Climate Change and Water Security Research at UNBC

Meeting of the **Main Table** of the Water Engagement Initiative

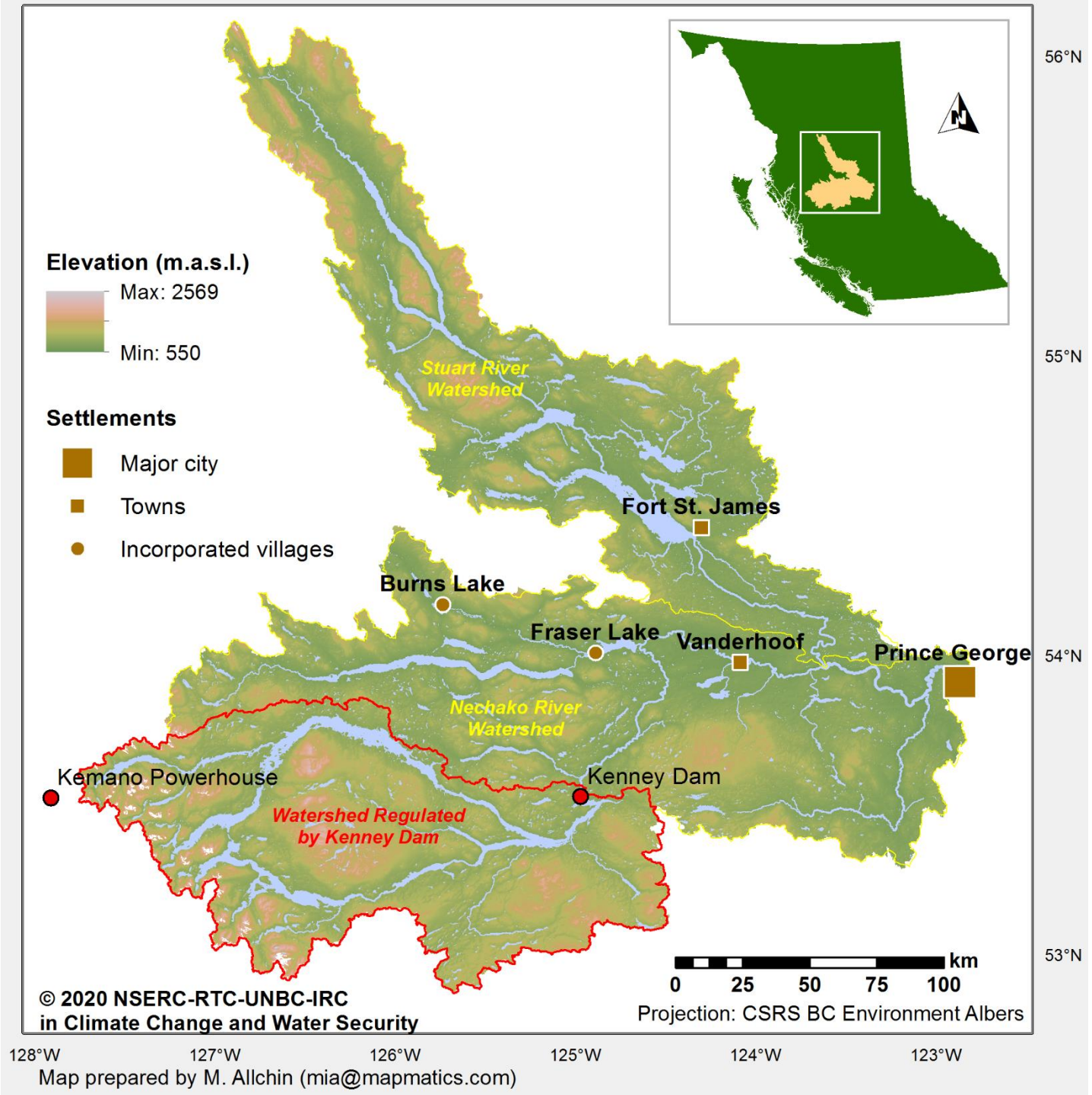
10 February 2021

Stephen Déry

Confluence of the Nechako and Fraser Rivers, Prince George, BC Unceded Lheidli T'enneh territory (Image Source: Wikipedia)

NHG Northern Hydrometeorology Group

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA



Nechako Watershed

Area: 47,200 km^2

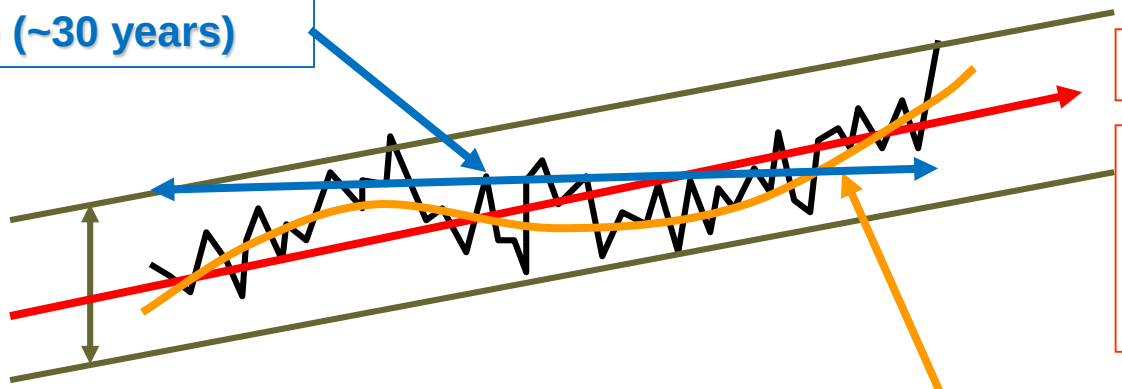
Regulated portion spans 14,040 km^2

Second largest tributary watershed to the Fraser River

Traditional territory of Carrier (Dakelh) people for 1000s of years

Name derives from “Netja koh”, which in the Carrier language means “big river”

Climate Normals, Variability & Change



Climate Normals

Long term (decades) averages or means in climate (~30 years)

Climate Change

Long term (decades to centuries) trends or major shifts in climate

Climate Variability

Short term (years to decades) rises and falls about the trend line (El Niño)

Climate Oscillations

Long term (decades to centuries) oscillations in climate (Pacific Decadal Oscillation)

Climate change in the Nechako Watershed

Research in collaboration with UNBC's Integrated Watershed Research Group (IWRG): Drs. Phil Owens, Margot Parkes & Ellen Petticrew

Tahtsa Lake & Rhine Crag viewed from Huckleberry Mine

nEEF Nechako Environmental Enhancement Fund
real estate foundation BRITISH COLUMBIA
Interior University Research Coalition
CORE STRENGTH FOR AN INNOVATIVE BRITISH COLUMBIA
NSERC CRSNG

Climate averages & climate change across the Nechako

1981-2010 Climate Normals

Site	T (°C)	P (mm)
Kemano	7.4	1987
Tahtsa*	2.7	1985
Ootsa	3.2	417
V'hoof	4.4	489
FSJ	3.5	487
PG	4.3	596

*Discontinued in 2010

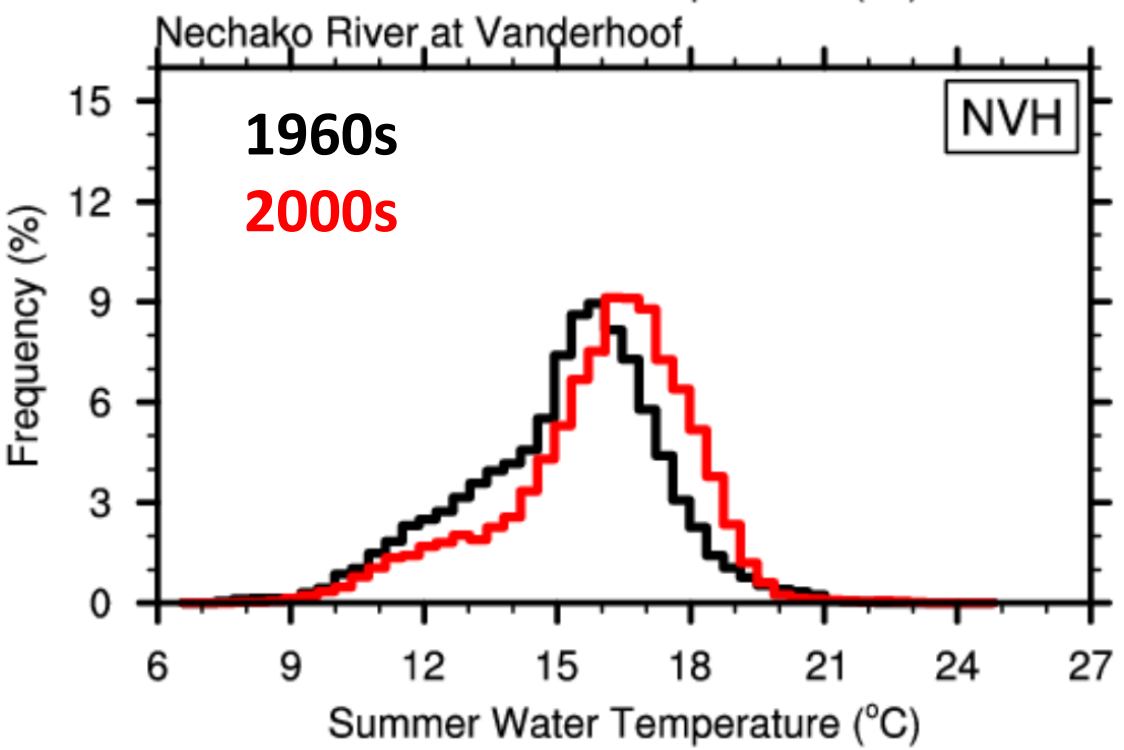
1950-2012 Climate Change

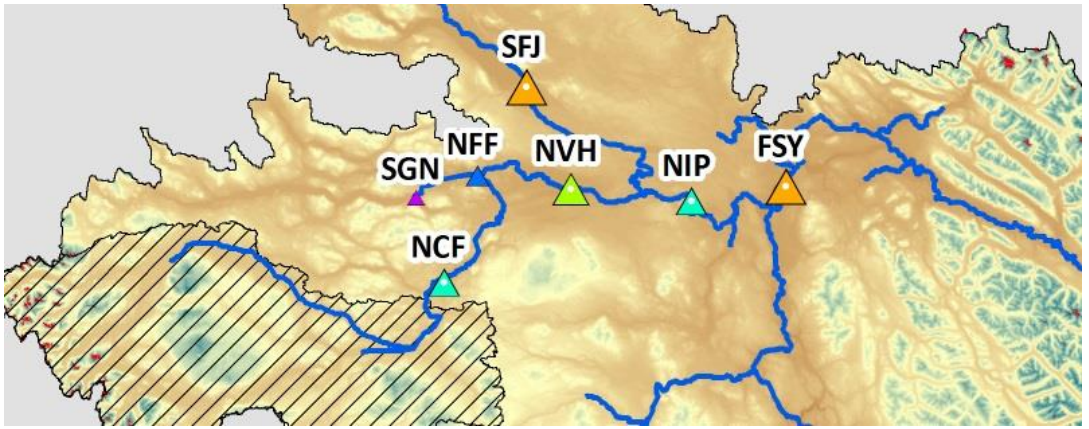
Variable	Change
Temp.	1.8°C
Prec.	+2%
Rain	+13%
Snow	-7%

River Water Temperatures

1950-2015 Summer Temp. Changes

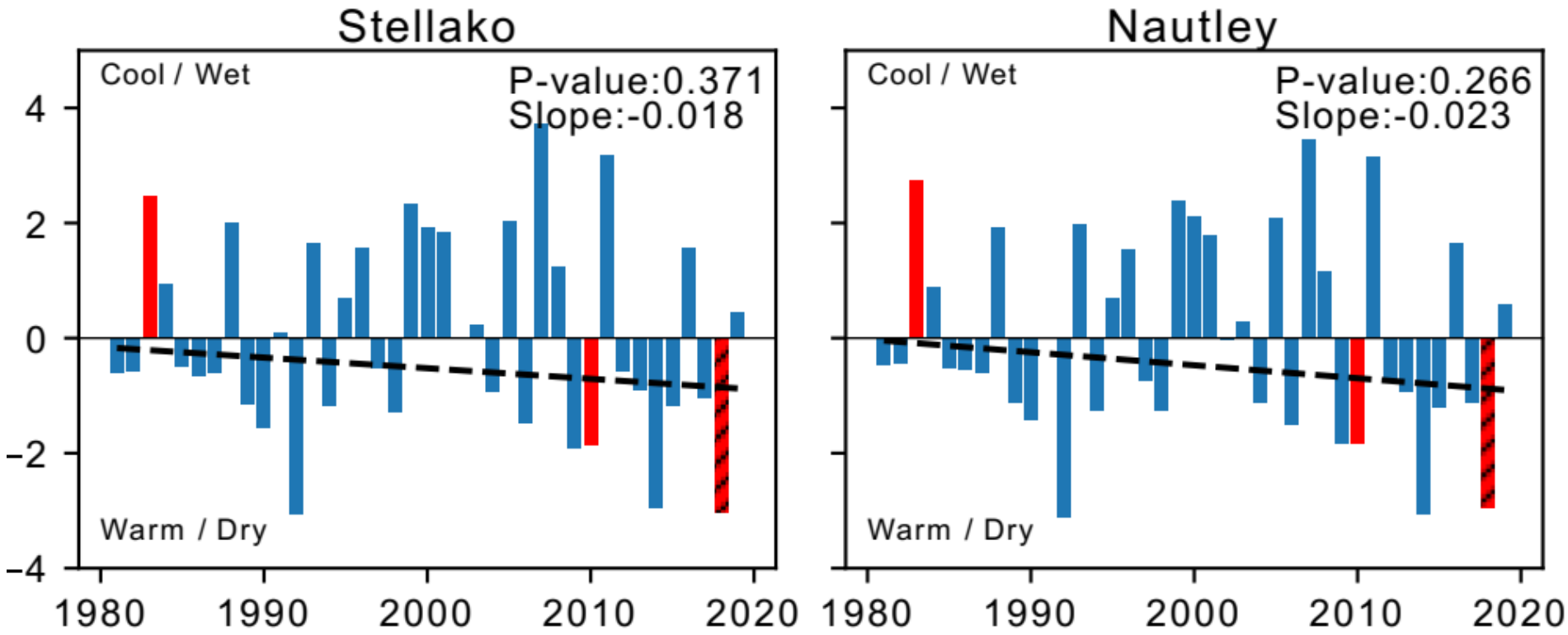
Site	River	Temp. ↑ (°C)
NCF	Nechako (Cheslatta Falls)	0.71
NFF	Nautley	0.27
NIP	Nechako (Isle Pierre)	0.84
NVH	Nechako (Vanderhoof)	1.17
SFJ	Stuart	1.40
SGN	Stellako	-0.19





In the Nechako Watershed, summer water temperatures rose on average by 0.7°C during 1950-2015 (Islam et al. 2019).

Climate change and wildfires in the Nechako Watershed



Bars indicate summer climate index values in a given year, with blue bars for non-fire years and red bars for major fire years. The dashed line indicates the linear trend (Vore et al. 2020).

NSERC CRSNG

RioTinto

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

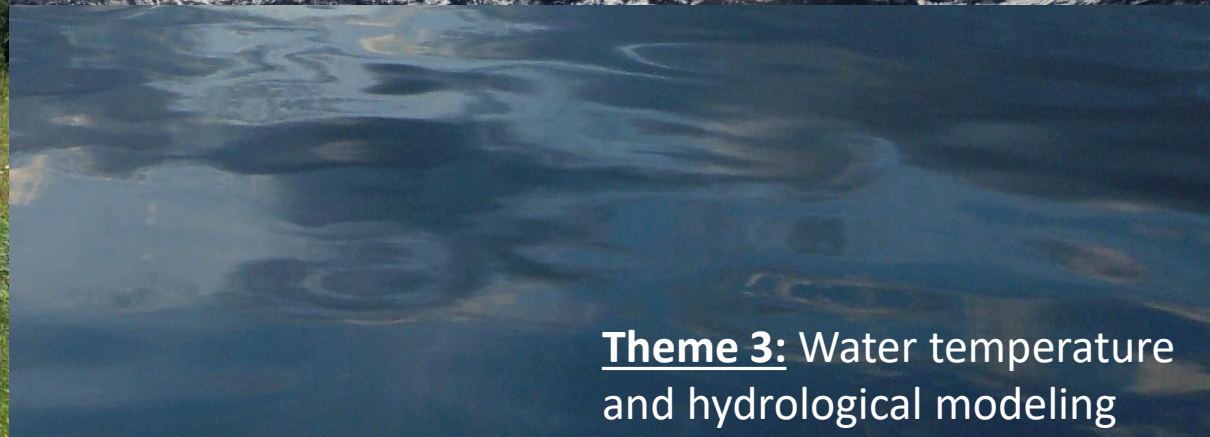
Industrial Research Chair (IRC) on climate change & water security

Tahtsa Lake & Rhine Crag
viewed from Mt. Sweeney

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

Theme 1: Hydrometeorological monitoring and data collection

Theme 2: Atmospheric and terrestrial rivers



Theme 3: Water temperature and hydrological modeling

Collaborations

Énergie Électrique

Industry

Rio Tinto

Community & First Nations

Nak'azdli Whut'en

Cheslatta Carrier Nation

Fisheries and Oceans Canada

Pêches et Océans Canada

Nechako White Sturgeon Recovery Initiative

nechako watershed roundtable

Fraser Basin Council

Academy

UNBC

UQÀM

Pacific Climate Impacts Consortium

University of Calgary

INRS

IRC

IWRG

Research Management

Science Advisory Board:

UNBC: Ellen Petticrew

Rio Tinto: Justus Benckhuysen

Govt.: Chelton van Geloven (FLNRORD)

Academic: Francis Zwiers (PCIC)

End User: James Rakochy (CCN)

IRC

Rio Tinto

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SAB

VPR

Vice-President Research and Graduate Programs:
Dr. Kathy Lewis

RM

Research Manager:
Jeremy Morris

OC

Outreach Coordinator:
Barry Booth

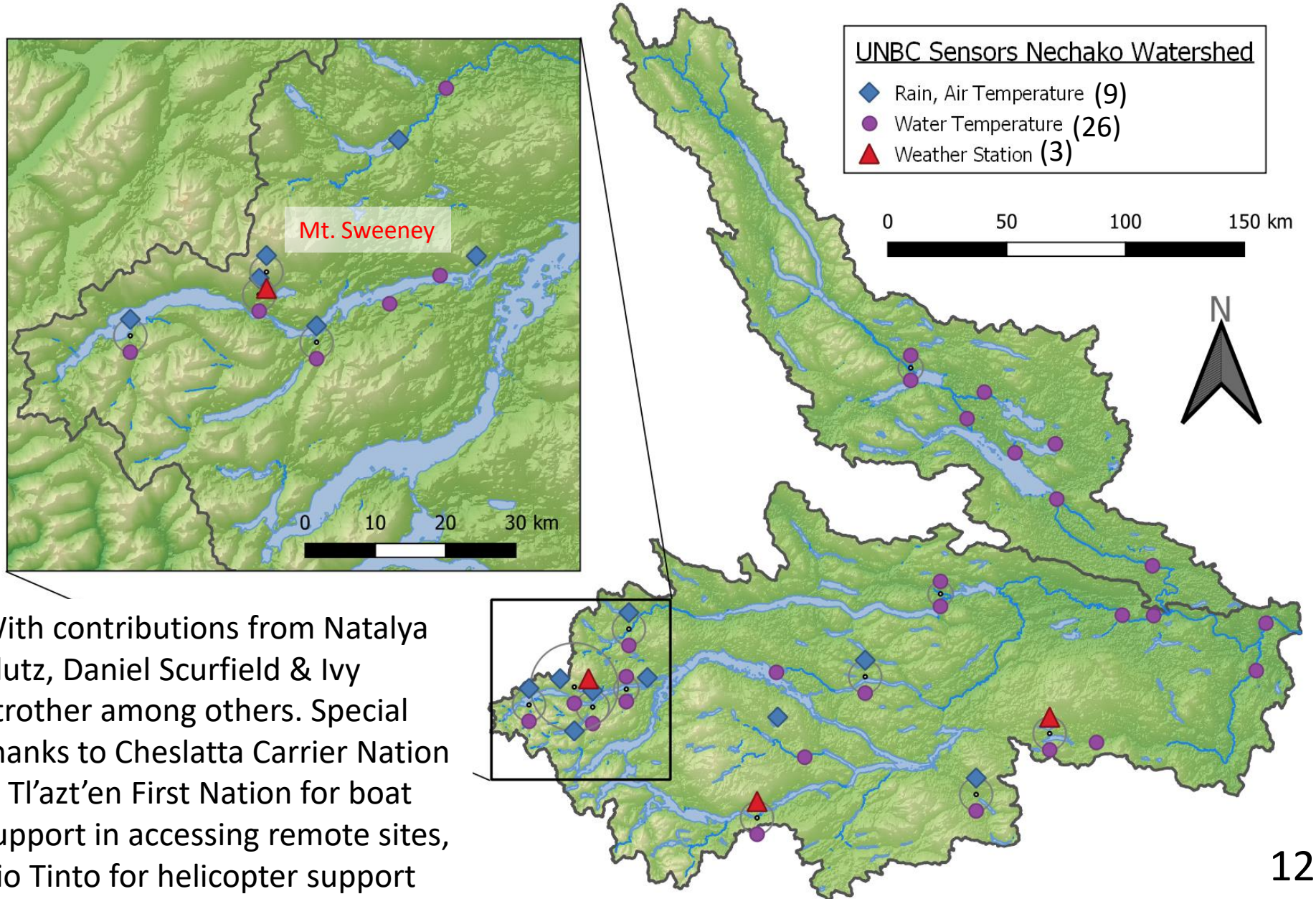
DM

Data Manager:
Justin Kokoszka

HQP

Highly-Qualified Personnel

Theme 1: Hydrometeorological Monitoring and Data Collection in the Nechako Watershed – Jeremy Morris



With contributions from Natalya Klutz, Daniel Scurfield & Ivy Strother among others. Special thanks to Cheslatta Carrier Nation & Tl'azt'en First Nation for boat support in accessing remote sites, Rio Tinto for helicopter support

View from Mt. Sweeney

TRARE

Tahtsa Ranges Atmospheric River Experiment

What

TRARE is a two-month field campaign in the upper Nechako Watershed

Who

Kelly Hurley (project manager), IRC team, Dr. Julie Thériault (UQAM)

Project Goal

To record and characterize the precipitation brought on by Atmospheric Rivers (ARs) a.k.a. “pineapple express” storms in the Nechako Watershed

Project Design

We will expand our existing network of meteorological stations in the Nechako Watershed. State of the art equipment will be installed in September & October 2021, when AR’s are most frequent. Instruments are strategically placed to detect altitudinal and longitudinal precipitation gradients (the rain shadow effect)

Significance

This will help us understand how climate change may impact the Nechako Watershed in the future through flooding, drought, landslide risks and assist with water resource management such as for hydropower generation

Theme 2

Quantifying the Roles of Regulation and Climate on Historical Streamflow in the Nechako Watershed

Justin Kokoszka

Objective:

- To investigate the individual, and combined roles, of regulation, climate change, and climate variability on streamflow in the Nechako River over the past 70 years.

Outputs:

- A 'naturalized' streamflow record for the Nechako River between 1950 and 2020.
- Assessment of changes in historical streamflow magnitude and timing due to regulation, climate change, and climate variability over various time periods.

Implications:

- Generated data can be used to validate and improve streamflow and water temperature modelling.
- Outputs can be used to enhance current water and fish management strategies and guide future management.

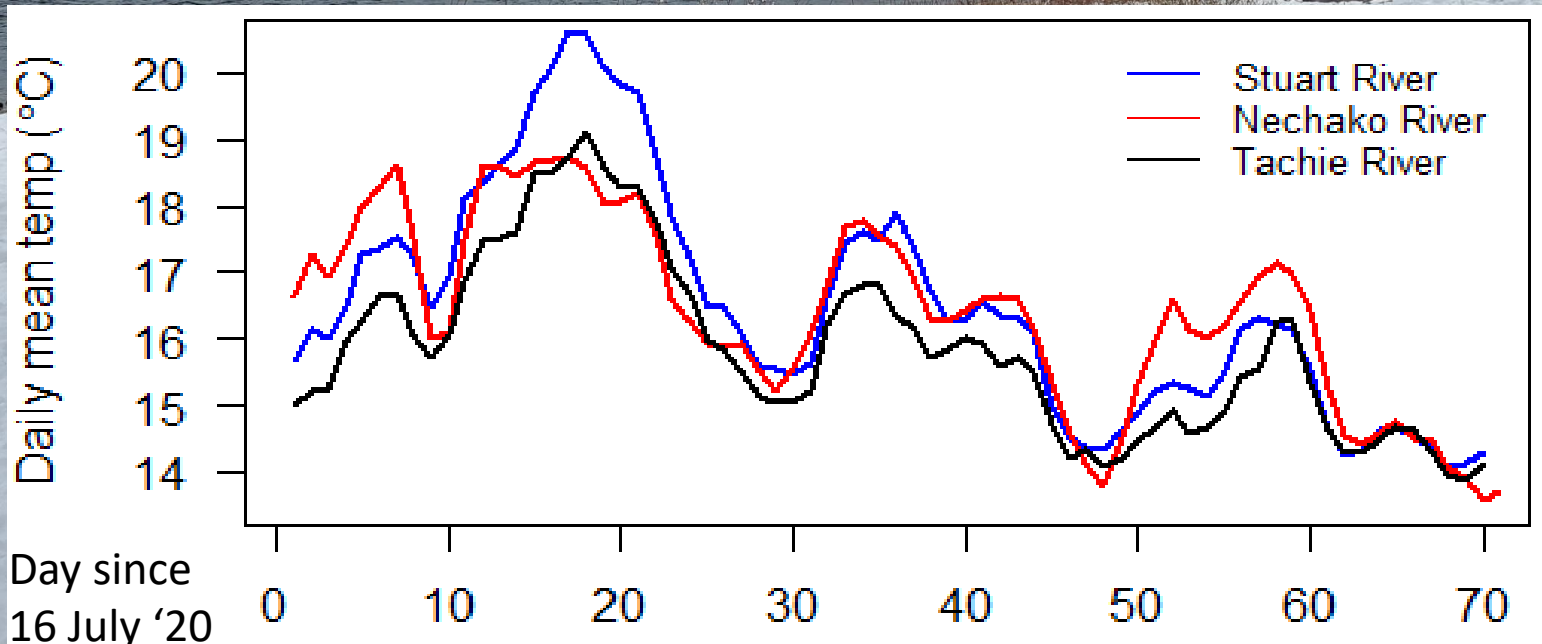
Photo credit: Cheslatta Carrier Nation

Trend Analysis in Water Temperatures within the Nechako Watershed - Adam MacDonald

Theme 2

Objective: To monitor historic and current water temperatures within the Nechako Watershed and quantify the roles of flow regulation, climate variability and climate change on its water temperatures trends

Stellako River



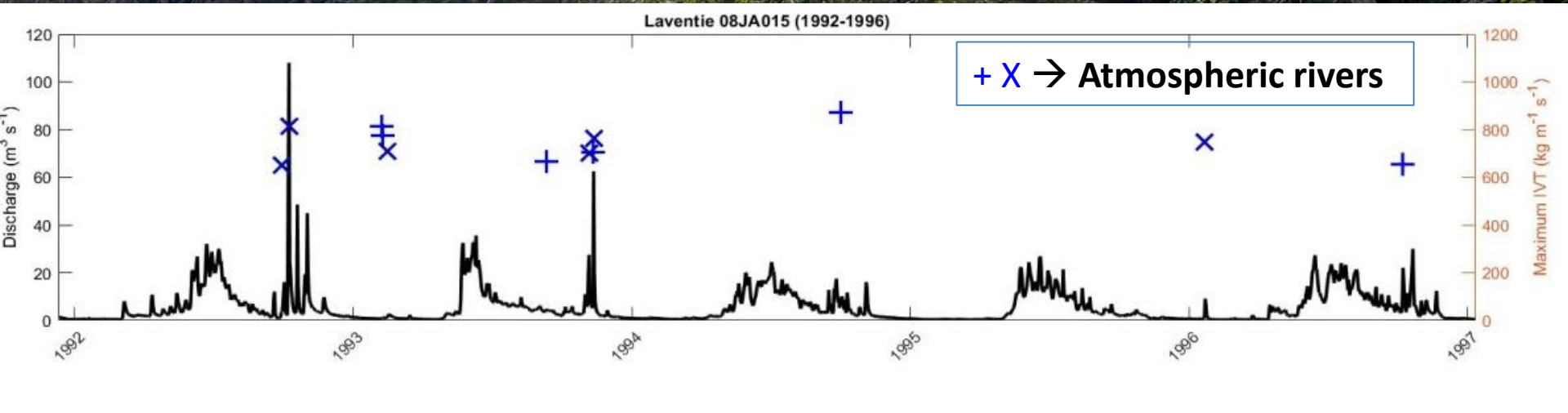
Theme 2

Terrestrial response to atmospheric rivers in the Nechako watershed

Bruno Sobral

Key Objective

Quantifying the contribution of atmospheric rivers to the water resources and security of the Nechako Watershed



Laventie Creek

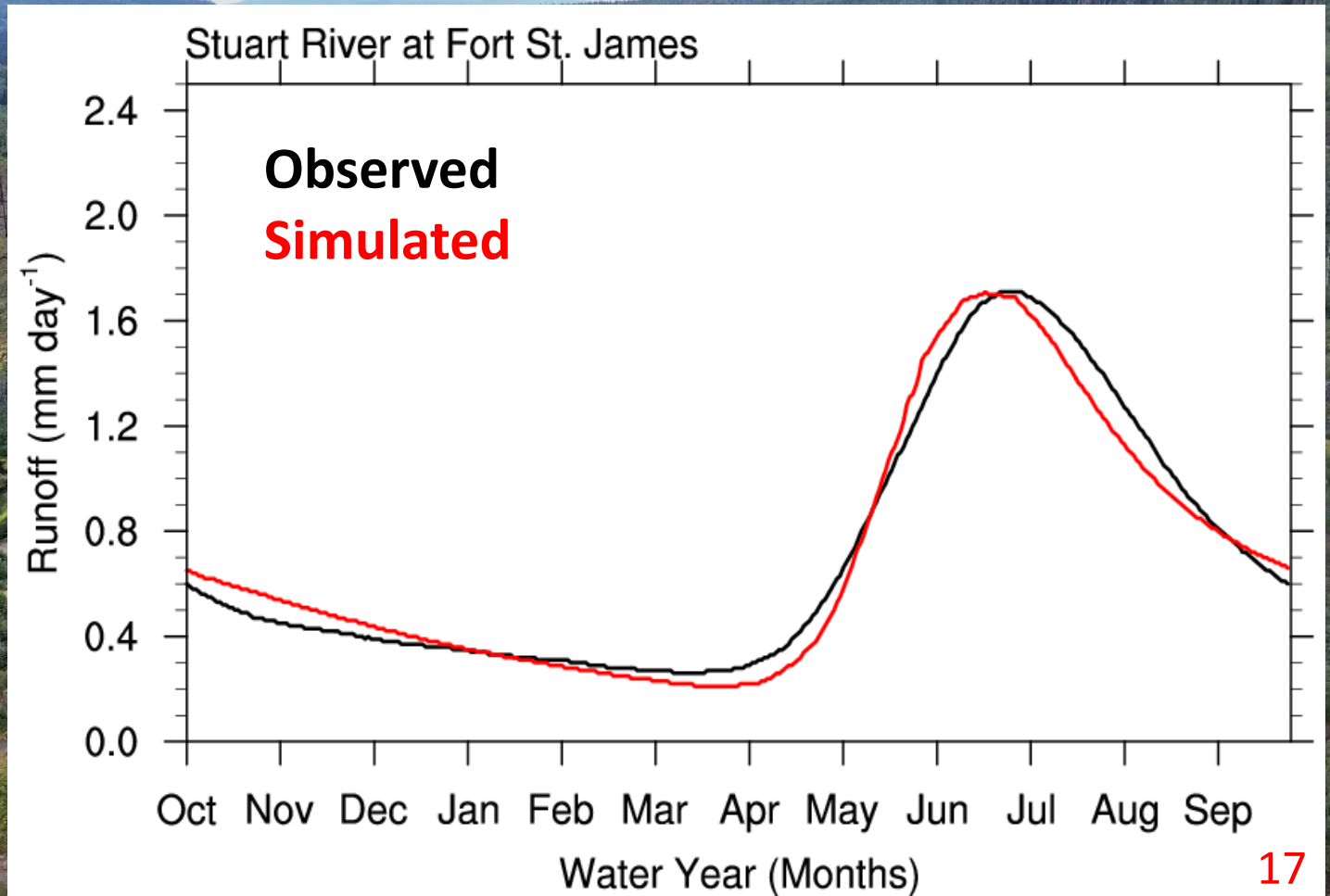
Impacts of climate change and landscape disturbances on the hydrology of the Nechako Watershed

Rajtantra Lilhare

Theme 3

Key objective: To quantify impacts of landscape disturbances (forest fires, deforestation, pest infestations, etc.), and flow regulation versus climate change on the overall hydrology of the Nechako Watershed.

Photo credit: Cheslatta Carrier Nation



IRC Communications

Component parts – Barry Booth

Direct contact with interested parties

Social Media

Research Outreach

Communications

New Website: http://web.unbc.ca/~sdery/irc

Twitter:
@chacal_chanel

Communications

Newsletters

We continue to share our progress both in the field and in the office through the production of quarterly newsletters. In 2020, we distributed newsletters in March, June, September and December. Our first newsletter of 2021 will be distributed to our mailing list of ~75 individuals before the end of March.

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RioTinto

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

Update from Project Leader.....1
Update from Research Manager..2
Data logger deployment 2
New weather station.....3
Data Manager update 4
Trends in observed runoff.....4

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 tagge the first Chinook of the 2020 year on Jun 8th, near Lytton. Photo by DFO. Up to 1 Chinook have been detected moving u stream by sonar near the Big Bar ferry.

RioTinto

October 7, 2020
Volume 2, Issue 3

Inside this issue

Update from Project Leader.....1
Update from Research Manager..2
Summer field work update.....3
Data Manager update 4
A tale of two summers 4
New additions to IRC team.....5

Special points of interest

- Stephen gave a presentation to the Kitimat Public Advisory Committee (KPAC) on September 8th, 2020 to provide the group a progress update on the IRC.
- We are in the process of recruiting a new research skills trainee to lead preparation of the Tahtsa Ranges Atmospheric River Experiment (TRARE) field campaign slated for late summer/early fall 2021.
- We are also currently recruiting another post-doctoral fellow who will undertake some hydrological simulations of the Nechako Watershed's hydrology in the context of future climate change...

Natalya at Mt. Sweeney.

Contact us by email: irc@unbc.ca if you wish to be added to our distribution list.

Community Outreach

The IRC team & IWRG colleagues will be involved in this week-long virtual community event. On the evening of Feb. 23rd there will be presentations by lead researchers, plus interactions with research staff & students.

Acknowledgments

- Our collaborators (IWRG, Drs. Stadnyk, Thériault, Zwiers)
- Our funders (NSERC, Rio Tinto, Eco Canada, NEEF, BC REF, IURC)
- Our community partners (many First Nations, DFO, District of Vanderhoof, Nechako Watershed Roundtable)
- Our industry partners (Rio Tinto, Huckleberry Mines, Centerra Gold, Telus, Triton)
- Rio Tinto staff (J. Benckhuysen, A. Czornohalan, K. Dobbin, B. Larouche, R. Loubier, A. Mercier, L. Olson, & others)
- UNBC, IRC team and SAB

- **Very special thanks to:**
- NEWSS/Wayne Salewski
- June & Denis Wood
- Cheslatta Carrier Nation
- Tl'azt'en, Stellat'en and Nak' azdli Whut'en First Nations
- Nadina Lake Lodge
- DFO Nadina Spawning Channel
- Lowprofiles Ventures
- Tatuk Lake Resort
- Mayor Gerry Thiessen & District of Vanderhoof Council
- Avison Management Services
- Water Engagement Initiative

Nadina River