PACIFIC CLIMATE IMPACTS CONSORTIUM

PCIC UPDATE

Volume 4 Number 2 • March 2011

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PCIC Publishes Final Phase I Hydrologic Results

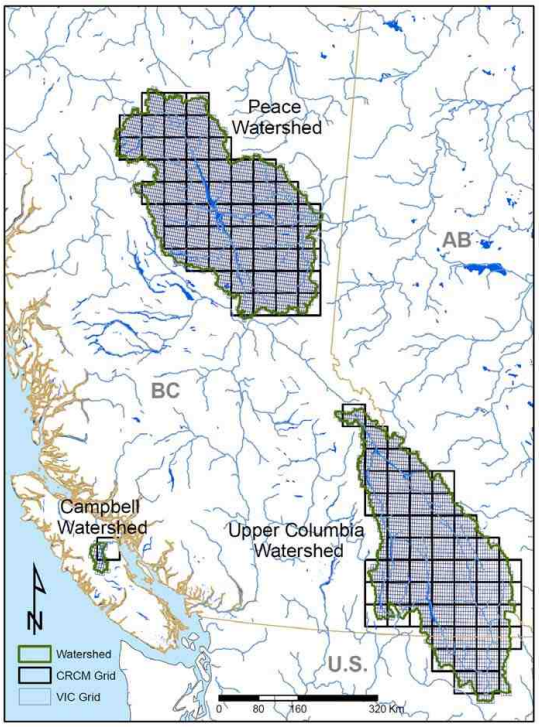
Final results from the first phase of PCIC's Hydrologic Impacts research program with BC Hydro were published on April 1. The reports are the culmination of four years of collaborative work aimed at better understanding the potential effects of climate variability and change on BC water resources.

The results are presented in four peer-reviewed project reports:

- *BCSD Downscaled Transient Climate Projections for Eight Select GCMs Over British Columbia, Canada* (Hydrologic Modelling),
- *Hydrologic Impacts of Climate Change in the Peace, Campbell and Columbia Watersheds, British Columbia, Canada* (Hydrologic Modelling),
- *Climate Diagnostics of Future Water Resources in BC Watersheds* (Regional Climate Model Diagnostics),
- *Climate Change Impacts on Hydro-Climatic Regimes in the Peace and Columbia Watersheds, British Columbia, Canada* (Synthesis).

A fifth report, *Climate Overview 2007: Hydro-Climatology and Future Climate Impacts in British Columbia*, was published in 2009.

The main objective of the Hydrologic Modelling project was to provide future projections of climate-induced changes in monthly and annual streamflow for three BC watersheds (the Peace, Campbell and Upper Columbia rivers) for the 2050s period (2041-2070). PCIC applied the Bias-Corrected Spatial Disaggregation (BCSD) method to statistically downscale an ensemble of global climate model (GCM) projections and used the results to drive Variable Infiltration Capacity (VIC) hydrologic model simulations at high spatial resolution.



Map showing the three BC watersheds studied: the Peace, Upper Columbia and Campbell Rivers. The larger and smaller squares represent the different grid sizes corresponding to the models used by the Regional Climate Model Diagnostics and Hydrologic Modelling projects, respectively.

The Regional Climate Model Diagnostics project had the same objective but applied a different method to obtain its results. Rather than applying the BCSD to the GCM projections and subsequently running these results through the VIC hydrologic model, the

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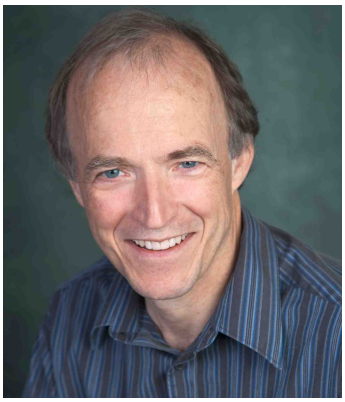
PCIC UPDATE is issued quarterly in September, December, March and June.
Editor: Greg Maruszeczka

PERSPECTIVE: Message from the Director



PCIC has come a long way since its predecessor, the Canadian Institute for Climate Studies, was established in early 1993. It is coming into maturity as a provider of robust climatic information to stakeholders throughout the region, and enjoys the support of many strong, committed partners. A key achievement winding up the fiscal year that has just ended was the delivery of a suite of reports that assess the impacts of projected climate change on water resources in the Peace, Columbia and Campbell River basins (see story, Page 1). The reports, which have been internally and externally peer reviewed, are representative of PCIC's commitment to quality, and its capacity to undertake and deliver complex projects to meet BC's need for reliable climate information. The reports provide not just projections of future conditions, but also provide detailed assessments of the uncertainties associated with the projections and the methods that were used to produce them. They reflect not just our own work, but also the participation, support and commitment of our stakeholders, including BC Hydro, with whom we are now developing a renewed and strengthened partnership.

The fiscal year boundary also marks the beginning of a very active phase in the development and application of BC's rich climate data resources. For the past year we have been assessing meteorological observations collected at the more than 1500 stations that we can now access as a result of the MOU that has been agreed to by BC's major observing network holders (see the news release at: http://www2.news.gov.bc.ca/news_releases_2009-2013/2010ENV0065-001290.htm). This is an unprecedented resource that spans the province and includes records that date as far back as 1917 in some locations. We are now in the process of developing an interactive data portal that will provide open access, "one stop shopping" for these and other data products. We have now also launched a unique collaboration with the PRISM Group at Oregon State University that will develop the capacity to use PRISM at PCIC, and that will incorporate as much of BC's data as possible to provide the province with updated high-resolution temperature and precipitation climatologies.

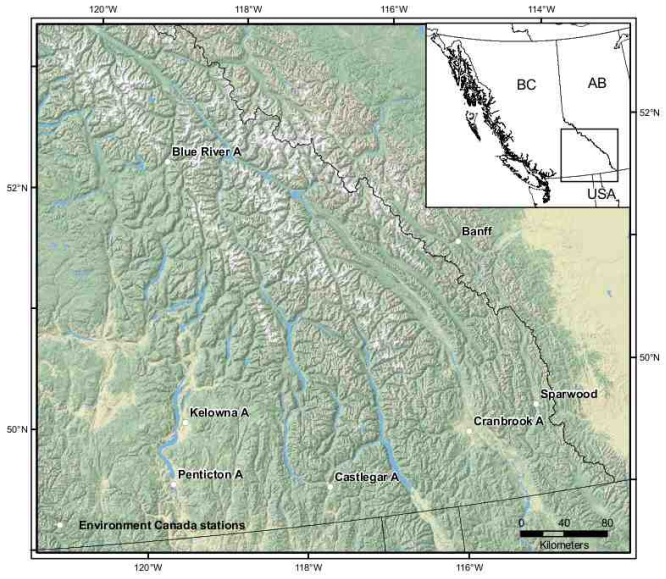
These are only two of many activities at PCIC — this newsletter describes some others of note, and many others are described on our website at http://pacificclimate.org. We look forward to another exciting and rewarding year as we continue to meet the challenge of serving our stakeholders and the province in the most effective way possible, through the delivery of robust, high quality climate information products and analyses.

Project Focus: Future Projections of Fire Weather Severity in Southeast British Columbia

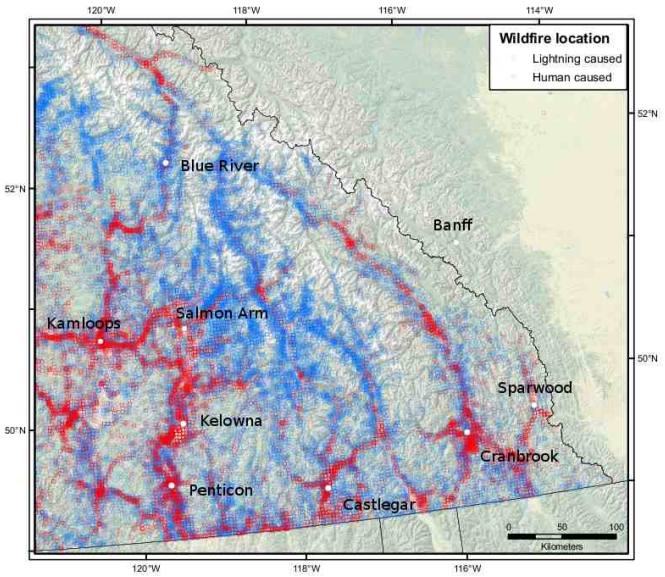
Wildfires are a significant source of ecosystem disturbance and property damage in British Columbia. According to the BC Ministry of Forests and Range, the last decade has seen annual expenditures for wildfire management average around $109 million. Two recent fire seasons in particular, 2003 and 2009, stand out as exceptional years when fire suppression efforts cost the province $371 million and $403 million, respectively.

Climate plays a significant role in determining the severity of wildfire in BC, and elsewhere. Globally, the spatial distribution of wildfire occurrence is strongly dependent on patterns of temperature and annual precipitation as these provide both fuel moisture and fuel availability for a particular area. Given the strong connection between climate and wildfire, it is likely that climate change will have a significant impact on wildfire frequency and severity.

In September 2010 PCIC Researcher Derek van der Kamp began work on a project to assess the impacts of climate change on fire weather severity in southeastern British Columbia. With support from Environment Canada the project used a statistical downscaling method, Expanded Downscaling, combined with the Canadian Fire Weather Index System, to provide future projections for seven meteorological stations in the study area using output from two global climate models (GCMs) and two emissions scenarios.



Topographical map showing the project study region. The white dots represent the seven Environment Canada meteorological stations used.



Locations of all fire starts from the period 1970-2006. Red dots indicate human-caused fires while blue dots indicate lightning-induced fires. The white dots show the seven Environment Canada meteorological stations used in the study.

Numerous studies have attempted to provide future projections of wildfire severity or frequency throughout Canada. However, the majority of these studies either focus on continental scales or analyse regions within the Boreal regions. Less work has been done for BC, where complex topography and large climatological gradients present difficulties when attempting to downscale surface conditions.

Overall, preliminary projections from the recently completed project show no obvious region-wide shifts in fire weather severity. This is in contrast to results from previous studies which suggested significant increases in severity. However, precipitation projections across the study area vary widely across stations and between GCM-emissions scenario combinations, leading to considerable uncertainty in subsequent projections of fire weather severity for southeastern BC.

Continued from Page 1

diagnostics project used several runs of Environment Canada's Canadian Coupled Global Climate Model (CGCM) to drive different versions of the Canadian Regional Climate Model (CRCM) with results provided by consortium partners Ouranos and the Université du Québec à Montréal. In this case, an embedded land surface scheme in the CRCM was used instead of a separate hydrologic model to resolve the hydrologic components like precipitation and surface runoff. It also excluded the Campbell River watershed from the study.

The Synthesis project compared and evaluated the two approaches applied by the Hydrologic Modelling and RCM Diagnostics projects. Results for all three projects indicate perceptible changes in streamflow for the selected watersheds by the 2050s. For example, both the Hydrologic Modelling and RCM Diagnostics approaches indicated a projected increase in streamflow and an earlier spring runoff for the Peace and Upper Columbia watersheds.

In comparing the two approaches the Synthesis project provided some insight into the capabilities and limitations of the Hydrologic Modelling and RCM Diagnostic methods. For example, the Hydrologic Modelling approach more closely matched the runoff for the baseline period than the RCM-based projections, in part due to the lack of catchment specific calibration and the influence of biases in the latter method. On the other hand, both methods were similar in their depictions of projected future values.

With the first phase of PCIC's Hydrologic Impacts research program now complete, planning is underway to extend this work to other BC watersheds while further refining the techniques. In addition, a summary report will be published that puts the projects and their results within the wider context of policy and planning.

Full versions of the final peer-reviewed project reports (in PDF) can be downloaded from the PCIC website at http://pacificclimate.org/resources/publications.

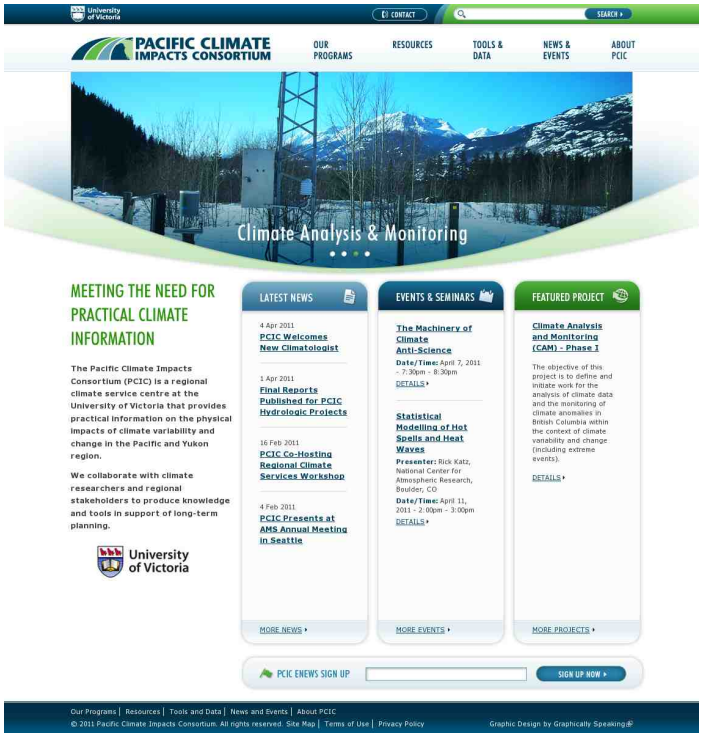
Website Redesign Offers New Look, Features

PCIC launched its newly redesigned website at pacificclimate.org on February 2. The website has a new modern look-and-feel as well as new features intended to better support climate information delivery.

Much more than a 'refresh' the new design represents a move away from static html pages to a dynamic database-driven system built on the Drupal CMS.

Some new features of the design include:

- An easy to navigate Resources section which includes browsable libraries of PCIC publications, past and present PCIC projects, and a glossary of climate-related terminology.
- A News and Events section that includes posted articles concerning PCIC and the climate science community as well as an Events Calendar and Seminars section with embedded viewer for watching live streaming webcasts of PCIC seminars.
- An expanded and organized About PCIC section which includes profiles on PCIC staff and descriptions of the consortium's governance structure.
- Targeted contact forms linked directly to PCIC staff profile pages so visitors can more easily identify who they're looking for and can make contact via email without the need for a separate email client program.
- An internal site-wide search facility to allow visitors to more quickly find the information they want based on search terms they choose.



The website redesign was developed and implemented in response to both internal and external feedback on the former design. Comments and feedback are both welcome and appreciated as PCIC strives to improve regional climate service delivery in the Pacific and Yukon region of Canada.

PCIC Hosting Regional Climate Services Workshop

PCIC is teaming up with the Institute for Coastal Research, Helmholtz Zentrum Geesthacht (Germany) to offer the workshop “Exploring Regional Climate Services: Meeting Stakeholder Needs for Practical Climate Information” at the University of Victoria November 21-23, 2011.

The three-day workshop will consider the ways in which climate information is communicated to stakeholders, what kind of information stakeholders need, how regional culture influences the flow of information, and the role that regional climate services play in mediating the flow of information. The goal of the workshop is to engage a broad range of climate researchers and representatives from various climate stakeholder groups.

Workshop co-sponsors include the Pacific Institute for Climate Solutions (PICS), the University of Victoria, and the KlimaCampus Hamburg in Germany. Results from the workshop will be published in a report and posted on the PCIC website for broad distribution to the larger applied science community and regional climate stakeholders.

For more information on how to submit a contributed paper for this event, please visit the PCIC website at http://pacificclimate.org/news-and-events/regional-climate-services-workshop-2011.

BC´s Regional Climate Service Provider

British Columbia has enormous resources, both built and natural, that are exposed to the rigors of our climate. Reducing the risks from that exposure requires information about the climate and its variability, and how those things will change in the future. PCIC’s mandate is to provide that information as a service to its stakeholders, including all British Columbians, in the context of the region where we live. Our main focus to date has been on longer term climate change, but in many cases, the more critical requirement is to plan for and adapt to climate change and variability that we are likely to experience in the shorter term, during the coming years and decades. Thus as PCIC matures, we will increasingly include information about the near-term climate in the products and services that we provide.

Highlights: PCIC Presentations and Meetings

Several representatives from PCIC presented at the 91st American Meteorological Society (AMS) Annual Meeting in Seattle, Washington January 23-27, 2011. Results from a wide range of PCIC work, representative of the consortium’s Hydrologic Impacts, Regional Climate Impacts and Climate Analysis and Monitoring themes, was presented through two oral presentations and two posters.

Associate Climatologist Dave Rodenhuis presented “Improved Climate Monitoring in British Columbia”, touching on some of the groundwork in implementing projects under PCIC's Climate Analysis and Monitoring Theme in conjunction with the BC Ministry of Environment. Hydrologist Arelia Werner presented “Regional Climate Model Projections for Decision-Making in the Upper Columbia Basin” on behalf of Climate Scientist Trevor Murdock, exploring the efficacy of using regional climate models over global climate models as tools for informing policy.

On February 23, PCIC Director Francis Zwiers opened Simon Fraser University seminar series “Global Warming: A Science Perspective” with his talk “The Instrumental Temperature Record and what it tells us about Climate Change”.

Also in late February, PCIC hosted the 4th session of the Expert Team on Climate Change Detection Indices (ETCCDI). Francis Zwiers is a member of the team along with colleagues from Canada, the Netherlands, Argentina, China, Australia, the United States and the United Kingdom. The ETCCDI is a joint effort between several climate-related groups and programs including: the World Climate Research Programme´s Climate Variability and Predictability (CLIVAR), World Meteorological Organization´s Commission for Climatology (CCI), the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the Global Energy and Water Cycle Experiment (GEWEX). It was established in part to provide international coordination and help organize collaboration on climate change detection and indices.

Visit the PCIC events calendar at http://pacificclimate.org/calendar for information on past and upcoming seminars and events.

Other PCIC News

New Hydrologist at PCIC

Dr. Rajesh Shrestha has joined PCIC as a Hydrologist working with the consortium's Hydrologic Impacts Theme. Rajesh has extensive experience in hydrologic and nutrient transport modelling, and assessment of climate-induced changes. Rajesh also possesses a strong background in the application of process-based and data-driven models for hydrologic catchment and river hydraulic modelling, flood forecasting, and risk and uncertainty analysis. He earned both his PhD and MSc in Water Resources Engineering from the Karlsruhe Institute of Technology, Germany and has postdoctoral experience working with Environment Canada's Water & Climate Impacts Research Centre.

New RCI Analyst at PCIC

Stephen Sobie has joined PCIC as a Regional Climate Impacts Analyst to assist in the evaluation of statistical downscaling techniques and provide an analysis of projected climate impacts on communities in the Pacific and Yukon region using a variety of future climate scenarios. He previously provided software development and meteorological analysis for the University of Victoria school-based weather station network, and studied precipitation trends on Vancouver Island as part of his graduate work. Stephen earned both his MSc in Earth and Ocean Sciences and BSc in Physics at the University of Victoria.

New Climatologist at PCIC

Dr. Faron Anslow has joined PCIC as a Climatologist working with the consortium's Climate Analysis and Monitoring Theme. His work will focus on the creation of historical climate records in British Columbia to establish a baseline against which climate variability and change in the province can be assessed. These data will be used to develop high-resolution, monthly climatology maps of BC in a collaborative effort with the PRISM group at Oregon State University. This information will be used for near real-time climate monitoring for application by climate stakeholders. Prior to joining PCIC, Faron worked as a postdoc at UBC exploring the effects of long-term climate change on alpine glaciers. He earned his PhD in Geology at Oregon State University and his MSc in Geography from the University of Calgary.

New Collaborative Project with PRISM Group Launched

Representatives from PCIC met recently with members of the Oregon State University PRISM Group, officially launching their three-year collaborative project to produce high-resolution climate maps of British Columbia.

Director Francis Zwiers, Dave Rodenhuis and James Hiebert joined PRISM Group Director Chris Daly and members of his team in Portland March 24-25 for their first formal meeting since the two groups signed their collaborative agreement in January 2011.

Parameter-elevation Regressions on Independent Slopes Model (PRISM) is a climate mapping system developed by Chris Daly. It uses point measurements of precipitation, temperature and other climatic factors to produce digital grid estimates of monthly, yearly and event-based climate parameters.

Thank you for your continued interest in the Pacific Climate Impacts Consortium. We are committed to maintaining PCIC as a stakeholder-driven consortium, rooted in the academic research community, yet looking outward. Hence, we welcome and value feedback from researchers and stakeholders either through our online contact form at http://pacificclimate.org/contact, via email at climate@uvic.ca, or telephone (250) 721-6236.