



Physical and chemical differences between natural and artificial pools in blanket peatlands

Ed Turner (1), Andy Baird (1), Mike Billett (2), Pippa Chapman (1), Kerry Dinsmore (3), and Joseph Holden (1)
(1) water@leeds, School of Geography, University of Leeds, Leeds, United Kingdom (j.holden@leeds.ac.uk), (2) Biological and Environmental Sciences, University of Stirling, Stirling, United Kingdom, (3) Centre for Ecology & Hydrology, Edinburgh, United Kingdom

Natural pools are common features of many northern peatlands. Numerous artificial pools are being created behind dams installed during drain-blocking, a common peatland restoration technique, significantly increasing the area of open water. Natural pools are known to be major sources of GHGs (e.g. Hamilton et al. 1994), but the reasons they are such 'hotspots' is poorly understood. We hypothesize that pools act as 'biochemical reactors' of particulate and dissolved organic carbon (POC and DOC) transported from surrounding peat that is processed into a range of products including CH_4 and CO_2 . Therefore, understanding the processes operating in both natural and artificial pool systems is fundamental to elucidating this hypothesis.

Water levels and temperature have been continuously monitored at six natural and six artificial pools within the 'Flow Country' blanket peatland in northern Scotland since May 2013. Bi-weekly sampling of waters from pools, peat matrix through-flow (via piezometers) and surface flow has been conducted for analysis of DOC, POC, DIC, CH_4_{diss} and CO_2_{diss} , together with GHG flux measurements from pool surfaces and adjacent peat.

We show that, to date, pool water levels rapidly respond to rainfall, although artificial pools appear to respond with greater magnitude. For example, over the course of same rainfall event (20-23 June 2013), natural and artificial pool levels increased between 5.3 and 9.8 cm, and 12.5 and 22.6 cm respectively. Temperature measured at *c.* 5 cm from the base of each pool shows distinct diurnal fluctuations, which are of greater magnitude in all but one of the natural pools compared to the artificial pools: over the same period (20-23 July 2013), the maximum diurnal variation at the artificial pool site was 5.1 °C compared to 9.2 °C within the natural pools. Vegetation cover is generally higher in artificial pools and may have a moderating effect on variations in pool temperature. Results of pool-water DOC analysis from regular sampling at the study site and a wider regional survey indicate DOC concentrations are consistently higher in artificial pools.

The implications of these preliminary results in relation to the carbon cycle and GHGs of blanket peatlands are briefly discussed.

Hamilton, J. D., Kelly, C. A., Rudd, J. W. M., Hesslein, R. H. and Roulet, N. T. (1994) Flux to the atmosphere of CH_4 and CO_2 from wetland ponds on the Hudson Bay lowlands (HBLs). *Journal of Geophysical Research* 99, 1495-1510.