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Will blocking historical drainage ditches increase carbon sequestration in upland blanket mires of Southwest England?

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Peat soils in the United Kingdom are estimated to store a minimum of 3,121Mt C (Lindsay, 2010). Despite being such a large carbon store the annual imbalance between uptake and release is small and susceptible to change in response to land management, atmospheric deposition and climate change. The upland blanket mires of Southwest England have been subject to extensive drainage and are particularly vulnerable to climate change as they lie at the lower edge of the peatland climatic envelope. The Mires-on-the-Moors project, funded by South West Water will restore over 2000 hectares of drained mire by April 2015. Herein, we question whether this restoration, which will block historical drainage ditches will allow the blanket bogs of Exmoor and Dartmoor National Parks to recover their ecohydrological functionality. We hypothesise that such mire restoration will increase the resilience of these ecosystems to climate change and will return these upland mires to peat forming/carbon sequestering systems.

A method is proposed which aims to understand the processes driving gaseous carbon exchange and peat formation in an upland blanket bog and quantifies the effect restoration has on these processes. We propose to measure the spatial variation in gas fluxes with respect to structural features of the mire; drainage ditches and nanotopes. The role of vegetation; the community composition, phenology and health will be explored as well as environmental variables such as water table depths, temperature and photosynthetically active radiation. Importantly, the experiment will partition below ground respiration to assess the environmental controls and effect of restoration on autotrophic and heterotrophic respiration separately. Unusually, it will be possible to collect both pre- and post-restoration data for two experimental sites with existing intensive hydrological monitoring (baseline monitoring of water table depths at 15 minute timesteps has been in place for > 1 year at ca. 160 locations across two experimental catchments on Exmoor). Remote sensing of vegetation structure (using both airborne LiDAR and ground-based laser scanning tools) alongside geospatial modelling will enable the effects of restoration on carbon storage to be modelled from headwater catchment to moorland scales.

Lindsay, R. (2010) Peatbogs and Carbon: A Critical Synthesis. University of East London, London.