Nechako Research
NEWSLETTER

September 2026 | Volume 8 | Issue 3

RIO TINTO RESEARCH CHAIRS

RioTinto | BC Works

NHG Northern Hydrometeorology Group

Freshwater Fish Ecology Laboratory | UNBC

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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.

Contents

In this issue of the Nechako Research Newsletter, you will find updates from the current teams of researchers, including updates from the summer season and plans for the fall season.

September 30th is the National Day for Truth and Reconciliation. We wear orange to honour the thousands of survivors of residential schools. #EveryChildMatters

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FFEL Team

Freshwater Fish Ecology Laboratory | UNBC

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

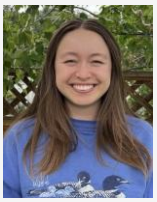
Rio Tinto Research Chair team members from the Freshwater Fish Ecology Lab.

Eduardo Martins

Project Leader

Melody Mah

Research Manager



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Samara Leake

M.Sc. Student

FFEL Team Updates

New Team Member

Samara Leake

Hello all! My name is Samara Leake and I am joining the FFEL Lab as a Master's student this fall. I previously completed my Bachelor of Science in Geography and Environmental studies at UVic in 2023. Since then, I have spent my time working on fish and wildlife projects with LGL Environmental Research Associates, and more recently with Fisheries and Oceans Canada. My research will investigate thermal tolerance of Chinook salmon eggs and fry in the Nechako River. I am really looking forward to joining the Nechako Watershed research community!

Prince George Sunflower Festival, Foreman Farms, Prince George

FFEL Updates

Eduardo Martins
Project Leader

This summer, PhD student John Gray completed the first thermal tolerance study on juvenile Chinook salmon (Oncorhynchus tshawytscha) in the Nechako River. Despite the well-documented decline of this threatened stock and the recognized importance of water temperature in limiting its productivity, we lacked empirical data on the thermal limits of juveniles rearing in the river. John's work addresses this gap directly, and in this issue he describes his field-based approach and the preliminary findings.

John conducted stream-side thermal tolerance trials adjacent to critical juvenile rearing habitat along the upper Nechako River. Conducting these experiments in the field (i.e., at the river itself rather than in a laboratory) avoided the transport and housing stress that can confound laboratory-based estimates and allowed trials to be conducted on fish acclimated to the temperatures they naturally experience. Trials were completed over two distinct periods: late May, approximately one month after peak juvenile emergence, and early July, capturing changes in thermal tolerance in response to seasonal warming. A total of 101 sub-yearling juveniles were tested across 27 trials, with all fish released back into the river after recovery from a non-lethal loss-of-equilibrium endpoint.

John's preliminary analyses estimated an overall critical thermal maximum (CTmax) of 28.1°C for juvenile Nechako Chinook, with CTmax increasing from 27.2°C during cooler conditions in late May to 29.1°C during warmer conditions in early July. While these CTmax values are well above temperatures that juveniles would encounter in the Nechako River, they are not the main focus of the study. The acclimation effect they reveal (i.e., the increase in thermal tolerance with prior exposure to warmer water) is ecologically informative, and the experimental design (i.e., exposing groups of fish to different warming rates) is what will allow us to develop a thermal death time (TDT) model that predicts temperature-driven mortality at the temperatures fish actually experience in the wild. This modelling framework parallels the approach being developed by Kirsten Mathison, Jonny Russell, Avery Dextrase, and Lucas Moura in their research, and together these projects will produce the first species-specific thermal mortality models for fishes of the Nechako watershed. We look forward to sharing the preliminary results of their work this summer in the upcoming issues of this newsletter!

Nechako River

The thermal tolerance of Nechako River Chinook salmon

John Gray
Ph.D. Student

Investigation of Threatened Nechako River Chinook salmon (Oncorhynchus tshawytscha) thermal tolerance was completed during the summer of 2026 to evaluate the effects of warming on juvenile survival. Ultimately, these data will enable the development of a model predicting temperature-driven mortality during natal residency. Such information is necessary for understanding bottlenecks to stock recovery and productivity, and will guide the development and implementation of local water management practices aimed at conserving this imperilled population.

Thermal tolerance trials were completed stream-side (i.e., field-based), adjacent to critical juvenile rearing habitat along the upper Nechako River. Typically these trials are completed in laboratories where animals (e.g., reptiles, amphibians, crustaceans etc.) can be housed and acclimated to a range of temperatures, an effect which typically alters individual thermal tolerance. While such an approach may allow for the control of critical factors (e.g., gut fullness and prior thermal exposure) it introduces transport and housing stress that is difficult to account for. Moreover, we were able to replicate acclimation effects by completing trials over two distinct periods of time. Repeat trials in late-May, approximately one month after peak juvenile emergence, and early-July, 2026 characterized changes in juvenile thermal tolerance in response to thermal acclimation (i.e., cool acclimation in May vs. warm acclimation in July).

Juvenile Chinook salmon captured from rearing habitat adjacent to the study site were immediately transferred to a 40L insulated container filled with water from the location of capture (Figure 1). Within the container, fish were housed separately in semi-permeable mesh containers to allow for the fish to be monitored individually (Figure 1). Following a 20min habituation period, water temperature within the container was warmed by a submersible heater at one of four set rates: 0.1 °C•min^{-1}, 0.2 °C•min^{-1}, 0.3 °C•min^{-1}, or 0.5 °C•min^{-1}. Temperatures were increased constantly from the temperature of capture to the temperature resulting in loss of equilibrium (LOE; i.e., temperature at which fish can no longer maintain body position in the water column), a non-lethal metric commonly used as a proxy for mortality. Upon LOE, individual fish were transferred to a cool container to recover and the temperature resulting in LOE and the time exposed to warming were recorded. After recovery, juveniles were released back into the river.

Figure 1. Visualization of the experimental set-up in which juvenile Nechako River Chinook salmon thermal tolerance trials were completed.

In total, 27 replicate trials evaluated the thermal tolerance of 101 sub-yearling (i.e., 0+) juvenile Chinook salmon during the summer of 2026 (12 trials and 47 juveniles in late-May and 15 trials and 54 juveniles in early-July). Preliminary analysis of these data aimed to estimate the critical thermal maximum (CTmax) of these fish, a value describing the upper thermal limit that organisms can endure and temperatures beyond which life cannot be sustained. Accordingly, we estimated that juvenile Nechako River Chinook salmon have an overall CTmax of 28.1 °C. As we expected, CTmax increased with acclimation temperature, tending to be lower during the early study period in late-May (CTmax = 27.2 °C) compared to the late study period in early-July (CTmax = 29.1 °C; Figure 2). Continued analysis of these data will evaluate the relationship between the intensity of thermal exposure (i.e., rate of warming) and the time of exposure, to parameterize a thermal death time (TDT) model that will provide the ability to predict temperature-driven mortality from thermal condition experience by the fish in the wild.

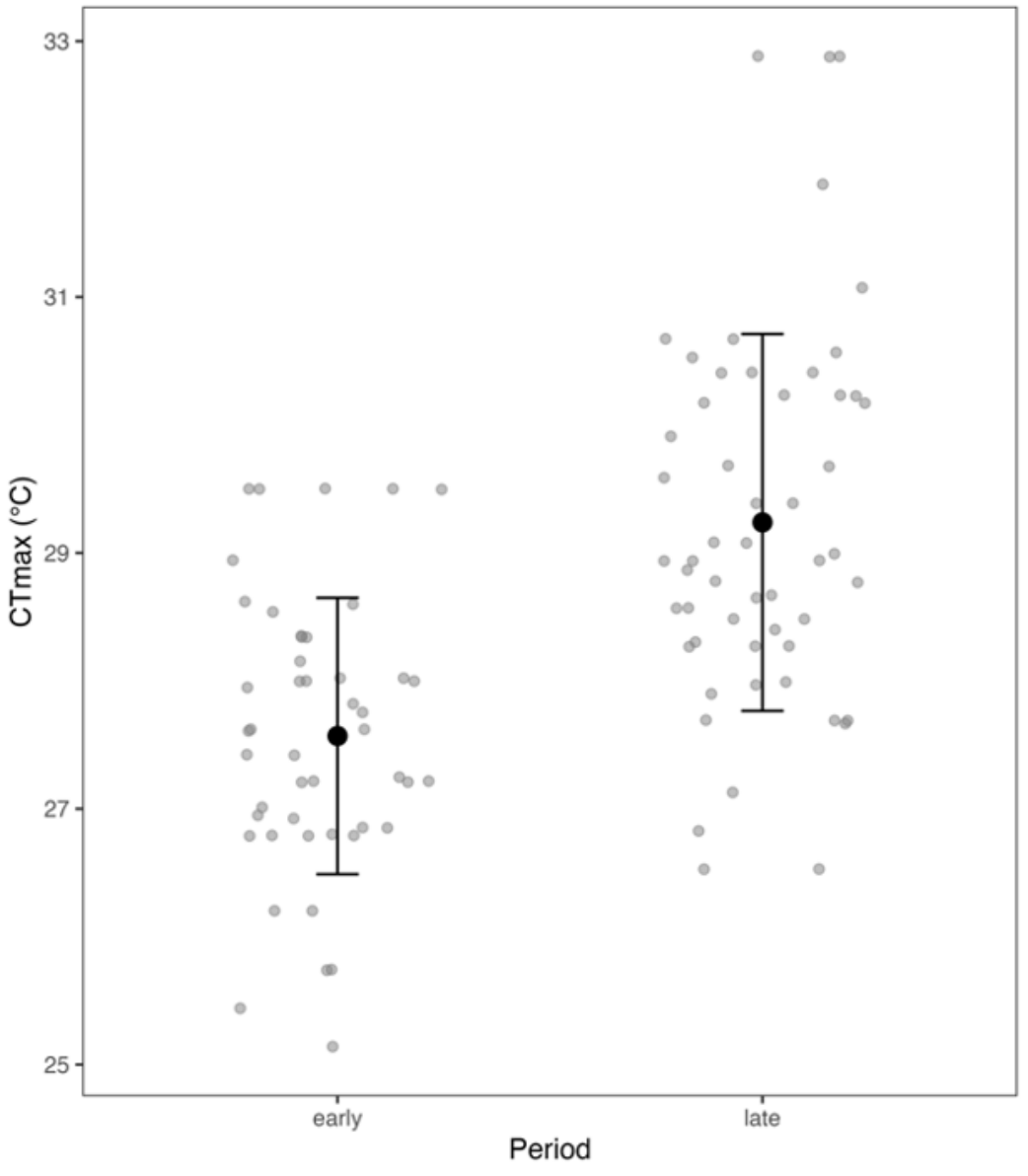

Figure 2. Juvenile Nechako River Chinook salmon critical thermal maximum (CTmax) estimated by data collected over early (May, 2026) and late (July, 2026) time periods.

NHG Team

Stephen Déry

Project Leader

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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M.Sc. Student
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Brianna Townsend

M.Sc. Student

NHG Team Updates

New Team Member

Brianna Townsend

My name is Brianna Townsend, and I am starting my Master's program with the NHG this fall. I received my Bachelor's in physical geography at Trent University, where I worked for the Trent Environmental Wind Tunnel (TEWT) lab. I also had the opportunity to learn from the Hillslope Ecohydrology Research (HER) lab, which facilitated the opportunity to work for the Canadian Forest Service as an analyst on Forest Ecohydrology. Afterwards, I returned to work at TEWT as a research assistant but missed research related to hydrology, so I am really excited to get the opportunity to link my wind-based, fluid mechanical knowledge with hydrology to study atmospheric river dynamics throughout the winter. When I am not studying, I love being near bodies of water, hiking and snowboarding.

Huckleberry Mine Weather Station

Stephen's NHG Updates

Stephen Déry
Project Leader

Happy Autumnal Equinox!

Yet another summer has flown by and we now transition to autumn with its brilliant colors, shorter, brisk days and cooler temperatures. Summer across the Nechako Watershed offered spectacular stretches of weather interspersed with much needed periods of cooler, wetter weather. The Environment and Climate Change Canada (ECCC) weather station at Prince George Airport recorded a total of 138 mm of precipitation in June, July and August, only 86% than the average, revealing yet another dry summer in our region. Nevertheless, this precipitation was sufficient to keep wildfire activity to a minimum in our region. Of note was the exceptionally wet Saturday August 1st when the ECCC weather station at Prince George Airport reported 34 mm of rainfall in a single day! All eyes are now fixed on the equatorial Pacific Ocean as a strong El Niño has emerged and is anticipated to peak during late fall into winter. As such, we can anticipate a generally warm, dry autumn followed by a low-snow winter. Current forecasts suggest the emergence of a "super" El Niño with sea-surface temperatures possibly exceeding 2°C above climatological values. This could disrupt the usual Northern Hemisphere atmospheric pattern and storm tracks that normally affect BC during the fall and winter seasons.

This issue of the Nechako Research Newsletter includes updates from our field crew that completed many site visits across the Nechako Watershed during the summer of 2026. Field crew manager Dylan Broeke summarizes the entirety of the field activities including the deployment of new weather stations at the Nechako Canyon and at Takla Lake. Furthermore, our team is starting to implement telemetry at some of our weather stations including Ness Lake, Nulki Lake and Francois Lake. Field crew members Kainen Parmar and Serenity Poirier provide an update on progress to date and future plans for implementating remote access to real-time data from our network of weather stations. Finally, I also provide a research update on some analyses of water temperature across Southeast Alaska and BC with contributions from UNBC colleagues Drs. Alex Bevington, Eduardo Martins, Phil Owens and Ellen Petticrew. This research contribution explores "freshwater thermal sensitivity" using a combination of observed air and water temperature records for 360 sites across Southeast Alaska and BC including the Nechako Watershed over a period of seven years.

With the new academic year starting at UNBC after Labour Day, I am looking forward to teaching again after my one-year sabbatical that concluded in June. This fall, I am co-instructor for a course titled "Biometeorology" in which students learn how to set up a weather station, collect observations for two weeks and then analyze the data for an interpretation of meteorological drivers and patterns during that period.

Moore's Meadow Nature Park, Prince George

This fall, we are welcoming a new Master's student, Brianna Townsend, who is joining the team for the Rio Tinto Research Chair in climate change and water security. Brianna will explore the impacts of landfalling atmospheric rivers on snowpack evolution in the Nechako Watershed between 2021-2026. This project will contribute to our mounting efforts to better understand the role of these storms on the hydrology of the Nechako Watershed and will be supported by our successful grant application to MITACS earlier this summer. We are also pleased to have Maziyar Dowlatabadibazaz return as a part-time Data Manager/Engineer and Justin Kokoszka as a part-time Research Skills Development Trainee. Otherwise, there is no change in the composition of our team except that the field crew members (Kainen Parmar, Serenity Poirier and Maria Tavares) have completed their summer positions as Research Assistants and are now shifting their focus solely to their Master's degrees and associated research projects.

We remain fully committed to disseminating information on our research and field work activities to the broader community. As outlined in the Outreach section of the newsletter, our team published recently two papers in peer-reviewed journals focusing on exceptional atmospheric rivers that impacted the Nechako Watershed in 1952, 1978 and 2009 (Sobral et al. 2026) and another focusing on the role of El Niño Southern Oscillation and the Pacific Decadal Oscillation on seasonal water temperatures in the Nechako Watershed (Sanikhani et al. 2026). I also had the pleasure of delivering a webinar to the BC Northern Real Estate Board on August 20th covering the topic of atmospheric rivers and floods in a changing climate. On August 23rd, I also participated in the preparation of a French-language documentary to be broadcast on Radio-Canada in September 2027 reporting on climate change impacts to the Fraser River. Footage was captured along the Nechako River / Netʃa koh at Cottonwood Island Park and at the Ness Lake weather station. Finally, UNBC's Integrated Watershed Research Group (IWRG) is planning an official launch event for its fourth phase of integrated watershed research in the Nechako Watershed. The event will be hybrid with remote participation on Teams and in person at the UNBC campus in Prince George, and will be held from 3:30-4:30 p.m. on Wednesday September 23rd. Please contact the IWRG at iwrg@unbc.ca should you wish to attend the event. The Outreach section of the newsletter provides full details on our recent outreach activities and our continued commitment to engage with the communities across the Nechako Watershed and beyond.

As we enter the beautiful fall season, we sincerely thank the many individuals, organizations and communities that provided support for our field activities and research during the summer 2026 field season. In particular, we thank the Nechako First Nations/Yinka Dene Nations, Cheslatta Carrier Nation, Takla Nation and Tl'azt'en Nation for supporting efforts to improve meteorological monitoring across the Nechako Watershed. The tremendous level of support we are receiving across the Nechako Watershed continues to motivate us to amplify our monitoring and research in this rapidly changing environment.

Wishing everyone a Happy Fall Equinox and a most pleasant autumn!

Stephen Déry

Freshwater thermal sensitivity across Southeast Alaska and British Columbia including the Nechako Watershed

Dr. Stephen Déry
Dr. Alex Bevington
Dr. Eduardo Martins
Dr. Phil Owens
Dr. Ellen Petticrew

River and lake temperatures remain key indicators of water quality and ecosystem health critical for many aquatic species. In response to climate change, land cover disturbances and other causes, water temperatures are warming globally including within the Nechako Watershed. However, lakes and rivers are not necessarily warming in line with air temperatures due to a multitude of factors including basin characteristics (e.g. elevation range, vegetation cover, glacier distribution, etc.), climate and hydrological regime.

Using water temperature data from various sources including Rio Tinto, the Water Survey of Canada and our own networks, we investigated how lake and river temperatures respond to variations in air temperature, referred to as “thermal sensitivity”. Our analyses spanned a broad range of geographical settings and environmental conditions across Southeast Alaska and British Columbia including the Nechako Watershed. Hourly observations of water temperatures and reconstructed air temperatures at 360 sites provided their weekly changes from January 2019 to December 2025. Weekly water divided by air temperature changes then quantified freshwater thermal sensitivity, expressed in units of °C (for water) per °C (for air).

Our analyses revealed that freshwater thermal sensitivity exhibited a wide range of values across the study area, even within the Nechako Watershed (Figure 3). Freshwater temperatures varied on average by 0.31°C for each 1°C change in air temperature at 341 study sites with data across all months; however, mean annual thermal sensitivities ranged from -0.01 to 0.72°C °C^{-1} at individual sites. Coastal watersheds where the Pacific Ocean moderates climate variations and where rivers do not experience a seasonal ice cover showed high annual thermal sensitivities. Conversely, mountainous watersheds observed much lower thermal sensitivities as extensive glacier cover and snowpacks kept water temperatures cool even during summer and insensitive to air temperature fluctuations.

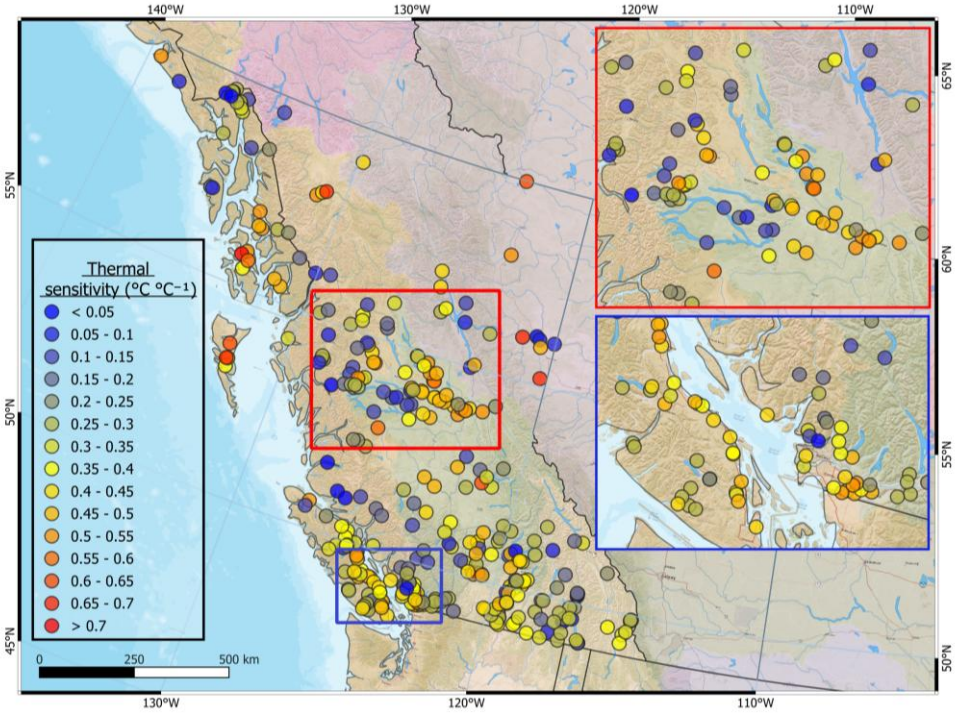

Figure 3. Mean annual thermal sensitivity (°C °C^{-1}) at 341 sites across Southeast Alaska and British Columbia, 2019-2025. The inset map (red box) in the top right of the figure delineates the region encompassing the Nechako Watershed and surrounding area. Cool colours (blues and greens) denote thermally resilient waterways while warm colours (oranges and reds) denote thermally sensitive waterways.

The inset map shown by a red box in the top right of Figure 3 focuses on the Nechako Watershed and surrounding area. Here, we see that the lower Nechako and Stuart rivers and their tributaries experienced thermal sensitivities ranging from 0.4 to 0.6°C °C^{-1}. This contrasts with the Cheslatta River where low (0.1-0.2°C °C^{-1}) thermal sensitivities were observed, in part because of higher water releases at Skins Lake Spillway during summer heatwaves decouple air and water temperatures over the duration of the Summer Temperature Management Program (STMP). Headwater streams such as Laventie, Rhine and Whiting creeks also showed low thermal sensitivities due to the influence of prolonged snowmelt and glacier melt inputs cooling water temperatures. Table 1 provides values of mean annual thermal sensitivities for 10 selected sites across the Nechako Watershed, illustrating the wide range of values seen from headwater streams (0.18°C °C^{-1} at Laventie Creek) to the main stem Nechako River (0.43-0.47°C °C^{-1}).

Table 1: Mean annual thermal sensitivity for 10 selected sites (listed alphabetically) in the Nechako Watershed.

Waterway / Site	Thermal Sensitivity (°C °C^{-1})
Cheslatta River below Murray Lake	0.12
Chilako River in Beaverly	0.51
Laventie Creek	0.18
Nautley River	0.39
Nechako River in Vanderhoof	0.47
Nechako River at Isle Pierre	0.43
Rhine Creek	0.28
Stellako River	0.09
Stuart River in Fort St. James	0.48
Whiting Creek	0.29

Our findings therefore provide key information on waterways and water bodies that may be more resilient to climate change as evidenced by low thermal sensitivities, and those more susceptible to climate-induced warming characterized by high thermal sensitivities. Our study concludes that mountain streams may remain resilient to climate warming although future thermal sensitivity may amplify as snowpacks, glaciers and ice covers retreat. These results form part of a manuscript currently under review at a journal called Water Resources Research. Once published, we will provide a link to the article in a future issue of the Nechako Research Newsletter.

Nechako River at Cottonwood Island Park, Prince George

Summer Field Season Update

Throughout the months of the summer, the field crew has been working long days to complete the field work consisting of data downloads and building new stations. New developments in telemetry have also been completed, which will start to bring more stations online for individuals to view live data. The telemetry project has been a focus by Kainen and Serenity this season. Find out more about the telemetry developments on the next page. Maria, Serenity, and Dylan built a new weather station underneath Kenney Dam (Figure 4) for Serenity's Master's project on solar radiation and for further research in the Nechako Canyon. Maria and Dylan were also able to build a brand-new weather station on a beautiful small island in Takla Lake (Figure 5), which may be the first in a new research project for the area.

Over the area of the Nechako Watershed, and a couple of trips down the Quesnel Watershed, field work this summer has been very successful with only a small handful of water temperature loggers lost at some time throughout the winter/spring. With weekly overnight trips and many 12-16 hour days, the field work is mostly wrapped up as the season comes to a close. With only a few smaller trips and perhaps some more development in telemetry, the 2026 field season was very effective at building new relationships, continuing work with different Nations and landowners, and building the NHG network of weather stations and water temperature loggers. With even more plans already underway for the season of 2027, the NHG is always growing to continue research.

Figure 4. Kenney Dam Weather Station

Figure 5. Takla Lake Weather Station

Dylan Broeke
Field Manager

Maria Tavares
M.Sc. Student
Field Technician

Kainen Parmar
M.Sc. Student
Field Technician

Serenity Poirier
M.Sc. Student
Field Technician

Live Weather Data! Progress and Plans

Kainen Parmar
M.Sc. Student
Field Technician

Serenity Poirier
M.Sc. Student
Field Technician

This summer, we have been working to expand telemetry across the NHG weather station network, allowing station data to be transmitted and accessed remotely. This will reduce reliance on manual site visits and make it easier to monitor both incoming data and station performance.

Our first successful implementation was at the Ness Lake weather station, where data can now be accessed remotely. Find the graphical representation of the data created in collaboration with Dr. Peter Jackson at https://cyclone.unbc.ca/nesslake/.

We have since turned our attention to the Nulki Lake and François Lake weather stations. Progress at these locations has been more gradual due to scheduling constraints and ongoing equipment troubleshooting. However, the work completed at Ness Lake has provided a valuable foundation for addressing these challenges. Our longer-term goal is to establish a reliable and consistent telemetry approach across the NHG weather station network so that we can improve access to timely data and support more efficient station monitoring.

Ness Lake Weather Station

Nulki Lake Weather Station

Outreach

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

Presentations

- 2026/07/15: Lee, E., Mah, M., Pugh, A., and Russell, J. Fish Adaptations. Exploration Place (Prince George, BC)
- 2026/08/20: Déry, S. J. Atmospheric rivers and floods in a changing climate. Webinars on Land and Water Sustainability, BC Northern Real Estate Board.
- 2026/08/25: Lee, E. and Mah, M. Studying Fish at UNBC. UNBC Active Minds (Prince George, BC)

Publications

- Sanikhani, H., Khorsandi, M., Déry, S. J., and St-Hilaire, A., 2026: Large-scale climate teleconnections and multiscale controls on river water temperature, Journal of Hydrology, 679, 136301. https://doi.org/10.1016/j.jhydrol.2026.136301

- Sobral, B. S., Richards-Thomas, T. S., and Déry, S. J., 2026: Meteorological features and hydrological impacts of three exceptional atmospheric rivers in British Columbia's Nechako River Basin, Weather and Climate Extremes, 53, 100926. https://doi.org/10.1016/j.wace.2026.100926

Media Interactions

- 2026/07/09: Low wildfire activity in northern BC despite ongoing moderate drought conditions, CKPG News, CKPG (Prince George, BC)
- 2026/08/23: The Fraser River's response to a changing climate, contribution to a documentary tentatively titled "Guardians of the Water" by Radio-Canada (Vancouver, BC)

Prince George Cutbanks

Outreach – Youth Engagement

This past July, FFEL members Allie, Erica, Jonny and Melody presented at the Exploration Place's Summer Camp for the "Nature Navigators" themed week. FFEL guided youth through the diversity of fish adaptations; physical or behavioral traits that make fish more suited to their environment, like color, shape, mouth position and senses. Campers then created their own unique fish, applying their new knowledge of fish adaptations. A crowd favorite was a fish name "Toe", a fish that uses its foot-shaped, toe-forward body to sense its surroundings in Bear Lake. Between creating "Toe", "Sunny fish", "King", "Lala", "Rainbow" and many others, campers interacted with FFEL's scientific equipment, learning hands-on how to identify, measure, tag, and track fish. The thermal drone took the show, feeding an interactive backdrop display for a thermal imagery dance party. Thank you to the Exploration Place for having us and thank you to all the campers for your incredible energy and enthusiasm for fish science!

Unique fish designed with various adaptations. See the crowd favorite "Toe" in the center.

Check out our websites!

https://web.unbc.ca/~sdery/rtrc
https://www.ffishlab.ca/

Outreach – Youth Engagement

Check out our websites!

https://web.unbc.ca/~sdery/rtrc

https://www.ffishlab.ca/

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