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# Integrating structural and spectral remote sensing data to understand ecohydrological condition at multiple spatial scales across upland landscapes.

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Upland landscape systems offer significant challenges for the organisations and communities tasked with managing these complex and often perturbed ecosystems. A key challenge for those tasked with the conservation or improvement of these landscapes (and their ecosystem services) is to understand the extent and hydrological condition of existing habitats and how these change through time, at a scale relevant to their management. Dartmoor National Park, in common with many other upland landscapes in the UK, is dominated by peatland ecosystems that are sensitive to ecohydrological perturbation, such as historic drainage and erosion.

In this study, we assessed the utility of multiple, fine-grained remote sensing datasets (<2m) (LiDAR, CASI and NIR aerial photography) to map peatland habitat condition and ecohydrological degradation across an upland landscape. This included mapping: hydrologically intact peatland areas, anthropogenic drainage ditches, peat cuttings, erosional gullies and bare peat areas. These mapped extents were further interrogated to understand areas within Dartmoor National Park that contribute to or exhibit ecohydrological degradation. A total of 444 $km^2$ of moorland was mapped to a resolution of $1m^2$ and an area of 29 $km^2$ or 9.2 % of the Dartmoor peatland area was identified as significantly and directly ecohydrologically degraded/eroding.

We have now begun to build upon this baseline understanding by implementing additional habitat mapping, utilising spaceborne remote sensing data (Sentinel 1 and 2) at a coarser spatial resolution (ca. 10m-20m). This methodology will allow enhanced repeatability, with satellite return periods as short as monthly. In combination with extensive and robust ground validation (undertaken in conjunction with Dartmoor National Park (UK) and including drone surveys), this mapping implements random forest tree algorithms to determine the extent of UK Habitat Classification (UKHab - http://ecountability.co.uk/ukhabworkinggroup-ukhab/) classes at level 3 and above. For the first time these data provide landscape managers and communities with data describing the structure, hydrological condition and vegetation assemblages across huge extents, providing a robust and impactful tool for future habitat management decisions.