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Assessing the Impact of Land Management on Organic Matter Composition in Peat Soils

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Peatlands are seen as important stores of terrestrial carbon, accounting for up to one-third of global soil carbon stocks. In some cases peatlands are shown to be emitters of carbon, in other cases carbon sinks depending on the site conditions and nature of degradation. However, carbon budget calculations carried out to date have a number of uncertainties associated with them and the composition of the carbon is generally not considered when determining carbon budgets.

Carbon cycling in peat is driven by four key factors (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). Land management is also recognised as an additional driver, but the impacts of many types of management are poorly understood. Among the four drivers listed by Laiho (2006) substrate quality is seen as the most significant. To date, little work has been carried out to characterise the quality of organic matter in peat soils; rather crude estimates have been made as to the quantity of carbon that is stored in peatlands, yet without understanding the composition of the peat, limitations are imposed on calculations of rates of carbon loss from peatlands.

This work seeks to examine how variations in the chemical composition of organic matter in peat varies with land use. The method published by Wieder and Starr (1998) was followed to determine eight fractions: soluble fats and waxes, hot water soluble, hollocellulose, cellulose, soluble phenolics, acid insoluble carbohydrates, water soluble carbohydrates and lignin. Samples were taken from burnt, grazed, drained, afforested and undisturbed sites at the Moor House UNESCO Biosphere Reserve in Northern England. The method was used to identify if differences were present in the recalcitrance of the peat and linked to gaseous carbon emissions data collected during fortnightly monitoring.

R. Laiho (2006) Decomposition in peatlands: Reconciling seemingly contrasting results on the impacts of lowered water levels Soil Biology & Biochemistry, 38, 2011-2024.

R.K. Wieder & S.T. Starr (1998) Quantitative determination of organic fractions in highly organic, Sphagnum peat soils Communications in Soil Science and Plant Analysis, 29, 847-857.