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Understanding the Impact of Land Management on Carbon Losses from Peatlands

A Savage (1), J Holden (1), and J Wainwright (2)

(1) University of Leeds, School of Geography, Leeds, United Kingdom (gyajs@leeds.ac.uk), (2) Department of Geography, University of Sheffield, Sheffield, S10 2TN, UK

British peatlands have historically been managed in many different ways to provide an income for rural communities. Such practices involve heather burning on grouse shooting estates, sheep grazing, drainage to increase the area of land available for agriculture and afforestation. Carbon budget calculations for unmanaged peatlands have demonstrated that peatlands are carbon sinks. At present, little is known about how management affects carbon stocks, and whether one strategy might be favoured over another in the future, from a carbon stock preservation perspective. As the need to safeguard carbon stocks rises up the political agenda, questions are being asked about how peatlands should be managed to limit carbon losses.

Carbon cycling in peat is governed by four drivers (Laiho, 2006), environmental conditions (e.g. temperature, water table level), substrate quality (e.g. how recalcitrant the peat is), nutrients (e.g. nitrogen required to synthesis the carbon stocks) and microbial community (e.g. are the microbes present able to utilise the available substrate). Changes in one or more of these drivers will influence the carbon budget of a peatland. How land management influences these drivers is unclear at present.

Carbon budget calculations carried out by Worrall et al. (2003 and 2009) indicate that carbon dioxide and dissolved organic carbon (DOC) account for the greatest losses of carbon from peatland systems. If climate change predictions are realised, peatlands are expected to become sources of carbon as rising temperatures and falling water tables will result in increased rates of carbon mineralisation and subsequent losses of carbon. By investigating the influence of land management on these key carbon loss pathways, more accurate predictions of the effects of climate change on UK peatlands can be made.

A field study was carried out in the British uplands to determine how carbon losses vary between differently managed peatlands, and to identify some of the underlying causes for such variations. The study focused on three of the driving factors identified by Laiho (2006): substrate quality, environmental conditions and nutrients. In addition, the physical properties of the peat – bulk density and air filled porosity which will control rates of gas and water movement within the peat profile, were studied.

This paper will present the results of the work which was carried out at the Moor House, National Nature Reserve. The work involved collection of peat cores from burnt, grazed, drained, afforested and unmanaged areas of peat. The chemical and physical properties of the peat that are relevant to carbon cycling (e.g. nutrients, metals, substrate quality, air filled porosity) were analysed and compared between sites, and correlated with carbon losses which were measured on a fortnightly basis; and meteorological and hydrological data which were collected throughout the study period. Based on these results, suggestions for peatland management strategies that preserve carbon stocks will be presented.

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