Geophysical Research Abstracts
Vol. 19, EGU2017-13113, 2017
EGU General Assembly 2017

A concept of ephemeral wetlands as water-transmitting landscape units in Canada's Western Boreal Plain

Alexander Hurley (1), Nicholas Kettridge (1), Kevin Devito (2), Kelly Hokanson (2), and Stefan Krause (1)

(1) University of Birmingham, School of Geography, Earth and Environmental Science, United Kingdom (agh514@bham.ac.uk), (2) Department of Biological Sciences, University of Alberta, Edmonton, AB, T6G 2E9, Canada

Hydrologic connectivity in the sub-humid Western Boreal Plain is largely controlled by storage-threshold dynamics where deep and coarse glacial deposits with high infiltration and storage capacities are prevalent. Here, vertical fluxes generally dominate over surface runoff, which has return periods of several years. Within this landscape, small, ephemeral wetlands with shallow peat soils are embedded in a matrix of other landscape units. They are typically gently-sloped and found in low-lying areas within forests or along margins of other wetlands. These ephemeral wetlands frequently saturate, and thus promote lateral water transfer as surface runoff or subsurface flows to adjacent and downstream systems. In the Western Boreal Plain, the importance of such water transmitting units (WTUs) is exacerbated by regional, multi-year water deficits resulting from inter-annual precipitation variability, and high evapotranspirative (ET) demand coinciding with most of the annual precipitation. Hence, the occurrence of WTUs may be key to maintaining the ecohydrological functioning of systems with temporary or missing connections to ground- or surface water.

We present a conceptual model of these shallow, ephemeral wetlands based on our current understanding of dominant, ecohydrological processes promoting water transmission and highlight current knowledge gaps. Ongoing research focuses on quantifying individual water balance components, identifying potential feedback mechanisms between vegetation, soil properties and layering, and how climate modulates them. Key questions are: (1) What are dominant water balance components and their seasonal and internal dynamics? (2) Do vegetation structure and community composition decrease ET losses from the soil surface and wetland vegetation by shading and sheltering (i.e. decoupling from turbulent atmospheric exchange)? (3) Do adjacent upland and wetland systems depend on water transmission to maintain their functioning and productivity? (4) Are saturation and lateral water transport enhanced by the formation of surface-near ice layers by decreasing storage capacity, and does spatial variability of soil properties affect this process? Ultimately, this work will contribute to a growing knowledge base on the ecohydrological functioning of landscape units and catchment dynamics of the Western Boreal Plain.