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Assessing the geomorphological effectiveness of Natural Flood Management measures in rural lowland fine sediment rivers

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Flooding is the UK's largest natural hazard with an estimated 1 in 6 properties at risk of inundation. The increasing interest in incorporating natural processes into flood management plans under the term Natural Flood Management (NFM) recognise the importance of working with nature to sustainable mitigate flood risk. However, measuring the efficiency of these methods at successfully reducing flood risk over time has yet to provide the evidence base required for managers and the public to back the transition from trusted hard engineered techniques.

The River Eye, Leicestershire, a rural catchment, joins the River Wreake downstream of Melton Mowbray. It's heavy clay soils and flashy regime caused a series of floods in 1998, 2000 and 2001. In response, catchment managers implemented a flood alleviation scheme which recognised fine sediment as a contributor to decreased water quality and increased flood risk. As part of the scheme in 2002, two NFM measures were installed in for the form of silt traps. These artificially widened and deepened areas of the channel were created to encourage sediment disposition and to reduce deposition and maintain channel capacity in downstream reaches. In the absence of design specifications associated with established traditional engineering defences the silt traps were custom designed and installed in locations where landowners were willing to accept the loss of land.

The silt traps have been intensely monitored for a two-year period to determine their effectiveness as a sustainable natural flood management measure. Sediment samplers were installed up and downstream of the silt traps to determine whether suspended fine sediment is reduced downstream. Three pressure transducers were installed in stilling wells 170, 70 and 0m upstream of the silt traps to investigate the hydrological impact on river stage resulting from the morphological change. In addition, two surveys of the silt trap bed were taken 10 months apart. Using an echo sounder to create a 3D survey of the silt trap and determine the rate of deposition over time. A complementary social study was also undertaken investigating residents, farmers and catchment managers views on NFM and perceived effectiveness at reducing flood risk.

Results indicate that both silt traps are successful at reducing the volume of suspended sediment downstream of the silt traps, though their efficiency appears to have a seasonal bias. The morphological survey provided a rate of deposition, providing an indication of maintenance timescales. Whilst the social survey highlighted the importance of identifying social responsibilities for NFM to be accepted by the community.

These hydrological, geomorphological and social investigations provide a significant knowledge base for this NFM technique and its impact on local and catchment flood risk.