



The use of Natural Flood Management to mitigate local flooding in the rural landscape

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The past decade has seen increases in the occurrence of flood events across Europe, putting a growing number of settlements of varying sizes at risk. The issue of flooding in smaller villages is usually not well publicised. In these small communities, the cost of constructing and maintaining traditional flood defences often outweigh the potential benefits, which has led to a growing quest for more cost effective and sustainable approaches.

Here we aim to provide such an approach that alongside flood risk reduction, also has multipurpose benefits of sediment control, water quality amelioration, and habitat creation. Natural flood management (NFM) aims to reduce flooding by working with natural features and characteristics to slow down or temporarily store flood waters. NFM measures include dynamic water storage ponds and wetlands, interception bunds, channel restoration and instream wood placement, and increasing soil infiltration through soil management and tree planting.

Based on integrated monitoring and modelling studies, we demonstrate the potential to manage runoff locally using NFM in rural systems by effectively managing flow pathways (hill slopes and small channels) and by exploiting floodplains and buffers strips. Case studies from across the UK show that temporary storage ponds (ranging from 300 to 3000m³) and other NFM measures can reduce peak flows in small catchments (5 to 10 km²) by up to 15 to 30 percent. In addition, increasing the overall effective storage capacity by a network of NFM measures was found to be most effective for total reduction of local flood peaks. Hydraulic modelling has shown that the positioning of such features within the catchment, and how they are connected to the main channel, may also affect their effectiveness. Field evidence has shown that these ponds can collect significant accumulations of fine sediment during flood events. On the other hand, measures such as wetlands could also play an important role during low flow conditions, by providing base flows during drought conditions. Ongoing research using hydrological datasets aims to assess how these features function during low flow conditions and how storage ponds could be used as irrigation ponds in arable areas.

To allow for effective implementation and upkeep of NFM measures on the ground, demonstration sites have been developed through a process of iterative stakeholder engagement. Coupled with the use of novel visualisation techniques, results are currently being communicated to a wider community of local landowners and catchment managers. The approach of using networks of interception bunds and offline storage areas in the rural landscape could potentially provide a cost effective means to reduce flood risk in small responsive catchments across Europe. As such it could provide an alternative or addition to traditional engineering techniques, while also effectively managing catchments to achieve multiple environmental objectives.