

Integrated Watershed Research Group



Final Report Phase 3

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in conjunction with
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Integrated Watershed Research Group

TABLE OF CONTENTS

Introduction.....	3
Timeline.....	3
Phase 3 - Overall Project Management Updates.....	4
Theme Updates	7
Theme 1 – Network of Experimental Watersheds for Integrated Research (Dr. Stephen Déry).....	7
Theme 2 – Landscape Disturbances on Sediment and Contaminant Fluxes (Dr. Philip Owens).....	9
Theme 3 – Fish Responses to Environmental Change (Dr. Eduardo Martins).....	10
Theme 4 – Co-benefits for Climate, Catchments (Watersheds) and Communities (Dr. Margot Parkes).....	12
Resources	16
Team: Human Resources.....	16
Publications	17
Presentations.....	18
Media Profile.....	19
Budget Summary	21

Integrated Watershed Research Group

Introduction

The University of Northern British Columbia (UNBC) is home to the Integrated Watershed Research Group (IWRG), formed in 2014. Comprising researchers from various disciplines, including Dr. Stephen Déry, Dr. Philip Owens, Dr. Ellen Petticrew (former member), and Dr. Margot Parkes, the group has focused on advancing integrated watershed-based research in northern British Columbia (BC). Their research is focused on the Fraser River Basin and other smaller northern BC river basins, such as the Nechako and Quesnel watersheds. A freshwater fish ecologist, Dr. Eduardo Martins, joined the team for Phase 3, expanding the group's research scope to study aquatic species like sockeye salmon, bull trout, and the endangered white sturgeon.

Over the past decade, the IWRG had two phases of research partly funded by NEEF: Phases 1 (2014-2017) and 2 (2018-2022). Published research from previous phases is available on the [IWRG website](#) and mainly focuses on the Nechako Watershed, where interrelated issues have been a focal point. Building on the outcomes of Phases 1 and 2, the group secured support from NEEFS (\$400,000) for Phase 3, for a total of \$800,000 with matching funds. This new phase, covering 1 July 2023 to 31 August 2025, aimed to strengthen relationships with stakeholders in the watershed, particularly First Nations communities. In this context, extra efforts were dedicated to enhancing and expanding the Nechako Watershed Portal, which serves as the main source of available information and data to all watershed stakeholders. Phase 3 involved increased cross-theme collaborations, particularly in sharing data and making them available through the Nechako Watershed Portal.

The funding has been supporting innovative research and initiatives in the Nechako Watershed, the training of highly qualified personnel (HQP) and sustaining existing research tools and infrastructure such as the Nechako Watershed Portal, hydrometeorological stations, water temperature loggers, biotelemetry equipment, sediment samplers and other monitoring equipment. The Nechako Watershed Portal is now hosted outside of UNBC servers to comply with new data storage requirements of the university, and since February 2024, it has been available and hosted at a new web address: nechakowatershed-portal.ca.

Within this report, we are delighted to present the current results and conclusions of IWRG's Phase 3 activities in the Nechako Watershed, which have laid a solid foundation of research and integrated work. We have been working to expand the research and connect partners, institutions, and stakeholders to extend the scope of our integrative approach while amplifying the actions for each theme of research. We strongly believe that our goals are to reach and contribute to the knowledge and improvement of the Nechako Watershed.

This final report provides an overview of our project timeline and overall project management, an update on each theme's achievements, followed by a summary of the use of resources, communication efforts, publications and a budget final update.

Timeline

This final report brings together information and project developments for all of Phase 3 (1 July 2023 to 31 August 2025). As an accumulative report, we gather in this document the past achievements as a historical background, along with the latest developments and achievements of all four themes.

Integrated Watershed Research Group

Phase 3 - Overall Project Management Updates

The new phase of research started officially on 1 July 2023. In August 2023, Bruno Sobral was appointed as Research Manager (RM) for Phase 3 of the NEEF/IWRG partnership. The official launch event for Phase 3 took place on 31 August 2023 at UNBC in Prince George, with diverse stakeholders contributing to a gathering of 30 people representing various segments of the Nechako Watershed. The session unfolded by presenting the scope of the upcoming research phase and sharing insights and results from the previous phases, fostering engagement and collaboration. Local media showed considerable interest in the planned activities of the IWRG in Phase 3. Several articles, media releases, and presentations have been delivered, featuring interviews with faculty members, and IWRG has had constant requests over the years of Phase 3. Refer to the Articles, Media Releases & Presentations section for details.

Regarding outreach, the IWRG team participated in the Koh-Learning Summer Gathering in Burns Lake in August 2023 and presented Phase 3 updates and plans during the Nechako Watershed Roundtable (NWR) annual meetings in November 2023 and 2024, and the NWR spring technical meeting in 2025. Collaboration with NWR partners continued, with Dr. Margot Parkes and, later, Dr. Stephen Déry serving on the Core Committee. Most recently, Dr. Eduardo Martins took the seat in the Core Committee as part of the IWRG's integrated work and collaboration. Additionally, collaborative meetings with Wayne Salewski explored potential partnerships between the IWRG and the Nechako Environment and Water Stewardship Society (NEWSS), showcasing the commitment to meaningful engagement with project partners. On 15 November 2023, the IWRG met with Danielle Courcelles of Métis Nation British Columbia to discuss potential partnerships.

To enhance knowledge integration, outreach and communication, efforts to refine the IWRG website and establish a long-term foundation for the Nechako Watershed Portal has intensified, with the Portal now hosted on a dedicated server outside UNBC, enhancing user experience in compliance with new UNBC hosting policies. The new domain name (<https://nechakowatershed-portal.ca/>) was launched in February 2024. The IWRG Research Managers (Bruno Sobral and Lucas Macedo Moura) worked closely with the team members supporting Portal data management and integration (Aita Bezzola and Lisa Rickard) to optimize the use of the Nechako Watershed Portal as a tool relevant across all IWRG research themes.

Following Bruno Sobral's stepping down as Research Manager (RM) in early 2024, Lucas Moura was recruited as the group's new RM. Lucas started working in March 2024, in conjunction with Bruno, to ensure a smooth transition of the project tasks and procedures. In the summer of 2024 and 2025, fieldwork resumed and played a strategic role in Phase 3 as the research across all themes expanded. There will be more specific updates for each theme in the theme updates section of the report.

On 12 June 2024, the IWRG team met with Ian Rogalski from the Canada Water Agency (CWA), during which Ian presented updates on CWA goals in support of watershed initiatives and the upcoming projects to be implemented. The IWRG team presented the Phase 3 updates and the ongoing research at the time, which was being developed towards an integrative and interdisciplinary approach to address the complex interactions among climate change, land use, watershed dynamics and ecological processes. Fortunately, the conversations also led to an invitation to apply for funding in the scope of the Fraser River Freshwater Ecosystem Initiative from ECCC and CWA. We applied to this initiative with the project “Amplifying integrated watershed research in the Nechako River Basin” and successfully secured \$201,127 in matching funds that supplemented Phase 3 of the NEEF project, covering the period of 12 September 2024 to 31 March 2025.

On 1 July 2024, the project's second year began, and we submitted our first annual report to NEEFS, which was approved. Throughout this process, we made a formal request to roll over some Year 1 unspent funds into Year

Integrated Watershed Research Group

2, as this amount was already committed for future activity in the project. This request was agreed upon and promptly responded to by the NEEFS Board. Regarding project management, during the first half of Year 2, the IWRG also requested the extension of the timeline of the project for two more months until 31 August 2025, with the final report to be submitted on 30 September 2025.

On 10 July 2024, an article informed by research undertaken during Phases 1 and 2 was published in the journal *PLOS Water*, titled: "Towards an integrative understanding of British Columbia's Nechako Watershed: Connecting knowledge systems to strengthen understanding of climate change, watershed security, health and well-being" (see 'Articles and Presentations' below). This paper was published as part of an internationally focused *PLOS Water* 'Special Collection' on *Watersheds and Health* which was released in early 2025.

In August 2024, Data Manager Lisa Rickard had to step down from her position, and we hired Ahmad Jalil as the new Data Manager. Ahmad has experience with technical support and was a good fit and addition to our efforts to enhance the usability and data integration of the Nechako Portal.

On 25 September 2024, the Nechako Watershed Roundtable held its Annual Meeting, and the IWRG participated by presenting a brief update on recent research progress from the group and demonstrating the use of some Nechako Watershed Portal features. The "British Columbia Watershed Governance: Celebrations, Considerations and the Path Forward" event featured a BC Watershed Roundtables and Councils panel, which shared their successes and insights. We also heard an update from the Indigenous Watersheds Initiative and learned about the newly formed Canada Water Agency.

On 21 October 2024, RM Lucas Moura attended the Nechako Watershed Roundtable Large Lakes Monitoring Working Group meeting, held in a hybrid format with in-person participation in the Nechako Watershed region in addition to online attendees. The meeting brought together key stakeholders, including representatives from Fisheries and Oceans Canada, provincial ministries, local First Nations, non-profit organizations, and academic institutions, to discuss the implementation of the Large Lakes Monitoring Strategy. The primary focus was on enhancing collaboration, sharing updates on current projects, and strategizing the management and monitoring of large lakes within the Nechako Watershed to address ecological and community priorities. Key highlights included updates on projects such as the Takla Nation Limnology Project, which identified nutrient limitations and climate-induced productivity changes in local lakes, and the Living Lakes Canada FIMP survey, which revealed increased shoreline disturbances on Fraser Lake over the past decade. A demonstration of the Nechako Watershed Portal showcased advancements in data integration and accessibility for monitoring and decision-making. The meeting underscored the importance of regional collaboration, capacity building, and sustainable funding to address challenges such as enforcement gaps and resource constraints. Participants emphasized the need for coordinated efforts to support long-term ecological health and community engagement within the Nechako Watershed.

Regarding outreach, on 29 November 2024, the event "Climate Change Adaptation and Resilience in the Nechako Watershed: The Water That Connects Us" was held at the Sandman Signature Prince George. This important gathering, co-chaired by Gina Layte Liston and Kim Menounos of NWR, and facilitated by Dan George of Four Directions Management Services, aimed to address the pressing issue of climate change and its impacts on the Nechako Watershed. A key highlight of the day was the presentation by Dr. Stephen Déry, who discussed the current and projected effects of climate change in the watershed. Dr. Déry's insights were important to the following discussions for understanding the broader environmental challenges in the region, including how climate shifts affect the economy, health, and forestry. The event also featured a keynote presentation by Dr. Margot Parkes and MSc student Jonathan Doyon on the importance of integrating youth in sustainability efforts within the watershed. Their discussion, titled *Koh-Learning in our Watersheds: Integrating Youth in Sustainability*, emphasized the importance of engaging the next generation in climate action and the sustainable management of natural resources.

Integrated Watershed Research Group

The presentation noted the value of IWRG research as an example of ‘made in the Nechako’ knowledge that can inspire and inform next-generation learners and underscored the importance of IWRG engagement as part of a wider network of collaborations that can connect with youth in the Nechako. Additionally, the event included discussions on First Nations' climate action plans, where participants worked collaboratively to identify priorities for building local resilience and developing frameworks for water sustainability. The event provided an invaluable platform for collaboration and dialogue as attendees worked together to shape the future of adaptation of climate change and resilience in the Nechako Watershed. In November 2024, an abstract was submitted to profile the IWRG team publication (Parkes et al., 2024) as part of the ‘Watersheds and Health’ collection that was released at the Oceania Planetary Health Forum on 26-28 February 2025 in Fiji.

On 2-3 June 2025, the NWR held their Spring Technical Meeting entitled "Action in the Nechako: Progress and Potential Across the Watershed". The event was held in partnership with Nak'azdli Whut'en on their traditional territory in Fort St. James. Fifty participants attended the two-day event, including government representatives, academics and NGOs. The IWRG was invited to present the latest updates of the work on the occasion, and Dr. Déry was also invited to provide a research update on climate change in the Nechako Watershed.

At the end of Phase 3, the group remains committed to maintaining climate, water and fish monitoring equipment in the Nechako Watershed as well as presenting and sharing valuable research through various channels like reports, newsletters, journal articles and the Nechako Watershed portal. Overall, Phase 3 sustained the group's efforts of having a constant presence in potential partnerships in the watershed and to strengthen the watershed-based research in the basin, while enabling the development of new research and projects through highly qualified personnel (HQP) and team members.

Integrated Watershed Research Group

Theme Updates

Theme 1 – Network of Experimental Watersheds for Integrated Research (Dr. Stephen Déry)

In our ongoing research focused on understanding changes in regional hydroclimate and their impacts on resource development in the Nechako Watershed, we continuously maintained and enhanced our network of hydrometeorological stations and other infrastructure and instrumentation across the watershed. At the end of Phase 3, there are eight research-grade meteorological stations and ~30 water temperature loggers scattered across the Nechako Watershed. Emphasis over the past two years was on the commissioning of a comprehensive meteorological observatory at Huckleberry Mine in the upper Nechako Watershed. With deployment led by Research Skills Development Trainees Dylan Broeke and Kirsten Calder-Sutt, this site now includes a full weather station, a micro rain radar, an optical disdrometer, with plans for expansion with a Snowfox snow monitoring device. Recent efforts in collaboration with colleagues at UQAM has allowed to make the data from this site [available in real-time](#). This infrastructure is quite critical given that we are developing several experimental watersheds in the area, including the Rhine and Whiting creeks (in collaboration with Theme 2) and the upper Nadina River. As highlighted by recent work led by PhD student Bruno Sobral, this area of the upper Nechako Watershed is especially prone to atmospheric rivers and, thus, was of considerable interest for Phase 3 research in collaboration with Theme 2 activities.

Aside from the meteorological observatory in the upper Nechako Watershed, the Theme 1 group provided, in November 2023, five basic weather stations (from matching funds) to members of the Nechako Valley Producers Group. This equipment was sourced from Davis Instruments to provide real-time data on key meteorological variables such as air temperature, humidity, winds and precipitation. In partnership with NEWSS, the five weather stations were deployed in the Vanderhoof agricultural belt, thereby providing real-time weather information for local farmers and ranchers. This provides critical meteorological data in an otherwise data-sparse region where conditions vary much spatially. The persistent drought in the Nechako Valley since the summer of 2022 has also demonstrated the need and value of meteorological networks across the Nechako Watershed for a range of end users and stakeholders. We are now assembling metadata on the deployment sites and preparing for future data archiving in collaboration with Andy Nadler and BC Agriculture.

In the spring and early summer of 2024, two additional weather stations were deployed across the Nechako Watershed. On May 28th, a research-grade weather station was deployed at Nulki Lake in partnership with the Nulki-Tachick Lakes Stewardship Society. This provided critical data to better understand the causes of algal blooms in Nulki Lake. Then, on June 27th, another research-grade weather station was commissioned at the Nadina River Spawning Channel, a Fisheries and Oceans Canada (DFO) facility. This weather station complements our existing network of water temperature sensors deployed on the Nadina River (two loggers), Glacier Creek (one logger) that flows into Nadina Lake (one logger). Meteorological data collected at the DFO facility helped us understand drivers for water temperature changes in this critical salmon waterway. Given that the site is situated to the lee of the Coast Mountains, it will allow comparisons to the conditions within the mountainous terrain at Huckleberry Mines.

The water temperature data collected across the Nechako Watershed, supported in part by NEEF, were incorporated into a study exploring how hydrometeorological extremes such as heat and cold waves affect the response of freshwater temperatures (Déry et al. 2024). A key result demonstrated weekly water temperature increases of up to 6°C in the lower Nechako Watershed in response to the early summer heat dome of 2021. Maximum water temperatures surpassed 30°C at Otter Creek and the Necoslie River during the heat dome.

Integrated Watershed Research Group

On 27 September 2023, Dr. Stephen Déry presented recent research efforts to the German Research Foundation, showcasing our commitment to sharing insights globally. Participation in the Annual General Meeting of the Nulki-Tachick Lakes Stewardship Society on 4 November 2023 and on 14 December 2024 emphasized our continued involvement in local community initiatives and plans to deploy the aforementioned weather station at Nulki Lake. Additionally, Dr. Stephen Déry provided expert commentary on recent drought conditions in northern BC through multiple interviews for CKPG News, contributing valuable insights to the public. Participation in the Water Engagement Initiative (WEI) continued, with Dr. Stephen Déry attending Main Table and Technical Working Group meetings. Notably, phase 1 of the WEI has officially concluded in 2024, marking a milestone in our ongoing contributions to water-related initiatives.

In early 2024, Lisa Rickard was recruited as a Research Associate who was co-supervised by UNBC collaborator Dr. Siraj ul Islam. Their research project sought to gauge the hydrological response to the cumulative impacts of land cover disturbances (with a focus on wildfires) and land use changes in the Nechako Watershed. Preliminary results revealed that, although the number of wildfires in the Nechako Watershed has decreased over time, the mean fire size and total area burned have increased. While the mean slope on which wildfires have occurred has remained fairly consistent, the wildfires appear to be shifting to higher elevations, as the mean fire elevation has slightly increased over time. Increases are also observed in the proportion of wildfires ignited by lightning.

In the summer of 2025, a meteorological station was deployed at Francois Lake. This work is in collaboration with Cheslatta Carrier Nation to further augment the number of experimental watersheds through Theme 1-related activities. We also added net radiometers at two existing weather stations (Huckleberry Mines and Tatuk Lake) to gather more data necessary to interpret water temperature fluctuations in those areas. Another weather station was deployed in mid-June 2025 at Isle Pierre, just west of Prince George. A class of grade 8 students from Prince George Secondary School assisted with setting up the weather station on 18 June 2025. Data collection will continue in the coming years, followed by the data quality control and management process so that we can share our data with our partners, collaborators and stakeholders in a timely fashion.

In collaboration with Theme 2 partners, we monitored atmospheric river activity during late summer and fall 2024 along BC's coast. This effort, led by PhD student Bruno Sobral, made use of atmospheric river (AR) forecasts and products from the Center for Western Weather and Water Extremes (CW3E) at the University of California San Diego (UCSD). We collected daily charts illustrating landfall locations of ARs along BC's coast, and time series of integrated water vapour transport and AR intensity on a 1 to 5 scale. Additional hydrometeorological products were sourced from Environment and Climate Change Canada, the Water Survey of Canada and the European Centre for Medium-Range Weather Forecasts (ECMWF). These datasets were used in conjunction with the water, sediment and chemical fluxes collected at Rhine and Whiting creeks by Theme 2 researchers. As well, meteorological data from Huckleberry Mine and Nadina River Spawning Channel will be used to further characterize meteorological conditions during ARs making landfall near the upper Nechako.

Developing a database system aiming to effectively consolidate all hydrometeorological data was also an important task in Phase 3. Discussions with the Theme 4 Nechako Watershed Portal team revealed its potential suitability for storing water temperature and climate databases from Theme 1. Quality control of all water temperature data collected between 2019 and 2024 was made, and the data were archived in the Nechako Portal and the publicly accessible Zenodo database, and shared with our Themes 2, 3 and 4 colleagues. Next, we plan on performing quality control and assessment (QA/QC) on all historical meteorological data collected in the Nechako Watershed.

Integrated Watershed Research Group

Another component of Theme 1 involved an examination of the impact of wildfires and deforestation on watershed hydrology using a test-bed watershed in the Nechako, an effort led by UNBC MSc student Krishna Kafle and Theme 1 collaborator Dr. Siraj ul Islam. We acquired wildfire perimeter data from the BC Wildfire Service to evaluate burnt areas in the Nautley River Basin (NRB) from 2010 to 2023. We selected the NRB as our study area, observing that approximately 30% of its forests was affected by wildfires between 2010 and 2023. We implemented the Variable Infiltration Capacity (VIC) hydrological model in the NRB with a 5 km horizontal resolution and a daily time step, utilizing ERA5-Land reanalysis forcing data. Currently, the model implementation is in the calibration and validation stage, where parameters are being fine-tuned by comparing simulations to observed discharge data from the Water Survey of Canada (WSC) at the NRB's main outlet on the Nautley River near Fort Fraser. Once we complete the calibration and validation process, we will conduct idealized VIC experiments. In these experiments, the model's land use files will be modified to replace forested areas with bare land, and the resulting streamflow will be compared to control runs to assess changes in watershed hydrology following deforestation.

Theme 2 – Landscape Disturbances on Sediment and Contaminant Fluxes (Dr. Philip Owens)

Throughout Phase 3, we continued our research on sediment sources, fluxes, and quality in the Nechako Watershed. MSc student Michael Samoil started in September 2023 and is co-supervised by Dr. Faran Ali, with support from Brendan Miller of the BC Ministry of Forests. The research focuses on the role of wildfires in modifying surface runoff and erosion on hillslopes in the Nechako Watershed.

During the period late June to early October 2024, Mike undertook a series of artificial rainfall experiments at 23 hillslope sites affected by the 2023 North Lucas Lake wildfire near Cheslatta Falls and the Kenney Dam. Of these, 18 were on hillslopes affected by wildfire, while five were nearby sites unaffected by the fire. Those sites impacted by the 2023 fire were on slopes of different steepness and different levels of soil burn severity. At each site, volumes of runoff water were determined, along with the amounts of soil eroded. Other properties (such as water infiltration rate) and soil properties were also determined. Samples of the mobilized soil/sediment were analyzed for a range of physical (e.g., particle size composition) and chemical (e.g., metals, phosphorus) properties. This work has been undertaken in consultation with the Cheslatta Carrier Nation (CCN). In November 2024, Mike visited the offices of the CCN and gave a presentation to the Nation on his work and preliminary results. The final results and findings from this portion of the work are contained in a manuscript submitted in July 2025 to a special issue of the *Journal of Soils and Sediments* on the theme: impacts of wildfires on soil and sediment systems. Mike has also given several presentations on this work: see the section on Presentations.

In 2025, Mike has mainly focused on using the field-based data, described above, in combination with spatial data on landscape characteristics (such as slope steepness and aspect, elevation, soil type, soil burn severity) to create a map of runoff and soil erosion risk — to road and water infrastructure and aquatic ecosystems — for the area impacted by the 2023 North Lucas Lake wildfire. We hope that this could be extended to other parts of the Nechako Watershed impacted by wildfires. Mike will be giving a presentation on this portion of his work at a 3-day workshop on wildfires in at UNBC in Prince George in October 2025.

In addition, in November 2024, Dr. Owens and postdoctoral research fellow, Dr. Kristen Kieta, collected several soil samples from the area impacted by the 2018 Shovel Lake wildfire. These have been analysed by a commercial laboratory (SGS-AXYS, Sidney, BC) for the analysis of polycyclic aromatic hydrocarbons (PAHs), an organic contaminant that is elevated in soils and aquatic sediments following wildfire. This continues the work started in NEEF Phase 2 — we first collected samples from this wildfire in 2019 during Phase 2 — enabling us to

Integrated Watershed Research Group

assess the medium- to long-term recovery of the landscape following this severe wildfire. This work serves as a valuable component of our research, addressing the broader implications of wildfires on soil and water quality, and ecosystem health. The results and findings from this work are presently being analysed and a manuscript is being prepared for submission to an academic journal.

Our work assessing the impact of atmospheric rivers on water, sediment and chemical fluxes – in collaboration with Theme 1 – has focused on two headwater watersheds in the Nechako: Rhine and Whiting creeks. Automatic water samplers (ISCOs) and time-integrated sediment samplers, along with HoBo probes to measure water level and flow, were installed by Kristen Kieta (with support from Theme 1 personnel) during the period from early August to late October 2024. This equipment enabled us to monitor and collect samples for numerous land-falling atmospheric rivers during this time period. During early 2025 we purchased new equipment using matching funds. In August 2025, we deployed this equipment in Rhine and Whiting Creeks to monitor water fluxes and sediment fluxes during the 2025 atmospheric river season.

Theme 3 – Fish Responses to Environmental Change (Dr. Eduardo Martins)

During Phase 3, our team worked on four sub-projects focused on Fraser Lake burbot, Nechako River white sturgeon, Stellako River rainbow trout, and Nechako River Chinook salmon. The project on burbot in Fraser Lake was conducted by MSc student Abigail Oviatt and Research Assistant Melody Mah, with support from Dr. Nikolaus Gantner from the BC Ministry of Water, Land and Resource Stewardship (WLRs). The project objectives were to quantify oxythermal conditions in Fraser Lake and assess whether burbot exhibit specific temperature and dissolved oxygen (DO) preferences during summer stratification. We deployed temperature and data loggers from May to October 2023 and 2024 (these data supplemented temperature and DO measurements logged during May and October 2021 and 2022). In 2023, due to a combination of logistical challenges associated with our boat being stolen from the UNBC campus and the rapid warming of the first 10 m of the water column in Fraser Lake after ice-off, we had a limited time to catch burbot under conditions that limited barotrauma and avoided thermal stress. For that reason, only 10 burbot out of a planned 30 were captured for tagging. In 2024, conditions were more conducive to a longer tagging period, and we were able to capture and tag an additional 25 burbot with acoustic transmitters. The tagging effort conducted during the NEEF project added to a total of 32 fish that had been tagged in 2021-2022. Our results showed that Fraser Lake reached surface water temperatures of 22.4 °C and benthic DO levels near 0 mg/L during summer stratification. Burbot generally occupied deeper, cooler waters during the day, but moved into shallower, warmer depths at night. Analysis of oxythermal habitat selection revealed that burbot selected temperatures between 4-8°C and DO > 12 mg / L or temperature between 10-12 °C and DO between 6.5-9.5 mg/L. Selected oxythermal habitats become virtually unavailable between mid-August and late October, where depths (> 15 m) with temperatures < 12°C exhibiting < 6 mg/L of DO. Analysis of the collected data is ongoing and will include an assessment of potential spawning aggregation sites using spatial-capture recapture models applied to acoustic telemetry data in the winter of 2026.

The project on Nechako white sturgeon is being led by PhD candidate Avery Dextrase with support from the Nechako White Sturgeon Conservation Centre. The project goals are to quantify thermal habitat use and selection by white sturgeon in the Nechako River and assess how effectively they can thermoregulate. Two years of field work have been completed as of fall 2025, with one final year to come in 2026. A total of 20 adult wild-caught white sturgeon and 40 hatchery-reared juvenile white sturgeon were tagged (approximately half in 2024 and in 2025). The adults ranged in fork length from 153 to 235 cm, and the juveniles from 55 to 83 cm. All fish were implanted with temperature, depth and activity sensing radio tags that transmit this information every 30 seconds to onshore radio receiver stations. The hatchery-reared tagged fish were released in approximately equal numbers at three locations in the Nechako River – approximately 50 km upriver from Vanderhoof, BC, in Vanderhoof, and 20 km downriver from Vanderhoof. The tagged wild-caught fish were captured and released within the 30 km

Integrated Watershed Research Group

stretch downriver of Vanderhoof. A total of six radio receiver stations were set up to monitor different sturgeon habitats in the Nechako River between river kilometers 6 and 191 in the spring, summer, and fall (river kilometers 6, 90, 110, 117, 136, and 191). The water temperatures and dissolved oxygen concentrations in each of these habitats were monitored with loggers that recorded these measures every 15 minutes. In summer 2025, a continuous map of surface temperatures and bathymetry in the reaches monitored by telemetry were collected using drone thermal imagery and echosounding. All of the tagged juvenile and adult sturgeon were detected by at least one radio telemetry station, and the majority of fish were detected at two or more stations. The radio receiver station located at river kilometer 117, which is the primary overwintering habitat of the sturgeon in the river, detected the highest number of tagged fish for a total of 18 adults and 27 juveniles. The body temperatures of the sturgeon have been closely following the mainstem river temperatures in each of the habitats, with the warmest body temperatures (~24°C) recorded in early July of 2024 at the receiver station at river kilometer 191. The transmitted sturgeon activity values indicate that sturgeon regularly move at slow, consistent speeds with occasional fast bursts of activity. The sturgeon has typically occupied deeper parts of the river column in each of the monitored habitats, however the juvenile sturgeon were recorded in shallower and more variable depths than the adults. Sturgeon activity, body temperatures, and depth will be monitored again in 2026 before the statistical analyses are initiated. In 2026, we will also conduct thermal preference trials with hatchery-reared juveniles, which will provide the required data to conduct analysis of thermoregulatory effectiveness by fish monitored in the field.

The project on Stellako River rainbow trout was led by MSc student Carly Walters and focused on the analyses of a 35-year long series of fish counts to investigate the environmental drivers of population dynamics. Specifically, we fitted a size-structured (size classes were 10-30 cm, 30-50 cm, and 50+ cm) population dynamics model to the count data and then we applied recently developed extensions of transient life table response experiments (tLTRE) to the model outputs. The tLTRE analysis enabled us to decompose variability and sequential changes in population growth rates into contributions from specific predictors (e.g., density dependence and environmental conditions, such as summer mean air temperature, stream discharge, sockeye salmon return abundance) of vital rates (e.g. survival) and population structure (i.e. relative abundance of each size class). We found that the dynamics of the study population was driven primarily by environmental stochasticity in productivity (i.e. fertility) in the first half of the time series (1988-2004). The primary driver of the dynamics since then (2005-2021) was mean summer temperature effects on survival of the smallest size class, which coincides with a period of rapid warming of summer temperatures due to climate change. This was also the main contributor to the declining average population growth rate observed in this period compared to the earlier period. Density-dependence on productivity and survival of the smallest size classes played an important, but secondary role in driving the dynamics of the population over the period. Although annual survival of the largest size class was strongly related to the abundance of sockeye salmon (used as food by rainbow trout), we found that variability in salmon subsidy did not contribute much to changes in rainbow trout population growth rate over time. This research emphasizes environmental conditions as the primary factor driving the Stellako River Rainbow Trout population dynamics. In particular, the substantial impact of temperature to the survival of the smallest monitored size class and associated contribution to population growth rates and population decline highlights the impact of climate change-induced warming on fish populations and the need to focus management and conservation efforts on small size classes of the stream-dwelling rainbow trout population. This research has been submitted to *Ecological Applications* and has received positive reviews. We are currently awaiting the journal's decision on publication after having submitted requested revisions.

PhD candidate Annika Putt led the project on Nechako River Chinook salmon, which aims to use historical data sets to model the dynamics of this population using an integrated population model (IPM). We compiled all available data for Nechako River Chinook salmon, including Fisheries and Oceans Canada (DFO and Nechako Fisheries Conservation Program (NFCP) spawner counts from 1975 to 2024; adult spawner biological data (age, length, sex, and fecundity) from DFO carcass assessments (1978-2010) and Spruce City Wildlife Association (SCWA) fecundity sampling (2022-2024); DFO in-river harvest estimates (sport, commercial, and food, social, and

Integrated Watershed Research Group

ceremonial); and fry abundance from incline plane traps (IPTs) (1990-2002, 2010). Combined, empirical data extended from 1975 to 2024. We do not have empirical data for upstream and downstream migration survival, ocean survival, freshwater survival, and breeding propensity in the study populations. Instead, we use previously published literature values in our model. We fitted several statistical models to each one of these data sets and their outputs were integrated via a stage-structured matrix population model that forms the core of the IPM. Preliminary model results indicate a 0.7 probability that the Nechako River Chinook salmon population was stable or increasing between 1975 and 2024. The model still requires a few adjustments for improving fit, which will be completed this fall. In the winter, the outputs will be used to conduct transient life table response experiment analyses to determine the demographic and environmental parameters that have been contributing the most to changes in population growth rates of the study population since 1975.

Theme 4 – Co-benefits for Climate, Catchments (Watersheds) and Communities (Dr. Margot Parkes)

Dr. Margot Parkes and other Theme 4 team members explored in phase 3 the broader potentials of profiling and expanding the co-benefits of the IWRG research for addressing climate and community concerns in the Nechako Watershed. In addition to Research Manager Lucas Moura and Data Manager Ahmad Jalil, members of Dr. Parkes' research lab worked actively on Theme 4, including Jamie Reschny and Research Assistant Isla Bressette, collaborations with research assistant Marleau Brown and Jonathan Doyon, and wider portal development group support from Scott Emmons and Austin Armstrong. Throughout Phase 3, progress has been made on Theme 4 objectives, focusing on refining the Nechako Watershed Portal, integrating new tools through the expansion of the portal's project function, and supporting the enhancement of knowledge exchange with diverse partners.

Theme 4 focused especially on the Nechako Watershed Portal's capabilities in handling and connecting socio-demographic and climate data. The team has progressed to a new phase of data integration within the Nechako Watershed Portal, with a focus on new tools to connect and profile environmental, social and health information using the new 'project' function (curating and profiling data for specific user-group purposes), and the new data-entry formats to expand options for community science/citizen science and archiving processes. The Nechako Watershed Portal team worked on adding portal functionality for commentary and multimedia by: expanding the amount and types of data, customizing the development of the portal interface to target audiences, initiating research/service agreements with portal users and creating custom portal interfaces; and profiling and expanding awareness of the portal with different user/partner groups through increasing the number of user/partner groups and partner training and workshops.

In addition, the team worked on updated guidelines and resources related to the expanding 'project' function. The project function enables anyone who can access the portal at <https://nechakowatershed-portal.ca/> to review curated sets of information without logging into the portal. A PDF guide and a video demonstration of the Nechako Watershed Portal function can also be found on the website and are listed in the Articles, Media Releases and Presentations section. In this way, Theme 4 worked to expand options for the portal to serve all IWRG themes as an effective platform for data dissemination among portal users.

In December 2023, Theme 4 submitted a successful proposal to Environment and Climate Change Canada for research titled: "Expanding the use of the Nechako Watershed Portal through ongoing collaboration, partnership, engagement, and Knowledge Mobilization." This funding has supported Phase 3 activities during the 2nd half of Year 1, including matching funding for a research assistant and portal development.

Integrated Watershed Research Group

On April 12, 2024, the Northern Health – Climate and Health Knowledge Exchange event occurred at UNBC. The event was a partnership with the Northern Health Authority (NHA), an important feature of Theme 4. It included planning focusing on the intersection of climate and health and profiling the benefits of a watershed perspective to enhance sub-regional understanding of lands, water, climate and health connections. Research Assistant Anna Hixson provided support for the collaboration with NH Climate Change and Health lead, Dr. Diana Kutzner, and the design of a full-day session on the UNBC campus in collaboration with other members of the NHA Climate and Health and Population Health Observatory Teams, IWRG team members, other UNBC colleagues across campus and community partners with interest in these themes. The collaboration with NHA underscores the interdisciplinary nature of our work, as well as the transdisciplinary priorities of engaging with knowledge and perspectives beyond the university, and a holistic approach to integrating health and climate data within the Nechako Watershed context. The NHA is also interested in climate scenarios for the Nechako Watershed and its impacts on human health, and Theme 4 work in Nechako has also informed ongoing collaborations focused on climate and health co-benefits (see: www.leaph.org/branch/climate-and-health-co-benefits).

Dr. Parkes also worked closely with Theme 4 collaborator Dr. June (Flor) Garcia-Becerra to discuss data integration frameworks and visualization tools, contributing to the group's ongoing efforts to enhance data representation for all stakeholders. In conjunction with the Research Associate Adriana Hurtado, Drs. Parkes and Garcia-Becerra developed the project: *“Integrating WASH solutions, health, and sustainability: a pathway for future research in the Nechako watershed areas and communities”*. This project was designed within the collaborative framework established by UNBC’s IWRG, in combination with the collaborative effort with Dr. Garcia-Becerra, which emphasizes ecosystems, water systems, sustainability, health, knowledge communities, and decision-making processes, highlighting the importance of considering watersheds as integral settings for health and sustainability. Dr. Garcia-Becerra’s research focuses on socio-hydrological resilience and the relevance of decentralized water, sanitation, and hygiene (WASH) systems to address vulnerabilities, providing more cost-effective, flexible, and sustainable solutions through a community-based approach. This collaborative project provided the opportunities to explore the state of WASH decentralized solutions research in the Nechako Watershed areas and communities and to identify potential interconnections between WASH solutions, health, climate change impacts, and water security in the region. This research collaboration was conducted by Research Associate Adriana Mayela Hurtado Bautista with an approach rooted in systems thinking and emphasizing the interconnectedness and interdependence of elements within a system. This perspective was essential for understanding the dynamics of climate change, water security, and health in the Nechako Watershed and determining whether WASH issues and solutions could be integrated into this dynamic, with a focus on better understanding of existing data and pinpointing areas where further research and data collection are necessary. Adriana worked with other IWRG team members to harness the Nechako Watershed portal saturation search to perform an inventory of the available information in the Nechako Watershed Portal. This work piloted a new role for the Nechako Watershed portal, extending the uses of the portal as the IWRG’s primary platform to curate, archive, and share watershed data and information and, for this project, providing a tool to access and analyze existing information in a systematic way.

The results of this analysis identified important themes relevant to climate, health and water security. The literature analyzed highlighted that future water availability in the Nechako Watershed is projected to be significantly impacted by declining snowpacks and other climate change-driven alterations and underscored the need to devise strategies that ensure sustainable water supply and quality for both human and ecosystem health. Also, drivers of change, such as resource development, climate variability, and forest disturbances, have had interconnected impacts on water issues, health, and overall watershed governance. Understanding these drivers is critical for developing adaptive management strategies that address the cumulative effects on the watershed. Additionally, a significant gap identified in the literature and portal resources is the underrepresentation of WASH in watershed and ecosystem management discussions: very little research with this focus was found in the Nechako Watershed, and this gap highlights the need for a more integrated approach that incorporates WASH considerations into broader water management frameworks. The analysis undertaken by Adriana Mayela Hurtado

Integrated Watershed Research Group

Bautista and overseen by Dr. Parkes and Dr. Garcia-Becerra has identified an important gap and opportunity to increase attention to WASH (especially decentralized water, sanitation, and hygiene) issues as a pathway to identifying new solutions and pathways to both understand and respond to interrelated climate change, water security and health and well-being challenges in the Nechako.

Members of Theme 4 also worked to update and revise the initial protocol for Nechako Saturation Search. This resulted in release of an open access list of publications “[Nechako Watershed Saturation Search \(Public\)](#)” (including 766 entries between 1934 and 2023); refinements of our approach to entering these resources into the Nechako Watershed Portal for release, and proposed updates to our protocol annual updates to this Saturation search, developed in partnership with the UNBC/Health Research Institute Knowledge Synthesis Centre.

In the second year of the project, the emphasis in the first half of Year 2 was on the refinement of the portal capabilities for knowledge exchange and collaboration with other community partners. Several key initiatives were the focus of discussions at our regular Nechako portal meetings, with a particular focus on developing a series of portal ‘projects’ to serve and profile the needs and interests of different user groups. Supported by additional matching funding secured by ECCC/CWA, we leveraged the objectives of phase 3 through efforts to expand and improve specific features of the portal, developing a more systematic protocol for annual updates to the portal content to ensure that data, figures, maps, and resources are routinely refreshed to reflect the latest research findings and data releases, as well as developing the implementation of the routinized approach for updates and new guidelines for community and partnership portal use.

Data Manager Ahmad Jalil began working with the team in August 2024 and actively managed user accounts on the Nechako portal, including approving and activating accounts, developing and sharing projects with users as needed, and trialling new approaches to importing datasets into the portal (e.g. identifying ways to convert existing datasets from source formats to the portal’s specific format). The work with research assistant Isla Bressette continued to refine the team’s approach to importing existing published resources into the portal, working through the steps of identifying resources, assigning geocodes, and geomapping these resources into the portal and approving drafts to ensure they are finalized and accessible by portal users. The portal team worked on streamlining the steps to curate these resources into accessible projects for different user groups to access and explore data, e.g. the ‘*Large Lakes Monitoring*’ project and ‘*Saturation Search*’ project.

The ‘*Large Lakes Monitoring*’ project involves an ongoing partnership with the Nechako Watershed Roundtable Large Lakes Monitoring working group and has made significant progress in systematically documenting, geographically referencing and making accessible an important collection of relevant research literature and publications using the portal. Through careful curation and validation, over 150 references have been successfully imported into the Nechako Watershed Portal, each enhanced with spatial attributes to enable geographic visualization. This collection represents a comprehensive synthesis of large lakes monitoring research, drawing from both academic publications and government documents. A notable challenge encountered during this process was the accessibility of certain historical government documents. For these cases, where online versions were unavailable, and attempts to contact authors and relevant authorities were unsuccessful, appropriate documentation protocols were implemented. These entries are maintained in the portal with clear notices regarding their historical significance and access limitations, ensuring transparency while preserving valuable historical information about the watershed.

With the Large Lakes database now entered, a next step was to expand and publish a ‘*Large Lakes Monitoring*’ project, drawing on other information that can be accessed through the Nechako portal and aiming to create a georeferenced collection of resources, maps, reports and related information available for access and further input by the Large Lakes Monitoring Working Group and other interested users. The progress with the ‘*Large Lakes*

Integrated Watershed Research Group

Monitoring' database has also underscored the need to identify potential overlaps with the broader Nechako watershed '*saturation search*' database (containing 766 references) to both eliminate duplicates and also to expand coverage of large lakes monitoring literature. Creating connections and synergies between projects (e.g. '*Large Lakes Monitoring*' project and '*Saturation Search*' project) also informed the development of the annual protocol for updating available resources and projects.

The Theme 4 emphasis on co-benefits has supported continued exploration of Nechako portal 'projects' as potential knowledge exchange opportunities for several active collaborations within the Nechako. Between July and December of 2024, Theme 4 team members have progressed work towards a series of "*Nechako Learning Module*" projects and updated options to expand the '*Cheslatta Archives*' project. We also started initial conversations about a revised and updated '*Climate and Health*' project in partnership with Northern Health.

The proposed series of "*Nechako Learning Module*" projects is informed by the final stages of the 'Koh-Learning in our Watersheds' program, a six-year partnership between UNBC and Nechako Lakes School District 91 (SD91) that concluded in December 2024. Collaboration among IWRG Theme 4 and Koh-learning Team members has identified new ways to use the Nechako portal to connect and profile educational resources. This is exemplified by the development of an interactive learning module specifically designed for Grade 11-12 students, leveraging the Nechako Watershed Portal's extensive datasets and informed by insights from the Koh-learning program. Module development continued during 2025, trialling and refining ways to integrate real-world environmental data, including climate projections, wildfire impacts, and water temperature measurements, with Indigenous knowledge to provide students with an integrative understanding of related issues in the watershed (e.g. connecting environment, community and health concerns). Working closely with educators (Research Assistant Marleau Brown) and members of the Koh-learning team (Research Assistant Jonathan Doyon), the Theme 4 portal team developed user-friendly, "grab-and-go" resources that enable teachers to effectively incorporate portal data into their curriculum. To address technical accessibility, solutions are being implemented to streamline portal access for classroom use. The educational content will guide students through exploring environmental data, analyzing research findings, and understanding the interconnections between the health of people, communities and ecosystems. This initiative demonstrated the portal's potential as both an educational tool and a platform for knowledge exchange between researchers, educators, and students, fostering a deeper understanding of watershed stewardship among young learners. Opportunities to link watershed modules and portal resources with place-based learning were trialed during field courses in northern BC (Nechako and Skeena-Bulkley watersheds), and are informing ongoing collaborations connecting land, waters and health (e.g. Watersheds and Health in *PLOS Water*, and land-based learning for health workforce development)

Ongoing discussions for data upload and user-driven project development were part of Phase 3 efforts and are still in development with Cheslatta Carrier Nation, who have reiterated their intention to use the Nechako Portal as a tool to profile digitized material from their Archive. Supported by a collaborative research agreement between the Cheslatta Carrier Nation and the IWRG, conversations were made to expand a '*Cheslatta Archives*' project in 2025. Some of the Cheslatta Carrier Nation's historical maps are already available in the portal, and the database has been curated to be profiled in the portal. The plan is to add these materials in partnership with the Cheslatta Carrier Nation in 2025, exploring features of the project function to curate and publicize this material to wider audiences and, when ready, to make the Cheslatta project publicly accessible.

Integrated Watershed Research Group

Resources

Below is a collation of resources across our team and themes, providing an at-a-glance overview of different kinds of outputs and deliverables. This was added to each Interim and Annual report in Phase 3, with an indication of what has changed since the previous reports.

Team: Human Resources

The names listed below reflect team members throughout Phase 3.

Cross-cutting for all themes

- Austin Armstrong (Portal website management support)
- Isla Bressette (IWRG Data technical support)
- Ahmad Jalil (new IWRG Data management and technical support)
- Lucas Macedo Moura (IWRG Research Manager)
- Lisa Rickard (Former IWRG Data management and technical support)

Theme 1

- Dylan Broeke (Research Skills Development Trainee)
- Finn (Kirsten) Calder-Sutt (Former Research Skills Development Trainee)
- Krishna Kafle (MSc student/Research Assistant)
- Erica Lee (NHG / FFEL Research Manager)
- Lisa Rickard (Former Research Associate)
- Bruno Sobral (Former PhD Student and RM)

Theme 2

- Dr. Kristen Kieta (Post Doctoral Fellow)
- Michael Samoil (MSc student)

Theme 3

- Avery Dextrase (PhD Student)
- Erica Lee (NHG / FFEL Research Manager)
- Melody Mah (FFEL Senior Technician)
- Abigail Oviatt (MSc Student)
- Annika Putt (PhD Candidate)
- Carly Walters (MSc Student)

Theme 4

- Isla Bressette (Research Assistant)
- Marleau Brown (Research Assistant)
- Jonathan Doyon (Research Assistant)
- Anna Hixson (Former Research Assistant)
- Adriana Hurtado (Research Associate)
- Ahmad Jalil (IWRG and Theme 4 Data Manager)
- Jamie Reschny (LEAPH Research Manager)
- Lisa Rickard (Former Research Assistant)

Integrated Watershed Research Group

Publications

Below is a summary of all articles published (or submitted) developed by the IWRG team during the project timeline:

- Bezzola A (2023). *Guide to accessing Nechako Watershed Portal Projects*. Integrated Watershed Research Group, University of Northern British Columbia. <https://nechakowatershed-portal.ca/?subId=1506>
- Déry SJ, Martins E, Owens PN, Petticrew EL (2024). Extreme hydrometeorological events induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America. *Communications Earth & Environment*, 5, 228. <https://doi.org/10.1038/s43247-024-01407-6>
- Hurley KM, Morris JE, Cardinal E, Gilbert DE, Kaveney AR, Sobral BS, Thompson HD, Thériault JM, Déry SJ (2025). The Tahtsa Ranges Atmospheric River Experiment (TRARE): Experimental design and case studies. *Discover Atmosphere*, 3, 12.
- Kieta KA, Owens PN, Petticrew EL (2023). Determination of sediment sources following a major wildfire and evaluation of the use of color properties and polycyclic aromatic hydrocarbons (PAHs) as tracers. *Journal of Soils and Sediments*, 23, 4187-4207. (based on Phase 2 work)
- Kieta KA, Owens PN, Petticrew EL (2023). Post-wildfire contamination of soils and sediments by polycyclic aromatic hydrocarbons in north-central British Columbia, Canada. *International Journal of Wildland Fire*, 32, 1071-1088. (based on Phase 2 work)
- Kieta KA, Owens PN, Petticrew EL (2024). Evaluating and improving the assessment of compound specific stable isotope derived sediment fingerprinting results in an agricultural watershed in British Columbia, Canada. *Catena*, 246, 108351. (based on Phase 2 work)
- Kokoszka JE, Broeke D, Calder-Sutt F, Khorsandi M, Tavares MA, Déry SJ (2025). Updating "Sub-hourly water temperature data collected across the Nechako Watershed, 2019-2021" to 2024 and with supplemental sites. *Data in Brief*, 61, 111710.
- Parkes MW, Bezzola A, Doyon J, Hurtado Bautista AM, Stone N (2024). Nechako Watershed Saturation Search (Public) [Internet]. Available from: https://www.zotero.org/groups/5510344/nechako_watershed_saturation_search_public/library
- Parkes MW, Déry SJ, Owens PN, Petticrew EL, Booth BP (2024). Towards an integrative understanding of British Columbia's Nechako Watershed: Connecting knowledge systems to strengthen understanding of climate change, watershed security, health and well-being. *PLOS Water*, Jul 10;3(7): <https://doi.org/10.1371/journal.pwat.0000263>
- Parkes, M. W., & Horwitz, P. (2025). Attending to the mesoscale: Watersheds and Health. *PLOS Water*, 4(2), e0000347. <https://doi.org/10.1371/journal.pwat.0000347>
- Richards-Thomas T, Déry SJ (2025). Moisture transport to British Columbia's Upper Nechako Watershed associated with three atmospheric rivers. *Discover Atmosphere*, 3, 9.
- Rickard L (2024). Guide to exploring information on Nechako Watershed Portal Projects. Integrated Watershed Resource Group (IWRG). Available at: <https://nechakowatershed-portal.ca/?subId=1506>
- Samoil M, Owens PN, Ali F, Miller B (submitted). The effects of soil burn severity and slope steepness on runoff and soil erosion following a severe wildfire in British Columbia, Canada. *Journal of Soils and Sediments*.
- Sobral BS, Déry SJ (2024). Water budget input linked to atmospheric rivers in British Columbia's

Integrated Watershed Research Group

Nechako River Basin. Hydrological Processes, 38(10), e15301.

<https://onlinelibrary.wiley.com/doi/10.1002/hyp.15301>

Presentations

Below is a summary of presentations made by the IWRG team during the project timeline:

- Broeke D, Déry SJ (2024). Nulki Lake Weather Station - Project Update, Annual General Meeting of the Nulki-Tachick Lakes Stewardship Society, 14 December 2024.
- Déry SJ (2024). Climate change and water security research in the Nechako Watershed. Visit of BC Hydro's President and CEO (Chris O'Riley) to the UNBC campus, Prince George, 8 August 2024.
- Dextrase A, Mah M, Pugh A (2025). Fish Adaptations. Exploration Place, Prince George, BC, 21 August 2025.
- Dextrase A, Mah M, Hinch SG, Martins EG (2025). Movement and activity of endangered Nechako River white sturgeon on the spawning grounds. North American Sturgeon and Paddlefish Society Meeting, Nelson, BC, 22 September 2025.
- Déry SJ, Owens PN, Martins E, Parkes MW, Moura L, Jalil A (2024). Update from UNBC's Integrated Watershed Research Group (IWRG), Nechako Watershed Roundtable annual meeting, virtual, 25 September 2024.
- Déry SJ (2024). Climate change in the Nechako Watershed, Climate Change Adaptation and Resilience in the Nechako Watershed workshop, Nechako Watershed Roundtable, Prince George, 29 November 2024.
- Martins EG (2025). Update on research on climate change and freshwater fish ecology in the Nechako Watershed. True North 2025 Business Development Forum in Prince George, BC, 6 May 2025.
- Parkes MW and Déry SJ (2025) "Towards an integrative understanding of British Columbia's Nechako Watershed" and "Attending to the mesoscale: Watersheds and Health" both profiled at Launch of 'Watersheds and Health' collection, Oceania Planetary Health Forum, 26-28 February 2025, Fiji.
- Putt A, Martins EG. Synthesizing Chinook Salmon data from the Nechako River watershed (2025). Annual Meeting of the Washington – British Columbia Chapter of the American Fisheries Society, Vancouver, Canada, March 2025.
- Samoil M, Owens P, Ali F, Miller B (2024). Assessment of post-wildfire erosion in the Nechako watershed, BC, using a rainfall simulator and remote sensing. Western Division of the Canadian Association of Geographers annual conference, Kelowna, 16 March 2024.
- Samoil M, Owens P, Ali F (2024). Assessing of post-wildfire runoff and soil erosion using a rainfall simulator. UNBC-PICS Wildfire Friday workshop, Prince George, 25 October 2024.
- Samoil M, Owens P, Ali F, Miller B (2025). Assessing post-wildfire hillslope runoff and erosion in the Nechako watershed, BC, using a rainfall simulator. Western Division of the Canadian Association of Geographers annual conference, Kamloops, 7 March 2025.
- Samoil M, Owens P, Ali F (2025). Assessing post-wildfire runoff and soil erosion in the Nechako watershed, BC, using a rainfall simulator. NRESi – Canadian Institute of Forestry (CIF) Master's Night, Prince George, 11 April 2025.

Integrated Watershed Research Group

- Samoil M, Owens P, Ali F (2025). Assessing post-wildfire runoff and soil erosion in the Nechako watershed, BC, using a rainfall simulator. Canadian Geophysical Union annual conference, Saskatoon, May 2025.
- Sobral B, Déry S, Martins EG, Owens P, Parkes M (2023). An update on Phase 3 of integrated research in the Nechako Watershed. Nechako Watershed Roundtable NWR Annual meeting, Vanderhoof, 7 November 2023.
- Walters CL, Gantner N, Hagen J, Spendlow I, Pillipow R, Martins EG (2025). Disentangling the contribution of density dependence and independence to population dynamics of stream-dwelling trout. 2025 Annual Meeting of the Washington – British Columbia Chapter of the American Fisheries Society, Vancouver, Canada, March 2025.
- Walters C, Pugh A, Martins EG (2025) Stellako River rainbow trout population and thermal ecology. Polar Coachman Fly Fly Fishing Club, Prince George, BC, 8 May 2025.

Media Profile

This list summarizes media interviews, reports, and profiles of the IWRG team’s research received since the beginning of the project:

- UNBC (2023) UNBC research group launches third phase of Nechako River Basin study. UNBC Media release - <https://www2.unbc.ca/newsroom/unbc-stories/unbc-research-group-launches-third-phase-nechako-river-basin-study> (August 31, 2023)
- Rickard L (2024) Guide to exploring information on Nechako Watershed Portal Projects. Integrated Watershed Resource Group (IWRG). Available at: <https://nechakowatershed-portal.ca/?subId=1506>
- Branco, D. (2024) Dr. Stephen Déry was interviewed to discuss the impacts of the ongoing drought in northern BC on groundwater levels. CKPG News. (January 08, 2024)
- Branco, D. (2024). Dr. Stephen Déry was interviewed to discuss the warm temperatures and rapid snowmelt in northern BC. CKPG News. (January 29, 2024)
- Bain, D. (2024) UNBC Researcher’s paper shows the impacts of extreme weather on waterways. MyPGNow. <https://www.myprincegeorgenow.com/196917/news/unbc-researchers-paper-shows-impacts-of-extreme-weather-on-waterways/> (May 05, 2024)
- Déry, S. (2024). Extreme hydrometeorological events induce abrupt and widespread changes in Pacific Northwest freshwater temperatures, <https://communities.springernature.com/posts/extreme-hydrometeorological-events-induce-abrupt-and-widespread-changes-in-pacific-northwest-freshwater-temperatures>. Blog entry at Springer Nature Research Communities. (May 01, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss Low flows in the Nechako River, Daybreak North, CBC Radio (March 18, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed on persistent drought conditions and low water levels in the Nechako River, The Tyee. (March 28, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss about the opening of golf courses with the early snowmelt and spring onset in Prince George, CKPG News, CKPG (Prince George, BC). (April 04, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss about the BC River Forecast Centre's 1 April snow report and low snowpacks in northern BC, CKPG News, CKPG (Prince George, BC). (April 10, 2024)

Integrated Watershed Research Group

- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss extreme hydrometeorological events that induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America, News, Fairchild TV. (May 1, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss extreme hydrometeorological events that induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America, Daybreak North. CBC Radio. (May 1, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss extreme hydrometeorological events induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America, News, Vista Radio (Prince George, BC) (May 01, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss extreme hydrometeorological events that induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America, Rocky Mountain Goat newsletter. (May 02, 2024)
- Déry, S. (2024) Dr. Stephen Déry was interviewed to discuss how the recent rains are alleviating the drought in northern BC, CKPG News, CKPG (Prince George, BC). (May 29, 2024)
- Fanshaw C (2023) Dr. Stephen Déry was interviewed to discuss sediment loads and the different coloration of the Nechako and Fraser rivers. CKPG News. (July 25, 2023)
- Fanshaw C (2025) Snorkeling the Stellako: UNBC researchers dive into rainbow trout health, CKPG News, CKPG (Prince George, BC) <https://ckpgtoday.ca/2025/07/31/snorkeling-the-stellako-unbc-leading-fish-ecology-research-on-rainbow-trout/>
- Jahn C (2023) UNBC researchers get funding: CKPG News. <https://ckpgtoday.ca/2023/08/31/unbc-researchers-get-funding/> (August 31, 2023)
- Jahn C (2024) Extreme hydrometeorological events induce abrupt and widespread freshwater temperature changes across the Pacific Northwest of North America. CKPG News. <https://ckpgtoday.ca/2024/05/02/extreme-weather-impacting-northern-bc-waterways/>. (May 02, 2024)
- Jahn C (2025) More Nechako Watershed research coming. CKPG News. <https://ckpgtoday.ca/2025/01/17/more-nechako-watershed-research-coming/> (January 17, 2025)
- Peterson (2023) UNBC research group gets \$800k to continue Nechako River Basin study. Times Colonist - <https://www.timescolonist.com/environment/unbc-research-group-gets-800k-to-continue-nechako-river-basin-study-7484370> (September 1, 2023)
- UNBC (2023) UNBC Extreme weather results in drastic changes to waterways. UNBC media release <https://www2.unbc.ca/newsroom/unbc-stories/extreme-weather-results-drastic-changes-waterways> (May 01, 2024).
- UNBC (2023) UNBC research group launches third phase of Nechako River Basin study. UNBC Media release - <https://www2.unbc.ca/newsroom/unbc-stories/unbc-research-group-launches-third-phase-nechako-river-basin-study> (August 31, 2023).

Integrated Watershed Research Group

Budget Summary

The budget presented in this section covers all the expenses for the project timeline (1 July 2023 to 31 August 2025). The IWRG was allocated \$200,000 each project year from NEEFS and committed another \$200,000 per project year from various sources for the required matching funds. A summary of (NEEF only) expenditures for the Phase 3 project is provided in the summary table below (see Table 1). Each of the four themes was allocated \$30,000 for Years 1 and 2, for a total of \$60,000 per theme. The shared budget allocated for Years 1 and 2 then amounts to \$61,818/year, while the 10% overhead/administration fee accounts for the remaining \$18,182/year.

By 31 August 2025, \$400,000 has been expended, which represents our total allocation from NEEFS for the Phase 3 project. The IWRG has fully matched all expenses and resources provided by NEEFS, with a total of \$516,000 covered in matching funds.

Attached to this report is a detailed Excel spreadsheet providing the complete project’s budget workflow that covers each theme's expended value for each line item. Consult the Excel spreadsheet for further details on the budget.

Table 1: Summary of NEEF expenditures for Phase 3. The table includes shared expenses in addition to those for each theme, plus the administration fee. The table includes allocated and expended resources (up to 31 August 2025) and their difference.

Full project (1 July 2023 to 31 August 2025)			
Line item	Allocated	Expended	Difference
Shared costs	\$123,636	\$125,875	(\$2,239)
Theme 1	\$60,000	\$60,158	(\$158)
Theme 2	\$60,000	\$57,815	\$2,185
Theme 3	\$60,000	\$59,780	\$220
Theme 4	\$60,000	\$60,008	(\$8)
Overhead (10%)	\$36,364	\$36,364	\$0
Total	\$400,000	\$400,000	\$0