Bow River Basin Council

Preserving Our Lifeline

working together to nurture, renew and protect the waters of the bow river basin

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Legislation and Policy Committee Workshop Summary Flood Update 2022

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On February 24th and 25th, the BRBC Legislation and Policy Committee (L&P) hosted a two-part workshop entitled Flood Update 2022. Part 1 updated participants regarding the physical science of flooding, while Part 2 provided case studies of what has happened in the Bow Basin since the June 2013 flood events.

Lorne Fitch and Dr. Mary-Ellen Tyler spoke to the ecosystem dynamics of the river and flooding. While ecologist Mary-Ellen focused on climate change impacts on the ecosystem, biologist Lorne had a specific message: to leave "Elbow Room for the River."

Lorne's presentations are always breathtaking and really cannot be summarized easily because his imagery captures a million words. For this workshop, he framed the physical science of flooding around the concept of gravity. While explaining that rivers don't cause floods, he asserted that they simply convey flood waters, and Albertans are faced with the gravity of changing weather patterns associated with climate change.

Healthy riparian area in the Bow Basin. Photo: Bow River Basin Council

Lorne discussed the physical characteristics of floods using photographs and conversation to hone in on key aspects. Triggering factors for floods include spatial occurrence, duration, onset time, frequency, seasonality, magnitude and intensity. These concepts were further explained through answers to eight key questions about floods: Why do floods happen? Where do they occur? How long do they last? What is the interval between onset and how soon they progress? How often do floods occur? When do they happen? How

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"The best way to protect people from flooding is to protect floodplains from people."

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big are they? What effects do they produce?

Lorne stressed that flood risk increases as floodplains are developed, removing the necessary natural infrastructure that naturally mitigates against severe weather events. Evaluating flood risk is the first step in mitigating it. Establishing a bottom line of how much risk any person or community is willing to accept is also helpful. If we design our landscapes to mitigate against a low risk of flooding, we may incur huge costs when an unanticipated flood occurs. Lorne spoke about the 1:100 and 1:200-year design standards used in Alberta and BC, and how both standards failed to protect roads and other infrastructure during severe weather events arising from climate change.

Climate change is precipitating a number of severe weather patterns, including larger storms, more intense storms, more precipitation, faster delivery, changes in timing and shifts from snow to rain. Just after Lorne's presentation, Albertans experienced all of these patterns within a three-day window from June 12th to 15th.

Flood preparations need to be considered both upstream where floodwaters originate and downstream where the effects of flooding usually play out in human settlements along rivers. Lorne stressed that society must retain natural infrastructure like wetlands, riparian lands and floodplains that absorb high water and slowly release it over the summer months. When we destroy those landscape features, we lose protection from both flooding and drought conditions.

Lorne explained that retention of natural infrastructure is relatively painless, while the destructive impacts of floods can take years to fix, even if society has the energy, time and finances to do so. Lorne stressed that we need to take a watershed approach to flood protection and mitigation, starting in the mountains and headwaters. We need to begin by understanding fluvial morphology, and by protecting the natural infrastructure associated with river dynamics that cause rivers to flow where they do due to gravity.

It is all about integration: integrating structural and non-structural measures, integrating traditional and non-traditional flood reduction knowledge, and providing incentives to ensure that all communities consider and reduce flood risks. Lorne finished the presentation by stating that "the best way to protect people from flooding is to protect floodplains from people." He also said that "intact undeveloped floodplains and riparian areas are essential flood safety valves."

Lorne's path forward in developing flood-risk reduction policies and plans included the following observations: floods will happen and cannot be ignored; their frequency, magnitude and duration will increase; a watershed approach is mandatory; and downstream floodplain protection is essential. The future will not be like the past, but will be more expensive. As a final remark, Lorne offered that human failure to protect our natural infrastructure to mitigate flood risk creates a future that looks a lot like Noah's Ark.

Dr. Mary-Ellen Tyler's presentation focused on the impacts of climate change on source waters, the natural landscape, and Alberta's current mitigation and adaption practices. People in southern Alberta have always faced the uncertainty of drought conditions alternating with floods. However, the majority of Albertans have yet to recognize that climate change and changing weather patterns are already happening and it's important to incorporate natural assets (wetlands, riparian lands, watercourses and headwaters) into the management of land use changes.

At the regional scale, climate change is driving reduced water availability, increased flooding, vegetation changes, reduced nutrient availability, uncertainty due to stochastic variability, novel ecosystems, and diurnal and seasonal temperature changes. The regional hydrological cycle is already semi-arid, so instead of trying to get rid of precipitation and snowmelt from the landscape as quickly as possible through grey infrastructure, we need to manage natural infrastructure on the landscape to retain moisture for as long as possible.

Our current watershed management practices are historically based on trying to make a complex system as predictable and certain as possible. Modelling, land use practices, water allocation, dams and reservoir construction have all been predicated on past variables and system stationarity. However, with projected increases in frequency and intensity of extreme weather events, old assumptions of stationarity

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cannot address the increasing and exponential variability in the system.

Our current top-down, command-and-control land use practices reduce water availability; change land cover, vegetation, soils and nutrients; lock the landscape into specific spatial patterns driven by the location of infrastructure corridors; increase biochemical waste generation and the need for safe disposal sites; lead to the emergence of novel ecosystems with new species and loss of biodiversity; and create spatial disconnection and fragmentation. The cumulative effects of current land use management policies are already visible, and climate change is worsening the situation.

Mary-Ellen shared an Alberta Environment and Parks (AEP) document, "Our Journey to Excellence," released in January 2022, which identifies four desired outcomes: increased resiliency, reduction of emissions, improved ESG (environmental and social governance) performance, and sustainable economic development. However, these are aspirational goals that do not address the uncertainty of how the climate system and temperature and precipitation regimes are changing. Conventional top-down, command-and-control resource management approaches are not effective in dealing with the complexity and uncertainty of social, ecological and hydrological responses to increasing and cumulative changes in climate conditions.

There are three serious watershed management issues that need to be addressed if Albertans want to mitigate the effects of climate change: future land use issues, future water allocation issues, and future dam and reservoir issues. These three themes are driving the need to re-think the type of modeling being used for decision support. The future will not resemble the past and watershed management practices will need to become increasingly adaptive and potentially transformative to deal with emerging and future conditions. For example, flood modelling needs to go beyond the traditional 1:100-year event. Mary-Ellen provided examples of jurisdictions where flood modelling was based on a 1:1,000-year event, suggesting a need to rethink our current building and development setbacks from floodplains and the water's edge. Mary-Ellen stated that seamless flood modelling requires interactive process-based models that include spatially explicit rainfall-runoff partition to reservoir controls; hydraulic models that account for flood wave propagation and building impediments; and multi-scale resolutions from watershed to channel to floodplain, to the urban core.

Mary-Ellen also stressed the importance of process-based hydrological models for a certain class of watershed management problems: "They are especially appropriate in situations where knowledge of flow paths or distributed state variables and/or preservation of physical constraints are important. Examples include spatio-temporal variability of soil moisture, groundwater flow and runoff generation, sediment and contaminant transport, and when feedback among Earth's various system processes to understand the impacts of climate non-stationarity are of primary concern. These are situations where process-based models excel and other models are unverifiable."

Mary-Ellen left participants with several key messages about adapting to climate change in the Bow Basin. First, she shared that "watershed management in climate change is not 'business as usual' and will require simultaneously managing for drought and flooding and uncertainty." She added that "complex social-ecological systems are not predictable. They are large-scale, non-linear systems full of surprises and cannot be understood by conventional linear and deterministic approaches."

Both Mary-Ellen and Lorne left workshop participants with plenty of questions and plenty to think about when designing flood management systems along the Bow. Their collective bottom line being that society must retain natural infrastructure like wetlands, riparian lands and floodplains that absorb high water in the spring and slowly release it over the summer months.

Jumping Pound Creek in Cochrane after the 2013 flood. Photo: Judy Stewart.

Prescriptions for Nature:
Alberta healthcare professionals can now write prescriptions for patients to spend time outdoors

This article is based on a March 28th, 2022, news release and was compiled by:

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At the March BRBC Quarterly Forum, Dr. Sonya Jakubec, Anne Robillard, and Dr. Clark Svrcek made an illuminating presentation on Prescribing Parks for Health and Wellbeing. Nature prescriptions were named one of the top eight global wellness trends in 2019 and are being implemented around the world. The UK and other countries have invested in park prescription pilots to help address mental and physical health problems and the resulting strain on their healthcare systems and economies.

The three presenters were motivated by their families' and patients' experiences in nature to bring Canada's national nature prescription program – PaRx – to Alberta (visit www.parkprescriptions.ca for information). Officially launched in Alberta in late March 2022, PaRx now gives the province's healthcare professionals the ability to formally prescribe nature to their patients.

Featuring practical, evidence-based online resources like quick prescribing tips and printable fact sheets, as well as an achievable green-time target of "2 hours per week, 20+ minutes each time," PaRx aims to make nature prescriptions easy and effective for both prescriber and patient. Any licensed healthcare professional can prescribe PaRx. They will also receive a nature prescription file customized with a unique provider code and instructions for how to prescribe and log prescriptions.

As we head into the fall season, now is a great time for healthcare professionals to promote the mental and physical benefits of nature and time spent outdoors. The Alberta WPACs are looking forward to learning more about this initiative as it progresses!

Helen Lake hike, summer 2022. Photo: Bow River Basin Council.

2022 Science Forum: The First BRBC In-person Event Since 2020!

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Bookending two years of COVID-19 public health restrictions, this year's BRBC Science Forum marked the first in-person BRBC event since March 2020 (also a Science Forum, fittingly). On May 4th, over 90 BRBC members returned to the excitement of in-person programming, catching up with familiar faces and creating new connections. For several speakers, the 2022 event at the Southern Alberta Institute of Technology's (SAIT) Heritage Hall was also their first opportunity to share years of incubating research with a captive audience.

Acknowledging some concern about appropriate precautions and individual comfort levels surrounding COVID-19, the atmosphere of the 2022 Science Forum was relaxed and friendly.

Once attendees were seated with coffee, Wendell Koning's opening remarks welcomed members back to an in-person BRBC setting. Fifteen speakers were included in this year's forum, divided among four themed sessions, with an additional display of six posters in the hallway. Wendell introduced the keynote speaker, Nicole Acosta (University of Calgary), who kicked things off discussing her work tracking Alberta COVID-19 trends using wastewater samples. Acosta presented online and you can view her work via the online Covid Tracker tool: https://covid-tracker.chi-csm.ca.

Wendell Koning at the podium for opening remarks. Photo: Bow RIver Basin Council.

The first session, "Climate Change and State of the Watershed," began with Dr. Brandi Newton (Alberta Environment and Parks) discussing historic and future trends of climate and freshwater availability in the Bow Basin. Newton anticipates increased winter precipitation, which will predominantly fall as rain due to an earlier onset of spring temperatures (1-2 months earlier by the 2080s). Next was Dr. Matthew Bogart (University of Lethbridge), whose research found that development activities within the South Saskatchewan River Basin had little impact on dissolved organic carbon (DOC) flux over the last 40 years. Instead, DOC content appears to follow natural climate cycles (i.e., the Pacific Decadal Oscillation). Kelsey Serviss (University of Calgary) wrapped up the session discussing geoarchaeological floodplain data and its potential to extend Bow River flood records.

Session two, "Methods of Aquatic and Riparian Assessment and Connecting Science to Action," began with Kathryn Hull (Alberta Riparian Habitat Management Society / Cows and Fish) summarizing the last 15 years of riparian restoration work in and around Calgary. Hull highlighted bioengineering techniques and the increasing threat of invasive species. Next, Brie Nelson (Alberta WaterPortal Society) discussed the

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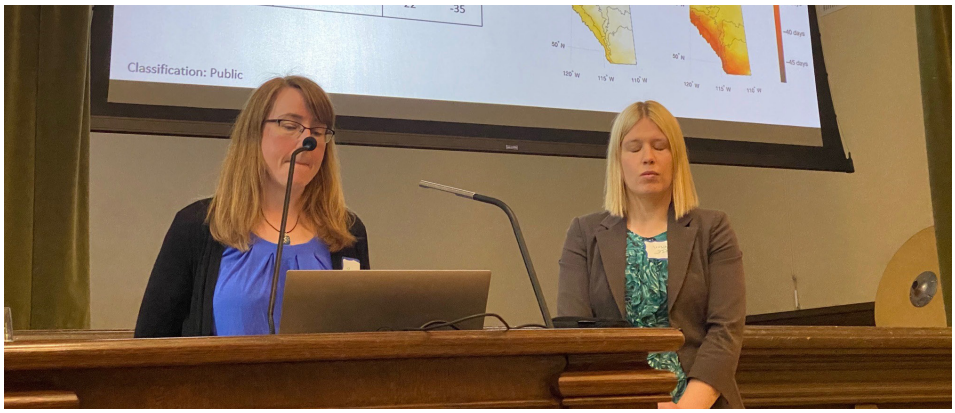
Alberta Water Nexus Project, an online tool to educate students about the interlinking nature of water, energy and food. You can find this resource at https://albertawater.com/nexus. Stacey Zhao (City of Calgary) concluded session two, presenting efforts to mitigate total suspended solids contributions from gravel back lanes into Calgary's stormwater system. The City is investigating alternatives including "quality gravel" whose shape resists removal.

After a meal catered by Hotel Arts, Janelle Villeneuve (Alberta Agriculture, Forestry and Rural Economic Development) started session three with "Threats to Human Health and Aquatic Ecosystems." Villeneuve's team used isotopic analysis to determine nutrient input sources causing invasive weed growth in irrigation canals. Dr. Nancy Martin (formerly with Alberta Environment and Parks, now with The City of Calgary) then described research modelling dissolved oxygen impacts resulting from Maximum Allowable Loads for phosphorus in the Bow River. Next, Eric Camm (City of Calgary) and Michael Wagner (Alberta Agriculture, Forestry and Rural Economic Development) jointly presented on the threats wildfires pose to drinking water sources, framing their discussion around responses to the Devil's Head wildfire of September 2020. On a similar topic, session three was rounded out by Jennifer Pouliotte (City of Calgary) whose research focuses on source water risks related to firefighting foams containing environmentally-persistent and difficult-to-remove perfluoroalkyl and polyfluoroalkyl substances (PFAS). Work is being done to encourage fire departments to implement foam alternatives without PFAS.



Brandi Newton and Brie Nelson at the podium. Photo: Bow River Basin Council.

The final session, "Understanding Groundwater and Groundwater-Surface Water Interactions," began with Sara Lilley (University of Calgary) whose Master's research characterizes karst aquifers, which create underground flow paths independent of surface topography. Another Master's degree student, Brayden Ralph (University of Calgary), then presented a novel modeling approach for alpine aquifers to accommodate a watershed-level analysis. Lucas Ogrins (University of Calgary) described his master's work investigating groundwater-surface water interactions of stormwater ponds at the Calgary International Airport. The final speaker of the day was Francisco Castrillon Munoz (Innotech Alberta) who has studied groundwater-surface water interactions between the Bow River and the Sunnyside alluvial aquifer in Calgary. His analysis methods tracking river water intrusion can be used to evaluate the effectiveness of flood controls along rivers.

In addition to the above speakers, a poster display area was maintained outside the event room. Poster topics included low impact development (Sean Elliot, University of Calgary), development impacts on urban groundwater-surface water interactions (Samuel Johnson, University of Calgary), long-term effects of phosphorus loading on wetland functionality (Cynthia Soued, University of Lethbridge), and water temperature profiles along Bighill Springs Creek (Dr. Ken Stevenson and Elliot Lindsay, Bighill Creek Preservation Society and Trout Unlimited Canada).

The forum concluded with an open invitation to gather at The Gateway on SAIT's campus, where a good number of attendees joined to share a drink and connect. Overall, the 2022 Science Forum was a fantastic success thanks to the dedicated work of the Science Committee and BRBC Program Coordinator, Brooke Kapeller. The BRBC is also grateful to Nisha Saini for coordinating with SAIT venue staff, and to Forum organizers, Wendell Koning, Mary Kruk, Brandi Newton and Cecilia Chung, and the session chairs, Brie Nelson, Chris Sullivan and Nicole Willment, who smoothly facilitated the event. Finally, thank you to all the engaged, science-minded BRBC members who attended, connected and made this year's forum a memorable event.

BRBC Watershed Planning Assistant: Reflections

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My name is Aidan Yakymyshyn and I worked for the Bow River Basin Council (BRBC) this past summer as a Watershed Planning Assistant. My instructor shared the posting for this summer student position while I was completing my first year in SAIT's Integrated Water Management program. It seemed the perfect opportunity to consolidate my studies and my new-found interest in watershed management. My courses had alluded to the BRBC and its role within the Bow River watershed. So, in my first semester, I joined the organization as a member - intrigued by its mission, but also a bit intimidated by the collective experience and expertise of the BRBC membership. After two friendly interviews I was offered the position. I now had the chance to explore a fundamental question of mine: "how does one actually go about managing a watershed?"

My first month at the BRBC was packed with happenings. It was a great time to join, with in-person work occuring more regularly and a recent re-shuffling of staff. On my first day I was introduced to BRBC Board members over lunch, grateful to feel welcomed by seasoned professionals. Two days later I attended the BRBC 2022 Science Forum and was immersed in the stellar scientific work of those in the basin, happy to be among familiar SAIT faces and numerous new ones as well. I was impressed at the engagement shown by the attendees, exemplifying how the BRBC creates avenues for basin-wide communication and integration.

BRBC summer student, Aidan Yakymyshyn, at the ridge above Helen Lake. Photo: Bow River Basin

The following Monday, I drove to Camrose with Brooke Kapeller for a meeting with other WPACs and was inspired by the diverse goals of each organization. That week, I also became involved with the BRBC's re-branding process, participating in lengthy discussions about the BRBC's historical membership and approach, and how the Council hopes to grow its membership going forward. I was able to write the "About Us" page for the new website, which was especially illuminating as the BRBC staff and I explored a future vision for the Council.

Another huge highlight of my summer was getting out into the Bow Basin. I spent days with the ERWP's Freshwater Field School program and assisting the Bighill Creek Preservation Society's water sampling program with Wendell Koning and Lyse Carignan. The BRBC also sponsored my completion of a Ducks Unlimited Wetland Identification field course and a CABiN field training course (along with Brooke Kapeller). I look forward to using CABiN skills this fall with stewardship groups like the Elbow River Watershed Partnership, and I intend to continue probing my interest in wetland ecology and regulatory frameworks.

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During numerous BRBC-related events, I met, networked and learned from many knowledgeable and passionate people in the basin. Such events included the BRBC's fantastic quarterly forums, committee meetings, the City of Calgary Mayor's Environmental Expo, and a recent unofficial hike to Helen Lake I organized. Everyone I've encountered during my time with the BRBC has been friendly and insightful, and I appreciate all those who make time to connect with young, curious individuals in their field.

I was also able to develop my GIS skills, with much of my time put towards the future online, GIS-formatted BRBC State of the Watershed (an ambitious undertaking). Additionally, I enjoyed experimenting with ArcGIS Story Maps, creating an online map to document the stormwater tours organized by the Youth and Young Professionals Committee with MAGNA Engineering Services Inc.

I'm excited to bring forward the lessons and connections I've gained from the BRBC into my life and career. I intend to continue my BRBC involvement as I begin my final year in the Integrated Water Management program at SAIT. Armed with a better understanding of the mechanisms and complexity of watershed planning, I'm looking forward to sharing what I have learned and incorporating these learnings in my capstone project. Whichever career path I take, I'll utilize the watershed-level insights I've gained from the BRBC and consider how my role can integrate with others in the basin.

Working alongside Mike Murray, Brooke Kapeller, Medini Prasai, Andrea Czarnecki, and the BRBC membership has been a true privilege. I thank the BRBC staff for the patience, support and trust they have shown me and my work throughout the summer. I am grateful to have had the chance to spend time absorbing the BRBC's thoughtful, passionate, resourceful and, above all, principled approach to shaping a healthy Bow River Basin, and I am humbled to have contributed to it.

Aidan Yakymyshyn examines a macroinvertebrate tray with Kate Lovsin (Lesser Slave Watershed Council) in Camrose while Carson Hvenegaard (Battle River Watershed Alliance) looks on. Photo: WPAC Education and Outreach Committee.

Meeting the Minister of Environment and Parks at the Calgary Stampede!

In July, the BRBC was invited to meet with Whitney Issik, Minister of Environment and Parks. Representatives from the Board of Directors attended the meeting and were thrilled for the opportunity to talk with the Minister about the BRBC and our work. A highlight of the summer for sure!

From left to right: Mark Bennett; Harpreet Sandhu; Richard Phillips; The Honourable Whitney Issik, Minister of Environment and Parks; Steve Meadows; Bev Yee; Brooke Kapeller.
Photo: Bow River Basin Council.

BRBC Quarterly Educational and Networking Forum ** In person **

September 14th, 9:00 am - 3:00 pm
TransAlta, 110 12 Avenue Southwest Calgary

SPEAKERS

Steve Meadows, BRBC Board Chair
Chair Report

Florencia Said and Sandaldeep Kaur University of Calgary and IBM
What SWIMs Around Comes Around: Demonstration of the SWIM Data Platform (v2)

Wendell Koning and Lyse Carignan Bighill Creek Preservation Society
Bighill Creek Water Sampling Efforts

Sharlene Fritz, Forest Matters
Rocky Mountains Forest Reserve Story Map

Shane Dorchak, Urban Systems
Mitigating Development Impacts on Watershed Health through Wetland Reconstruction

Mike Murray and Brooke Kapeller BRBC
BRBC Updates and Opportunities

Additional presentations to be confirmed

Click here to register for the Forum.

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The next BRBC newsletter will be released in December.

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