Geophysical Research Abstracts
Vol. 19, EGU2017-8854, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

Shallow peatland ecohydrology - the control of peat depth on moss productivity

Simon Dixon (1), Nicholas Kettridge (1), Paul Moore (2), Kevin Devito (3), Amey Tilak (1), Rich Petrone (4), Carl Mendoza (5), and Mike Waddington (2)

(1) University of Birmingham, Geography, Earth & Environmental Science, Birmingham, United Kingdom (s.j.dixon@bham.ac.uk), (2) School of Geography and Earth Sciences, McMaster University, Hamilton, ON, L8S 4K1, Canada, (3) Department of Biological Sciences, University of Alberta, Edmonton, AB, T6G 2E9, Canada, (4) Department of Geography and Environmental Management, University of Waterloo, Waterloo, ON, N2L 3G1, Canada, (5) Department of Earth and Atmospheric Science, University of Alberta, Edmonton, AB, T6G 2E3, Canada

Northern peatlands represent an important sink in the global carbon cycle. Shallow peatlands and marginal connective wetlands can be essential components of many northern peatland landscape mosaics, playing a vital role in landscape connectivity and wider landscape hydrology. However the ecohydrological function of these shallow, marginal systems has been largely overlooked, with peatland hydrology research focused on relatively deep bog systems. In order to predict landscape scale wetland function and its vulnerability to climate change we need to understand how these shallow connective systems function. The balance between moss productivity and water loss provide a key component of these systems, as water use efficiency controls the rate of moss growth and thus controls the amount of atmospheric carbon sequestered in peat. Understanding how productivity of shallow peatland systems responds to changes in evaporative stress will aid predictions of peatland landscape hydrological function in a changing climate.

To determine the factors influencing peat productivity, water balance simulations using Hydrus 1-D were conducted over annual growing seasons for different soil profile depths, compositions and antecedent moisture conditions.

Our results demonstrate a bimodal distribution of peatland responses; either primarily conserving water by limiting evapotranspiration or, maximizing productivity. For sustained periods of evaporative stress, shallow marginal systems are least able to buffer periods of evaporative stress due to limited labile water storage, and will limit evaporation, conserve water and be less productive. Conversely, where present, both deep water storage and a shallow initial water table prolong the onset of high vegetative stress, thus maximizing moss productivity. However, a total depth of 0.8 m is identified as the threshold above which increasing peat depth has no further effect on changing vegetative stress response and thus landscape function.

These results are important as moss productivity, along with rate of organic matter decay are the two principle factors controlling the build-up of peat, and therefore sequestration of carbon. With a predicted increase in the frequency and size of rain events in northern latitudes our results indicate the productivity of shallow wetland systems may increase, but greater moisture availability will increase the likelihood they remain as wetlands in a changing climate.