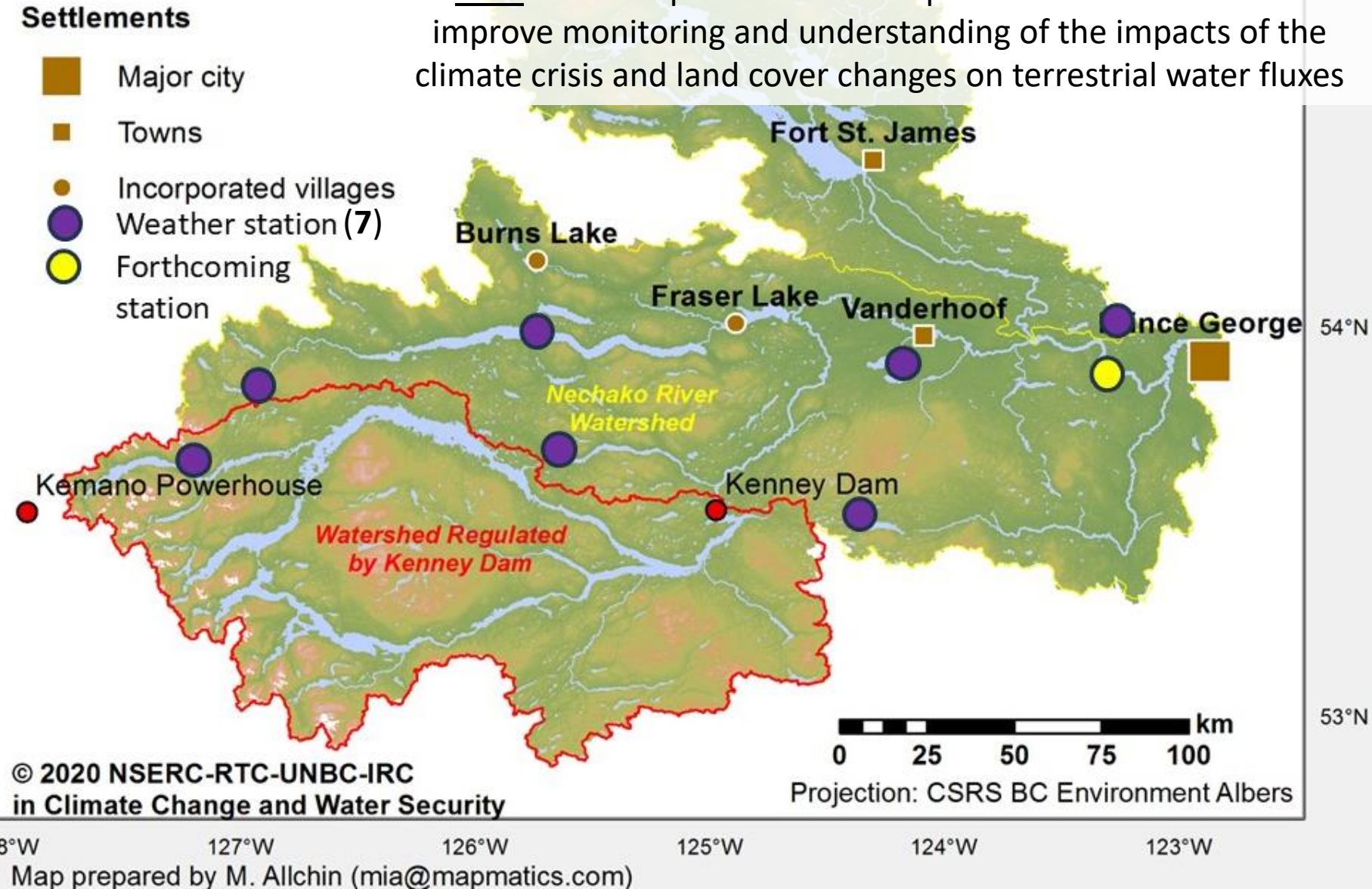
Timeline: 1 July 2023 to 31 August 2025 with a 2-month extension approved by NEEFS

Budget: Total value of the project is \$0.8M, with the total award from NEEF being \$0.4M and ECCC / CWA providing half of the required matching funds



Theme 1: Network of Experimental Watersheds for Integrated Research (NEWIR)

Aim: to develop a network of experimental watersheds to improve monitoring and understanding of the impacts of the climate crisis and land cover changes on terrestrial water fluxes



Francois Lake weather station



Thanks to: NEEF, Cheslatta Carrier Nation, BC Ferries and WaterBridge Equipment Ltd.

Theme 1: Water Temperature Monitoring Network

Link to data: <https://zenodo.org/records/15053907>

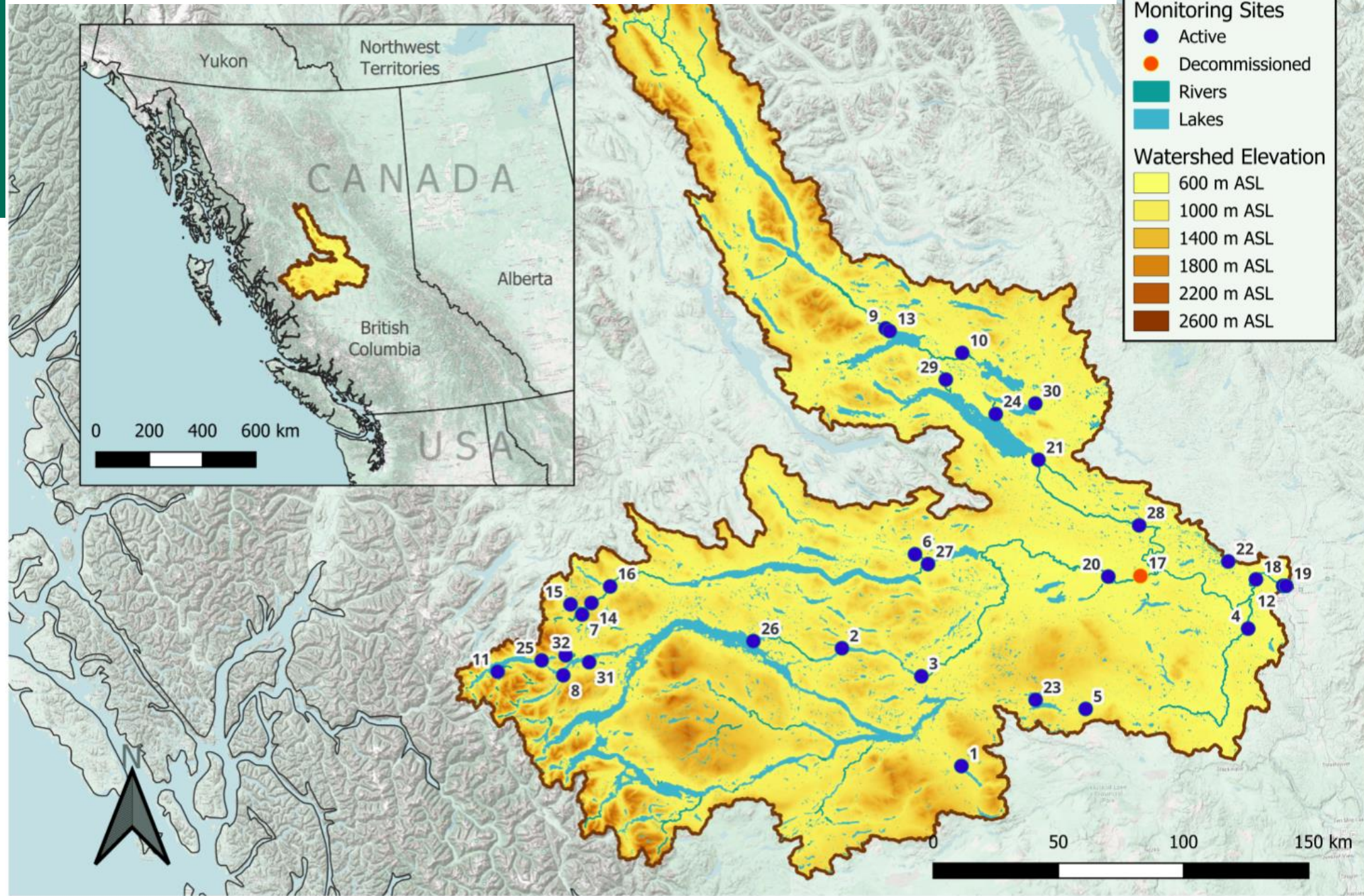
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Data have all been quality controlled for 2019-2024 at 32 sites in the Nechako

Data deposited at Nechako Watershed Portal and Zenodo

Open-access paper in press at ***Data in Brief*** describing the updated dataset

Map by Maria Tavares



Themes 1 and 2: Joint Atmospheric River (AR) CWA Project

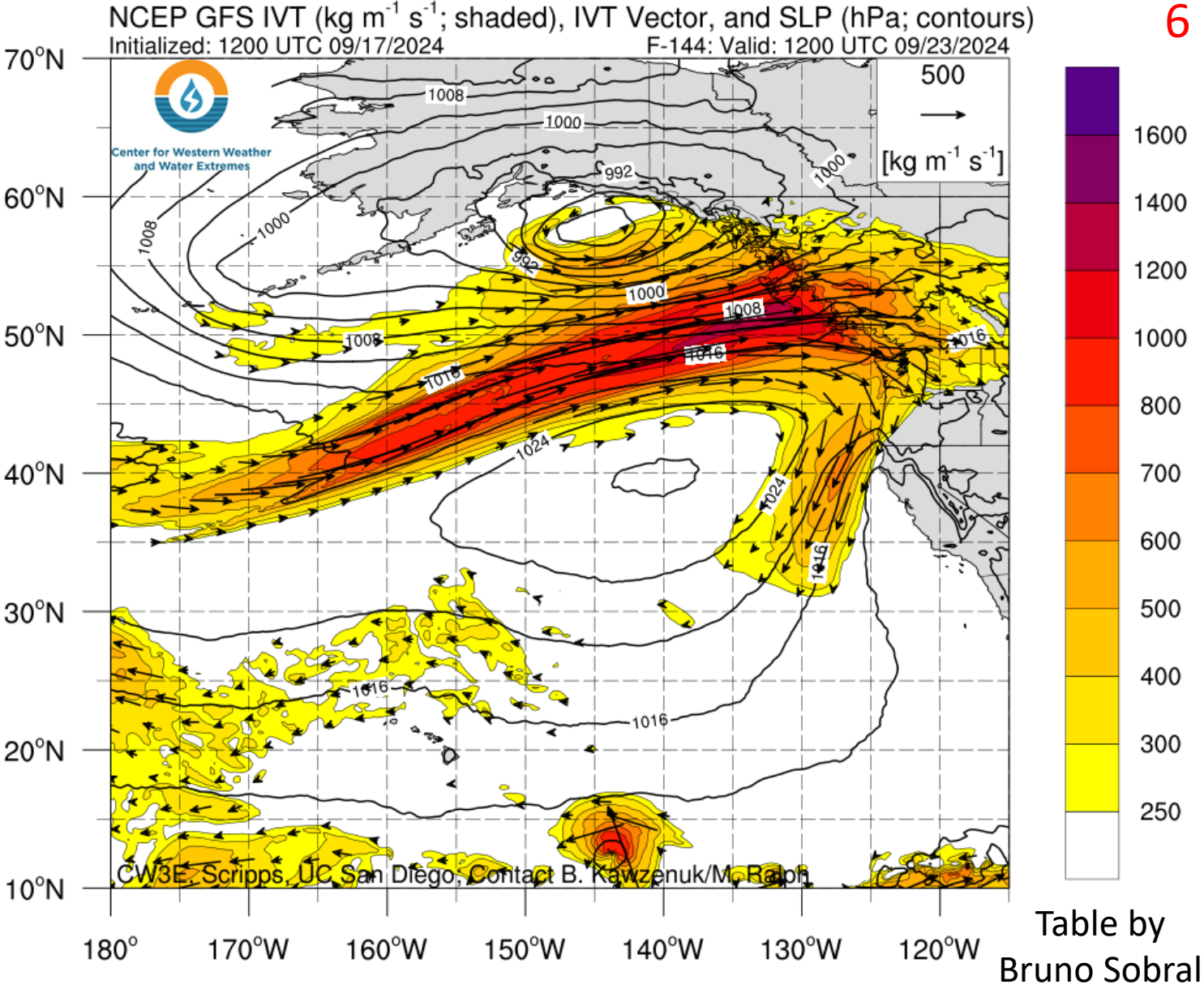
In collaboration with Theme 2, we tracked all land-falling ARs impacting the upper Nechako Watershed during fall of 2024

A total of 9 AR events including a category 2 to 3 storm affected the basin

Data analysis ongoing with plans for a new field campaign this autumn



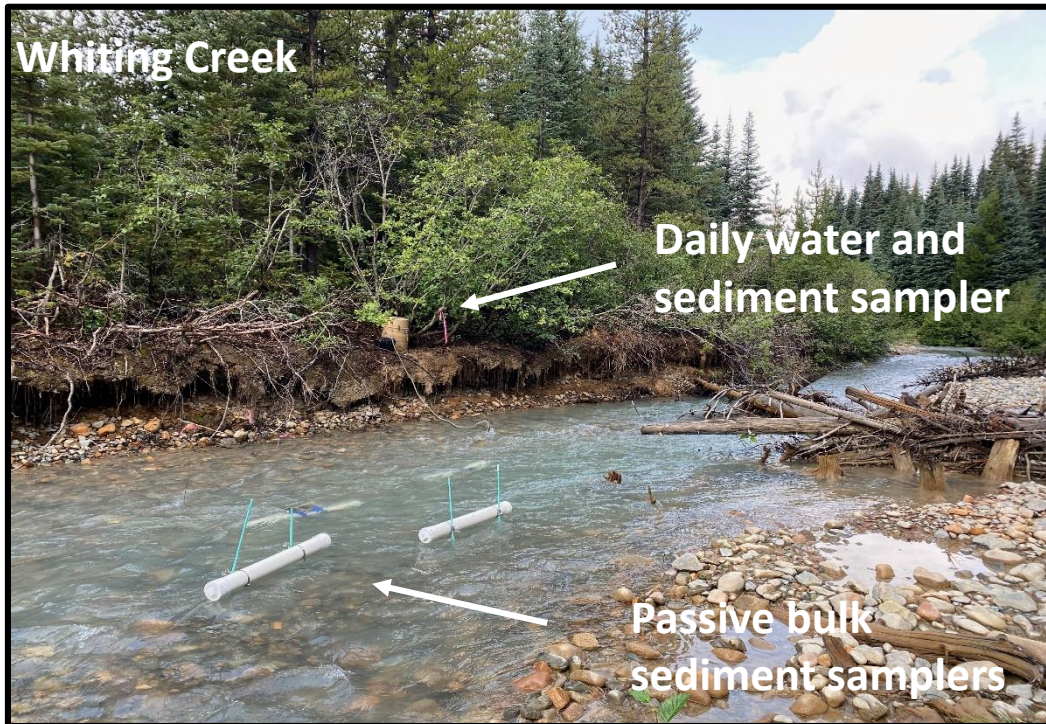
MECHE Observatory at Huckleberry Mine (Dylan Broeke)



Event #	1		2		3		4		5		6		7		8		9	
	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF
Start Date and Time	25 Aug - UTC_02	25 Aug - UTC_18	30 Aug - UTC_01	29 Aug - UTC_21	07 Sep - UTC_11	08 Sep - UTC_01	16 Sep - UTC_01	20 Sep - UTC_12	21 Sep - UTC_07	22 Sep - UTC_19	23 Sep - UTC_22	30 Sep - UTC_05	06 Oct - UTC_15	06 Oct - UTC_17	12 Oct - UTC_19	12 Oct - UTC_23		
Finish Date and Time	26 Aug - UTC_08	26 Aug - UTC_18	31 Aug - UTC_04	30 Aug - UTC_21	09 Sep - UTC_02	09 Sep - UTC_01	17 Sep - UTC_01	21 Sep - UTC_18	22 Sep - UTC_13	25 Sep - UTC_06	25 Sep - UTC_07	30 Sep - UTC_23	07 Oct - UTC_18	07 Oct - UTC_23	14 Oct - UTC_07	14 Oct - UTC_11		
Max IVT ($\text{kg m}^{-1} \text{s}^{-1}$)	309	286	428	373	393	323	349	435	503	740	742	519	367	388	426	488		
Duration (hours)	30	24	27	24	39	24	36	30	33	60	33	18	27	30	36	36		
TIVT (10^7 kg m^{-1})	2.71	2.09	3.23	2.54	4.1	2.25	3.57	3.49	4.47	10.32	5.16	2.27	2.83	3.45	4.55	5.10		
AR_Category (Ralph et al 2019)	AR1	AR1	AR1	AR1	AR1	AR1	AR1	AR1	AR2	AR3	AR2	AR1	AR1	AR1	AR1	AR1		

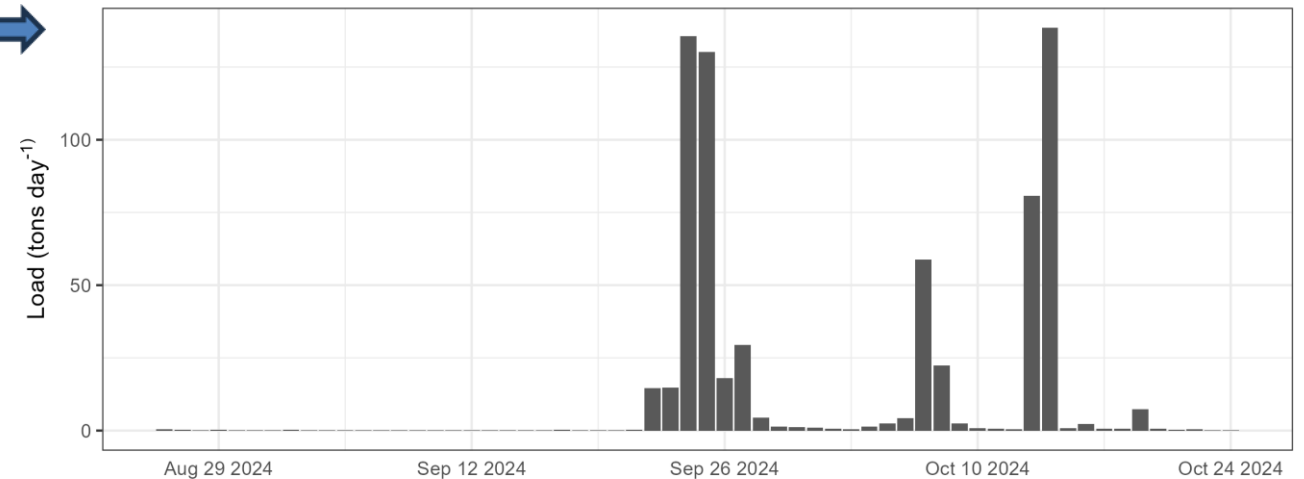
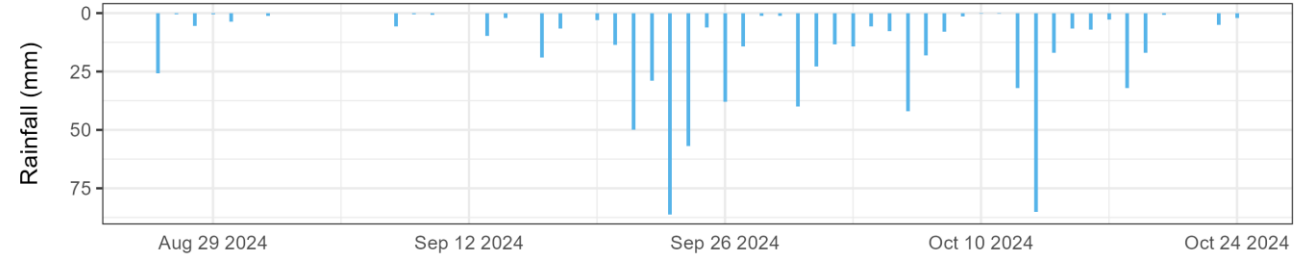
Theme 2: Effects of Landscape Disturbances on Sediment and Contaminant Fluxes

- In collaboration with Dr Kristen Kieta and Theme 1 group led by Dr Stephen Déry
- Instrumented two headwater creeks and monitored numerous ARs in 2024 field season
- Purchased new water and sediment samplers and will monitor the 2025 season



Aim: To determine how landscape disturbances, such as land-falling atmospheric rivers and severe wildfires, modify erosion of the landscape and the delivery of fine sediment and associated chemicals to river channels.

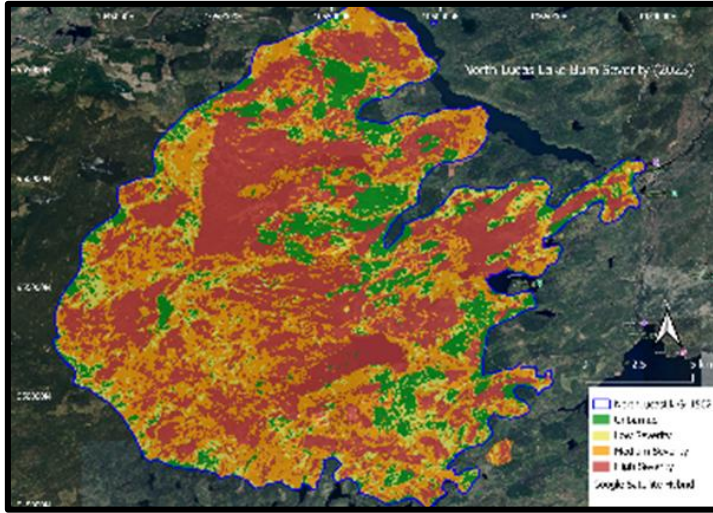
- **Atmospheric rivers work** – funded by CWA
- Wildfire work – funded by NEEF (phase 3)



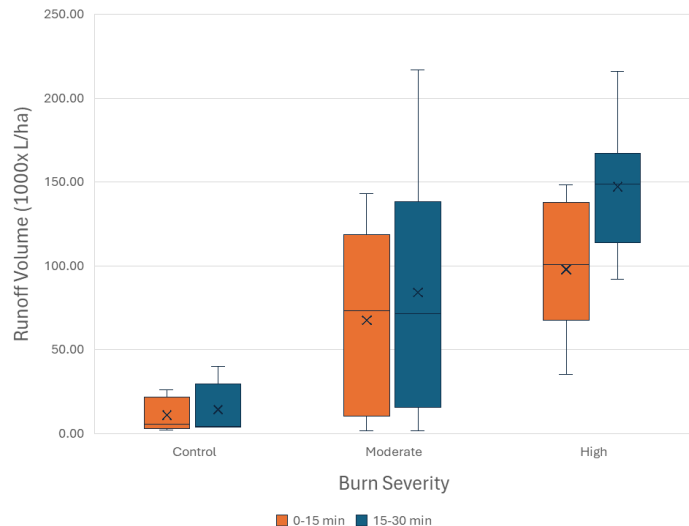
Plot of daily sediment loads transported in Rhine Creek in response to large rainfall amounts during several ARs in 2024

Theme 2: Effects of Landscape Disturbances on Sediment and Contaminant Fluxes

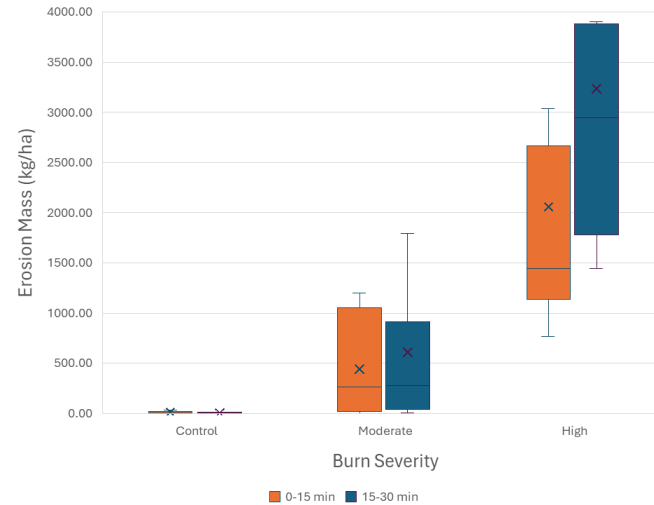
Soil burn severity map for 2023 North Lucas Lake wildfire



Runoff by severity



Erosion by severity



Results show greater runoff and erosion in higher burn severity areas. Developing a runoff and erosion risk map for the burned area.

Wildfire work – funded by NEEF (phase 3)

- Studied the 2023 North Lucas Lake wildfire near the Kenney Dam. In collaboration with Mike Samoil (MSc student), Dr Faran Ali, Brendan Miller (Ministry of Forests) and Cheslatta Carrier Nation
- Used a rainfall simulator to examine the effects of rainfall events on hillslope runoff, soil erosion and contaminant delivery to streams



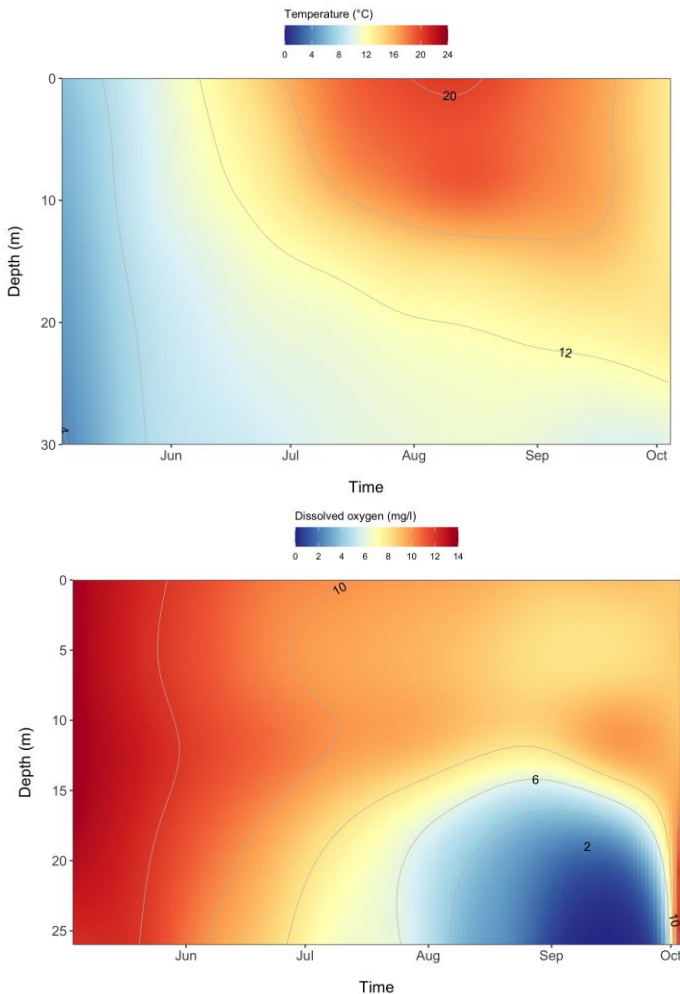
Theme 3: Fish Responses to Environmental Changes

Aim: Investigate short- and long-term responses of fish to environmental changes including climate change in the Nechako Watershed.

Completed analysis of Stellako rainbow trout snorkel survey data (1988-2022), revealing that warming temperature has been one of their main drivers of decline since the early 2000's.



Completed data collection on oxythermal habitat use by burbot in Fraser Lake. Data analysis ongoing.

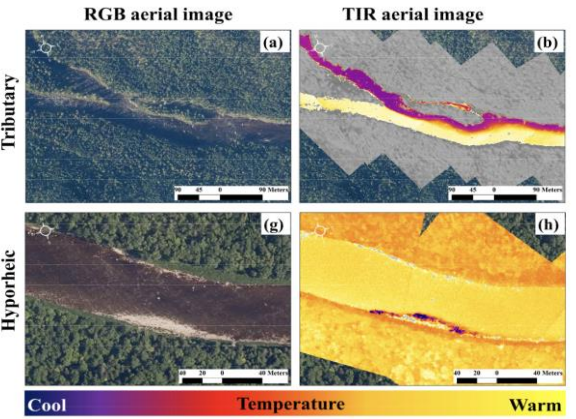


Theme 3: Fish Responses to Environmental Changes

Aim: Investigate short- and long-term responses of fish to environmental changes including climate change in the Nechako Watershed. 10

Initiated data collection to investigate white sturgeon and Chinook salmon thermal habitat use and thermoregulatory behaviour in the Nechako River in 2024.

Initiated data collection to investigate rainbow trout thermal habitat used and thermoregulatory behaviour in the Stellako River in 2025.



Theme 4: Amplifying Co-benefits for Climate, Catchments (Watersheds) and Communities

Linking across IWRG themes!

- Refine and strengthen the **Nechako Watershed Portal** to support the diverse data archiving, profiling and sharing needs of **established and emerging partners/audiences e.g.**
 - **Nechako Watershed Roundtable – connecting the dots across different information & knowledge**
 - **School District 91 and 57 – cultivating youth curiosity (and other learners too!)**
 - **Northern Health – connecting climate, catchments and communities (Nechako as an exemplar).**
- **Identify and trial integrative tools and processes to amplify co-benefits** for climate, catchment/watershed & communities.
- Explore and expand **knowledge exchange opportunities** to enhance **partner learning, intersectoral action** and to amplify the co-benefits of watershed security.



L.E.A.P.H.

Learning from Eco-social Approaches to Public Health

The Nechako Watershed Portal

Nechako Watershed Portal

The screenshot displays the Nechako Watershed Portal interface. On the left, a 'Map Tools' sidebar includes options like 'Add Layer', 'Identify Results', 'Draw Vectors', 'Buffer', 'Clip', 'Difference', 'Split', 'Intersection', 'Union', 'Download', 'Project', and 'Export'. The main map area shows the Nechako Watershed boundary in pink, surrounded by geographical features like the Keena Mountains, Rocky Mountains, and Fraser Plateau. A 'Layers' panel on the right lists various data layers, including 'Fire Decade', 'Watershed Overview', 'Community', 'First Nation Community', 'Land, Health & Healing Story', 'disturbance_unweighted', 'Overall ECHOScreen Score', 'Kenney dam', 'Sediment Source and Dynamics', 'SD91', 'NHG C', 'Spider', 'School F', 'Regional', 'Natural R', 'Health S', 'ESRI Top', 'Google Im', and 'OpenStre'. The 'Watershed Overview' layer is currently selected. The bottom of the interface shows the 'Stewardship Portal | Vers' logo.

This screenshot shows the 'Welcome to the Nechako Watershed Learning Module' page. It features a table of projects with columns for 'Project Name' and 'Creator ID'. The table lists various projects such as 'Stellako', 'NWR Spring Technical', 'asus_subdivision_history', 'Wetlands_Teacher_Resources', 'R Annual Meeting 2023', 's garbage', 'nate and Health', 'aslatia Carrier Nation Archives', 'ter, Sanitation, and Hygiene', 'project Lucas', 'Lisa', 'ge Lakes Monitoring Working Group', and '3'. The 'Welcome to the Nechako Watershed' project is highlighted. Below the table, there is a 'Search filter' section with a dropdown menu for 'Project Name' and a 'Search' button. The 'Description' section on the right provides an overview of the learning module, stating it is created for students, teachers, and community members to bring together different knowledges and data to encourage integrative thinking and address the nexus of climate change, community, and health. It also includes a 'Learning Module Answer Key' link and the 'LEAPH Lab Nechako Watershed Portal Home' link.

"Welcome to the Nechako Watershed"
Learning Module Guide
Connecting Climate, Health, and Community Through Data Exploration

Learning Objectives

Utilize and benefit from the different kinds of data and resources stored within the Nechako Watershed Portal to:

Overcome siloed approaches and encourage critical and integrative thinking skills that connect across ecological, social, and health dimensions of the watershed.

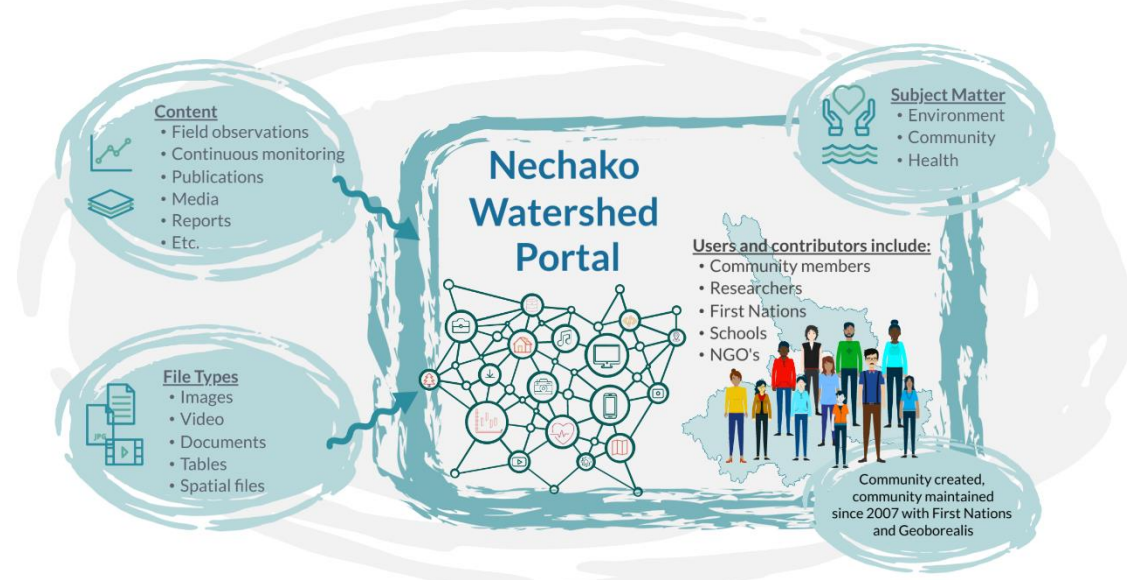
Understand how climate change (e.g., warming temperatures, forest fires, flow rates, and precipitation patterns) and related industrial activities (e.g., resource extraction) create cascading effects impacting human and non-human living systems and community well-being.

Learn about Indigenous worldviews and knowledge to cultivate a more holistic understanding of the interconnected relationship between people and the watershed.

<https://nechakowatershed-portal.ca/>
Fostering knowledge exchange

Future plans for the IWRG

- 2025 summer field season – site visits across the Nechako Watershed + possible AR field campaign
- Nechako Watershed Portal Ongoing Projects and routine updates/guides:
 - “Welcome to the Nechako” Project
 - “Climate and Health” Project
 - “Large Lakes Monitoring” Project
 - “Saturation Search” of publications
 - Still aiming to profile Cheslatta Carrier Nation Archives
- Potential funding application(s) to expand integrated watershed research in the Nechako Watershed by the IWRG



Thank you to our partners, funders, and for your attention!



Watersheds BC



NECHAKO
WATERSHED
ROUNDTABLE



Fraser Basin Council

SCHOOL
DISTRICT



NECHAKO
LAKES



UFFCA



Lheidli T'enneh
Wheni Lheidli T'enneh ts'inli



NECHAKO ENVIRONMENT & WATER STEWARDSHIP SOCIETY

NEWSS



real estate
foundation
BRITISH COLUMBIA



TAKLA NATION



WET'SUWET'EN
FIRST NATION



northern health
the northern way of caring

Mitacs



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