CREW CENTRE OF EXPERTISE FOR WATERS

Evaluating an upland Natural Flood Management hydrometric network: implications for future monitoring

Research summary

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Evaluating an upland Natural Flood Management hydrometric network: implications for future monitoring

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PURPOSE OF RESEARCH

At the request of the Allan Water Steering Group (Scottish Government), this project sought to assess the River Knaik Natural Flood Management (NFM) monitoring network. The following research questions were posed:

1. Is the existing monitoring network in the Allan Water catchment fit for purpose?
2. How can it be improved to reflect future opportunities for managing surface water runoff to lower flood risk to communities downstream?
3. What can we learn from the Allan Water and other similar monitoring networks to inform future monitoring of catchments with (or with a potential for) NFM measures?

BACKGROUND

- NFM has increasingly been promoted and applied as a means of Flood Risk Management (FRM) alongside a wide range of other traditional flood defences. However, despite this progress, the evaluation of its effectiveness at larger catchment scales (> 10 km^2) is incomplete and case studies remain rare. Hydrometric networks consisting of rainfall and stream gauges are implemented to measure the hydrological response to land use changes brought about by NFM.
- The Allan Water catchment (216 km^2) drains parts of Perthshire and Stirlingshire. The towns in the catchment including Dunblane and Bridge of Allan are prone to flooding. A flood study commisioned by SEPA in 2011 to provide solutions to the flooding, highlighted the River Knaik catchment (37 km^2) – a headwater of the Allan Water – as a key area for NFM intervention
- Since 2015, the upper River Knaik (Figure 1A) has been monitored with three rain gauges (Figure 1B) and four river gauges to evaluate the FRM benefits of NFM.
- Measures to date have consisted of plot scale trial tree planting, reduced sheep stocking and peatland restoration. The total area of peatland restoration (1km^2) and trial tree planting, amounts to 2.5% of the catchment area.

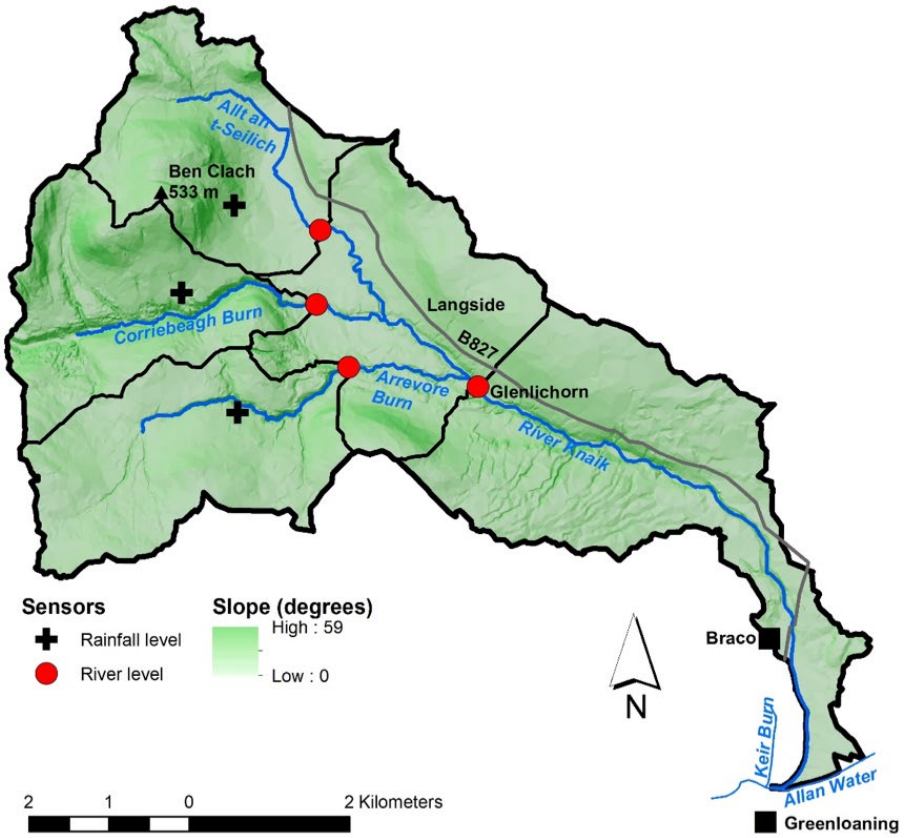
RECOMMENDATIONS FOR NFM MONITORING

Based on the assessment of the monitoring network, options for redeploying it elsewhere, alternative monitoring approaches and improving the current network were outlined.

Of wider relevance, the Knaik NFM monitoring project and other NFM monitoring projects from the UK highlight key learning points and principles that are relevant to all NFM monitoring:

- Greater certainty over the likelihood of NFM measure implementation is needed before monitoring is planned and installed to reduce project risk.
- To ensure data quality and continuity (i.e. no data gaps) reliable funding and expertise over a sufficient duration are needed for data quality checking, storage and instrument maintenance/downloading.
- At the outset, a clear understanding of monitoring aims and timescales is needed that is relevant to the type and scale of NFM measures proposed. Consultation with a hydrologist is advised. This will ensure the monitoring is fit for purpose.
- If measures are small in nature relative to catchment size, then targeted, local scale monitoring is potentially more valuable for understanding intervention responses and is less uncertain than monitoring at larger scales.
- Where staff resource is lacking, 'light touch' simple monitoring rather than scientific, detailed monitoring is more realistic and should be considered more widely.
- The logistics of carrying out detailed, robust monitoring in flashy upland catchments like the River Knaik are considerable and should be factored in to other future NFM monitoring projects.

A



B

Figure 1. A Topography, sub-catchments and monitoring network of the River Knaik catchment. **B** A tipping bucket rainfall gauge (1) linked by a buried cable to a combined data logger and telemetry aerial (2) to enable remote data collection, in the Corriebeagh Burn sub-catchment.

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