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Impacts of land management on flood risk: a multiscale experimental and modelling investigation in an upland Welsh catchment

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Farmers and other rural land managers are facing increasing demands to ensure land is managed in a sustainable manner. Issues that must be considered include biodiversity, flood risk, diffuse and point-source pollution, social, environmental and economic sustainability and climate change impacts. However, understanding and predicting the impacts of land management is a fundamental research challenge. Experimental and modelling studies of the link between land use management change and various sustainability criteria are mostly small-scale; the few concerned with large scale impacts have very limited data support. There are also major problems of interpretation due to landscape heterogeneity. Results from recent research quantifying impacts of land use management on runoff at the hillslope scale, and developing new modelling strategies to generate meaningful predictions at catchment scale are presented. Comprehensive plot and field scale data are used to inform development and parameterisation of detailed hydrological models. Results, in combination with information from catchment scale data and up-scaling techniques, are used to formulate appropriate representations at larger scales. Application of the multi-scale modelling tools to data from a predominately sheep-grazed, artificially drained clay catchment in Wales (Pontbren) demonstrate the potential of localised strategic land use changes for reduction of flood risk.