Geophysical Research Abstracts
Vol. 14, EGU2012-740-2, 2012
EGU General Assembly 2012

Assessing the ecohydrological status of a drained peatland: Combining thermal airborne imaging, laser scanning technologies and ground water monitoring.

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Upland peat bogs are fragile and hydrologically sensitive ecosystems that are the UK's largest terrestrial carbon store. Despite these attributes, the demise of wetlands across large areas of moorland globally, has resulted in concomitant changes to moorland ecology, hydrological processes and carbon fluxes.

There is a need for spatially explicit monitoring approaches at peatland sites in the UK as although there has been a national effort to restore drained peat uplands, baseline and post restoration monitoring is largely absent. Understanding the ecological and hydrological status of peatlands using remotely sensed data allows the restoration status of such wetlands to be understood over large extents and landscape scale management targeted appropriately. The shallow, blanket peats of Exmoor National Park, in the southwest of the UK are the focus of this research because:

(a) Historically, significant areas of upland peat have, been extensively drained through UK government "moorland reclamation" programs.

(b) A large restoration project funded by South West Water is underway in association with Exmoor National Park, The Environment Agency and Natural England. This project represents an important scientific opportunity to build the first fine spatial resolution dataset for understanding pre- and post-restoration conditions in upland peatland systems.

(c) Exmoor provides an analogue for future change of other northern peatlands as it lies on the southerly margins of peat formation in terms of its climate, ecology and hydrological characteristics.

Our experimental approach examines how the structural characteristics of the vegetation and the peatland surface, relate to water table depth at a range of scales. Thermal airborne imaging data (TABI) at $2m^2$ resolution and data extracted from airborne LiDAR digital surface models ($0.5m^2$ resolution) (Luscombe et al., 2011) were used to examine the relationship of key vegetation communities, with spatial patterns of water table depth. Water table depths were also monitored at 15 minute intervals from over 80 locations within four nested scales at each of the two research catchments. This monitoring data is supported with ground-based terrestrial laser scanning (TLS) data to examine the relationship between ecosystem structure and water table responses at a fine ($<1m^2$) spatial resolution.

Early results from this work suggest a strong spatial dependence between structurally distinct minerotrophic vegetation communities and areas where the water table is nearer to the surface. Vegetation communities known to be indicators of damaged blanket peatlands were also found to be more prevalent in those areas where depth to water table was greater and artificial drainage structures were intact and functional. This paper will show the key results from the above analyses and will assesses the potential of using these techniques to assess the ecohydrological condition of these peatlands over larger extents.

LUSCOMBE, D., ANDERSON, K., WETHERELT, A., GRAND-CLEMENT, E., SMITH, D. & BRAZIER, R.E. (2011) Monitoring Exmoor's upland peatland systems using laser scanning technologies pre- and post-restoration. Earth Observation in a Changing world. Bournemouth, UK, Remote Sensing and Photogrammetry Society.