E-BOOK OF ABSTRACT

Institute for Environmental Sustainability

Mount Royal University

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2/2/2021

PROGRAM FOR 2021 VIRTUAL WORLD WETLANDS DAY SYMPOSIUM

8:30 -8:40	Welcome and Opening Remarks
8:40 - 9:20	Professor Richard Petrone: Alpine Watershed Management: Are Wetlands the Tap on the World's Water Towers
9:20 - 10:00	Dr. Nandita Basu: Wetlandscapes: Land use Legacies and Water Quality Futures
10:00 - 10:10	Virtual Coffee and Screen Break
10:10 - 10:50	Dr. Scott J. Ketcheson: Wetlands, Water Availability and Headwater Catchments in the Lower Athabasca River Basin
10:50 - 11:00	Virtual Coffee and Screen Break
11:00 - 11:40	Dr. Pascal Badiou: Wetlands as Nature Based Solutions: Examples from the Canadian Prairies
11:40 - 12:00	Discussion Panel and Closing Remark

Keynote Papers

Alpine Watershed Management: Are Wetlands the Tap on the World's Water Towers

Professor Richard M. Petrone

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Abstract

Canadians across several provinces use water dependent on regular and predictable mountain streamflow, which are largely influenced by the vulnerability of alpine headwater supply to natural (climate) and anthropogenic (land-use) disturbances. In recent years, Alberta has been impacted by severe mountain-derived flooding and drought with profound economic, ecosystem health, and food and energy production disturbances. These crises and impacts illustrate that Alberta's supply of mountain-sourced waters is at risk, influenced by climate change and extreme weather. Thus, it is imperative that we assess the dynamics in mountain water supply as influenced by ecohydrological processes, weather extremes, climate variability, and variability in land-use. it has become evident that alpine wetlands, and their landscape connection, exert a strong control on mountain water yield, but that our scientific understanding of the ecohydrologic processes that give rise to wetland functions in this region is especially weak. Thus far, it is clear that mountain wetlands possess auto- and exo-genic (forest hydrological connections, local climate, groundwater connectivity) ecohydrological feedbacks for maintaining wet conditions, and may contribute to streamflow when runoff exceeds subsurface storage. Preliminary work in the Bow River Basin to establish the basic ecohydrological function of alpine wetlands, and their interactions with groundwater and forests will be presented, while assessing their overall hydrological role in changing mountain environment, and the resulting interactions with ecology.

Speaker's Brief Bio

Prof. Petrone is recognized internationally as a leading expert in the hydrometeorology and ecohydrology of wetland and forest systems, and high latitude and altitude hydrology, with a special emphasis on atmospheric – vegetation interactions. Dr. Petrone's most significant contributions are in advancing our understanding the ecohydrological function of, and interactions between, peatlands and forests of the Western Boreal and Canadian Rockies. His team has also initiated advances in landscape reclamation design and ecohydrological assessment. His research group has made significant progress in the areas of ecohydrological functioning of Boreal peatlands and forests, evapotranspiration and hydrological interactions between Western Boreal peatlands and forests, scaling fluxes in heterogeneous landscapes, ecohydrological and biogeochemical functioning of in reclaimed ecosystems, and the effects of wildfire on peatland and forest ecohydrology. Prof. Petrone is currently the Past-President of the Canadian Geophysical Union, Canada's Senior Representative to the International Association of Hydrological Sciences, President of the International Commission on Coupled Land-Atmosphere Systems, and a member of the UNESCO International Hydrology Program.

Wetlandscapes: Land use Legacies and Water Quality Futures

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Abstract

More than 50% of global wetland area has been lost over the last 200 years, resulting in losses of habitat and species diversity as well as decreased hydrologic and biogeochemical functionality. Recognition of the magnitude of wetland loss as well as the wide variety of ecosystem services provided by wetlands has in recent decades led to an increased focus on wetland restoration. Restoration activities, however, often proceed in an ad hoc manner, with a focus on maximizing the total restored area rather than on other spatial attributes of the wetland network. In this seminar, we will discuss the importance of a landscape-scale approach to wetland restoration and protection and will provide a broad context for thinking about the effects of wetlands on water quality. We will first discuss spatial patterns of wetland loss and the potential implications of these losses on ecosystem functionality. Here, we will specifically focus on the disproportionate loss of smaller wetlands found in the North American Prairie Pothole region. Next, we will discuss in more detail the role of wetland size in driving biogeochemical behavior. In particular, we will discuss differences in nitrogen (N) and phosphorus (P) removal rates across a continuum of wetland size. Finally, we will discuss our most recent work, in which we have used National Wetland Inventory data and 5-km grid-scale estimates of N inputs and outputs to estimate current wetland N removal by U.S. wetlands. We will show results suggesting a clear, spatial disconnect between high-density wetland areas and N hotspots, and we will discuss future U.S.-scale scenarios for wetland restoration, which focus on maximizing N removal and thus providing powerful water quality benefits.

Speaker's Brief Bio

Nandita Basu is an Associate Professor and University Research Chair, jointly appointed in the Departments of Civil and Environmental Engineering and Earth and Environmental Sciences at the University of Waterloo. She is the 2020 recipient of AGU's Sulzman Award for Excellence in Education and Mentoring. Nandita is currently the Director of the Collaborative Water Program at Waterloo, Member of the Royal Society of Canada, College of New Scholars, and Editor-in-Chief of the Journal of Hydrology. Nandita is a watershed hydrologist and biogeochemist, and her research interests cover a broad range of issues related to water in human-impacted environments. From problems of nutrient pollution in intensively farmed regions to drought in water-stressed areas of India to urban water pollution and water quality effects of wildfire, Nandita uses tools from environmental science, engineering and the social sciences to improve our ability to sustainably manage water resources. Nandita's current research focuses on the legacies of nutrients that accumulate in the subsurface and lead to time lags between implementation of watershed conservation measures and water quality improvement. Her team is developing models to quantify these time lags and to help identify management strategies such as wetland restoration to maximize nutrient removal. In recent work, her lab developed methodologies to quantify nutrient retention by wetlands at the continental scale, and constructed scenarios of wetland restoration to optimize water quality benefits.

Wetlands, Water Availability and Headwater Catchments in the Lower Athabasca River Basin

Dr. Scott J. Ketcheson
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Abstract

Headwaters, which represent the inception point of streams, are vital regions within any catchment owing to their important role as source-areas of freshwater generation. Wetlands located within these headwater reaches contribute to increased water availability for receiving ecosystems and larger streams and rivers. Small "mountains" scattered throughout northern Alberta likely represent important headwater sources of water for large rivers far from the Rocky Mountains. However, there are not many instrumented catchments on these small mountains to understand their function. In this talk, I will present research from the Stony Mountain Headwater Catchment Observatory, which comprises five small (<10 km^2) headwater catchments ~40 km south of Fort McMurray; the first of its kind in the lower Athabasca River Basin. I will describe these catchments and some of the innovative technologies that we are using to collect data from the field, as well as present some findings that highlight the importance of northern Alberta's "mountains" and wetlands on sustaining water flows in local streams and regional rivers in the Athabasca River Basin.

Speaker's Brief Bio

Dr. Scott Ketcheson is an Assistant Professor and NSERC Canada Research Chair in Hydrological Sustainability at Athabasca University. As a field hydrologist, Dr. Ketcheson studies the movement of water between forests, wetlands, and streams in northern Alberta. His research program uses both traditional hydrological techniques and innovative sensor networks to gain a better understanding of the how headwater catchments work and their importance for keeping water flowing through streams and rivers within the lower Athabasca River Basin.

Wetlands as Nature Based Solutions: Examples from the Canadian Prairies

Dr. Pascal Badiou

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Abstract

While prairie wetlands are typically quite small, they punch above their weight in terms of the diversity and level of ecosystem services they provide to society. Research has demonstrated that these tiny wetlands are important for buffering against floods and drought, and for filtering and processing nutrients and other pollutants in runoff. Additionally, prairie wetlands are important bastions of biodiversity supporting beneficial insects, birds, and amphibians. Lastly, wetlands are globally significant terrestrial carbon stores and play an important role adapting to and mitigating the impacts of climate change. This presentation will highlight the nature-based solutions that prairie wetlands provide in terms of buffering against floods, non-point source nutrient pollution and mitigating the impacts of climate change. Specific examples will be taken from the Camrose Creek watershed and other locations in the Canadian Prairies, including constructed wetlands used as green infrastructure in the city of Winnipeg.

Speaker's Brief Bio

Pascal Badiou is a Research Scientist with the Institute for Wetland and Waterfowl Research (IWWR), the science arm of Ducks Unlimited Canada. His research focuses on the ecology of wetlands and large shallow lakes, with specific interest in the role wetland restoration and conservation can play in regulating water quality and quantity in agricultural watersheds of the Canadian Prairies. He is also interested in how the interaction of multiple stressors such as invasive species, increased nutrient loading, pesticides and climate change affect wetland ecosystems. Additionally, Pascal has been conducting research to determine the importance of wetlands in carbon cycling and how these systems can be managed to mitigate against climate change. He's also interested in the use of constructed wetlands for the management of stormwater and treatment of sewage effluent to improve water quality at the watershed scale within urban environments.