Geophysical Research Abstracts
Vol. 16, EGU2014-11266, 2014
EGU General Assembly 2014

A Decision Support Matrix (DSM) approach to mapping the impacts of flooding mitigation using a Flood Impact Model (FIM)

Gareth Owen, Paul Quinn, and Greg ODonnell

Newcastle University, Civil Engineering and Geosciences,Newcastle, United Kingdom (g.j.owen@newcastle.ac.uk)

The village of Great Ayton on the River Leven catchment (35 km2), UK, has been impacted by a number of floods in recent years. A flood management scheme based on the installation of Natural Flood Management (NFM) interventions has commenced to deal with this issue. Evidence gathered within the subtributaries (less than 10 km2) demonstrates the potential for NFM techniques to have some effect on the local flood peaks. However, the problem arises as to how to upscale these results to the catchment scale, which involves consideration of the timing of the delivery of water from the landscape units, interactions flows at confluences, the spatial patterns of rainfall, antecedent conditions and so forth. This study uses a novel Flood Impact Model (FIM) and a nested network of observed flow measurements. Essentially the approach involves the disaggregation of the outlet hydrograph by making assumptions about the spatial distribution of runoff generation. The channel network is parameterised through a comparison of the timing of observed hydrographs at a number of nested locations within the catchment. The greater the number of flow recording instruments installed within the catchment the better network is thus defined.

The Environment Agency, North Yorkshire Moor National Park, the Forestry Commission (England), local farming and town residents formed a catchment consortium for the Leven. An initial catchment plan was created and local evidence was gathered, with a flow instrumentation network installed. A simple visual Decision Support Matrix (DSM) was then used to convey the likely impacts that arise from any area undergoing future flood management measures. The DSM encourages end users to create a NFM scheme by studying the degree to which runoff can be altered locally and how that flow will be propagated through the network to the point of impact. The model contains a simple runoff generator based on the UK Flood Estimation Handbook (FEH) method (though any runoff generation model can be used within the FIM). The model shows the implications of changing the FEH runoff parameters as specified by the Hydrology of Soil Types (HOST) distributed dataset. The HOST dataset is considered as providing a reasonable approximation of the runoff patterns across the catchment. This dataset can be combined with a land use map to estimate the changes in runoff resulting from the intensification of farming. The DSM relates the impact in runoff in terms of alterations to soil management practices and flow connectivity (e.g. ditch management), which can be easily understood by farmers and land managers. The DSM and the FIM together help to encourage the consortium to agree a wide range of NFM methods to reduce flood risk in the village of Great Ayton.