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Reconstructing a century of agricultural land use and drivers of change from social and environmental records

Heather Sangster (1), Hugh Smith (2), Mark Riley (2), Haykel Sellami (2), Richard Chiverrell (2), and John Boyle (2)

(1) University of Liverpool, Department of Geography, United Kingdom (heather.sangster@liverpool.ac.uk), (2) University of Liverpool, Department of Geography, United Kingdom

Changes to agricultural land use practices and climate represent serious challenges to the future management of rural landscapes. In Britain, the modern rural landscape may seem comparatively stable relative to the long history of human impact. However, there have been important changes linked to the intensification of agricultural practices during the last ca. 100 years and more recently improvements in land management designed to reduce impacts on land and water resources. Few studies attempt high-resolution spatial reconstruction of historic land use change, which is essential for understanding such human-environment interactions in the recent past. Specifically, the absence of detailed spatio-temporal records of agricultural land use/land cover change at the catchment-scale presents a challenge in assessing recent developments in land use policies and management. Here, we generate a high-resolution time-series of historic land use at the catchment-scale for hydrological modelling applications. Our reconstructions focus on three catchments in England ((1) Brotherswater (NE Lake District); (2) Crose Mere (Shropshire); (3) Loweswater (NW Lake District)) spanning a range of agricultural environments subject to different levels of land use change; from intensively-farmed lowlands to upland catchments subject to lower-intensity grazing. Temporal reconstructions of changes in land management practices and vegetation cover are based on historic aerial photography (1940s-2000s) and satellite-derived land cover maps (1990, 2000, and 2007), in combination with annual records of parish-level agricultural census data (1890s-1970s) and farmer interviews, in order to produce an integrated series of digital land cover and land practice maps. The datasets are coupled with composite temperature and precipitation series produced from a number of local stations. Combined, these spatio-temporal datasets allow a comprehensive assessment of land use and management change against the background of climatic variability and historic socio-economic drivers of change.