Abstract for the poster exhibition

Managing high and low river flows using rural land management practices

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Both floods and droughts are thought to be becoming more frequent and severe in the United Kingdom. Possible explanations for this trend include both climate change and land use change. Climate models are predicting more extreme precipitation events in the future, while land management scenarios are dependent upon an interaction of complex economic, political and social factors. The effects of land use changes are reasonably well known at the field scale, although there is some uncertainty in scaling up the effects to the catchment scale. This research aims to bridge the gap between these two spatial scales and will also investigate whether land management practices can have a positive effect on both high and low flows simultaneously. The catchment used for this research is the River Eden, Cumbria, which has recently experienced severe floods e.g. Carlisle 2005 and droughts e.g. 2003.

This research is based on a proposed conceptual framework of the sequence of processes which result in flood and drought generation which are; climatic factors, partitioning rainfall into runoff, hydrological connectivity, catchment storage and channel conveyance. The methodological approach is performing a series of scenario based simulations using a reduced-complexity physically-based 2D hydrological model., CAS-Hydro (Durham) 1.1, which couples a new 1D water balance model with an existing 2D spatially-distributed hydrological model. The output of this model is the surface and subsurface flow delivery rates. The importance of channel conveyance and attenuation, especially relating to tributary phasing and relative timing, on high and low flows downstream will be investigated using the ISIS Flow model. Finally the downstream floodplain inundation will be modelled using a two-dimensional diffusion-wave model. The sequence of models enables the influence of a land use or climatic change to be traced back to the causal hydrological process and the overall impact on flood and drought risk.