June 19, 2020
Volume 2, Issue 2

# The Nechako IRC Newsletter

## An update from Dr. Stephen Déry, Project Leader

Greetings!

June 30th marks the completion of the first year of the NSERC/Rio Tinto Industrial Research Chair (IRC) in Climate Change and Water Security at UNBC and thus an opportunity to reflect on our progress thus far. Indeed, we embarked on the 5-year program of research 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 aim to elucidate 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.

During our first year of activity, we completed a pilot project on monitoring water temperatures at eight sites across the Nechako Watershed, an effort upon which we will expand during this summer. We also established potential sites to deploy 10 rainfall gauges to measure the sharp 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 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. Two undergraduate students from UNBC, Natalya Klutz and Danny Scurfield, were recruited to support our summer field activities. Recruitment of students/personnel and project initiation will continue this summer and fall including the hydrological and modelling efforts, for which an update will be provided in our next newsletter.

In this edition of the Nechako IRC Newsletter, you will find a piece by Rajtantra Lilhare describing recent trends in observed flows for the major waterways draining the Nechako Watershed. The newsletter also includes a contribution by Natalya Klutz describing possible sites for the deployment of water temperature loggers across the Nechako Watershed during this summer field season. These devices will be critical in assessing the impacts of day-to-day weather variations and flows on water temperatures on both regulated and unregulated waterways of the Nechako Watershed. Such data are especially useful in assessing the quality of aquatic habitat for species such as Nechako White Sturgeon, Chinook and Sockeye Salmon. Daniel Scurfield also provides a brief report on the Mt. Sweeney weather station and plans for additional meteorological monitoring in the Nechako Watershed this summer. Finally, an update on other recent activities and news items are provided throughout the newsletter.

In the coming weeks and months we will make concerted efforts to visit some of the communities and First Nations in the Nechako Watershed and so we look forward to meeting some of you in the near future. A final reminder that we welcome any feedback you may have on this newsletter and our research, and encourage to keep track of our activities on our website.

All the best,
Stephen
Northern Hydrometeorology Group (NHG), UNBC

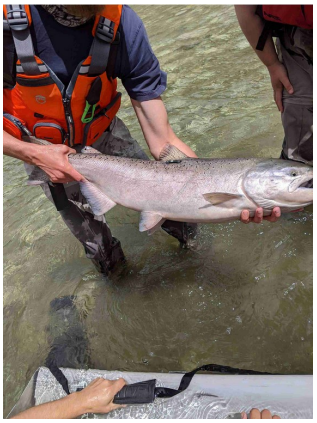
*Flowering Calypso orchids in Wilkins Park near Prince George, herald the coming of spring in the Nechako.*

### Inside this issue



### Special points of interest

- The IRC Science Advisory Board met on June 2nd to evaluate progress over the first year of activity and plans for the summer season.
- Two additional graduate students are joining the IRC team in September and will be introduced in our next newsletter.



*The Big Bar response team radio tagged the first Chinook of the 2020 year on June 8th, near Lytton. Photo by DFO. Up to 30 Chinook have been detected moving up-stream by sonar near the Big Bar ferry.*

## Research Manager Update
Jeremy Morris

Our undergraduate field assistants have been busy testing our stream temperature probes, tipping bucket rain gauges and the Mt. Sweeny weather station, and preparing all the additional gear required for a successful deployment campaign which is expected to take place over the month of July. In addition we have begun contacting stakeholders across the watershed to coordinate these efforts. Coming into the start of this busy field project we have seen excellent work from our undergraduate field team and are thrilled to provide them with this research experience. I look forward to developing relationships with members of local communities of the Nechako Watershed, learning more about the region from those who live there, and sharing the knowledge we at NHG generate through our work in this beautiful part of the province.
.

## Summer plans: Deployment of stream temperature data loggers in the Nechako Watershed
Natayla Klutz

In the summer of 2020, we anticipate implementing approximately 20 stream temperature loggers throughout the Nechako Watershed (Figure 1). Using information provided by our industry partner and other organizations, we have developed a map of potential deployment sites. We chose stream temperature logger sites based on the proximity to existing weather stations, existing or historical Water Survey of Canada river discharge sites and tipping bucket sites. Additionally, many of the sites were requested by stakeholders. Each site will contain a single logger installed in perforated PVC pipe with caps on either end. Depending on channel depth, type of bedload, discharge velocity, and cost the PVC will be anchored in the water body through one of two methods. We plan to focus on utilizing underwater epoxy. At locations where this is not applicable, the PVC pipe will be attached to a cement block, placed in the river, and tethered to the shore.

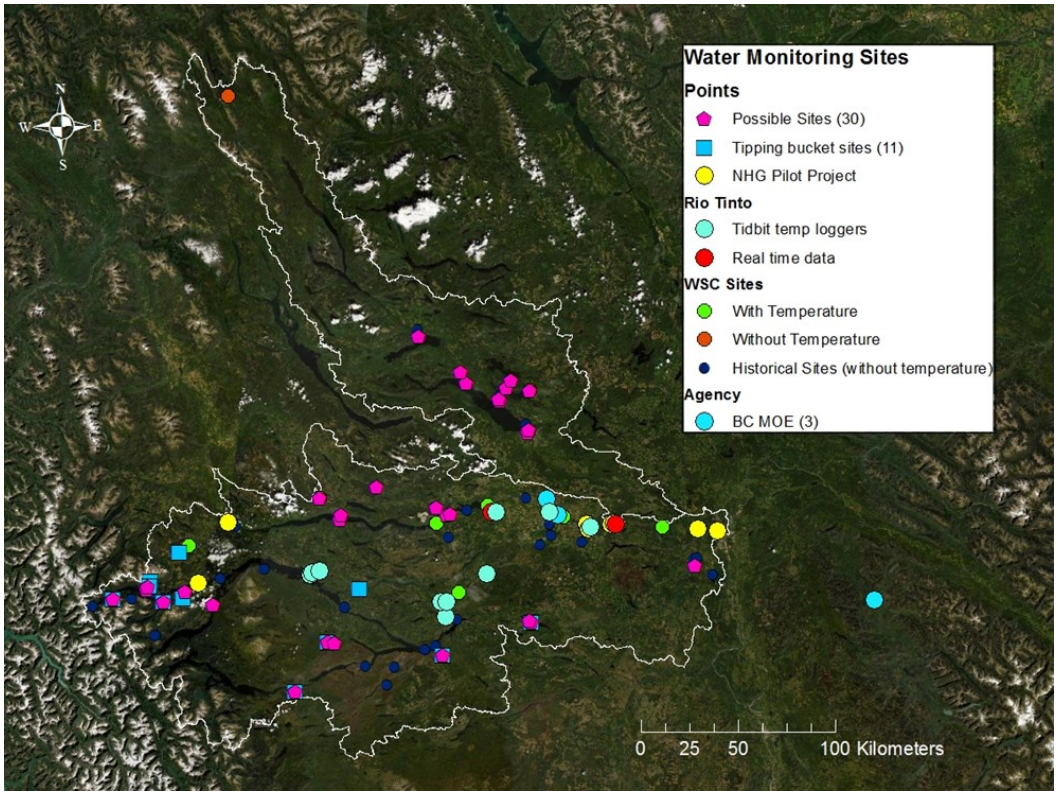



Figure 1. Location of proposed monitoring sites in the Nechako Basin in relation to other monitoring sites.

Two research assistants will implement and maintain the loggers, as well as download the data throughout the summer. The data will be particularly useful in model calibration and validation, looking at spatio-temporal patterns in water temperatures across the Nechako, and analyzing how stream temperature changes due to variations in climate are impacting aquatic species in the Nechako Watershed, particularly Chinook and Sockeye Salmon and Nechako White Sturgeon. Once the loggers are implemented, they can be maintained for years to come, providing essential data for research.

## New weather station: Mt. Sweeney, Tahtsa Ranges

Daniel Scurfield

The NHG will install its newest weather station on Mt. Sweeney and 10 tipping bucket precipitation gauges throughout the Nechako Watershed beginning this June. Mt Sweeney is approximately 133 kilometres southwest of Houston, overlooking Tahtsa Lake and the Nechako Reservoir. This weather station along with others make up the Cariboo Alpine Mesonet (CAMnet): a network of weather stations and climate monitoring devices in north-central British Columbia.

The Mt. Sweeney station will be equipped with a number of sensors that will measure and record temperature and relative humidity, snow depth, wind speed and direction, incoming solar radiation, and barometric pressure. As well, surface and subsurface temperature probes will be included, in addition to an all-weather precipitation gauge.

Mt. Sweeney is located on the Tahtsa Ranges of British Columbia, in the Coast Mountains and this weather station will capture information on atmospheric rivers also known as "Pineapple Express" storms, causing large precipitation events in the upper Nechako Watershed. The data collected from this weather station and tipping bucket precipitation gauges throughout the Nechako Watershed will be used to produce more accurate precipitation fields, thereby providing a greater understanding of precipitation events over time and space.

Figure 2. Future Mt Sweeney weather station under going testing in the Research Manager's back yard. The station consists of a 6 m tripod with snow depth, wind, solar radiation and atmospheric pressure sensors, and a Pluvio2 weighing precipitation gauge (cone shaped sensor in photo). Once the Pluvio2 is installed at Mt. Sweeney, it will be mounted at a height of 3 m within the windshield pictured in the foreground. Hiding at the back left of the photo is one of the 10 tipping bucket rain gauges to be deployed across the reservoir region.

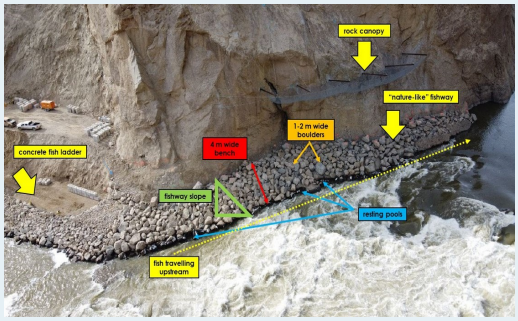
## Big Bar Slide: an update

Since the report of the massive landslide in June 2019 at Big Bar that impeded salmon migration on the Fraser, and ultimately the Nechako and Stuart Rivers, efforts are being undertaken to ensure that the salmon runs of 2020 will be able to move through this section of the Fraser to their spawning grounds. Work ramped up in December of 2019 and is continuing as weather and water levels permit.

The work being undertaken at the Big Bar site is monumental in scale. Efforts include the construction of a 'natural-like' fishway, the installation of a Whooshh Passage Portal, and the installation of a fish ladder to enable fish collection and transport by Whooshh or truck. There are also efforts being directed towards prioritizing stocks impacted by the landslide for emergency enhancement efforts which will include the capture and transport of some of stocks to off-site hatcheries.

It is difficult to fathom the magnitude of the problem that this slide caused. It was reported that the 2019 escapement of early run of Stuart River Sockeye was but 1% of the 2015 brood year and less than 1% of the long-term cycle average. Similar dramatic declines of early run Chinook Salmon were also noted.

How the efforts that are being taken at the Big Bar Slide will affect migrating salmon is uncertain at this time. What is clear is that this event has added another factor that is affecting the status of salmon in the Fraser/Nechako/Stuart River systems and speaks to the importance of this project as climate change, unlike this slide, will likely be a persistent and possibly more insidious impact to salmon stocks.
If you are interested, official Big Bar updates can be found here.




Aerial view of key "nature-like" fishway features which will support fish travelling upstream. Photo: DFO


UNBC IRC Research Program

3333 University Way
Prince George, BC
V2N 4Z9

Phone: 250-960-5193
E-mail: irc@unbc.ca
Website: http://web.unbc.ca/~sdery/irc.htm


# Data Manager update


Justin Kokoszka


The NHG will be implementing a database for our weather station network "CamNet". The project will take an open-source approach by using an open-source relational database platform (i.e. PostgreSQL). The project hopes to integrate data into a single platform that will aid in data management and increase data accessibility among stakeholders and the public. Currently the project is in the planning phase which includes development of an equipment inventory.

# Trends in observed flows in the Nechako


Rajtantra Lilhare


Cold regions and snow-dominated river basins are particularly sensitive to changing climate. As a result, it is essential to analyse drivers of historical trends in water resources of these basins. The period 1955-2015 reveals a clear pattern of negative changes in the observed mean annual runoff from five Water Survey of Canada gauging stations across the Nechako Watershed (Figure 3). The most and least substantial negative changes occur in the Nechako River at Vanderhoof (40-50%) and Stuart River near Fort St. James (0-10%), respectively for 1955-2015. Hydrological model simulations will help us to better understand the drivers of historical changes in hydrology and to project potential future changes therein. This research program has a major objective to analyse and simulate historic flow conditions of the NRB using the Variable Infiltration Capacity (VIC) hydrologic model for 1955-2019. Further, we will quantify the impacts of both regulation and climate change on the overall hydrology of the Nechako.

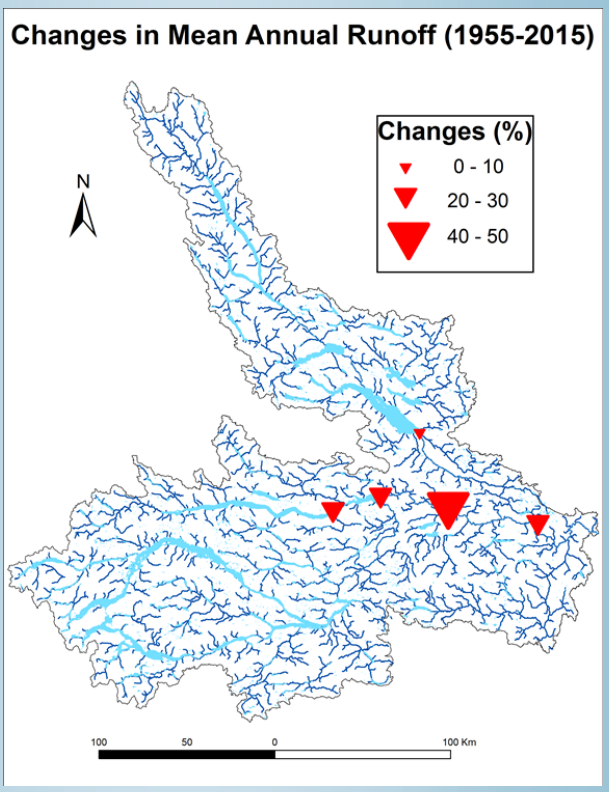



Figure 3. Map depicting the spatial variability in the changes in mean annual runoff for five naturally flowing rivers across the Nechako River Basin for 1955– 2015. Downward pointing triangles denote negative changes for the 1955-2015.