



BRBC Science Webinar Series 2021

Feb. 23, Mar. 23, Apr. 27, and May 25

9:30-11:30am

We invite you to join us virtually for the Bow River Basin Council's Annual Science Forum!

The purpose of this forum is to increase awareness of watershed-related research and projects in the Bow River Watershed.

Forum Agenda:

Tuesday, February 23 (9:30-11:30am):

Monitoring for a Changing Environment

- **Hydrological Response of the Elbow River Under a Changing Climate**
Presented by: Cuauhtémoc Tonatiuh Vidrio Sahagún, University of Calgary
- **A classification-based virtual watershed modeling approach to understand sensitivity of the Prairie hydrology to changes in climate**
Presented by: Christopher Spence, Environment and Climate Change Canada
- **Flooding, climate change, and the need for a precautionary approach: a case study for Redwood Meadows, AB**
Presented by: Jon Fennell, SAIT

Tuesday, March 23 (9:30-11:30am):

State of the Watershed

- **Tracing tributary sources of dissolved and particulate material in the Bow and a deep dive on dissolved chloride**
Presented by: Patrick Laceby, Alberta Environment and Parks
- **Understanding multiple anthropogenic threats in the context of natural variability: ecological processes in the Bow River**
Presented by: Nilo Sinnatamby, University of Calgary
- **All New V6.0 Alberta Tomorrow Educational Tool, Bow River Basin Scenarios**
Presented by: Jennifer Janzen, Alberta Tomorrow

Tuesday, April 27 (9:30-11:30am):

Exploring Methods of Environmental Assessment

- **Development of a receiving water adaptive monitoring and management framework for studying emerging contaminants in wastewater**
Presented by: Neal Tanna, University of Calgary
- **City of Calgary continuous in situ monitoring of rivers and creeks (2007 – present)**
Presented by: Brian Maude and Jessica Gillis, City of Calgary
- **The benthic perspective; what's happening beneath the surface at Bighill Creek**
Presented by: Tobin Benedict, Bighill Creek Preservation Society

Tuesday, May 25 (9:30-11:30am):

Connecting Science to Action

- **Long-term monitoring to improve the practice of soil bioengineering in Calgary**
Presented by: Mike Gallant, Kerr Wood Leidal Associates Ltd.
- **Effectively implementing water and resource recovery: A draft guide**
Presented by: Jacqueline Noga, University of Alberta



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Abstracts

Presenter names are in bold.

February 23, 9:30-11:30am - Monitoring for a Changing Environment

Hydrological Response of the Elbow River Under a Changing Climate

Yixuan Zhou¹, **Cuauhtémoc Tonatiuh Vidrio-Sahagún^{2*}**, M. Cathryn Ryan¹, Jianxun He²

¹Geoscience, University of Calgary, 2500 University Dr. NW, Calgary, AB T2N 1N4, Canada

²Civil Engineering, Schulich School of Engineering, 2500 University Dr. NW, Calgary, AB T2N 1N4, Canada

The Elbow River, a tributary of the Bow River, is an ideal river to investigate its hydrological response to climate change due to its importance to Calgary's water supply and unregulated nature. This study investigated the spatial and temporal trends of hydroclimate variables (including flow, precipitation, snowpack, and air temperature for available data between 1967 and 2015) to understand the Elbow's hydrologic functioning in three sub-watersheds and assess its flow response to climate change at different temporal scales. In general, average daily and annual peak flow showed different temporal evolutions spatially with significantly increasing trends observed in the middle and lower, but not the upper, watersheds. Flood events were primarily driven by intense rain events and not a function of the previous winter's snowpack. The improved understanding of the Elbow River's hydrological conditions and possible changes under a changing climate is key to developing strategies to manage the river water resources more effectively.

A Classification-based Virtual Watershed Modeling Approach to Understand Sensitivity of the Prairie Hydrology to Changes in Climate

Balew A. Mekonnen¹, John W. Pomeroy¹, Kevin R. Shook¹, **Christopher Spence²**, Colin J. Whitfield¹, Jared D. Wolfe¹

¹University of Saskatchewan, Saskatoon, Saskatchewan, Canada

²Environment and Climate Change Canada, Saskatoon, Saskatchewan, Canada

Evaluating sensitivity of Bow River Basin hydrological regimes to climate requires an approach that can disentangle the influence of climate and agricultural practices in this highly managed landscape. This presentation will summarize the application of a classification-based virtual watershed modeling approach to understand sensitivity of prairie hydrology to changes in climate. Across the prairie portion of the Bow River Basin, simulations of expected warming imply water managers should expect maximum annual snowpacks to decline 35% in depressions and 22% in cultivated fields, and 27% less annual runoff by the end of the 2020s than occurred from 1986 – 2005, but this can be moderated if mean annual precipitation increases 10 to 20%. This modelling approach is part of the development of a broader integrated modelling framework to assess environmental change in the Canadian Prairie in which hydrological, groundwater, aquatic chemistry and biodiversity models are linked to generate information on how multiple systems may respond to climate and agricultural practices.



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February 23, 9:30-11:30am - Monitoring for a Changing Environment

Flooding, Climate Change, and the Need for a Precautionary Approach: A Case Study for Redwood Meadows, AB

Jon Fennell¹

¹SAIT Integrated Water Management Program

As our climate changes in response to a warming world, the water balances in our basins here in western Canada are similarly shifting to accommodate a “new normal”. Shorter winters, earlier snowmelts, and increased rain-on-snow events is affecting the timing and magnitude of river flows to the point where the current paradigm of flood forecasting is being challenged. The floods of 2005 and 2013 in the Bow Basin were wake-up calls regarding how changing climatic conditions are affecting our basin, and the associated risk to those located in floodplain environments. Although some may still debate the degree of influence associated with climate change, a precautionary principle needs to prevail in order to manage the future unknowns related to our shifting hydroclimate.



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March 23, 9:30-11:30am - State of the Watershed

Tracing tributary sources of dissolved and particulate material in the Bow and a deep dive on dissolved chloride

Patrick Laceby

Resource Stewardship Division, Government of Alberta

Abstract - TBA

Understanding Multiple Anthropogenic Threats in the Context of Natural Variability: Ecological Processes in the Bow River

Sinnatamby, R.N.¹, Mayer, B.², Kruk, M.K.², Rood, S.B.³, Farineau, A.¹ and Post, J.R.¹

¹Department of Biological Sciences, University of Calgary, Calgary, AB

²Department of Geoscience, University of Calgary, Calgary, AB

Identifying the threats responsible for observed biotic and abiotic changes in riverine systems is complicated by natural drivers of variation. The Bow River, Canada provides an ideal model to resolve these influences and explore spatial relationships. By combining existing studies of the Bow River's biota with new data, we demonstrate how threat-natural driver interactions depend on season and the abiotic factor and biotic community or species of interest. We conclude that the severity of the impact and riverine recovery depend on the magnitude of the threat, its longitudinal position and proximity to other threats and natural drivers.

All New V6.0 Alberta Tomorrow Educational Tool - Bow River Basin Scenarios

Jennifer Janzen

Alberta Tomorrow

An overview of the all new V6.0 of the Alberta Tomorrow Educational application. Complete with a climate change module, separated out best practices, water data app, and recently released 360 Virtual Tours of Alberta's Ecoregions. Jennifer Janzen, Executive Director will give a quick demonstration of some of these new features and be available to answer questions.



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April 27, 9:30-11:30am - Exploring Methods of Environmental Assessment

Development of a Receiving Water Adaptive Monitoring and Management Framework for Studying Emerging Contaminants in Wastewater

R.N. Tanna, P. Marjan, F.J.Wrona, K.R. Munikittrick

In order to support strategic plans developed by the City of Calgary, research is being undertaken at the semi-controlled setting at the Advancing Canadian Wastewater Assets (ACWA) facility at the Pine Creek Wastewater Treatment Plant in parallel to the Bow River Watershed. The data generated is intended to guide subsequent monitoring and development of a predictive model that will enable the City to operate and manage water/wastewater infrastructure in a cost-optimized manner. Data analysis is focused on extracting practical and actionable insights but equally as an engagement tool for local Indigenous communities and stakeholders.

City of Calgary Continuous In Situ Monitoring of Rivers and Creeks (2007 – Present)

Brian Maude, **Jessica Gillis**, Phil Jerome
The City of Calgary

The City of Calgary's Water Quality Monitoring (WQM) Group has developed knowledge and experience using multi-parameter sondes for in situ continuous monitoring of rivers and creeks in the Bow Basin in and around Calgary.

Each monitoring location is unique and presents its own challenges in how the instrument is deployed to minimize public disturbance and equipment damage while maintaining data quality and staff safety. The data produced from each location is unique to itself and builds the overall understanding of the water quality and natural cycles at each body of water that is monitored.

This presentation will showcase the field aspects of the in situ continuous monitoring program, including deploying instrumentation, troubleshooting monitoring challenges, with an overview of some of the data produced and how it is used.

The Benthic Perspective; What's Happening Beneath the Surface at Bighill Creek

Tobin Benedict
Bighill Creek Preservation Society

The Bighill Creek Preservation Society performed their first aquatic invertebrate study in 2019. Aquatic benthic invertebrates are proven to be a key biomonitoring organism due to their tolerance to pollutants. The Canadian Aquatic Biomonitoring Network (CABIN) protocols were utilized in the study design, permitting the comparison of findings across varying watersheds in Canada and Alberta. Findings support indications of a healthy water system.



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May 25, 9:30-11:30am - Connecting Science to Action

Long-Term Monitoring to Improve the Practice of Soil Bioengineering in Calgary

Mike Gallant, MScE, P.Eng., Kerr Wood Leidal Associates Ltd.

Norma Posada, City of Calgary Water Resources

Harpreet Sandhu, City of Calgary Water Resources

Pierre Raymond, Terra Erosion Control Ltd.

Andre Evette, INRAE, Grenoble, France

Alan Dodd, Longview Ecological

Kathryn Hull, Cows and Fish

The use of soil bioengineering techniques has been shown to increase riverbank resilience against climate change in comparison to conventional techniques. Since 2005, over 65 soil bioengineering projects have been designed, are currently under construction or constructed in Calgary, with the majority implemented after the 2013 flood. The City of Calgary developed the Riparian Monitoring Program (RMP) in 2017 to document the successes and failures of techniques and plant materials used in a selected number of soil bioengineering projects in Calgary to understand the effectiveness of bioengineering techniques and improve overall project outcomes. This presentation will summarize the results from the 2018 and 2019 RMP field assessments of over 40 soil bioengineering sites in Calgary.

Effectively Implementing Water and Resource Recovery: A draft guide

Dr. Nicholas Ashbolt, **Jacqueline Noga**, Dr. Jane Springett,

Water & Resource Recovery Lab, School of Public Health, University of Alberta

Climate change has reached Canadians in a real way, and in particular is challenging Southern Alberta with increasing water scarcity. Water and resource recovery (WRR) - the recovery of water and other valuable resources from rainwater, stormwater, blackwater, and greywater - offers an opportunity to improve the current situation and prepare for an uncertain future. To support efforts to navigate the social – scientific interface in WRR, the recently published WRR Roadmap (Community Water and Resource Recovery Implementation Roadmap) provides guidance on social engagement. This presentation will include an overview of the WRR Roadmap and discussion about the implications and opportunities for WRR in Southern Alberta.