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Managing runoff and flow pathways in a small rural catchment to reduce flood risk with other multi-purpose benefits

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From 2000 to 2009 there have been a high number of flood events throughout Northern Europe. Meanwhile, there is a demand for land in which to construct homes and businesses on, which is encroaching on land which is prone to flooding. Nevertheless, flood defences usually protect us from this hazard. However, the severity of floods and this demand for land has increased the number of homes which have been flooded in the past ten years. Public spending on flood defences can only go so far which targets the large populations first. Small villages and communities, where in many cases normal flood defences are not cost effective, tend to wait longer for flood mitigation strategies.

The Belford Burn (Northumberland, UK) catchment is a small rural catchment that drains an area of 6 km2. It flows through the village of Belford. There is a history of flooding in Belford, with records of flood events dating back to 1877. Normal flood defences are not suitable for this catchment as it failed the Environment Agency (EA) cost benefit criteria for support. There was a desire by the local EA Flood Levy Team and the Northumbria Regional Flood Defence Committee at the Environment Agency to deliver an alternative catchment-based solution to the problem. The EA North East Flood Levy team and Newcastle University have created a partnership to address the flood problem using soft engineered runoff management features. Farm Integrated Runoff Management (FIRM) plans manage flow paths directly by storing slowing and filtering runoff at source on farms. The features are multipurpose addressing water quality, trapping sediment, creating new habitats and storing and attenuating flood flow.

Background rainfall and stream stage data have been collected since November 2007. Work on the first mitigation features commenced in July 2008. Since that date five flood events have occurred in the catchment. Two of these flood events caused widespread damage in other areas of the county. However, in Belford only two houses were flooded. Data from the catchment and mitigation features showed that the defence measures resulted in an increase in travel time of the peak and attenuated high flows which would have usually travelled quickly down the channel to the village. For example, the pilot feature appears to have increased the travel time of a flood peak at the top of the catchment from 20 minutes to 35 minutes over a 1 km stretch of channel. There are currently ten active mitigation features present in the catchment. More features are planned for construction this year. Early data from the catchment indicates that the runoff attenuation features are having an impact on reducing flood flows in the channel and also slowing down the flood peak. At the same time the multi-purpose aspects of the features are apparent.