Flooding alleviated by targeted tree planting and river restoration

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A study by an international team of scientists, led by the Universities of Birmingham and Southampton, has shown that strategic planting of trees on floodplains could reduce the height of flooding in towns downstream by up to 20 per cent, according to research published in the journal *Earth Surface Processes and Landforms*.

Researchers studied a whole river catchment in the New Forest over an area of 100 square kilometres, upstream of the town of Brockenhurst. They wanted to understand how tree planting, river restoration and logjams might affect the 'peak height' of a flood in a downstream urban location.

The research was funded by the Environment Agency who is interested in the potential for river restoration techniques to be incorporated into wider flood risk management programmes. Using a digital terrain model of the landscape and a hydrological model simulation the scientists found that planting trees on the floodplain and increasing the number of logjams, across 10-15 per cent of the total river length could reduce the peak height of a potential flood in the town by 6 per cent once the trees had grown for 25 years.

They also found that for more extensive floodplain forest and river restoration, for example in 20 - 25 per cent of the total river length resulted in a reduction in flood peak height of up to 20 per cent. As the trees age and the forests become more mature and complex up to 100 years post planting there are larger reductions in flood peak height.

Dr Simon Dixon, from the University of Birmingham's Institute of Forest Research (BIFoR), lead author of the study, said: "As our research shows, targeted tree planting and restoration can contribute to reducing flood risk. We believe that tree planting can make a big contribution to reducing flood risk, and should be part of a wider flood risk management approach, including conventional flood defences. Tree planting would represent an extra element that helps to slow down the arrival of rain water to vulnerable locations."

The research team also studied engineered log jams - man-made dams which have numerous ecological benefits and have been shown to locally slow the flow of rivers. Recently it has been thought that log jams were a positive intervention and could form part of a general strategy for alleviating flooding. However the scientists found that although logjams slow the flow locally, this did not always translate to reduced flood risk at the catchment scale. Although logjams reduce downstream flood risk in some locations, in others they had no effect, or even increased flood risk - the researchers recommend detailed site studies to identify the best locations to install them for flood mitigation.

Dr Simon Dixon continued: "Logjams contribute to slowing the flow by backing up water and pushing it onto the floodplain. In locations where the floodplains are meadows or crops the water may still be able to flow over the surface quickly. To make the best contribution to flood mitigation it is important they are used in locations with complex bankside vegetation to slow water flowing over the floodplain."

Professor David Sear from the University of Southampton, who supervised the project, said: "With increasing interest in alternatives to conventional hard flood defences, there is an urgent need for evidence that these alternatives can work. This research reminds us that natural processes, when targeted carefully, can reduce downstream flood risk alongside other societal benefits including biodiversity and recreation."

More information: S.J. Dixon et al. The effects of river restoration on catchment scale flood risk and flood hydrology, *Earth Surface Processes and Landforms* (2016). DOI: 10.1002/esp.3919