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Natural Flood Management in context: evaluating and enhancing the impact.

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The series of flood events in the UK throughout December 2015 have led to calls for a reappraisal of the country's approach to flood management. In parts of Cumbria so-called "1 in 100" year floods have occurred three times in the last ten years, leading to significant infrastructure damage. Hard-engineered defences upgraded to cope with an anticipated 20% increase in peak flows and these 1% AEP events have been overwhelmed.

It has become more widely acknowledged that unsympathetic agricultural and upland management practices, mainly since the Second World War, have led to a significant loss of storage in mid and upper catchments and their consequent ability to retain and slow storm run-off. Natural Flood Management (NFM) is a nature-based solution to restoring this storage and flood peak attenuation through a network of small-scale features exploiting natural topography and materials. Combined with other "soft" interventions such as restoring flood plain roughness and tree-planting, NFM offers the attractive prospect of an intervention that can target both the ecological and chemical objectives of the Water Framework Directive and the resilience demanded by the Floods Directive.

We developed a simple computerised physical routing model that can account for the presence of in-channel and offline features such as would be found in a NFM scheme. These will add storage to the channel and floodplain and throttle the downstream discharge at storm flows. The model was applied to the heavily-modified channel network of an agricultural catchment in North Yorkshire using the run-off simulated for two storm events that caused flooding downstream in the autumn of 2012. Using up to 60 online features we demonstrated some gains in channel storage and a small impact on the flood hydrograph which would, however, have been insufficient to prevent the downstream floods in either of the storms.

Complementary research at JBA has applied their hydrodynamic model JFLOW+ to identify areas of the catchment that will naturally retain storm run-off and quantified the effects of removing this storage on the run-off. It is suggested that enhancing the storage capacity of these areas may be a low impact approach in keeping with the ethos of NFM that has a significant, and quantifiable impact, on storm flows.