



Optimising NFM in headwater catchments to protect downstream communities (Protect-NFM)

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Headwater catchments are at risk of flooding, but the scale of communities in these catchments can make it difficult to secure resources for hard engineering approaches to flood risk management. Natural flood management (NFM) is the practice of managing flood risk by protecting and restoring the natural regulation function of river catchments. It has the potential to provide environmentally sensitive ways to reduce flood risk and protect areas where hard flood defences are not feasible. The extensive landscape restoration work ongoing across the UK uplands is currently funded outside flood defence budgets and not always accounted for in existing understanding of catchment NFM assets. There is clear opportunity to enhance NFM delivery through optimisation of these works for runoff regulation.

This paper introduces an innovative £ 1.2 million project which aims to demonstrate that moorland restoration could be a low-cost way to reduce the risk of flooding in vulnerable rural communities near steep upland streams and rivers, and to optimise multi-benefit restoration work for NFM impact. Demonstrating the efficacy of NFM in large catchments has been difficult, but our work on the restoration of smaller headwater catchments is at a scale where we would expect to be able to evidence NFM benefit. Previous research by the project team has shown that upland restoration can have a substantial impact on the flow of water during storms. Following revegetation, storm hydrographs have significantly longer lag times (106% increase relative to control), reduced peak flows (27% decrease relative to control). With the addition of gully blocking the effects are almost doubled. However, there are no significant changes in the volume of stormflow runoff following either restoration treatment. We argue that the reintroduction of vegetation to bare soils and damming of erosional channels increases surface roughness which slows the flow of water entering streams. This delays the release of water from the uplands, alleviating the chance of flooding downstream.

Protect-NFM will investigate the potential for greater NFM benefits at the catchment scale, accrued from implementing a wider range of upland restoration approaches in optimal combinations and spatial configurations. We build on our previous research to optimise gully block design and investigate the re-establishment of Sphagnum and woodland planting on storm water channel delivery and catchment discharge. We will also derive further empirical evidence of the impact of gully blocking and re-vegetation as these systems mature. This will allow us to build a conceptually sophisticated model to predict the impact of NFM measures at the catchment scale. The model will be used to test the impact of NFM intervention scenarios for 21 communities at risk of flooding in the Greater Manchester area. The ultimate goal of the project is to provide practical and policy guidance on the implementation of headwater NFM interventions across the UK.