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RioTinto

UNBC UNIVERSITY OF
NORTHERN BRITISH COLUMBIA

NSERC/Rio Tinto Industrial Research Chair on Climate Change and Water Security

Annual Report – Year 1

(1 July 2019 – 30 June 2020)



Prepared by Dr. Stephen Déry

2019-2020 IRC Annual Report

Preamble

June 30th, 2020 marks the completion of the first year of the Natural Sciences and Engineering Research Council of Canada (NSERC)/Rio Tinto Industrial Research Chair (IRC) on Climate Change and Water Security at UNBC. The 5-year program of research started on July 1st, 2019 with the objective to better understand and quantify the roles of climate variability, climate change, and water management on the long term water security of the Nechako Watershed. Among other research topics, we are elucidating some of the complex interactions between climate change and human interventions on flow volumes and water temperatures in the Nechako River using a combination of in situ observations and computer modelling.

Official Launch

The official launch of the NSERC/Rio Tinto IRC program of research was held on November 4th, 2019 at UNBC. The event began with a welcome to the unceded Lheidli T'enneh territory by Elder Marcel Gagnon, and was followed by presentations by Affonso Bizon (Rio Tinto), Stephen Déry (UNBC/IRC) and President Daniel Weeks (UNBC; Figure 1). In attendance were many members of the UNBC community, representatives from Rio Tinto, and the community at large including stakeholders from the Nechako Watershed. Local media also attended the event, which led to many interviews following the presentations. A media release was jointly issued that day by UNBC and Rio Tinto to announce the partnership between the two organizations. Messages on social media, the activation of the [IRC website](#), and an introductory letter issued to ~100 stakeholders in the Nechako Watershed further advertized the new IRC program of research.



NSERC/Rio Tinto Senior Industrial Research Chair in Climate Change and Water Security Dr. Stephen Déry will use \$1.5 million in new research funding to examine the effects climate change is having on the Nechako River watershed.

Figure 1: Photo of the IRC official launch event held on the UNBC campus on November 4th, 2020 (left) and the corresponding media release issued on the day of the event (right).

Personnel and Training

During the first year of activity, a number of highly-qualified personnel (HQP) were recruited to support the IRC program of research (Figure 2). In supporting roles, Jeremy Morris acts as the research manager (RM) while Barry Booth is the outreach coordinator (OC). Training of graduate and undergraduate students forms a central component of the IRC. Two undergraduate students from UNBC, Natalya Klutz and Danny Scurfield, were recruited as field assistants (FAs) to support our spring/summer 2020 field activities while a research skills trainee (RA), Ivy Strother, set the stage with preparations and planning for the 2020 field season plus Theme 1 monitoring activities. As of May 2020, a MSc student, Justin Kokoszka, leads a project on the naturalization of flows in the Nechako River while PhD student Bruno Sobral will start his graduate program in September 2020 investigating atmospheric rivers that affect the Nechako Watershed. Finally, Rajtantra Lihare will begin his position as a post-doctoral fellow (PDF) in August 2020 to lead hydrological modelling efforts. Recruitment of students/personnel and project initiation will continue this summer and fall including the hydrological and water temperature modelling efforts, with additional personnel joining the team this fall.

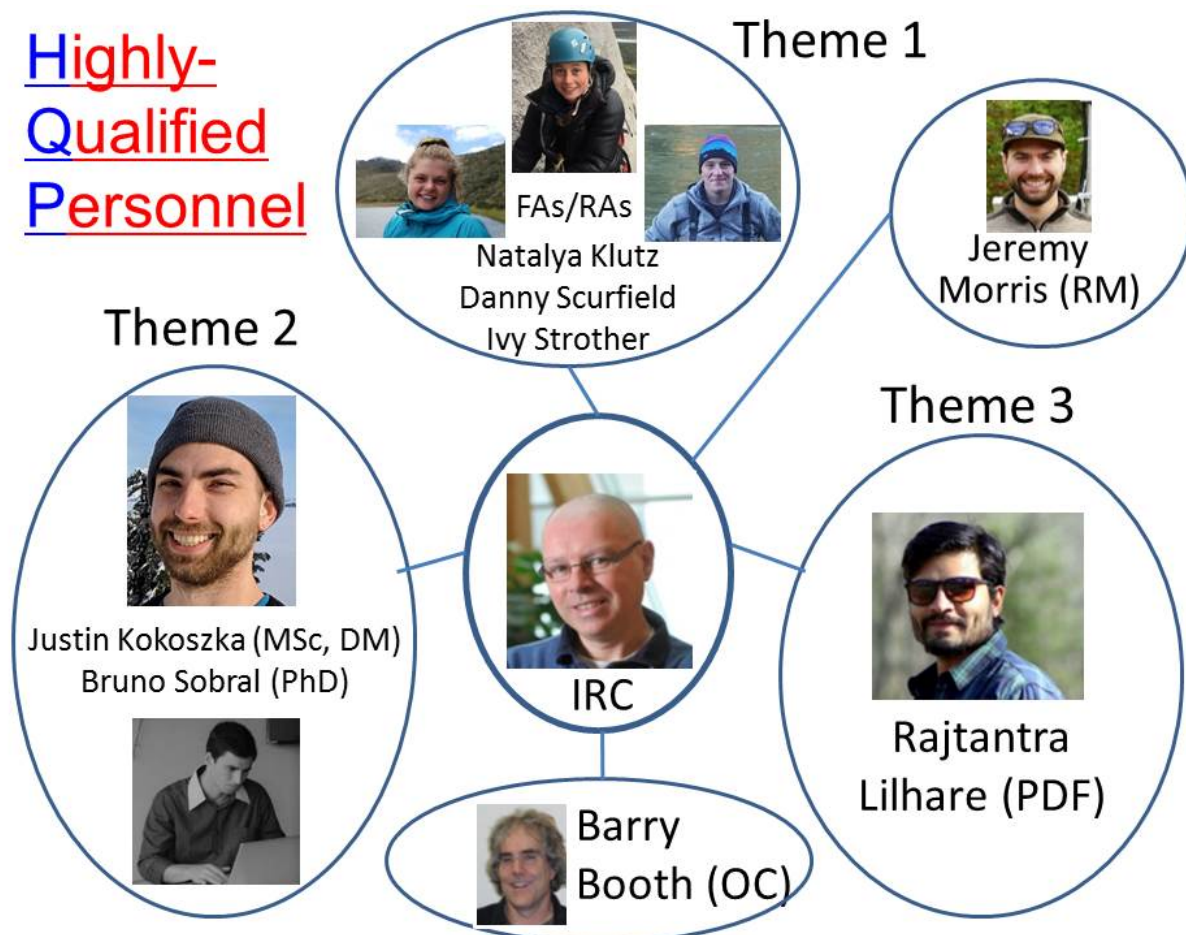


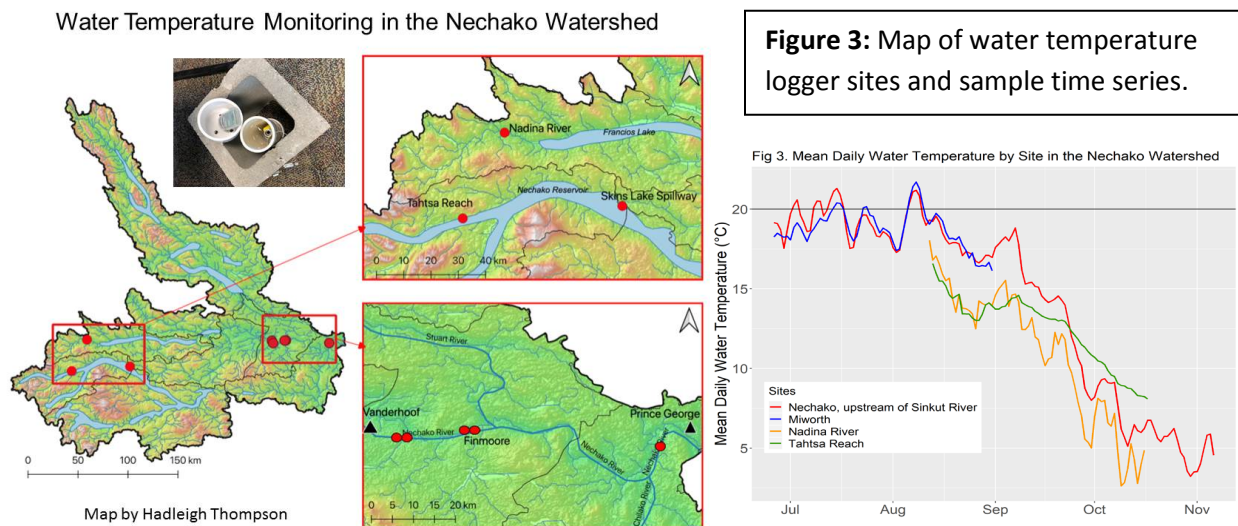
Figure 2: Diagram illustrating the current highly qualified personnel (HQP) recruited under each of the three research themes along with supporting staff members.

Research Management

Aside from the recruitment of personnel, a Science Advisory Board (SAB) was formed in 2019 to oversee the progress of the IRC program of research. The SAB comprises five members: Mr. Justus Benckhuysen (Rio Tinto), Dr. Ellen Petticrew (UNBC), Mr. James Rakochy (Cheslatta Carrier Nation), Mr. Chelton van Geloven (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD)), and Dr. Francis Zwiers (Pacific Climate Impacts Consortium). The SAB along with the UNBC Director of Research, Mr. Mark Barnes, and Rio Tinto's Advisor for Communication and Communities, Mrs. Lianne Olson, met on June 4th, 2020 to hear and evaluate progress thus far with the IRC program of research through an online presentation by Dr. Déry. The SAB will meet with the Chairholder and his personnel on an annual basis to ensure the IRC objectives are met and progress remains satisfactory. The SAB will report to the UNBC Vice-President of Research and Graduate Programs.

Field Activities

During our first year of activity, we completed a successful pilot project on monitoring water temperatures at eight sites across the Nechako Watershed (Figure 3). This is to assist with future water temperature modelling efforts and to capture spatio-temporal patterns in water temperatures. Sample data reveal a few instances of above 20°C mean daily water temperatures along the main stem Nechako River between Vanderhoof and Prince George in the summer of 2019. A surprising finding was the observation of cooler water temperatures in the Nechako River at Miworth near Prince George compared to Vanderhoof (upstream of the Sinkut River) in July during the Summer Temperature Management Project, illustrating the notable influence of the Stuart and Chilako rivers on thermal conditions of the Nechako River near its confluence with the Fraser River.



Communication Strategy

A comprehensive communication strategy was unveiled during the official launch of the IRC on November 4th, 2019. This includes a [provisional website](#), presence on social media (e.g. Twitter, LinkedIn, and ResearchGate), and a Slack workspace to facilitate interactions between the IRC team members. After the official launch event, an introductory letter was disseminated to over 100 stakeholders across the Nechako Watershed to announce the initiation of the IRC program of research. Two media releases were jointly issued by UNBC and Rio Tinto (November 4th, 2019 and June 30th, 2020) and a quarterly newsletter disseminates further information on the IRC to the general public. Dr. Déry also presented a progress report to the True North Business Forum, a prelude to the northern BC Natural Resources Forum, held in Prince George on January 28th, 2020. Finally, a poster describing the precipitation gauge array including potential site selection was completed.

Community Engagement

The success of the IRC relies on a broad communication strategy and community engagement. To that end, efforts are being made to communicate with First Nations as to where field work and other research is being undertaken as part of the IRC. We are carrying out this work with the assistance of FLNRORD First Nations advisors from the Omenica and Skeena districts to identify pertinent personnel within the Stelat'en, Nak'azdli, and Tl'azt'en Nations. This has been of particular importance due to concerns expressed by some First Nations relating to outside activities in traditional territories during the COVID 19 pandemic. Our outreach efforts in August 2019 led to a meeting with James Rakochy, Marco Jorge and other members of the Cheslatta Carrier Nation to discuss plans for the deployment of meteorological equipment and water temperature loggers in the upper Nechako Watershed. Other engagement has included touring the Fisheries and Oceans Canada's Nadina River Spawning Channel with Mitchell Harborne, meeting with Gary Thompson of Lowprofile Ventures to access the alpine site at Mount Sweeney, as well as meeting Brad and Wendy Thompson at Nadina Lake Lodge, and initiating conversations with Centerra Gold and Imperial Metals for data sharing and access to potential field sites. Dr. Déry is also fully engaged in Rio Tinto's Water Engagement Initiative and is participating in monthly main table and technical working group meetings. Further, Dr. Déry remains involved in the Nechako Watershed Roundtable by participating in its meetings.

Industrial Partner Engagement

Dr. Déry interacts on a regular basis with the industrial partner via email, phone, and in person meetings. The principal contact person at Rio Tinto for research is Justus Benckhuysen (Nechako Operations Coordinator) while for outreach interactions are facilitated by Lianne Olson (Advisor Communications/Communities). Additional communication with the water management team including Bruno Larouche and Alec Mercier proceeds on a periodic basis for the exchange of data and metadata, knowledge on Rio Tinto's operations and system in the Nechako Watershed,

and to identify monitoring and information gaps in the basin. Finally, an application for a permit to access and deploy hydrometeorological equipment in Tweedsmuir North provincial park was jointly prepared by Dr. Déry's team and Rio Tinto staff. The permit has been provisionally accepted and will allow the installation of a hydrometric and precipitation gauge at Eutsuk River.

Budget

The IRC program of research is supported equally by NSERC and Rio Tinto with a total budget of \$1.5M over five years. Approximately half of this budget is allocated to support Dr. Déry's salary and benefits. With the release of these funds and to fulfil the requirements of NSERC's IRC program, UNBC is in the process of hiring a new tenure-track faculty member to build capacity in hydrometeorology. The remainder of the available funds was disbursed mainly for the support of HQP (43.6%) and to purchase new equipment (39.2%) such as the Mt. Sweeney meteorological station, water temperature loggers and precipitation gauges as well as computers and a field tablet. Additional material purchases (2.4%) and costs related to dissemination (0.01%) accounted for the remaining expenditures. As of the end of June 2020 we expended 85.4% of the overall allocated funds for Year 1 of the IRC. Any year-end surplus of funds will be transferred to Year 2 as expenditures are expected to ramp up for the support of new trainees, expanded field work, travel and outreach activities.

While NSERC and Rio Tinto provide the bulk of the funding for the IRC program of research, additional support was provided through Eco Canada (three successful applications for a total sum of about \$20K) and the Nechako Environmental Enhancement Fund (previously secured with members of the UNBC Integrated Watershed Research Group). An application to Global Water Futures has secured additional funding that will support a new PhD student at UNBC starting in January 2021 who will focus on *compound events* associated with landfalling atmospheric rivers, including those affecting the Nechako Watershed. A proposal for an equipment grant is currently under internal review with possible submission this fall to the Canada Foundation for Innovation. If successful, this would provide additional resources to monitor atmospheric rivers in the upper Nechako Watershed and to assess components of the water budget for Nechako headwater catchments. Finally, we have secured \$11.8K through an internal call to the Real Estate Foundation of BC to assess land cover changes on recent major floods in the province including within the Nechako Watershed.

Prospects for Year 2

Despite the challenges encountered during the first year of activity, namely due to a month-long faculty strike at UNBC in November 2019 followed by the COVID-19 pandemic in 2020, the IRC program of research is well under way and making steady progress. In Year 2, we anticipate filling additional positions with potentially one new MSc (fall 2020) and one new PhD student (spring 2021), in addition to another post-doctoral fellow (fall 2020). The summer 2020 field season will focus on deployment of the meteorological equipment and water temperature loggers

across the Nechako Watershed. Indeed, we anticipate deploying another 20 or so water temperature loggers across the Nechako Watershed. Areas of special interest lie in the Stuart River Basin and in the Upper Nechako Watershed. We also established potential sites to deploy 10 rainfall gauges to measure the steep precipitation gradients that exist from the wet Coast Mountains onto the dry Interior Plateau. Finally, we have been testing a comprehensive weather station that will be deployed this summer at Mt. Sweeney, just north of Tahtsa Lake, to better monitor storms such as “Pineapple Expresses” that impact the upper Nechako Watershed. All of this monitoring equipment was acquired over the first year of the IRC and is currently being tested and calibrated prior to deployment this summer. A dedicated effort will be made to meet stakeholders throughout the watershed and to communicate our findings to the general public. Exchanges of information with Rio Tinto will intensify as we begin to obtain results from our research. Depending on the COVID-19 situation, a visit to Rio Tinto’s office in the Lac St-Jean area may also proceed to facilitate exchanges with the industrial partner. A new faculty member will join the Environmental Science program at UNBC and will collaborate closely with Dr. Déry and his team of researchers.