



Impacts of peat restoration on peak flow characteristics of upland headwater catchments

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As part of the current focus on ecosystem services provided by peatlands, there is renewed interest in the hydrology of upland blanket peats and more specifically in the hydrological changes associated with peat erosion and restoration. Peat restoration has often been cited as having potential benefits for downstream flood risk through the reduction of peak flows and increases in storm hydrograph lag times. However, evidence of the impacts of peatland restoration practices on storm hydrology and downstream discharge peaks has been limited by lack of measurement of flow response following restoration programmes. This paper reports a hydrological monitoring programme associated with the restoration of a blanket peatland in the Peak District, UK through the practices of erosion gully blocking and the re-vegetation of bare peat. The main component of the project is a before-after-control-impact (BACI) study on three hectare-scale eroded, bare peat catchments, two of which have been restored and one of which is acting as an unmodified control. Monitoring commenced in early summer 2010, and restoration of the experimental sites by reseeded and gully blocking took place between July 2011 and March 2012. To complement the main study, a broader spatial comparison of the hydrological behaviour of catchments with different degradation and restoration conditions has been made, including (i) an intact reference peatland, (ii) the eroded/bare peat sites, and (iii) a 'late stage' restored area of peatland which was re-vegetated in 2003. Results reveal significant differences between the storm hydrograph characteristics of intact, eroded and restored catchments consistent with the hypotheses that (a) peat erosion significantly decreases storm flow lag times and increases storm flow peaks in these peatland systems and (b) peat restoration reverses these effects. Associated overland flow data suggest that gully blocking and re-vegetation within gully systems are crucial controls on the storm hydrograph and peak flow responses. The study shows that peat restoration in upland blanket peat systems can contribute to the reduction of downstream flood risk.