

# Monitoring the efficacy of Natural Flood Management storage structures on flow attenuation and flood risk reduction


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# Aims and research questions

- To understand the hydrological response and dynamic storage function of three water storage NFM features to different sized rainfall events across a monitoring period:

1. What are the filling, storing and spilling functions of these storage structures?
2. What impact do their performance have for in-channel storm hydrographs?
3. Considering their lower and upper thresholds, what impact does construction and management have on their effective performance as flood management structures?

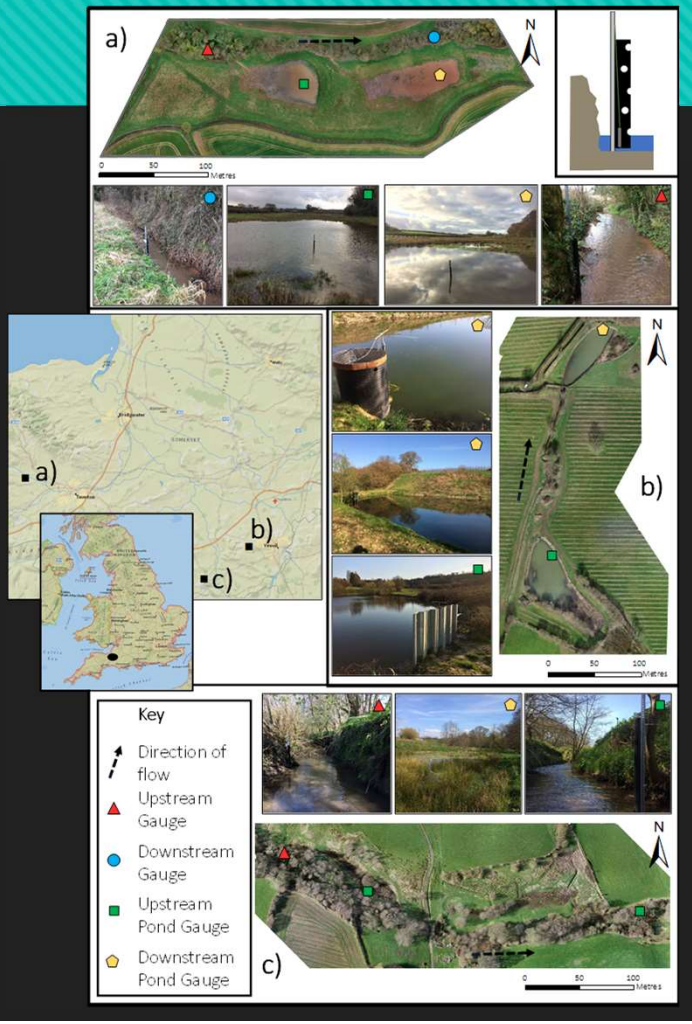


Image: monitored sites in Somerset, UK: (a) double offline floodplain storage, Halsewater, Tone catchment (b) online storage with controlled outflows, Wellham's Brook catchment and (c) offline floodplain storage, Merriott Stream catchment.

# Key methods

- A 2 year monitoring programme in Somerset, UK studying the storage function of Natural Flood Management Structures
- Collection of continuous discharge and volume data, supplemented through manual and UAV surveys.
- Separation of rainfall events to examine the hydrological response of these NFM features and their performance on a local scale.

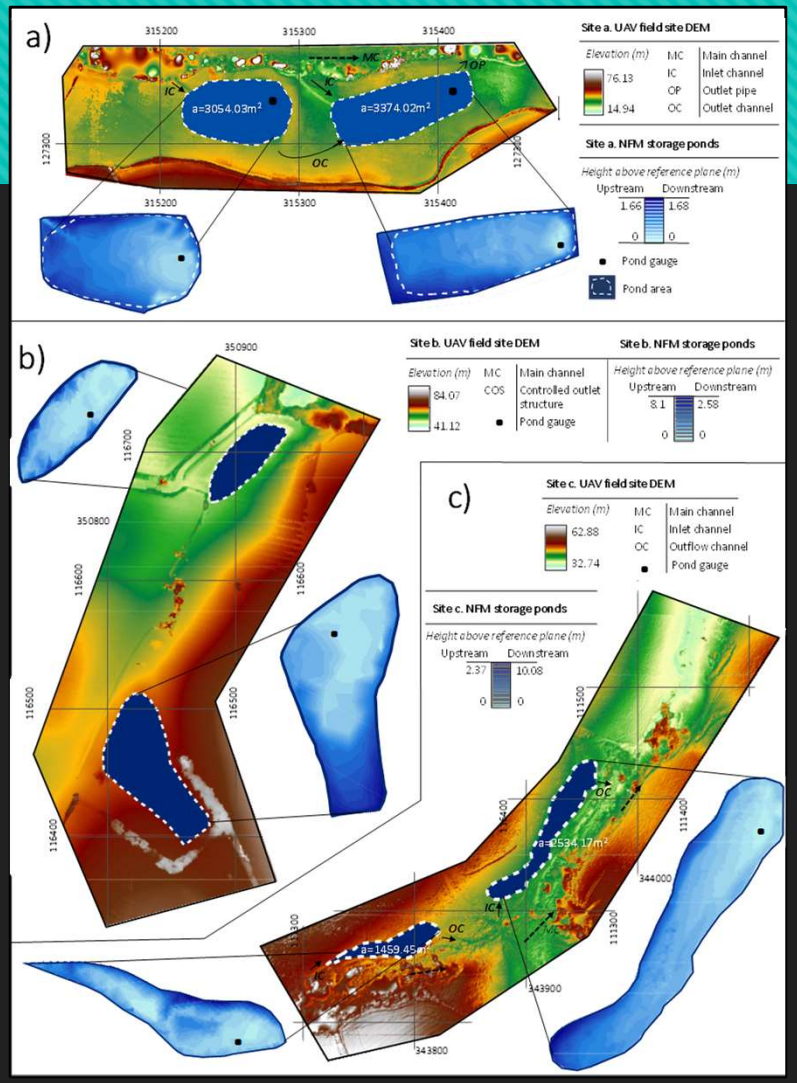


Image: Study site DEMs (a-c), derived from UAV and manual individual structure surveys, for use in analysis of structure thresholds, and for volume conversions.

# Example results: Site (a)

- Figure: Site (a) – double floodplain storage (Halsewater, SW-England) - dynamic time series

- Storage site is designed to attenuate water on the landscape through the connection of two floodplain ponds (UP and DP)
- Time series demonstrates pond dynamic filling, storing and spilling function, captured during 4 storms during the 2019-2020 winter period - indicated through ★
- Further analysis will reveal NFM pond impact on in-channel hydrograph

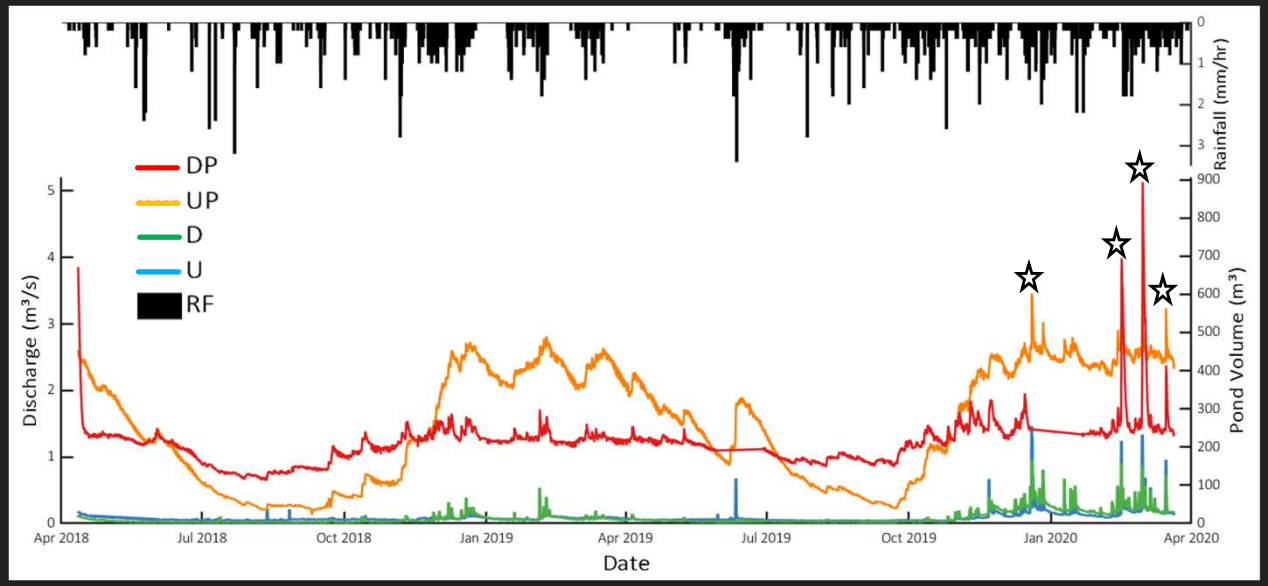


Image: Upstream in-channel gauge (U), downstream in-channel gauge (D), upstream pond gauge (UP), downstream pond gauge (DP) and rainfall (RF)

# Example results: site (b)

- Figure: Site (b) online storage ponds with controlled outflows (Wellham's Brook, SW-England) dynamic time series/ management
- Online storage site is designed to attenuate water in-channel behind managed outflows at each pond.
- This function is demonstrated during monitored storm events - upstream pond behaves as a buffer to the downstream pond.
- Downstream gauge illustrates higher lag times as storm water is contained behind upstream outflow – examples are indicated on time series as ★

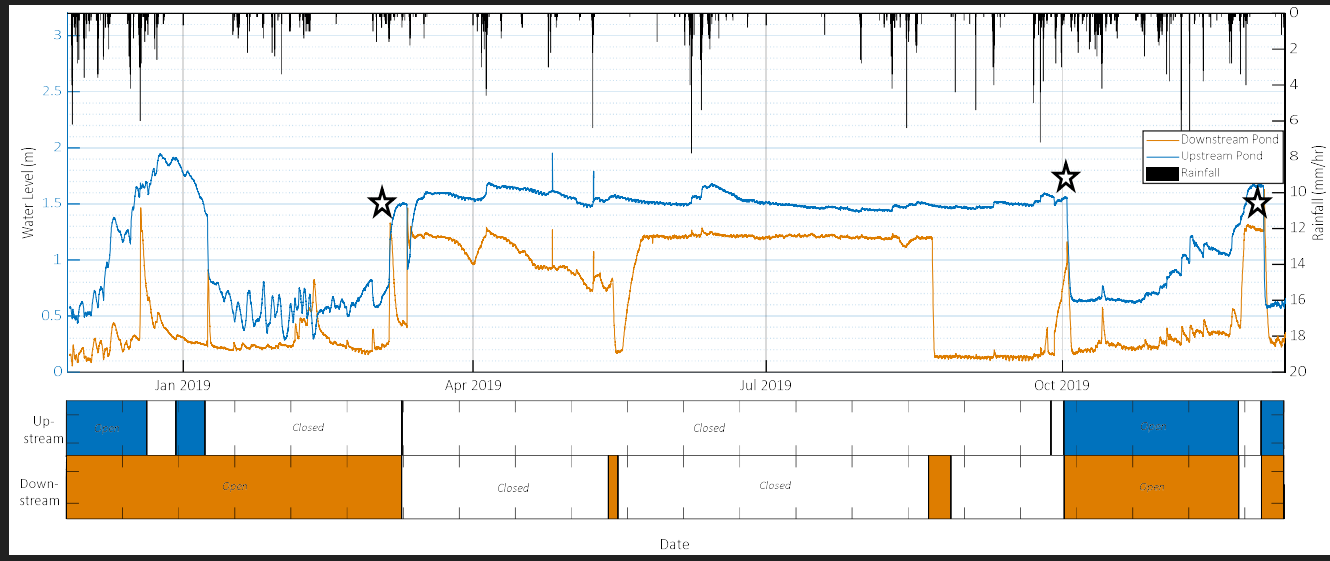


Image: Upstream pond gauge and downstream pond gauge, managed through their respective outflow control

# Ongoing work and contact details

This work is currently ongoing, in conjunction with research covering:

1. The effects of subsoiling and soil management for improving soil physical and hydraulic properties
2. Characterisation of in-channel NFM features to evaluate their impact on a local and catchment scale using the hydrological modelling framework: DECIPHeR.

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