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# The role of local observations as evidence to inform effective mitigation methods for flood risk management

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This poster presents a case study that highlights two crucial aspects of a catchment-based flood management project that were used to encourage uptake of an effective flood management strategy. Specifically, (1) the role of detailed local scale observations and (2) a modelling method informed by these observations.

Within a 6km2 study catchment, Belford UK, a number of Runoff Attenuation Features (RAFs) have been constructed (including ponds, wetlands and woody debris structures) to address flooding issues in the downstream village. The storage capacity of the RAFs is typically small (200 to 500m3), hence there was skepticism as to whether they would work during large flood events. Monitoring was performed using a dense network of water level recorders installed both within the RAFs and within the stream network. Using adjacent upstream and downstream water levels in the stream network and observations within the actual ponds, a detailed understanding of the local performance of the RAFs was gained. However, despite understanding the local impacts of the features, the impact on the downstream hydrograph at the catchment scale could still not be ascertained with any certainty.

The local observations revealed that the RAFs typically filled on the rising limb of the hydrograph; hence there was no available storage at the time of arrival of a large flow peak. However, it was also clear that an impact on the rising limb of the hydrograph was being observed. This knowledge of the functioning of individual features was used to create a catchment model, in which a network of RAFs could then be configured to examine the aggregated impacts. This Pond Network Model (PNM) was based on the observed local physical relationships and allowed a user specified sequence of ponds to be configured into a cascade structure.

It was found that there was a minimum number of RAFs needed before an impact on peak flow was achieved for a large flood event. The number of RAFs required in the network was also found to differ between events, due to the timing and shape of the hydrograph. However, once a threshold was crossed, for each additional RAF added, a clear impact on the peak flow was observed. Using a selection of observed flood events and design storms; a typical range of 15 to 35 percent reduction in flow peak was achieved with 35 RAFs. Now that 40 RAFs have been constructed in Belford, the local Environment Agency is confident that the scheme is working satisfactory. Crucially, it was the detailed local observations that informed the design of the PNM and it demonstrated to end users why the approach was working. The RAF network approach is being taken up elsewhere.