Nechako Research NEWSLETTER

December 2025 | Volume 7 | Issue 4

RIO TINTO RESEARCH CHAIRS

RioTinto | BC Works

Freshwater Fish Ecology Laboratory | UNBC

TERRITORIAL ACKNOWLEDGEMENT

Working on traditional First Nations territories in a scientific context is a humbling and deeply appreciated privilege. The opportunity to work hand-in-hand with Indigenous communities is a gift for which we are sincerely grateful. This collaboration not only enriches scientific understanding but also fosters mutual respect and cultural exchange. We are grateful for the trust and partnership extended to us, and we strive to approach this work with the utmost gratitude and responsibility. We acknowledge that our work takes place within the unceded traditional lands of 15 First Nations:

- Binche Whut'en
- Cheslatta Carrier Nation
- Lake Babine Nation
- Lheildli T'enneh
- Nadleh-Whut'en
- Nak'azdli Whut'en
- Nee-Tahi-Buhn Indian Band
- Saik'uz
- Skin Tyee Band
- Stellat'en
- Takla Lake
- Tl'azt'en
- Ts'il Kaz Koh (Burns Lake) Band
- Wet'suwet'en First Nation
- Yekooche First Nation

Netʃa koh (Nechako River) at Cottonwood Island Nature Park in Prince George

The Nechako River is referred to as Netʃa koh, meaning 'Big River' in the traditional language of the Dakelh Nations.

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HAPPY WINTER SOLSTICE AND HAPPY HOLIDAYS!

Stephen Déry

As autumn comes to an end, we now look forward to a snowy winter to replenish the storage of freshwater across the drought-stricken Nechako Watershed. The members of the Northern Hydrometeorology Group (NHG) and the Rio Tinto Research Chair (RTRC) in climate change and water security wish everyone very Happy Holidays! May this be a most pleasant and restful time with family and friends as we celebrate the conclusion of yet another year. Indeed, December 31st, 2025 marks (already!) the conclusion of the first year of the RTRC in climate change and water security's program of research.

Autumn did bring some moderate levels of precipitation across the Nechako Watershed along with a couple of windstorms, particularly in late October and early November. Indeed, it was an active storm / atmospheric river season bringing much needed precipitation to the Nechako Watershed. The Environment and Climate Change Canada (ECCC) weather station at Prince George Airport saw 71% of normal precipitation between September to November, while Skins Lake Spillway reported 52% of normal precipitation. Meanwhile, precipitation was quite abundant in the headwaters of the Nechako with the provincial snow pillow site at Tahtsa Lake up to 144% of normal snow accumulation by the end of November. If this pattern continues during the winter in association with La Niña conditions in the tropical Pacific Ocean, then perhaps we will have more substantial replenishment of water during the 2026 spring freshet across the Nechako Watershed including the reservoir area.

Research contributions from the NHG in this issue of the newsletter cover a wide range of topics. First, Research Associate Hadi Sanikhani presents his research looking at relationships between large-scale oscillations in sea-surface temperatures (SSTs) in the Pacific Ocean, such as El Niño Southern Oscillation (ENSO) and seasonal water temperatures in the Nechako Watershed. As there is generally a lagged response between seasonal water temperatures to longer-term varying SSTs, there may be the possibility of undertaking seasonal predictions of waterways draining the Nechako Watershed. Research Skills Development Trainee Devin Wittig reports on his investigation of the response of water temperatures in the headwaters of the Nechako Watershed to landfalling atmospheric rivers. Meanwhile, Data Manager Maziyar Dowlatabadibazaz provides an update on his efforts to assemble, quality control and archive all of the water temperature and meteorological data collected by the team. With nearly two decades of data at some field sites, this is proving to be a massive undertaking to ensure our datasets remain accessible to other researchers and partners across the globe. Finally, Dylan Broeke provides an update on recent field activities conducted across the Nechako Watershed including the installation of a Snowfox sensor at the Huckleberry Mine weather station to measure snow water equivalent (SWE) in partnership with Rio Tinto and Imperial Metals.

Nechako River

My one-year sabbatical continued this past fall, allowing more time to focus on research, supervision of graduate students and other researchers, meetings with various partners and other administrative duties. In September, an extensive final report was submitted to the Natural Sciences and Engineering Research Council of Canada (NSERC) outlining all of the accomplishments and deliverables completed under the NSERC / Rio Tinto Industrial Research Chair in climate change and water security. Then, during the first three weeks of October, I had the distinct pleasure of working out of UNBC's Northwest Campus in Terrace, BC. This allowed me to work on our weather station deployed on the rooftop of the building, and to meet partners at Rio Tinto and Ecofish Research / Trinity Consultants to discuss recent progress on several projects. By late October into November, the focus shifted to several research initiatives including an analysis of water temperatures across BC and Southeast Alaska during 2019-2024 and disseminating our research findings at various meetings and workshops.

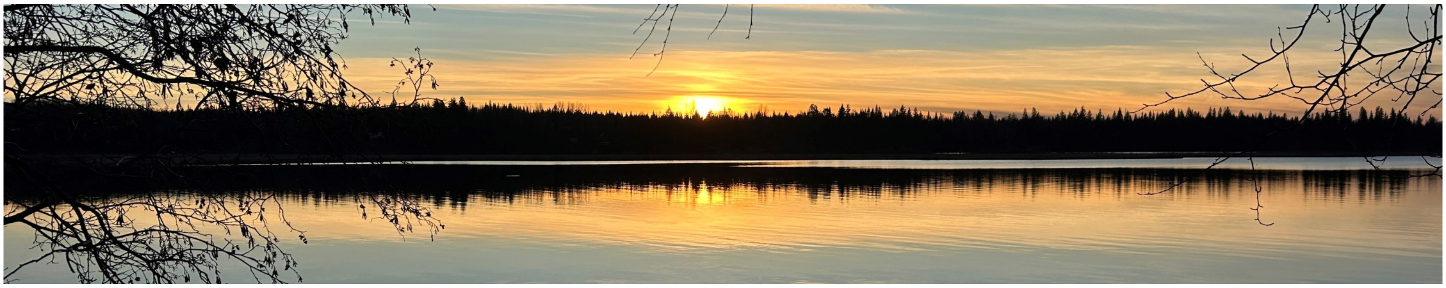
The outreach section of this newsletter provides information on a recent presentation I delivered at the Northern BC Stream Temperature Symposium on our continued efforts to improve water temperature monitoring and research in the Nechako Watershed. As well, I delivered a brief update on recent progress by UNBC's Integrated Watershed Group (IWRG) on integrated watershed research at the Nechako Watershed Roundtable's annual meeting in October and the Main Table meeting of the Water Engagement Initiative in early December. You will also find a list of recent media interactions and other community engagement activities. This includes details on an outreach activity conducted by field crew leader Dylan Broeke in the Robson Valley. As well, several members of the team had oral and poster presentations at various meetings this fall.

This autumn, we welcomed one new member to the RTRC team, Dr. Mehdi Bateni (see bio later in the newsletter). Dr. Bateni began his position of Research Associate on December 1st and will tackle a project looking at the recent drought (2022-2025) across the Nechako Watershed. Congratulations are also in order for MSc student Justin Kokoszka who successfully defended his MSc thesis on December 8th. Justin will remain in the team this coming winter as a Research Skills Development Trainee and investigate the water budget of the Nechako Watershed in the context of a changing climate. In January and February 2026, the NHG will also host Duane Noel, a PhD candidate at Concordia University in Montreal, as an intern. Duane will be introduced to the topic of atmospheric rivers and this will better prepare him for his doctoral research at Concordia that focuses on floods in eastern Canada.

The start of the New Year will be busy for the RTRC team as on January 16th we will have our first meeting with the new Science Advisory Board (SAB) that oversees the progress with our programs of research. We are most grateful to all seven members of the SAB for their willingness to participate in this important process to ensure our work progresses in a satisfactory manner.

Wishing everyone very Happy Holidays! All the best in 2026!

Stephen Déry



Ness Lake

NHG TEAM

Dr. Stephen Déry is the Rio Tinto Research Chair in Climate Change and Water Security.

Rio Tinto Research Chair team members from the Northern Hydrometeorology Group.

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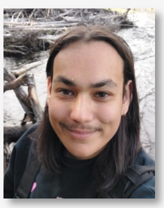
Post-Doctoral Fellow

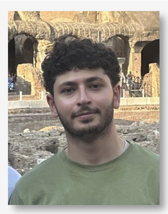
Erica Lee
Research Manager
Newsletter Editor

Justin Kokoszka
M.Sc. Candidate

Dylan Broeke
Field Manager



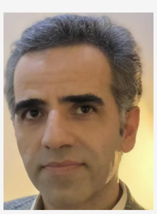
Kainen Parmar
M.Sc. Student



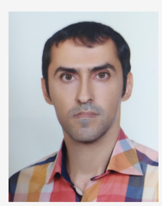
Maziyar Dowlatabadibazaz
Data Manager

Nisarga Sharma
M.Sc. Student

Devin Wittig
Research Skills Development Trainee



Hadi Sanikhani
Research Associate



Mehdi Bateni
Research Associate

NHG TEAM UPDATES

New team member!

Mehdi Bateni

Hello everyone! My name is M. Mehdi Bateni. I hold a PhD in Water Resources Engineering and a postdoc from IUSS (Italy). My work focuses on modeling hydrological extremes under non-stationary conditions and assessing climate change impacts. I combine advanced programming, geospatial tools, process-based models, multivariate statistics, and machine learning to improve water security decision-making in data-scarce basins. I welcome collaboration with researchers and practitioners on resilient, climate-adaptive watershed management. I'm excited to contribute my hydrological modeling and statistical expertise to the Northern Hydrometeorology Group, enhancing the Nechako Research team's water security and climate resilience work through collaborative watershed management solutions.

Prince George

LINKING LARGE-SCALE CLIMATE TELECONNECTIONS TO RIVER WATER TEMPERATURES IN THE NECHAKO WATERSHED (NSERC ALLIANCE PROJECT)

Hadi Sanikhani

Rivers in northern British Columbia are very important for salmon and other aquatic life. Even modest variations in temperature can lower oxygen levels and stress fish populations [1]. This study looks at how climatic trends from the Pacific Ocean affect the temperature of river water in the Nechako Watershed. This will help us protect these ecosystems and plan for the future.

What are teleconnections?

Climate teleconnections are broad climate patterns that link weather and climate conditions across far-distant regions of the Earth. The El Niño–Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) are two important ones. When ENSO is in its positive phase, called El Niño, it usually makes British Columbia warmer and drier. When it is in its negative phase, called La Niña, it usually makes the weather cooler and wetter. The positive phase of PDO also makes the region warmer, while the negative phase makes the weather cooler. These patterns can vary the temperature of the air and the amount of snow on the ground in western Canada. This can then change how warm or cool rivers get. Understanding this connection helps us predict when fish might face challenging conditions and act early to protect them [2].

Data and method

We utilized 75 years of daily river water temperature data (1950–2024) from the Air2Stream model [1]. The U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Indices database (https://psl.noaa.gov/data/climateindices/list/) provided the ENSO and PDO data. Long-term pattern-matching tools let us figure out when and how these climate signals change the temperature of rivers. Figure 1 shows the study region, which is the Nechako Watershed, and the monitoring stations that were looked at in this investigation.

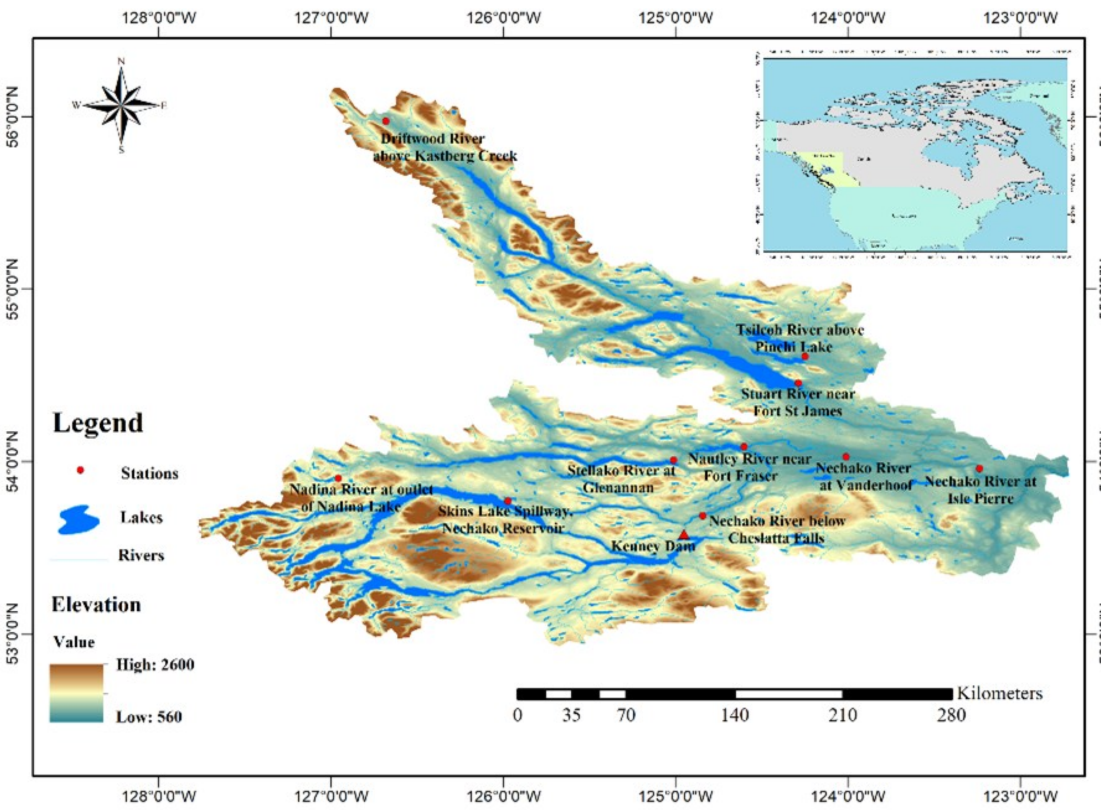


Figure 1. The Nechako Watershed and the river temperature monitoring sites that were employed in this investigation

Major Outcomes

The ENSO causes river temperatures to change in the short term. When El Niño emerges, rivers are usually warmer, and when La Niña occurs, they are usually cooler. The PDO shows a stronger and longer-lasting influence on temperature variations. Its positive phases usually coincide with warmer periods in the watershed, while negative phases align with cooler conditions. Figure 2 shows this general pattern, which shows that PDO has a stronger and longer-lasting effect on river temperature variability. Figure 2 illustrates the variations in river water temperature between positive and negative PDO phases among the monitoring stations involved in this study, emphasizing PDO's more pronounced and enduring impact on river temperature variability.

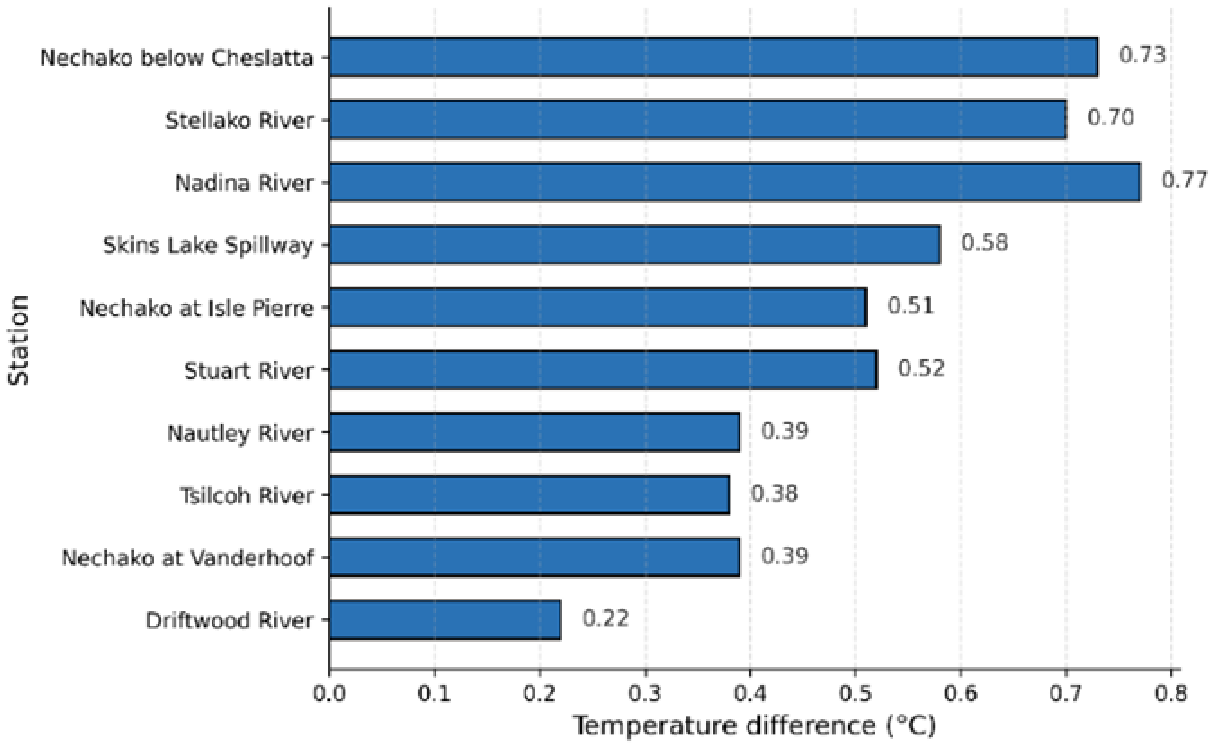


Figure 2. Differences in Summer river water temperature between positive and negative PDO phases

Management consequences and future steps

These findings provide water managers with practical guidance. When climate indicators suggest a positive phase of the PDO or an El Niño event, early adjustments in reservoir operations and enhanced temperature monitoring can help maintain suitable conditions for salmon and other aquatic species. Such proactive measures support the Nechako Summer Temperature Management Program and strengthen long-term watershed resilience. The next stage of this research will integrate snowpack information to examine how winter accumulation influences these temperature responses. The main goal is to build a simple and reliable tool that turns global climate signals into local river temperature forecasts. This will allow managers to get ready for problems and take action quickly to manage watersheds in a way that is sustainable.

References

[1] Khorsandi, M., & Déry, S. J. (2025). A novel method for frequency analysis of high water temperatures using temperature duration curves in a partially regulated watershed. Science of The Total Environment, 968, 178863.
[2] Mantua, N. J., & Hare, S. R. (2002). The Pacific decadal oscillation. Journal of Oceanography, 58(1), 35-44.

ATMOSPHERIC RIVERS AND STREAM RESPONSE AT LAVENTIE CREEK

Devin Wittig

Atmospheric rivers (ARs) frequently impact coastal regions bordering the Pacific Ocean, including British Columbia, where they can strongly influence temperature, precipitation, and streamflow patterns. While they often make headlines along the coast, these storms also reach well into the interior and can influence watersheds such as the Nechako. Laventie Creek, in the upper Nechako Watershed (Figure 3), is one place where we can see how these storms affect small northern streams. By combining water temperature measurements from NHG with discharge data from the Water Survey of Canada, we can track how Laventie Creek responds when an AR passes through.

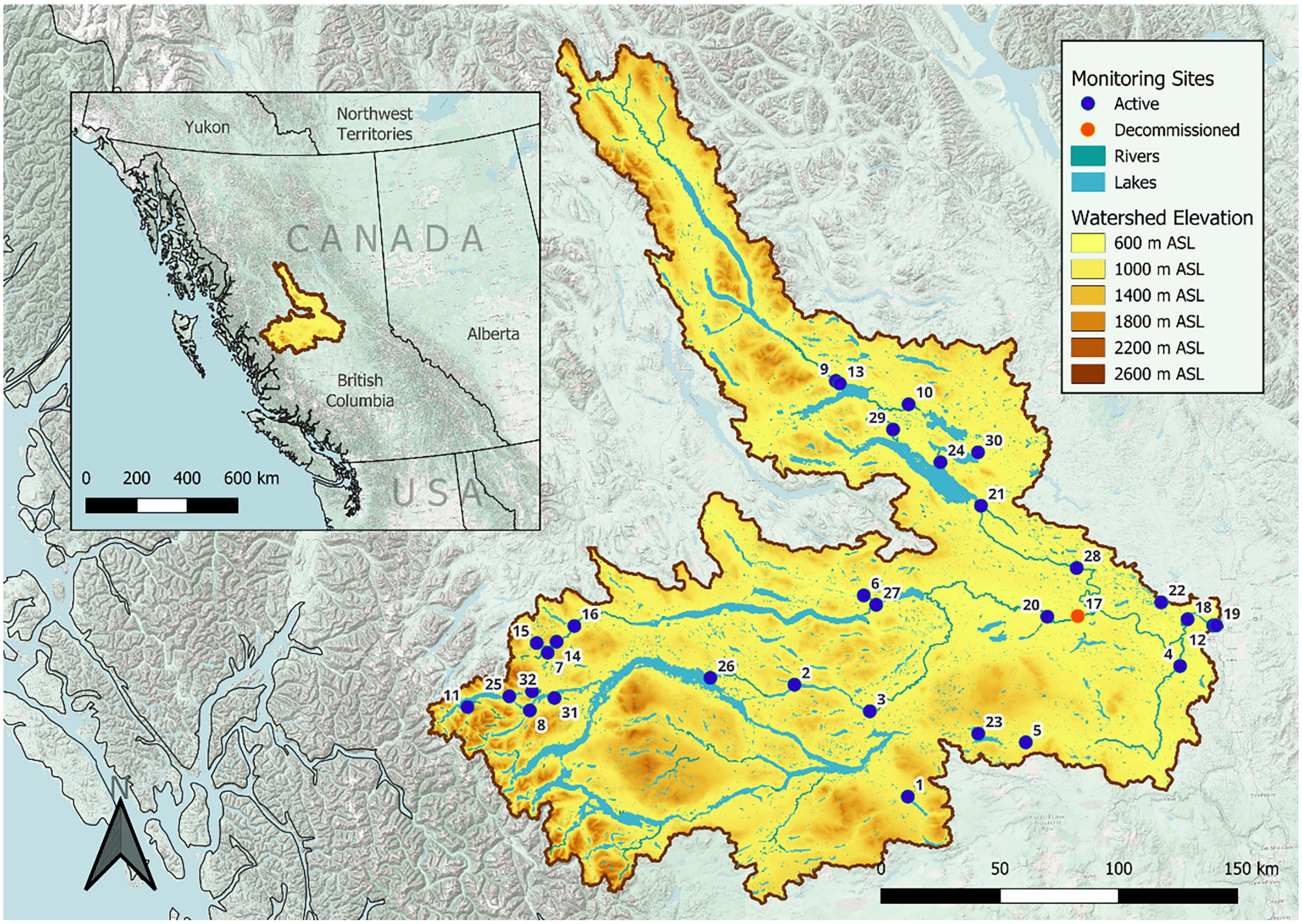


Figure 3. Map of the Nechako Watershed, showing elevation, major rivers and lakes, and active water temperature (WT) monitoring sites (blue circles) operated by the Northern Hydrometeorology Group (NHG). Laventie Creek, represented by point 11 on the far western side of the Upper Nechako Reservoir, is one of the WT sites where continuous water temperature records are paired with Water Survey of Canada streamflow data. Map developed by Kokoszka et al. (2025).

2024 Monitoring Season and Observed AR Events

Between 15 September and 15 October 2024, the Global Ensemble Forecast System (GEFS) detected four atmospheric river (AR) events affecting Laventie Creek. Figure 4 shows the interaction between stream discharge, water temperature, and AR activity during this period. Each shaded green bar represents an AR event that coincided with a sharp, short-lived increase in discharge (blue line) recorded by the Water Survey of Canada discharge station. Discharge rose rapidly during the late September and mid-October AR events, peaking one to two days after the AR began. Water temperature (red line) showed brief fluctuations, followed by a steady seasonal cooling trend. Together, these observations illustrate how ARs can drive pronounced hydrologic and thermal responses in small northern headwater streams, with potential implications for fall-migrating fish in other regional watersheds where species such as salmon, kokanee, and trout depend on stable flow and temperature conditions during their seasonal movements.

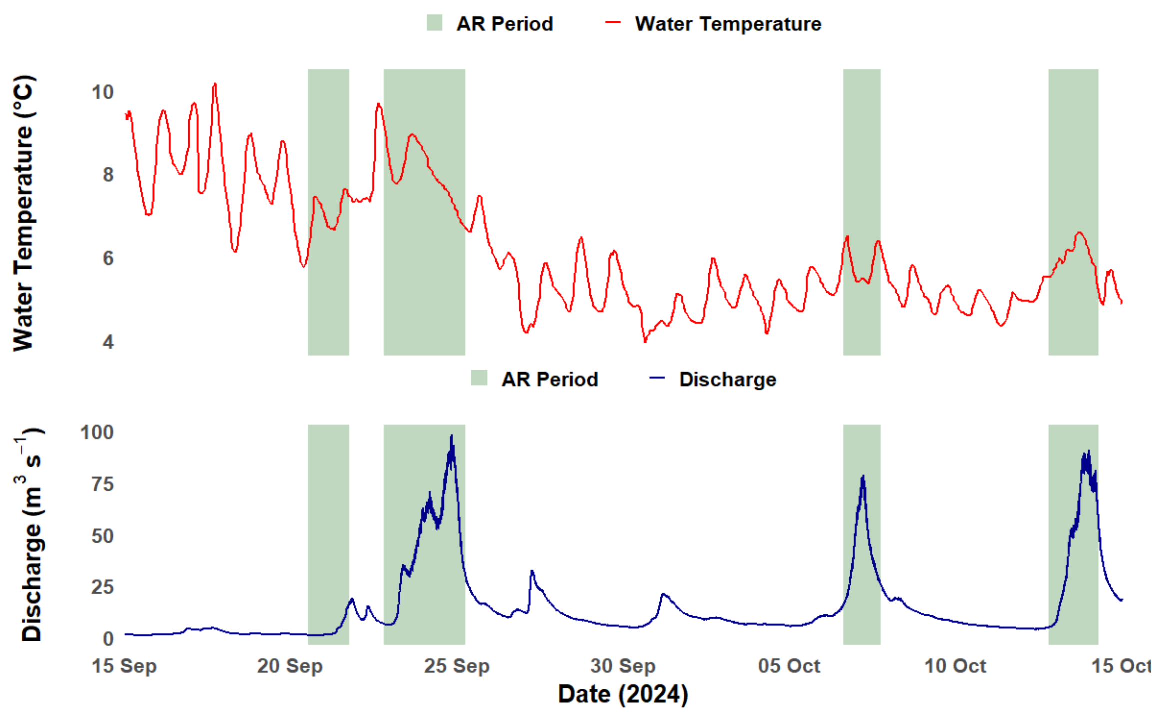


Figure 4. Water temperature (red) and discharge (blue) at Laventie Creek from 15 September–15 October 2024. Green shading marks atmospheric river (AR) events detected by the Global Ensemble Forecast System (GEFS).

Ongoing Collaboration in the Upper Nechako

To expand on this work, Dr. Phil Owens and Dr. Kristen Kieta at UNBC are examining how AR events over the 2024 and 2025 fall seasons affect sediment transport in the upper Nechako. Water and sediment samplers were installed at Rhine and Whiting Creeks near Huckleberry Mine, complementing NHG's temperature sensors and meteorological observatory. All of these data will be analyzed in the coming months to better understand how ARs shape sediment and water fluxes to the Nechako Reservoir.

Acknowledgments

Special thanks to Dr. Bruno Sobral for acquiring and processing the fall 2024 atmospheric river dataset, which made this analysis possible.

LEGACY DATA COLLECTION AND ENGINEERING

Maziyar Dowlatabadibazaz

Recent data management efforts have included standardizing and reprocessing our historical environmental data. Our goal is to make legacy data more accessible, reliable, and easier to use for future analysis, plotting, and quality assurance/control (QA/QC).

Standardization and Compilation

Our research group has been collecting environmental data for two decades, with some sites going back to 2006, and some being no longer active. In recent years (post-2023), we have adopted using the tablet application "Fast Field" to standardize our data collection and data download procedures. This new system ensures that all metadata and data are logged rigorously, where each data download is supported with a report that can help explain certain problems with the collected data.

However, our historical data (pre-2023) was collected using a variety of methods and loggers. This has resulted in several challenges:

- **Inconsistent Formats:** Data are spread across hundreds of different files, including various Excel (.xlsx, .xls) and CSV formats.
- **PST (Pacific Standard Time) vs PDT (Pacific Daylight Time):** Some CSV files were converted to PST while others remained PDT, which would result in inconsistencies when merging two data files.
- **Irregular Naming:** The same measurement (e.g., battery voltage) might be labeled "BattV," "Batt_V," or "Battery" in different files from different years.
- **Irregular Timestamps:** Data were often recorded at inconsistent intervals, with gaps or duplicate entries, making it difficult to plot or analyze over time.
- **Scattered Documentation:** Old QA/QC notes, site visit logs, and other important context were often stored separately or behind layers of folders.

TOA5	CR1000_TatukLake	CR1000	73481	CR1000.Std.28.02	CPU:TatukLakeFinal_Nov5_2015.CR1	18379	Table1									
TIMESTAMP	RECORD	BattV	AirTC_Avg	RH	Rain_mm_Tot	WS_ms_Avg	WS_ms_Std	WindDir	WindDir_Avg	DT	Q	TCDT	DBTCDT	BP_mbar	T109_C	T109_C_2
TS	RN	Volts	Deg C	%	mm	meters/second	meters/second	degrees	degrees					mbar	Deg C	Deg C
		Smp	Avg	Smp	Tot	Avg	Std	Smp	Avg	Smp	Smp	Smp	Smp	Smp	Smp	Smp
2021-05-01 00:00:00	191418	12.92	1.914	79.14	0	0.102	0.197	11.18	227.7	229.1	205	229.7	5.298	905.2245	-1.475	6.233
2021-05-01 00:15:00	191419	12.89	1.507	80.3	0	0.238	0.245	221.9	204.8	230.5	191	230.8	4.154	905.275	-1.133	6.244

Figure 5. 2021 Tatuk Lake site data prior to compilation.

TIMESTAMP	RECORD	Batt_V	AirTC	RH	Rain_Tot	WS_Avg	WS_Std	WindDir	WindDir_Av	DT	Q	TCDT	DBTCDT	Pressure	T109_1	T109_2
(PDT)		(volts)	(°C)	(%)	(mm)	(m/s)	(m/s)	(degrees)	(degrees)	(cm)		(cm)	(cm)	(mb)	(°C)	(°C)
5/1/2021 0:00	191418	12.92	1.914	79.14	0	0.102	0.197	11.18	227.7	229.1	205	229.7	5.298	905.2245	-1.475	6.233
5/1/2021 0:15	191419	12.89	1.507	80.3	0	0.238	0.245	221.9	204.8	230.5	191	230.8	4.154	905.275	-1.133	6.244
5/1/2021 0:30	191420	12.86	1.679	78.87	0	0.599	0.333	232.1	239.5	230.5	194	230.7	4.334	904.9513	-1.613	6.255

Figure 6. 2021 Tatuk Lake site data post compilation.

Standardization Process

We are working through the data for each research site separately, which allows us to have custom and changeable codes for each site. The process follows four key steps:

1. **Standardize Column Names:** We first create a single "master template" for each site. Then, we scan through all the files and rename inconsistent column headers.

2. **Compilation:** All the individual standardized files for a site are "stitched together" into one continuous file. During this step, the process removes any duplicate time entries and rows, and we ensure that time zone conversions are in PDT for all files.

3. **Consistent Timeline:** The process creates a clean, consistent timeline for the entire dataset, with one entry every 15 minutes. Times that are not in 15-minute format are rounded to their closest quarter-hour. If no data exist for a specific 15-minute slot, a blank "NaN" (Not a Number) value is inserted. This prevents gaps in graphs and makes the data much easier to analyze for future work.

4. **Archive and Document:** As we process the data, we are also centralizing all related historical documentation. Previous logs, old quality assurance quality control notes, and relevant wiki entries are being collected and placed into the same organized folder as the newly cleaned data. This creates a single, complete archive for each location.

Flexibility

This system has been designed to be both robust and flexible. Each research site has its own dedicated processing script. This approach means we can easily customize the output for specific research needs. If a project requires a unique measurement, a different set of column names, or a special format, we can modify the script for that specific site without affecting data processing for any other location.

Data Requests

We are actively processing sites, but you can request historical data at any time. The final cleaned files are available for plotting, analysis, and further QA/QC. For data requests, please email the specific site, time span, meta-data or any variables of interest to:

- Maz Dowlatabadibazaz (Data Manager): dowlataba@unbc.ca
- Stephen Déry (Project Leader): sdery@unbc.ca

FALL FIELD SEASON UPDATE

Dylan Broeke

As the weather gets colder and fall comes to an end, field work continues. One of the main accomplishments of this fall was the addition of the SnowFox Snow Water Equivalence (SWE) sensor at Huckleberry Mine near Houston, BC. The SnowFox sensor was supplied by Avison Management Services, an environmental consultant based in Vanderhoof, BC, and deployed by Dylan and Dr. Kristen Kieta (Figure 7). The count data of the SnowFox are displayed on the live server that NHG collaborator Hadleigh Thompson from UQAM (Quebec) built. The Snow Water Equivalence (SWE) is calculated by combining the SnowFox data and the barometric pressure from the ClimaVue50 on the NHG's weather station. While at the mine, Dylan collected NHG water temperature data from local creeks and streams.

Figure 7. Deployment of SnowFox sensor.

Figure 8. Huckleberry Mine. Left to Right: Weather Station, Parsivel Disdrometer, Micro Rain Radar.

During the fall, Data Manager Maz Dowlatabadibazaz and Dylan conducted data downloads at water temperature sites and weather stations, including our newest weather station at Isle Pierre (Fig 9). Due to low water levels, some rivers like the Stuart River left our data logger exposed on the beach. These specific sites were deployed back into the water. Dylan was also able to go out to the Stellat'en First Nation and meet with Isaiah Reynolds, Stellat'en Fisheries Coordinator to redeploy a water temperature logger back into the Stellako River. Due to this year's high salmon return, many tourists visited the river and tampered with the logger. From this, Dylan pulled out the logger earlier in the fall and redeployed it in a more secure spot. In addition to redeploying the Stellako River water temperature logger, Isaiah and Dylan redeployed the Nithi Creek water temperature logger back in the water, as it too was left on the beach from low water levels.

Figure 9. Isle Pierre Weather Station.

FFEL UPDATE

Eduardo Martins

This fall marked the successful conclusion of the 2025 field season for our ongoing research on rainbow trout thermal ecology in the Stellako River. The study, led by FFEL's MSc students Carly Walters and Allison Pugh, focused on how rainbow trout interact with an increasingly variable and warming thermal environment and the behavioral strategies they use to cope with temperature changes.

Throughout the summer, Carly and Allison worked long hours deploying equipment, mapping thermal habitats using a drone and numerous temperature loggers, tagging fish with acoustic and radio transmitters, servicing telemetry stations that were continually listening to information sent by the transmitters (presence of a fish ID, body temperature, fish depth, and fish activity), and swimming down the Stellako to count rainbow trout in different habitats using snorkel survey techniques. Carly and Allison are now starting to process all these data to quantify how rainbow trout exploit thermal habitats and potential thermal refuges (patches of cooler water in the river) to regulate their body temperature, and how they respond behaviourally to changes in the Stellako temperatures throughout the summer.

In this issue of the newsletter, they share some insights of their initial exploration of the collected data. As they transition into more in-depth data analysis this winter, they will focus on processing drone imagery and temperature logger data to produce a high-resolution thermal map of the river, as well as the telemetry and snorkel survey data to quantify thermal habitat use. In 2026, Carly will also conduct thermal preference experiments to determine preferred temperature ranges for the Stellako rainbow trout. This will be combined with the river and body temperature collected this past summer to assess how effectively rainbow trout managed to maintain their body temperatures within their preferred range, given the availability of thermal habitats in 2025.

This has been one of the most enjoyable and rewarding field projects I have ever participated in. I joined Carly and Allison in their snorkel surveys and was amazed by not only by seeing the rainbow trout going about their daily activities underwater, but also by how alive, beautiful, and diverse the Stellako River is under the surface. We were lucky enough to also swim the river while the sockeye salmon were migrating and ending their journey from the Pacific Ocean to spawn in the Stellako and Nadina. These experiences gave me a much greater appreciation for life under water in the Stellako River and motivates me to make every effort to continue studying the fish that make this special river their home.

Stellako River

FFEL TEAM

Dr. Eduardo Martins is the Rio Tinto Research Chair in Climate Change and Freshwater Fish Ecology.

Rio Tinto Research Chair team members from the Freshwater Fish Ecology Lab.

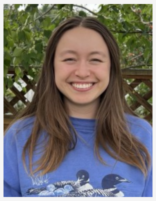
Freshwater Fish Ecology Laboratory | UNBC

Eduardo Martins

Project Leader

Melody Mah

Research Manager



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Kirsten Mathison

M.Sc. Student

Eliseu Peixoto

M.Sc. Student

Jonny Russell

M.Sc. Student

STELLAKO RIVER POST-FIELD SEASON UPDATE: THERMAL HABITAT USE AND THERMOREGULATION OF RAINBOW TROUT (*ONCHORHYNCHUS MYKISS*)

Carly Walters

Allison Pugh

The 2025 field season has concluded, celebrating a landmark in the Stellako River rainbow trout (*Oncorynchus mykiss*) thermal ecology study, which is investigating how rainbow trout interact with a changing thermal environment. As freshwater systems continue to warm, understanding of how cold-water species such as rainbow trout behaviourally thermoregulate to cope with heat stress is increasingly critical.

To accomplish this goal, we examined rainbow trout movement and temperature-related physiology during the warmest months of 2025. Our work combined thermal habitat mapping, fish-tracking technologies, and physiological monitoring to quantify how this population of rainbow trout utilize thermal habitats and maintain preferred body temperatures under thermally stressful conditions.

Thermal Habitat Assessment and Trout Response

Using a combination of temperature monitoring, drone-based thermal infrared (TIR) imagery, acoustic and radio telemetry, and snorkel surveys, we are investigating the relationship between rainbow trout and the thermal landscape of the Stellako River. Seventy-four water temperature monitoring stations, nine dissolved oxygen monitoring stations, and TIR flights will allow us to map fine-scale thermal heterogeneity and identify thermal habitats. The movement of 43 acoustically tagged rainbow trout was monitored using 26 acoustic telemetry stations and monthly snorkel surveys to determine when and where fish accessed different habitats during warm water periods to allow us (led by Allison) to investigate how the trout used thermal habitats. In addition, seven radio-telemetry stations tracked the habitat use and physiology of 45 radio tagged rainbow trout, that included internal temperatures, depth, and activity, to allow us (led by Carly) to quantify thermoregulatory effectiveness and assess how body size, thermal heterogeneity, diel cycles, and water temperature influences the energetic costs of coping with thermal stress.

Figure 10. Allison and Carly surgically implanting a telemetry tag into a rainbow trout in the Stellako River.

End of Season Summary and Next steps

The field season concluded successfully. All temperature loggers and telemetry stations operated reliably, a complete set of drone-based TIR imagery collected, and fish tagged were tracked throughout the monitoring period. Preliminary analysis of the water temperature data derived from the loggers demonstrates early season distribution of temperatures was low across the river, and became more variable as conditions progressed into warmer, low flow periods. We have explored the diurnal temperature distribution by river reach used with the radio telemetry data and observed that rainbow trout body temperatures were generally higher in comparison to the stream temperature during the day than during the night. The next phase of the projects will focus on processing drone imagery to develop a high-resolution thermal map, analyzing movement and physiological data from acoustic and radio telemetry, and modeling thermal habitat use and thermal regulation. In addition, thermal preference trials will be completed in Spring 2026 to define the preferred temperature range for the population.

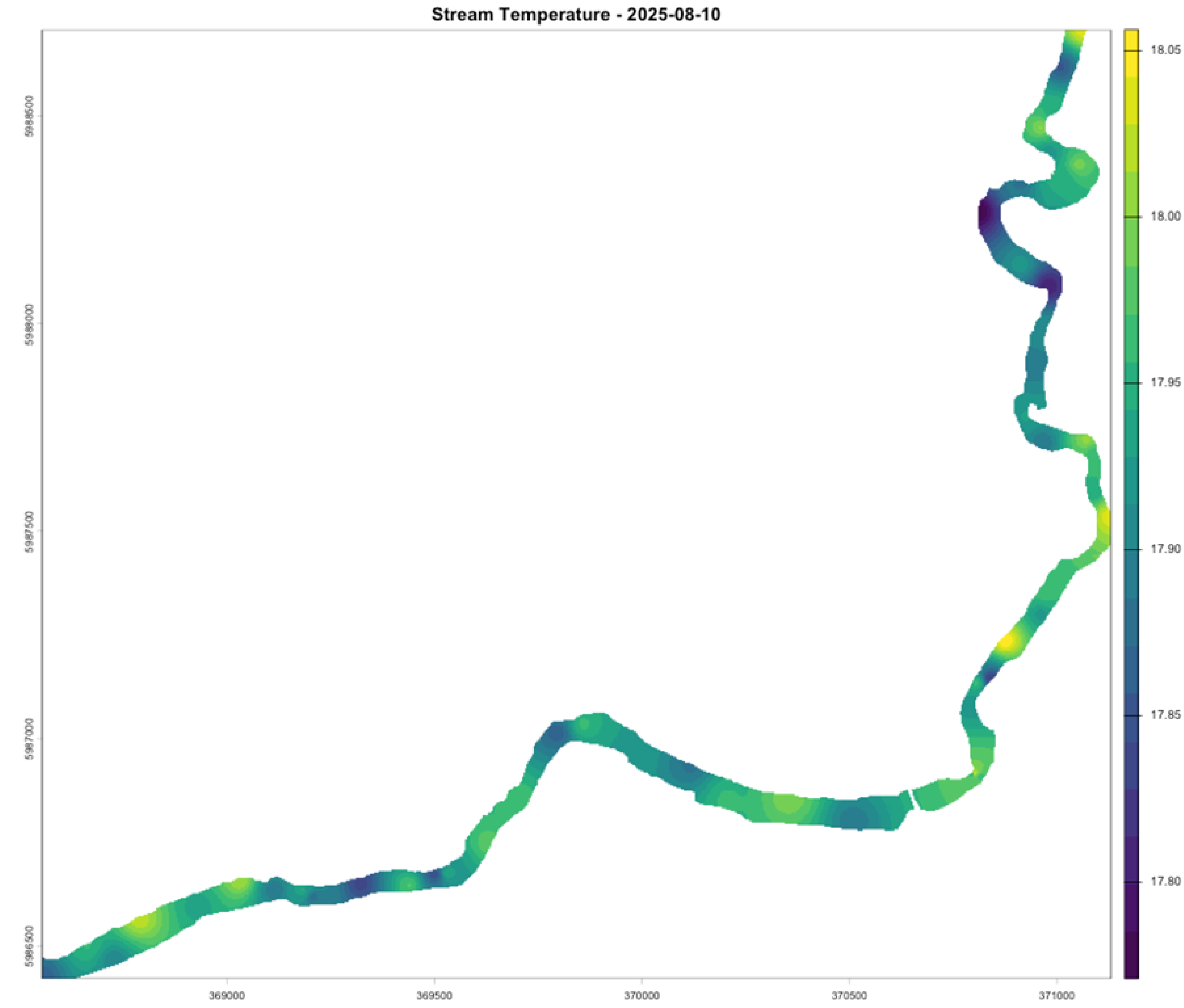


Figure 11. Distribution of the thermal habitat in the Stellako River for the bi-weekly period starting on August 10, 2025. Thermal habitat ranges from warmer (yellow) at 18.05 degrees Celsius, to cooler (purple) at 17.80 degrees Celsius

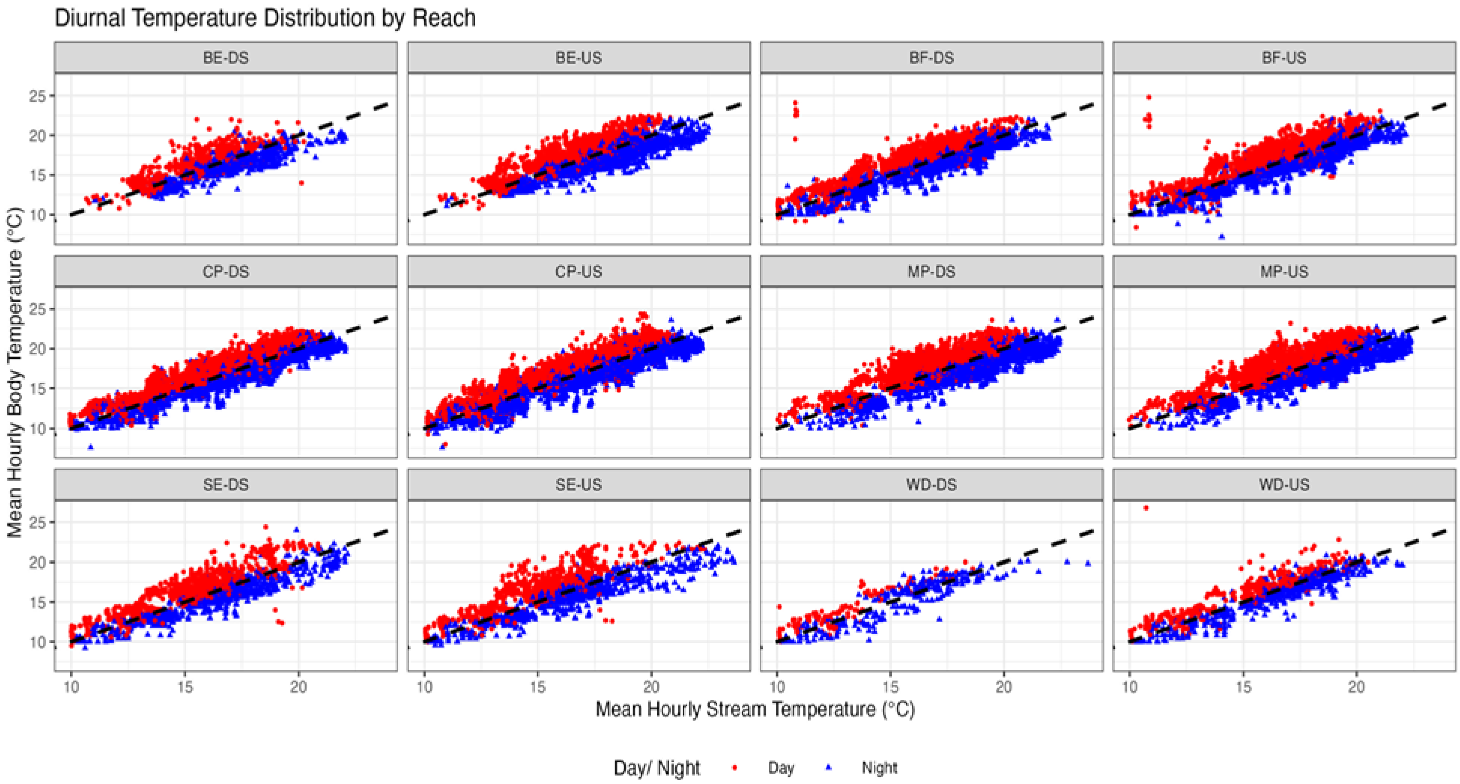


Figure 12. Diurnal distribution of body and stream temperature throughout the monitoring period, by reach.

Stellako River

OUTREACH

Communicating our findings through various means continues to be a top priority!

PUBLICATIONS

- Fleischmann AS, Papa F, Hamilton SK, Melack J, Forsberg B, Val A, Collischonn W, Laipelt L, Rossi JB, Andrade BCD, Mendel B, Alves P, Bandeira M, Custódio L, Gomes MC, Hymans D, Keppe I, Memdes R, Nascimento R, Silva PDS, Vieira C, Xavier R, Zumak A, Ruhoff A, Zhou W, Macintyre S, Martins EG, Filizola N, Marinho R, Severo EB, Frias M, Alquezar RD, Lauretto L, Gravena W, Coelho A, Chávez-Pérez H, Braz-Mota S, Chamy M, Moreira DM, Santos LG, Peleja JRP, Marmontel M. 2025. Extreme warming of Amazon waters in a changing climate. Science, **390**:606-611. https://doi.org/10.1126/science.adr4029

PRESENTATIONS

Northern Hydrometeorology Group

- Déry, S. J., Martins, E., Owens, P. and Parkes, M. (2025, October 14). Amplifying integrated watershed research in the Nechako River Basin: A progress update from UNBC's Integrated Watershed Research Group. Nechako Watershed Roundtable annual meeting, Prince George, BC.
- Khorsandi, M. and Déry, S. J. (2025, October 15). Long-term hindcasts and projections of stream temperature using the Air2Stream model: Applications in data-scarce watersheds, Workshop on process-based approaches to modelling stream temperatures , Université du Québec en Outaouais in Gatineau, Québec.
- Déry, S. J. (2025, November 20). Stream temperature monitoring and research in the Nechako Watershed, 2019-2025. Northern BC stream temperature symposium, UNBC, Prince George, BC.
- Sanikhani, H., Khorsandi, M. and Déry, S. J. (2025, November 20). From climate patterns to river heat: Exploring ENSO–PDO and stream temperature links in the Nechako Watershed. Poster presentation at the Northern BC stream temperature symposium, UNBC, Prince George, BC.
- Parmar, K., Déry, S. J., Jackson, P. J. and Spinola, D. (2025, December 5). Spatiotemporal variability of microclimates in the Vanderhoof Agricultural Belt, British Columbia, NRES 700 poster presentation, UNBC, Prince George, BC.
- Sharma, N. and Déry, S. J. (2025, December 5). Flavours of atmospheric rivers and hydrological response in British Columbia, NRES 700 poster presentation, UNBC, Prince George, BC.

Freshwater Fish Ecology Lab

- Martins, E. G. (2025, November 20). Thermal Ecology of Freshwater Fishes. Northern BC stream temperature symposium, UNBC, Prince George, BC.
- Walters, C. (2025, November 20). What Factors Influence Rainbow Trout (Oncorhynchus Mykiss) Thermal Ecology in the Stellako River? Northern BC stream temperature symposium, UNBC, Prince George, BC.
- Dextrase, A. (2025, November 20). Thermal Experience and Behavior of Nechako River White Sturgeon on Spawning Grounds. Poster presentation at the Northern BC stream temperature symposium, UNBC, Prince George, BC.
- Hirsch, L., Lee, E., Mah, M. and Pugh, A. (2025, November 28). Studying Fish at UNBC. Presentation at Girl Guides of Canada—1st Kelly Road Guides, Prince George, BC.

OUTREACH

Communicating our findings through various means continues to be a top priority!

MEDIA INTERACTIONS

- 2025/10/23—The 2025 summer wildfire season and meteorological conditions across northern BC, CKPG News, CKPG (Prince George, BC)
- 2025/11/24—Current low snowpacks in Prince George and impacts, CKPG News, CKPG (Prince George)

MEETINGS

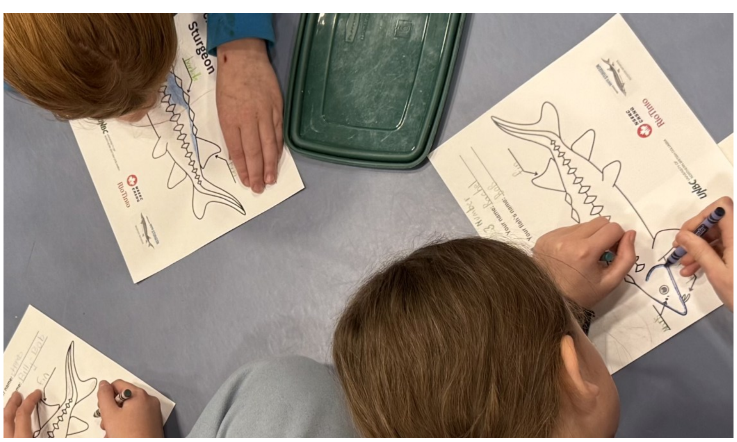
- On Monday 27 October 2025, Stephen met with Zita Botelho, CEO of the Fraser Basin Council (FBC), as well as with Kim Menounos (Senior Manager, Interior Regional Programs, FBC) and Jonathan Doyon (Nechako Watershed Roundtable (NWR) Core Committee member and UNBC Master's student) to discuss the ongoing partnership between FBC/NWR and UNBC.

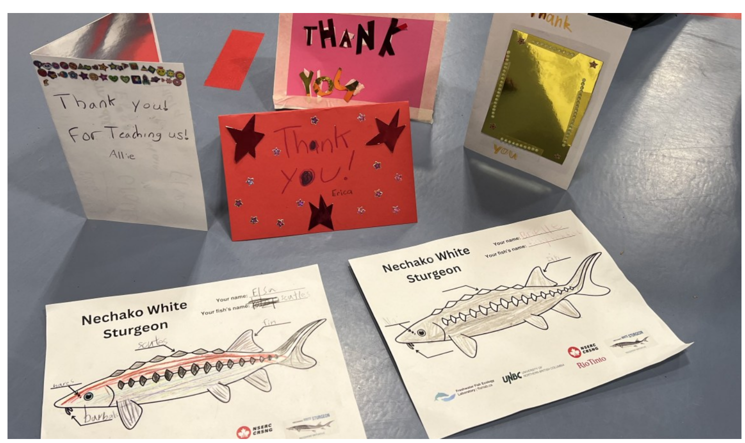
Ness Lake

OUTREACH—YOUTH ENGAGEMENT

On November 28th, FFEL members conducted a youth engagement activity in Prince George for a group of 18 Girl Guides, aged 8-12 years old. MSc Students Allie Pugh and Liz Hirsch, along with Research Managers Erica Lee and Melody Mah, delivered a presentation titled "Studying Fish at UNBC", exploring how and why we study fish at the FFEL. The Girl Guides dove headfirst into a snorkel survey slideshow, learning how to count and identify local fish species. After achieving pro-snorkeler status, the Girl Guides learned about other ways we study fish, including netting, trapping, angling, and tracking. At the end of the presentation, FFEL members asked the Girl Guides what the importance of studying fish is. Answers including "To protect endangered species", "To prevent overfishing", and "Because we care" were just a few among the choir of fabulous responses. After the presentation, the Girl Guides completed sturgeon themed activity sheets, and interacted with select scientific equipment hands-on, learning to take fish measurements, set up traps, interpret thermal maps, and much much more!

Thank you to the 1st Kelly Road Guides for being fin-tastic participants during our outreach night! A perfect evening filled with light, learning, and fun!






Sturgeon Anatomy Matching
Fin?
Scutes?
Nares?
Barbels?


FLOY TAG


Sturgeon Anatomy Matching
Fin?
Scutes?
Nares?
Barbels?
Nechako White Sturgeon

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