PACIFIC CLIMATE IMPACTS CONSORTIUM

PCIC UPDATE May 2020

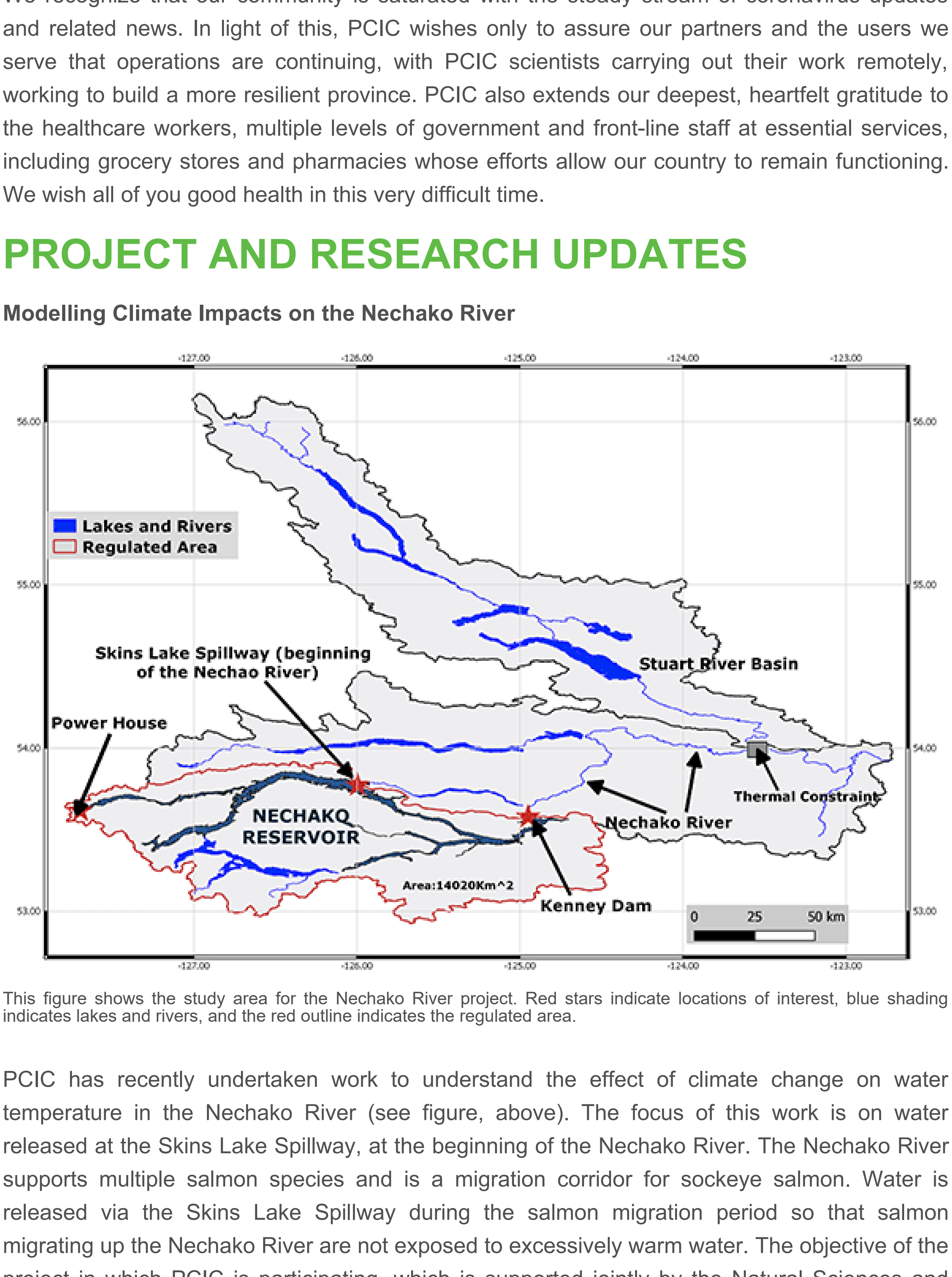
SPECIAL UPDATE

Regarding COVID-19

We recognize that our community is saturated with the steady stream of coronavirus updates and related news. In light of this, PCIC wishes only to assure our partners and the users we serve that operations are continuing, with PCIC scientists carrying out their work remotely, working to build a more resilient province. PCIC also extends our deepest, heartfelt gratitude to the healthcare workers, multiple levels of government and front-line staff at essential services, including grocery stores and pharmacies whose efforts allow our country to remain functioning. We wish all of you good health in this very difficult time.

PROJECT AND RESEARCH UPDATES

Modelling Climate Impacts on the Nechako River



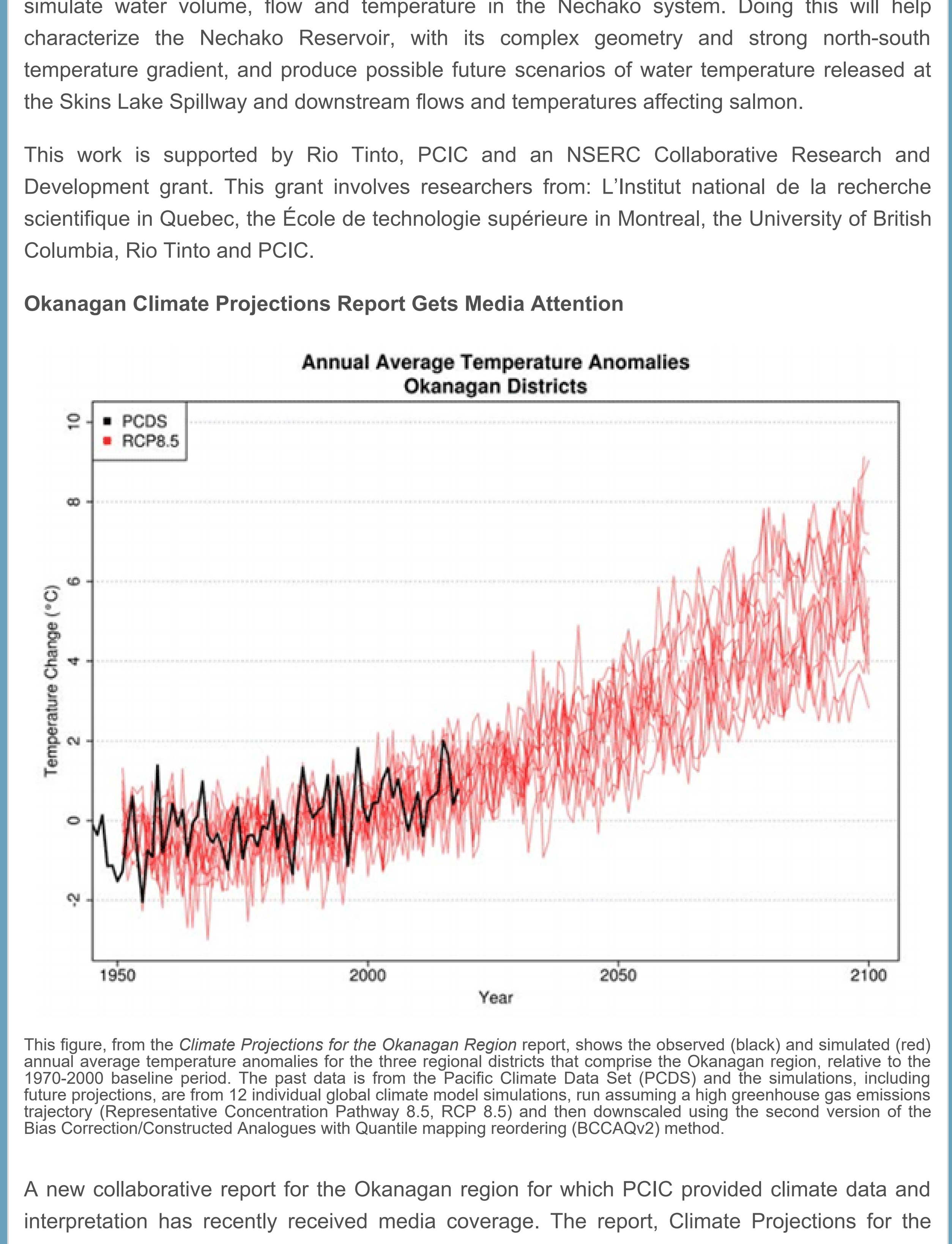
This figure shows the study area for the Nechako River project. Red stars indicate locations of interest, blue shading indicates lakes and rivers, and the red outline indicates the regulated area.

PCIC has recently undertaken work to understand the effect of climate change on water temperature in the Nechako River (see figure, above). The focus of this work is on water released at the Skins Lake Spillway, at the beginning of the Nechako River. The Nechako River supports multiple salmon species and is a migration corridor for sockeye salmon. Water is released via the Skins Lake Spillway during the salmon migration period so that salmon migrating up the Nechako River are not exposed to excessively warm water. The objective of the project in which PCIC is participating, which is supported jointly by the Natural Sciences and Engineering Research Council of Canada (NSERC) and Rio Tinto, is twofold: to learn more about the impacts of warm water on the salmon and sturgeon that live in the Nechako, and to project future streamflow and water temperature changes in the Nechako River and Nechako Reservoir. It is hoped that the information that is obtained can help determine how a suitable migration environment can be maintained in the river in the future.

The changing climate could increase the impact of reservoir operations on fish habitat in several ways, such as changing the temperature of the water and through changes in the amount of water flowing through the Nechako system due to changes in precipitation and evaporation. This creates a need to anticipate and better understand the potential impacts of climate change on the temperature and water flow regimes of the Nechako Reservoir. Researchers at PCIC have therefore coupled their streamflow model (the Variable Infiltration Capacity model with glaciers, VIC-GL) with a hydrodynamic model of the Nechako Reservoir (here, a two-dimensional model that simulates fluid flow in a body of water) and a water quality model (which simulates the distribution of things such as temperature, dissolved gases and effluents within water) in order to simulate water volume, flow and temperature in the Nechako system. Doing this will help characterize the Nechako Reservoir, with its complex geometry and strong north-south temperature gradient, and produce possible future scenarios of water temperature released at the Skins Lake Spillway and downstream flows and temperatures affecting salmon.

This work is supported by Rio Tinto, PCIC and an NSERC Collaborative Research and Development grant. This grant involves researchers from: L'Institut national de la recherche scientifique in Quebec, the École de technologie supérieure in Montreal, the University of British Columbia, Rio Tinto and PCIC.

Okanagan Climate Projections Report Gets Media Attention



This figure, from the *Climate Projections for the Okanagan Region* report, shows the observed (black) and simulated (red) annual average temperature anomalies for the three regional districts that comprise the Okanagan region, relative to the 1970-2000 baseline period. The past data is from the Pacific Climate Data Set (PCDS) and the simulations, including future projections, are from 12 individual global climate model simulations, run assuming a high greenhouse gas emissions trajectory (Representative Concentration Pathway 8.5, RCP 8.5) and then downscaled using the second version of the Bias Correction/Constructed Analogues with Quantile mapping reordering (BCCAQv2) method.

A new collaborative report for the Okanagan region for which PCIC provided climate data and interpretation has recently received media coverage. The report, Climate Projections for the Okanagan Region, was highlighted in a recent article on Global News. Some of the key findings of the report are that the Okanagan region will experience warmer temperatures year-round with considerably hotter summers and a longer growing season. The region is also projected to see an increase in precipitation during all seasons except during the summer, which is projected to become drier.

Read the Global News article.

Read the new collaborative report.

New Hydrologic Model Output Available on PCIC's Data Portal

The Hydrologic Impacts Theme recently released its latest modelling results on PCIC's Data Portal. Simulations were prepared with an upgraded version of the Variable Infiltration Capacity model with glaciers (VIC-GL), which was coupled to the regional glacier model. A historical run, driven by PCIC's gridded meteorological data for northwest North America (PNWNAmet), is available from 1945 to 2012. Twelve hydrologic scenarios, as driven by six global climate models from the fifth phase of the Coupled Model Intercomparison Project (CMIP5), run under two Representative Concentration Pathways (RCPs), 4.5 and 8.5, and statistically downscaled with the second version of the Bias Correction/Constructed Analogues with Quantile mapping reordering technique (BCCAQv2), using PNWNAmet as a target, are available from 1945 to 2099. The modelling domain includes the Peace, Fraser and entire Columbia (US and Canada) river basins. There are 120 routing sites with results on the Station Hydrologic Model Output Data Portal page. Gridded data are available for 13 fluxes and states, including Snow Water Equivalent, Evaporation and Glacier Mass Balance, all spatially and temporally subset-able on the Gridded Hydrologic Model Output Data Portal page.

Go to the Station Hydrologic Model on PCIC's Station Hydrologic Model Output Data Portal page or the Gridded Hydrologic Model Output Data Portal page.

STAFF PROFILE: DR. KAI TSURUTA

Dr. Kai Tsuruta is a Postdoctoral Hydrologic Scientist at PCIC, where his work focuses on studying the primary effects of climate change on the hydrology of regional watersheds as well as the secondary effects that result from changes to vegetation and land-cover. He does this by coupling land-cover models, which simulate the physical cover at the Earth's surface, such as forests or wetlands, with hydrologic models, which simulate the flow of water on and through the Earth's surface.

Kai started out in mathematics, in which he achieved a PhD, but then moved into climate science. When asked about the change, he explains, "I got into climate science because I wanted to work in an applied discipline that has a more direct impact on people." Kai went on to do a second PhD, in which his research was focused on future sediment transport under climate change scenarios. For this, he relied on the results of hydrological models from PCIC. "I took my job here partly because I wanted to learn more about the inputs I was using and be capable of generating them myself," he says.

The complex connections between elements in the climate system can lead to counterintuitive results that are quite fascinating in their own right. Kai explains, "One of the things I find interesting is how conceptually opaque climate change consequences can be." He continues, "Before starting a modelling project, I have a concept of what the results should look like. But elements of the water balance typically don't change in isolation, so predicting the effects of something like glacier recession requires considering how all of the other components of runoff are changing and interacting with one another. As a thought experiment, this is quite challenging and model results often surprise me and lead to unexpected insights."

Kai's current research is focused on the effects of climate change—and corresponding glacier recession—on the headwaters of the Columbia River at the Mica Dam. This dam is the first in a series along the Columbia River that are partly governed by the Columbia River Treaty between the United States and Canada. BC Hydro uses the corresponding Kinbasket Reservoir for hydro-electrical power as well as for flood control and environmental purposes. Changes to the magnitude or variance of the reservoir's inflow are of operational consequence to BC Hydro and may strain the relationship between their sometimes competing objectives. Understanding how this may be affected by the changing climate is key, so that planners can better prepare and weigh out potential options.

OUTREACH AND EDUCATION

Presentation on Climate Tools for Resource Road Adaptation

In order to introduce the PCIC Climate Explorer to the forest industry, PCIC recently delivered a webinar on climate tools in partnership with FPInnovations. The webinar was part of a series to help the forest industry and governments with adaptation planning for forest service roads. The PCIC Climate Explorer, introduced in the webinar, can help to inform planning for decision makers and infrastructure managers in many sectors in order to increase their resilience in the face of climate chance impacts.

Watch the webinar.

Explore the resources available for resource road planning.

New User Training Material Available

PCIC is part of a collaboration enabled by the Canadian Centre for Climate Services, with Ouranos, the Computer Research Institute of Montreal, the Prairie Climate Centre and HabitatSeven to develop the climate information portal Climatedata.ca. Over the past year PCIC staff have been engaging users and leading training sessions to test an introductory PowerPoint presentation for decision makers. An updated version of that presentation is now available at the ClimateData.ca. Anyone can access and use the presentations for their own training and briefing purposes. The presentation was developed to be accessible to those who are new to climate science, but it can also be used as the basis for webinars or workshops for users of various technical backgrounds.

Access the presentation at ClimateData.ca/training.

The Pacific Climate Seminar Series

The most recent talk in the series was delivered by Dr. Robert Gifford, on February 26th. In the talk, titled, *The Dragons of Inaction – and How to Slay Them*, Professor Gifford discussed the gap between good intentions and impactful behaviour as regards environmental issues.

Read more about Dr. Gifford's talk.

Because of the ongoing coronavirus pandemic, the Pacific Climate Seminar Series is currently suspended.

Future Webinars

PCIC is currently organizing webinars with our partners. We will post upcoming webinars on our news and events page, as they are scheduled. Check back in this section in coming months for more information.

See the News and Events section of our site for upcoming webinars as they are announced.

PCIC Corporate Report Released

PCIC is pleased to announce the release of its 2018-2019 Corporate Report. PCIC continued with its pattern of growth over the 2018-2019 fiscal year. PCIC continues to engage with multiple sectors and work with its partners to advance climate science knowledge and deliver services that are driven by user needs. The Report outlines PCIC's efforts to provide ever-more comprehensive climate services and support planners in building a more resilient BC and surrounding region.

Read the 2018-2019 Corporate Report.

PCIC STAFF NEWS

This spring saw changes in PCIC's Operations team, as PCIC's long-time Administrative Coordinator, Shelley Ma, left for maternity leave and PCIC welcomed Shayna Thompson to the role. Shayna will be facilitating PCIC's day-to-day operations for the next year and a half. PCIC also extends a warm welcome to Dr. Nigus Demelash, who is joining our team as a Post-Doctoral Research Hydrologist under the British Columbia Salmon Restoration and Innovation Fund. While at PCIC, he will deploy and use the RAVEN model to generate projections of hydrologic and stream temperature conditions under future climates for select watersheds in coastal BC. These hydrologic and thermal projections will, in turn, feed into a risk assessment procedure, to assess the ability of salmon populations to sustain production or respond to restoration efforts.

PCIC is also happy to welcome two Assistant Programmer Co-ops to PCIC's Computational Support Group, Sangwon Lim and Eric Yvorchuk. Both Sangwon and Eric will help to develop web-based analysis tools. Sangwon is supported by the BC Salmon Restoration and Innovation Fund and Eric is participating as part of the Data Analytics for Canadian Climate Services (DACCS) project funded by a Canada Foundation for Innovation Cyberinfrastructure grant.

PEER-REVIEWED PUBLICATIONS

Ben Alaya, M.A., C. Ternynck, S. Dabo-Niang, F. Chebana and T.B.M.J. Ouarda, 2020: Change point detection of flood events using a functional data framework. *Advances in Water Resources*, 137, 103522, doi:10.1016/j.advwatres.2020.103522.

Li, C., Y.Sun, **F. Zwiers**, D. Wang, X. Zhang, G. Chen, and H. Wu, 2020: Rapid warming in summer wet bulb globe temperature in China with human-induced climate change. *Journal of Climate*, Early Online Release, doi:10.1175/JCLI-D-19-0492.1.

Meshesha, T.W., J. Wang and **N. Demelash Melaku**, 2020: A modified hydrological model for assessing effect of pH on fate and transport of Escherichia coli in the Athabasca River basin. *Journal of Hydrology*, **582**, 124513, doi: 10.1016/j.jhydrol.2019.124513.

Williamson, S.N., C. Zdanowicz, **F.S. Anslow**, G.K.C. Clarke, L. Copland, R.K. Danby, G.E. Flowers, G. Holdsworth, A.H. Jarosch, and D.S. Hik, 2020: Evidence for Elevation-Dependent Warming in the St. Elias Mountains, Yukon, Canada. *Journal of Climate*, **33**, 8, 3253–3269, doi:10.1175/JCLI-D-19-0405.1.

Our website | Follow us on Facebook

Our address is:
Pacific Climate Impacts Consortium
University House 1
2489 Sinclair Road
University of Victoria
Victoria, British Columbia
Canada V8N 6M2