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Simulated livestock trampling and compaction of a peat soil – impact on gaseous CO2 fluxes

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In the UK livestock production is concentrated in lowland areas managed by extensive and intensive production methods. However, there is also a livestock industry based on less intensive farming methods in upland areas usually of hill sheep. Grazing in these rural areas tends to occur on moorland and heathland habitats underlain by peat and peaty soils. There is a great deal of carbon stored in the peats of the UK and changes to land management, such as changes in grazing practice, in these marginal areas may have important consequences for the carbon balance.

The presence of grazers could lead to a number of impacts upon sensitive organic soils including the physical impact of trampling and compaction. There is very little in the way of research in the UK on the physical trampling of peat soils and notably how changes in intensity affect carbon stores. Of the few studies that investigate trampling and carbon, Robroek et al. (2010) show that the absence of vegetation from trampled research tracks on a blanket bog led to an increase in runoff events and transport of particulate organic carbon (POC) and that rapid recovery of the vegetation resulted in cessation of these effects. Robroek et al. (2010) investigated hydrological and vegetation changes following trampling but did not consider gaseous emissions of carbon.

This study simulates a range of trampling intensities on peat cores and studies the CO2 emissions from cores subjected to heavy, medium and low intensity trampling (daily, bi-weekly and weekly trampling of equivalent sheep pressures). Initial results (to end 2010) show that in the weeks immediately following initiation of trampling there was a decrease in carbon fluxes from the trampled cores. Following the initiation of trampling, carbon flux values across all cores were approximately 54%, 29% and 72% of the control cores for primary productivity (PP), net ecosystem exchange (NEE) and net ecosystem respiration (NER). However, there were differences between trampling intensities and also in the first weeks immediately following initiation of trampling. This paper will update these numbers with additional monitoring (due to end Feb 2011) and explore some of these observed results.

References

Robroek, B.J.M., Smart, R.P. and Holden, J., 2010. Sensitivity of blanket peat vegetation and hydrochemistry to local disturbances. Science of the Total Environment, 408(21): 5028-5034.