ONE Planet
Doctoral Training Partnership

Natural Environment Research Council

Project title: Solving the Leaky Barrier Conundrum: Nature Based Solutions to reduce flooding.

Ref: OP2404

Keywords: Flooding, Nature-Based Solutions, Mitigation, Leaky barriers

One Planet Research Theme:
Climate & Climate Change ☒ | Earth System Processes ☐ | Anthropocene ☒ | Environmental Informatics ☐

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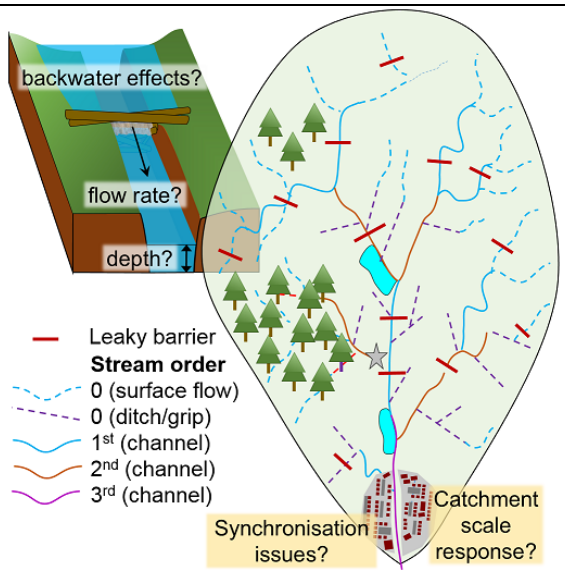
Key Research Gaps and Questions:
Flooding is a major problem worldwide and it is one that is difficult to solve. Land use change and a growing population increase flood risk year on year. Climate change, resulting in wetter winters and more intense summer storms, will exacerbate these effects. In recent years there has been a move away from traditional large, engineered structures to manage flooding to many small-scale interventions distributed across the landscape, an example of which is the leaky barrier (LB). LBs can be used to mitigate flood risk and provide other benefits such as reducing diffuse pollution. Yet, LBs are poorly understood.

This project combines physical and mathematical modelling to improve understanding of how LBs behave individually and in combination with other features across real catchments, answering fundamental questions about the aggregate effects of clusters of features in catchments.



Project Description:
Experimental work will include: (1) Hydraulic lab experiments conducted in controlled conditions to validate models for a variety of leaky barrier designs and materials in the new Novak Flume Research Facility; (2) Possible case study sites: Weardale NFM demonstrator or Lustrum Beck NFM. These sites will allow a number of larger leaky barrier features to be instrumented and tested in rural environments.

Mathematical modelling will be undertaking including: (1) Pond forensic modelling in which simple models are applied to mimic observations taken in the flume and at demonstration sites; (2) 1D/2D hydrodynamic models. Experimental results will provide data to inform hydrodynamic models. The aim is to produce a 1D model that can capture the range of behaviour observed in experiments for a range of LB designs and materials (3) Network models. The effects of series of LBs in a network of channels will be modelled in order to answer fundamental questions about their aggregate effects.

Prerequisites:

Essential: Strong numerical skills and willingness to master hydrological modelling.
Desirable: knowledge of hydrological processes and flood management; experience of fieldwork and/or experimentation
For more information, please contact Caspar Hewett (caspar.hewett@ncl.ac.uk).

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