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

Nechako Watershed Roundtable
Spring Technical Meeting
3 June 2025

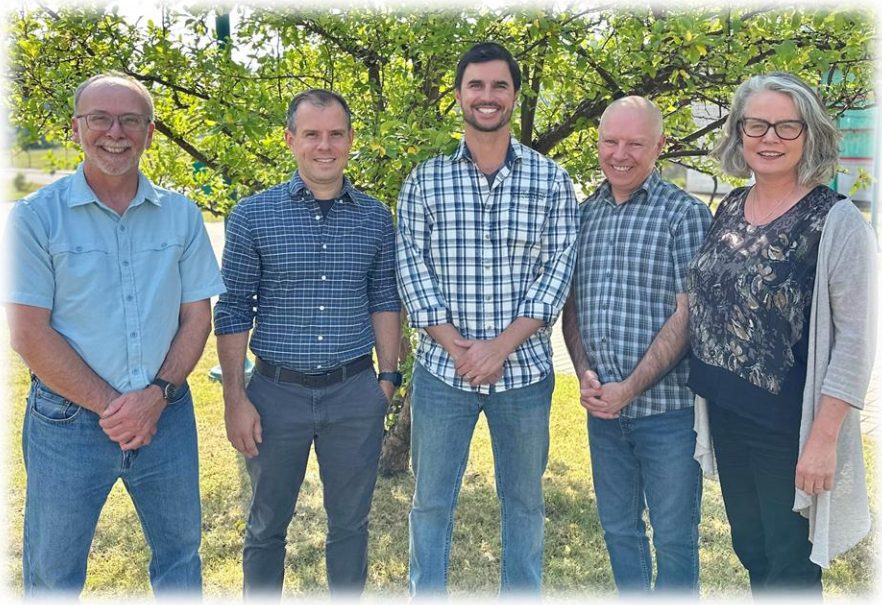
Nechako Environmental Enhancement Fund

UNBC

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

NAK'AZDLI WHUT'EN

The Integrated Watershed Research Group (IWRG) and Timeline



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

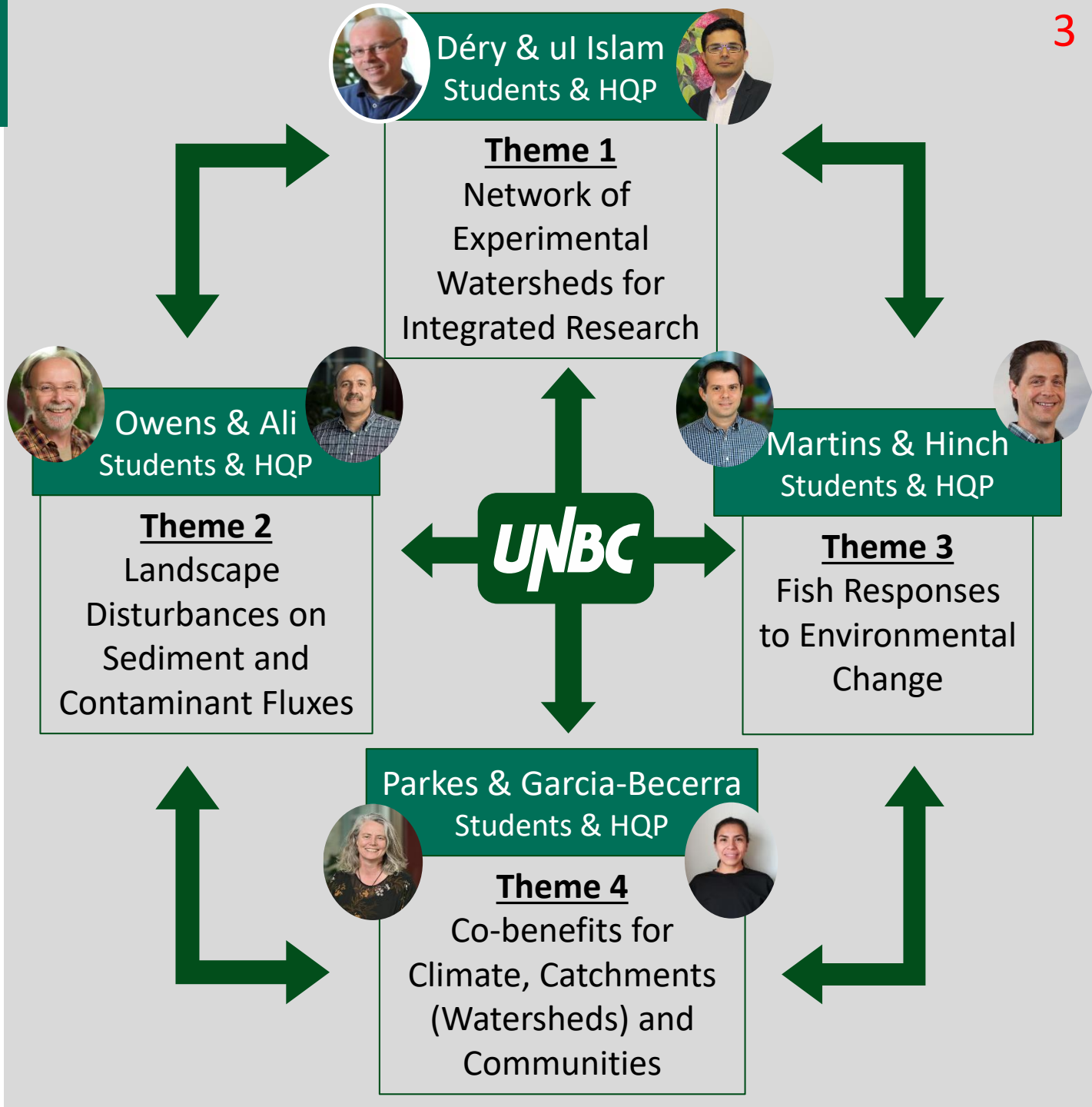
2022: ***Eduardo Martins*** joins the IWRG (Freshwater fish and habitat)
2023: ***Bruno Sobral*** recruited as Research Manager
2024: ***Lucas Macedo Moura*** recruited as Research Manager
2024: Additional matching funds secured from ECCC / CWA
2024: Publication of *PLOS Water* article (Parkes et al., 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.

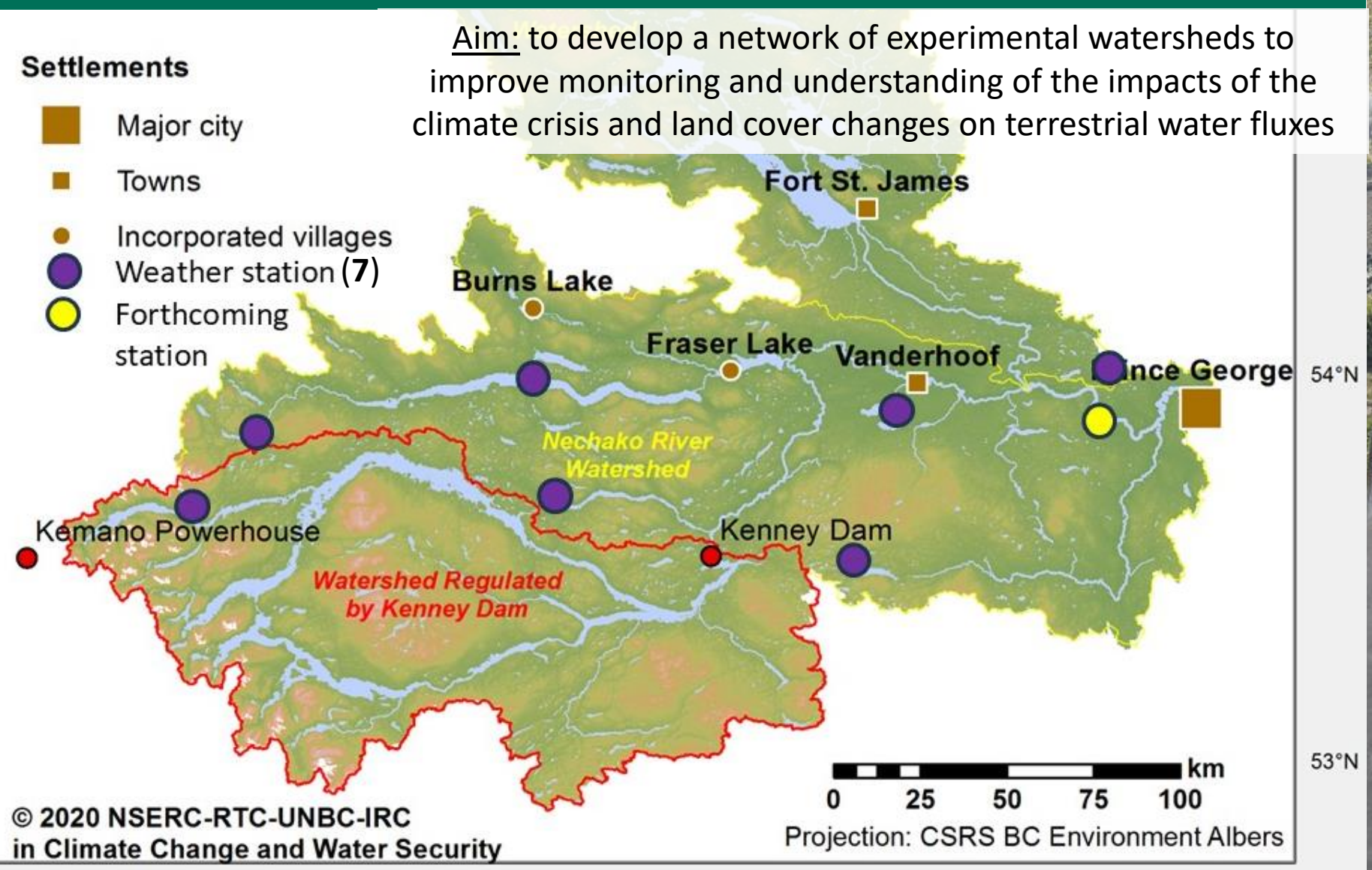
Timeline: 1 July 2023 to 31 August 2025 with a 2-month extension approved by NEEFS

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



Theme 1: Water Temperature Monitoring Network

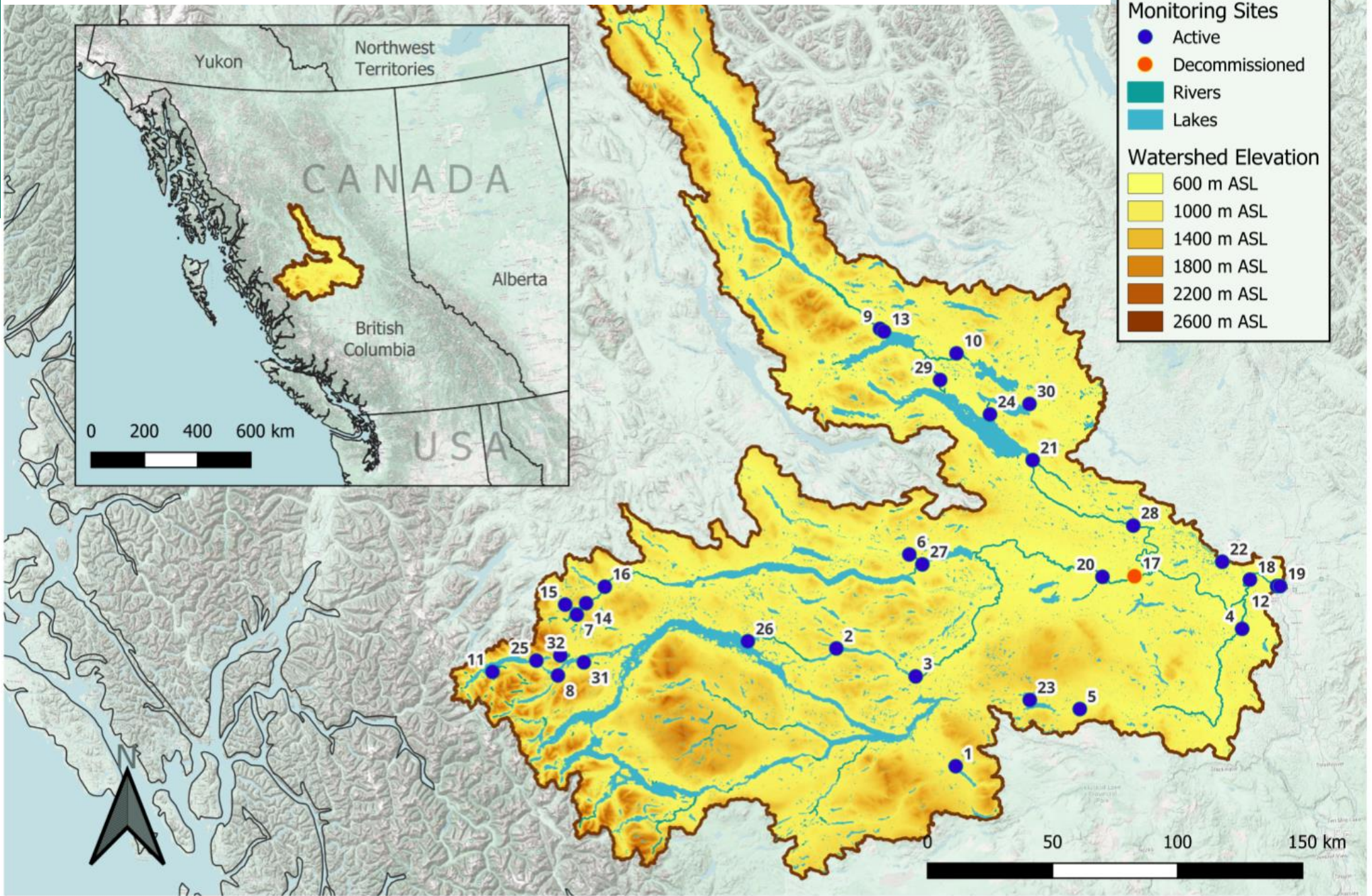
Link to data: https://zenodo.org/records/15053907

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)

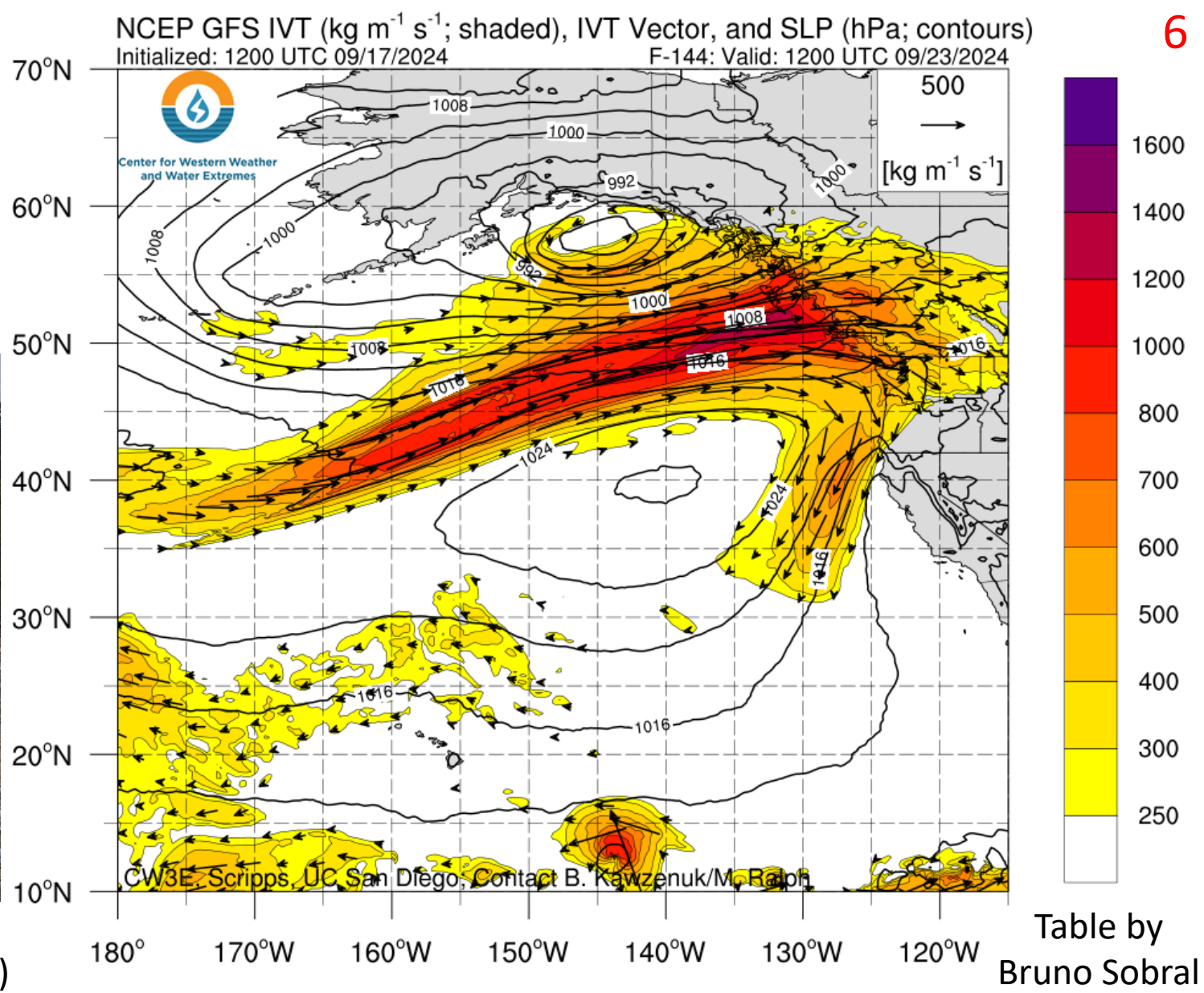


Table by Bruno Sobral

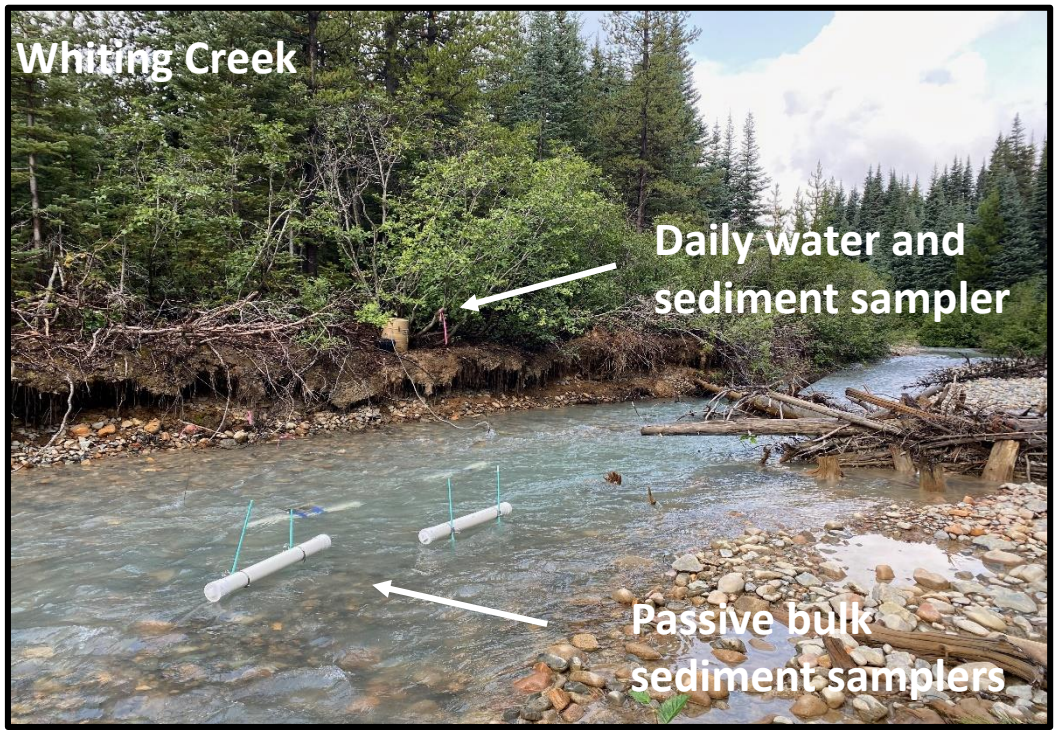
Event #	1		2		3		4		5		6		7		8		9	
	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF	GEFS	ECMWF
Start Date and Time	25 Aug - UTC_02	25 Aug - UTC_18	30 Aug - UTC_01	29 Aug - UTC_21	07 Sep - UTC_11	08 Sep - UTC_01		16 Sep - UTC_01	20 Sep - UTC_12	21 Sep - UTC_07	22 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 (kg m^-1 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

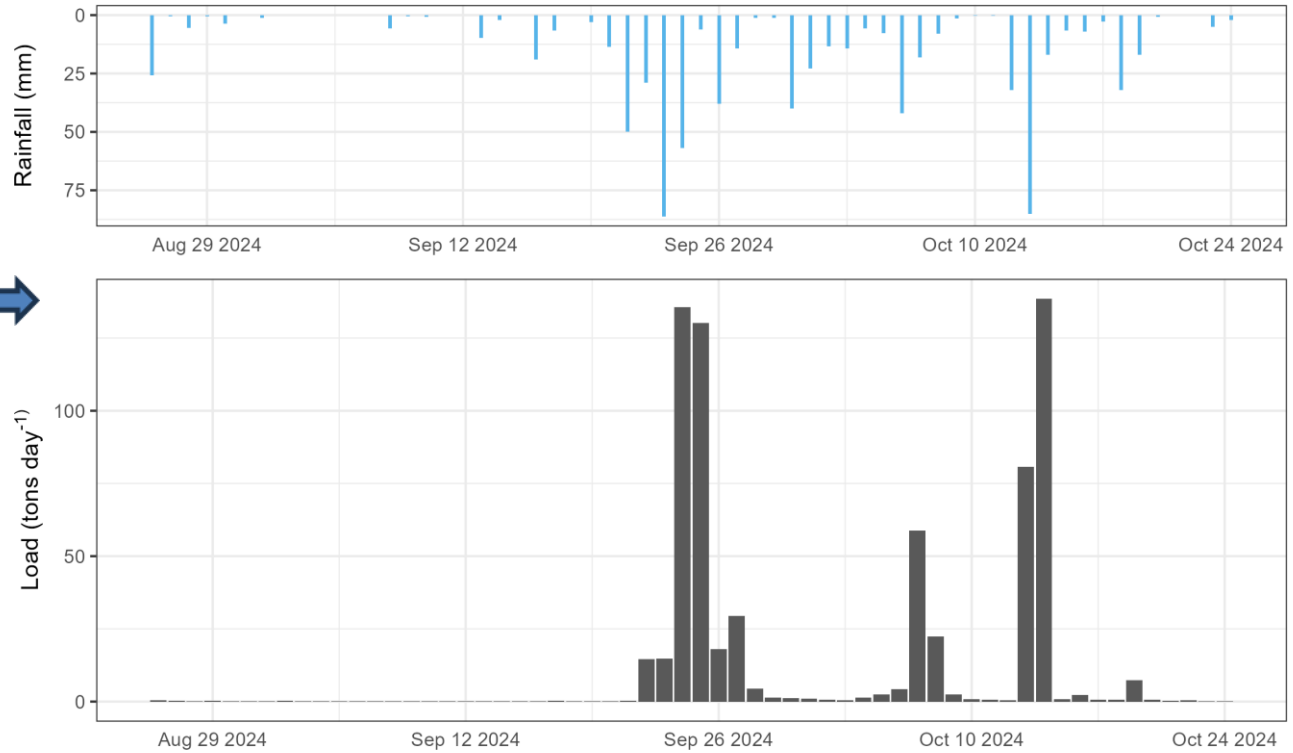
Theme 2: Effects of Landscape Disturbances on Sediment and Contaminant Fluxes

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.

- 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

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





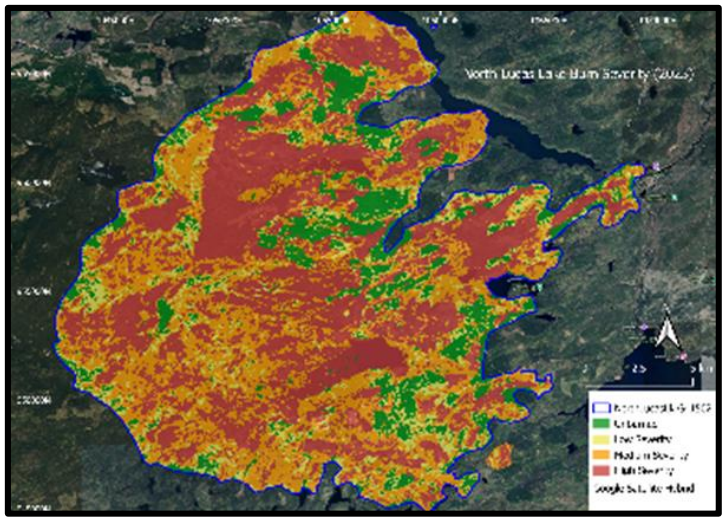
Plot of daily sediment loads transported in Rhine Creek in response to large rainfall amounts during several ARs in 2024

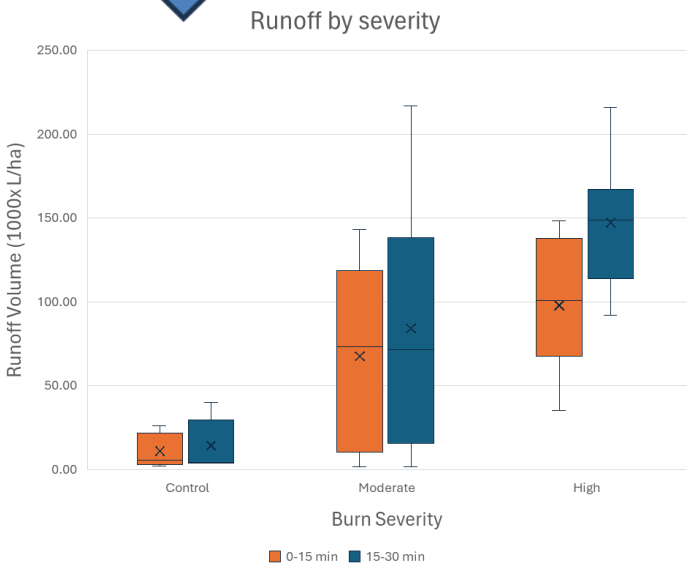
Theme 2: Effects of Landscape Disturbances on Sediment and Contaminant Fluxes

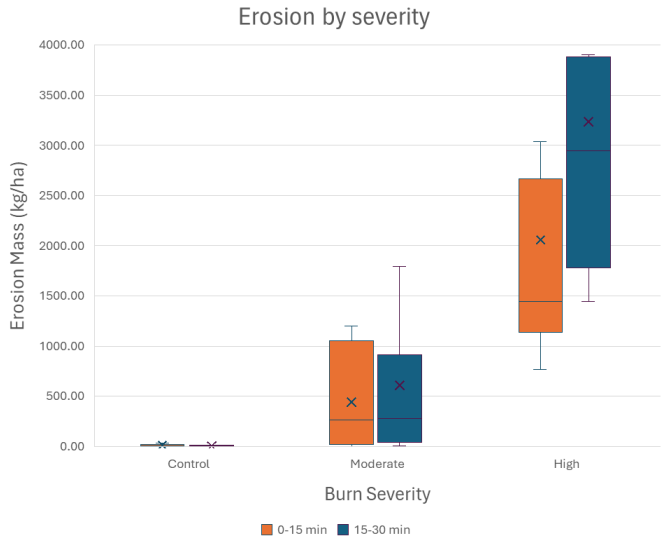
Wildfire work – funded by NEEF (phase 3)

- 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

Soil burn severity map for 2023 North Lucas Lake wildfire







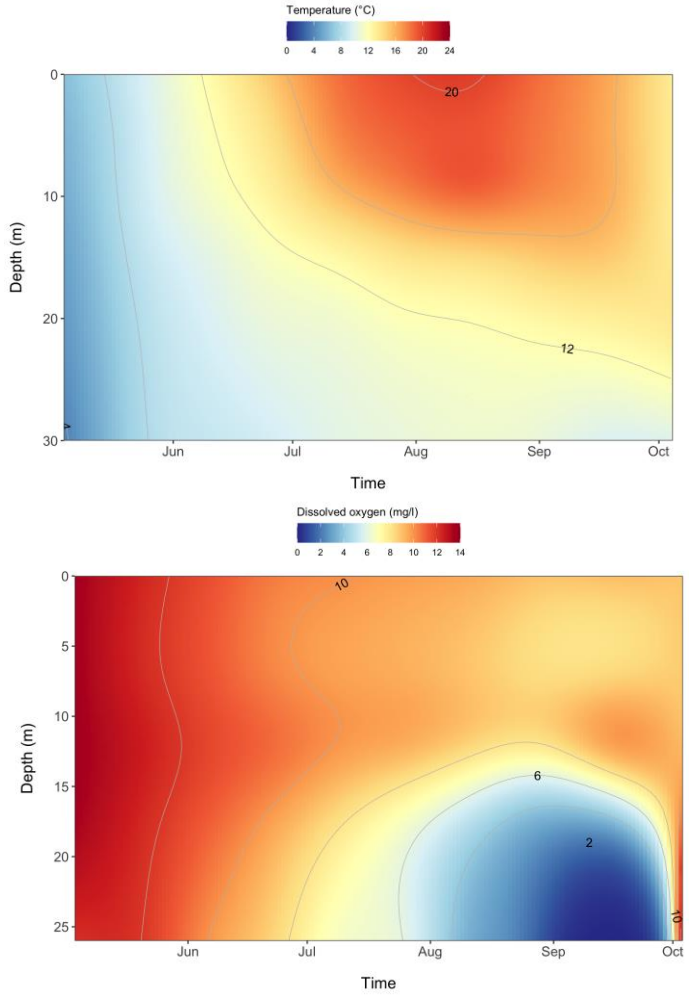
Results show greater runoff and erosion in higher burn severity areas. Developing a runoff and erosion risk map for the burned area.

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.

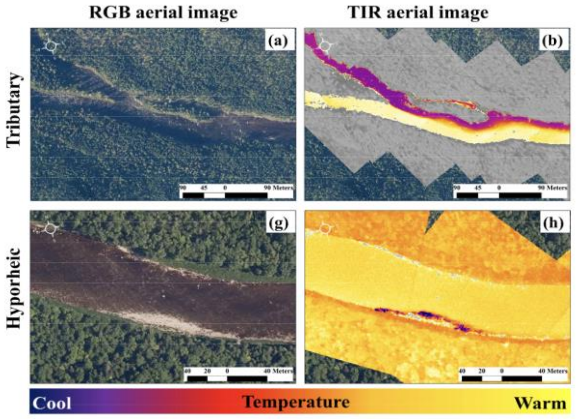
Completed data collection on oxythermal habitat use by burbot in Fraser Lake. Data analysis ongoing.



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.

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

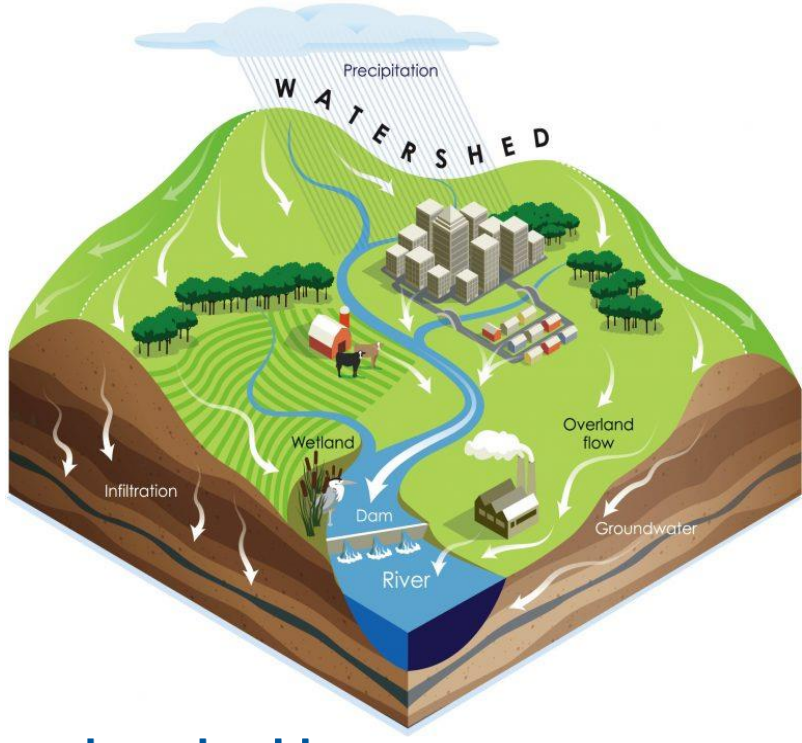
Linking across IWRG themes!

- 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.

NECHAKO WATERSHED ROUNDTABLE



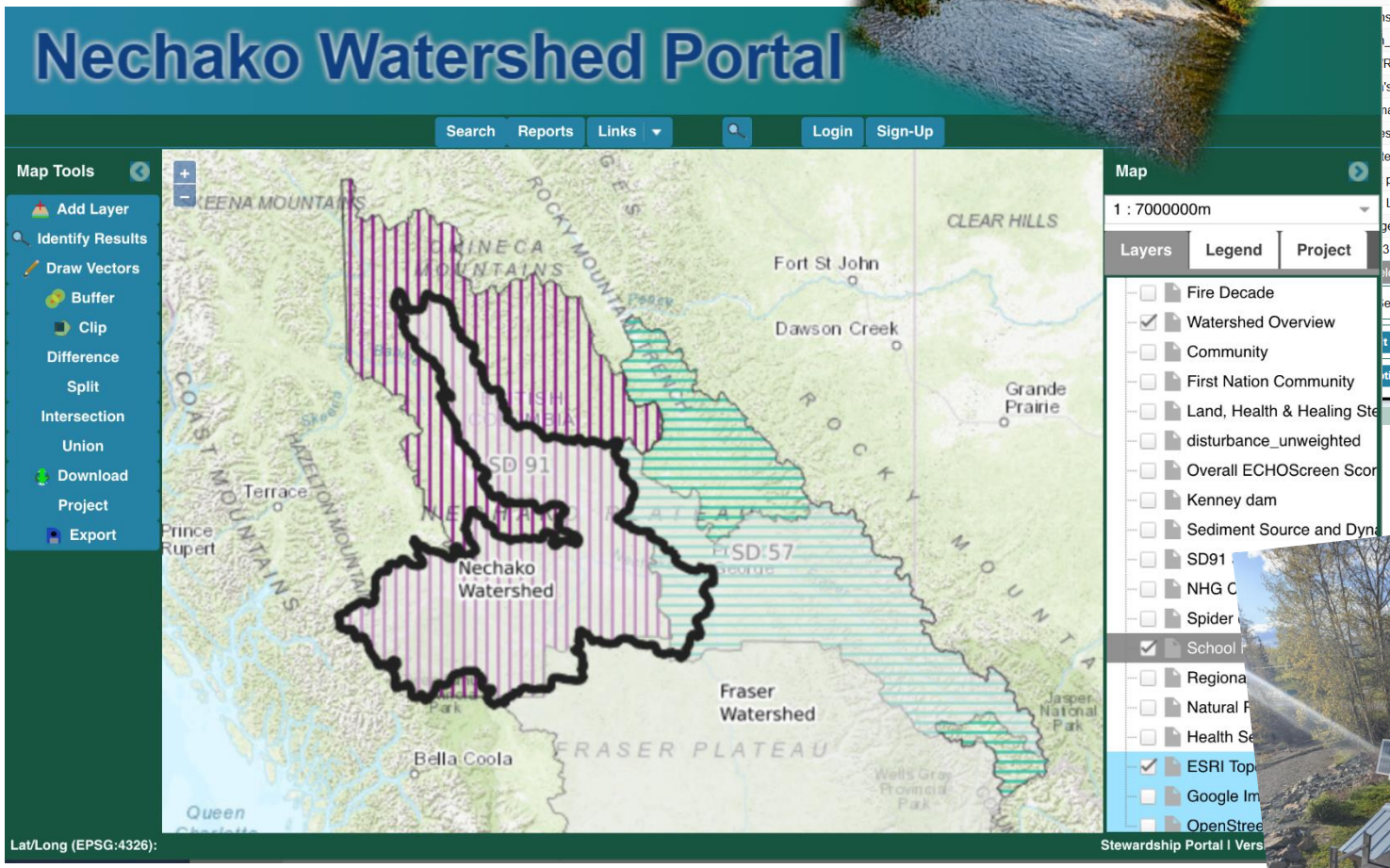
SCHOOL DISTRICT 91 NECHAKO LAKES

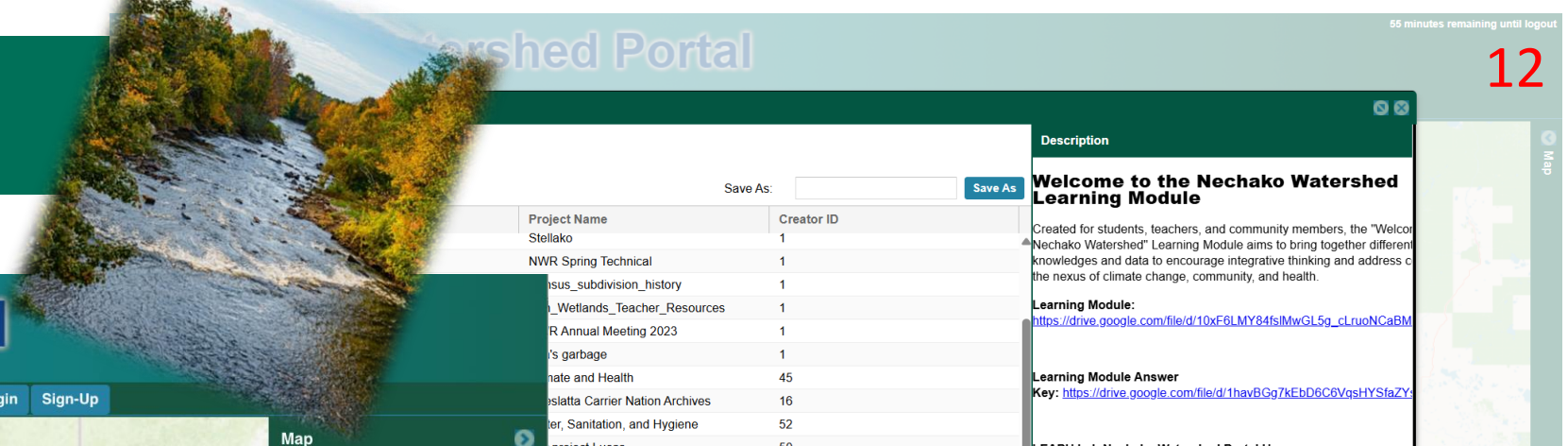
northern health
the northern way of caring

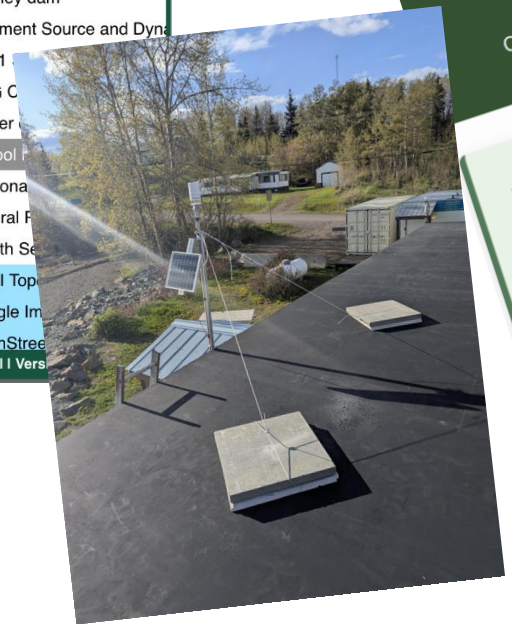
L.E.A.P.H
Learning from Eco-social Approaches to Public Health

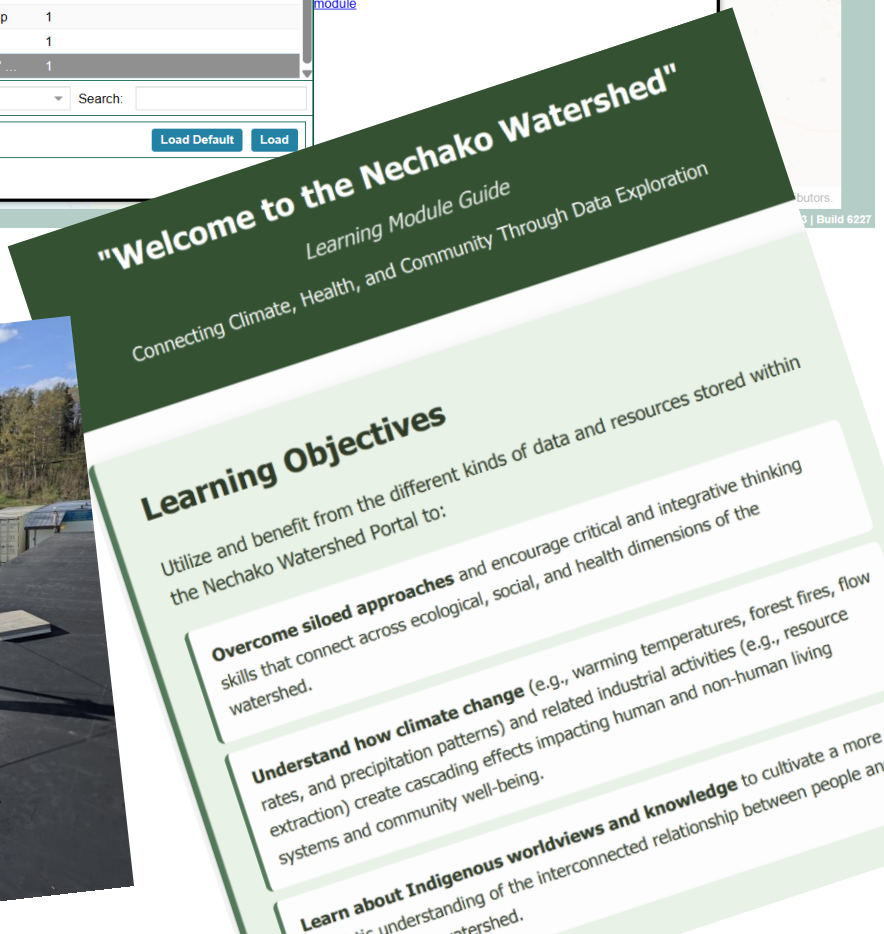
Image credit: accokeek.org.

The Nechako Watershed Portal









https://nechakowatershed-portal.ca/

Fostering knowledge exchange

Future plans for the IWRG

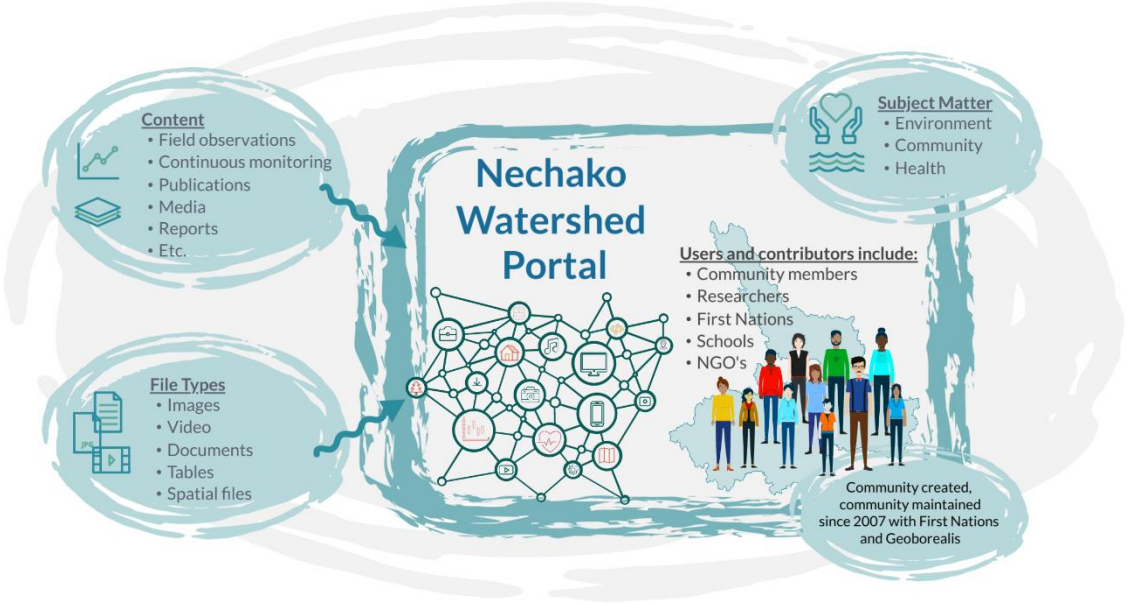
•2025 summer field season – site visits across the Nechako Watershed + possible AR field campaign

• 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


Francois Lake, May 2025



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