Research Experience Placement (REP) Scheme

Project Title:
Geomorphic Change Detection in Natural Flood Management Features: A Multi-Year Assessment of Flood Storage Capacity in the Upper Thames

Project Supervisors:
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Host Organization and Department (if applicable):
UK Centre for Ecology & Hydrology (UKCEH), Water & Climate Science, Wallingford

Project Description:

Natural Flood Management (NFM) features such as storage ponds and field corner bunds work by temporarily storing floodwater. Over time, sediment accumulates in these features, reducing their storage capacity — yet this loss is rarely quantified or accounted for in hydraulic models. Understanding how quickly storage is lost is essential for maintenance planning and realistic long-term modelling of NFM performance. Robotham et al. (2021) first quantified sediment accumulation and storage volumes in NFM ponds at Littlestock Brook, Oxfordshire, approximately two years after construction, finding the upstream pond had lost ~20% of its design capacity. This project will extend that baseline to 2026, building a multi-year trajectory of storage change across ponds and bunds at this site, which has over 60 installed NFM measures as part of the Evenlode NFM project.

The student will collect and analyse sediment from traps deployed in ponds and behind bunds at the start and midpoint of the placement, following an established laboratory protocol for suspended sediment concentration, organic matter content (loss on ignition), and total phosphorus. To quantify volumetric storage change, the student will conduct GNSS topographic surveys along pond transects and compare these with existing transect data from 2021 and 2025, a drone LiDAR DEM from April 2025, and Environment Agency LiDAR representing near-baseline conditions. Volumetric change will be calculated using an accessible GIS tool such as the Geomorphic Change Detection plugin, aiming to develop a repeatable workflow that catchment partnerships could apply to their own sites. The project sits within the EU Horizon Europe SpongeScapes project at UKCEH.

Skills and Career-Development Opportunities:

The student will gain hands-on experience in field data collection including sediment trap sampling and GNSS topographic surveying of NFM features. In the laboratory, they will learn a complete sediment analysis protocol covering suspended sediment concentration, loss on ignition, and total phosphorus determination. A significant component involves GIS-based analysis — working with LiDAR DEMs, drone survey data, and GNSS transect data to calculate volumetric change using tools such as the Geomorphic Change Detection (GCD) plugin in QGIS or ArcGIS. The student will develop skills in environmental data analysis by integrating new measurements with an existing multi-year dataset. The placement also offers exposure to hydraulic modelling concepts — understanding how field-collected data feeds into HEC-RAS models for flood risk assessment. The student will interact with researchers across UKCEH's hydrology group and will be encouraged to attend team meetings and any available seminars or workshops during their placement.

Wider context of research:

The student will split their time between fieldwork, laboratory analysis, and desk-based GIS and data analysis. Field activities include sediment trap collection from NFM ponds and bunds, and GNSS topographic surveys along transects through storage features. Laboratory work covers the full sediment analysis protocol at UKCEH Wallingford. GIS analysis brings together multi-year survey and LiDAR datasets to quantify volumetric change. These activities give direct understanding of how field observations underpin catchment-scale flood modelling and NFM evaluation, ensuring the student experiences the full research pipeline from data collection through to interpretation.

Project Timeframe:

Six weeks starting mid-June 2026, with some flexibility to accommodate the student's availability. Flexible or part-time working arrangements can be considered to widen participation. The supervisor is available throughout the summer period.