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Impact of managed moorland burning on peat nutrient and base cation status

Sheila Palmer (1), Martin Gilpin (1), Catherine Wearing (1), Kerrylyn Johnston (1,2), Joseph Holden (1), and Lee Brown (1)

(1) University of Leeds, Geography, Leeds, United Kingdom (s.m.palmer@leeds.ac.uk, +44 (0)113 3433308), (2) School of Environmental Science, Murdoch University, 90 South St, Murdoch 6150, Western Australia

Controlled 'patch' burning of moorland vegetation has been used for decades in the UK to stimulate growth of heather (Calluna vulgaris) for game bird habitat and livestock grazing. Typically small patches (300-900 m2) are burned in rotations of 8-25 years. However, our understanding of the short-to-medium term environmental impacts of the practice on these sensitive upland areas has so far been limited by a lack of scientific data. In particular the effect of burning on concentrations of base cations and acid-base status of these highly organic soils has implications both for ecosystem nutrient status and for buffering of acidic waters. As part of the EMBER project peat chemistry data were collected in ten upland blanket peat catchments in the UK. Five catchments were subject to a history of prescribed rotational patch burning. The other five catchments acted as controls which were not subject to burning, nor confounded by other detrimental activities such as drainage or forestry. Soil solution chemistry was also monitored at two intensively studied sites (one regularly burned and one control). Fifty-centimetre soil cores, sectioned into 5-cm intervals, were collected from triplicate patches of four burn ages at each burned site, and from twelve locations at similar hillslope positions at each control site. At the two intensively monitored sites, soil solution chemistry was monitored at four depths in each patch. Across all sites, burned plots had significantly smaller cation exchange capacities, lower concentrations of exchangeable base cations and increased concentrations of exchangeable H+ and Al3+ in near-surface soil. C/N ratios were also lower in burned compared to unburned surface soils. There was no consistent trend between burn age and peat chemistry across all burned sites, possibly reflecting local controls on post-burn recovery rates or external influences on burn management decisions. At the intensively monitored site, plots burned less than two years prior to sampling had significantly smaller exchange capacities and lower concentrations of soil base cations in surface soils relative to plots burned 15-25 years previously. In contrast, surface soil solutions in recently burned plots were enriched in base cations relative to older plots and relative to the control site, possibly due to enhanced leaching at bare soil surfaces. The results offer evidence for an impact of burning on peat nutrient and acid-base status, but suggest that soils recover given time with no further burning.