IUCN National Committee United Kingdom

Peatland Programme

Peatland Catchments and Natural Flood Management

Report to the IUCN UK Peatland Programme's Commission of Inquiry on Peatlands Update

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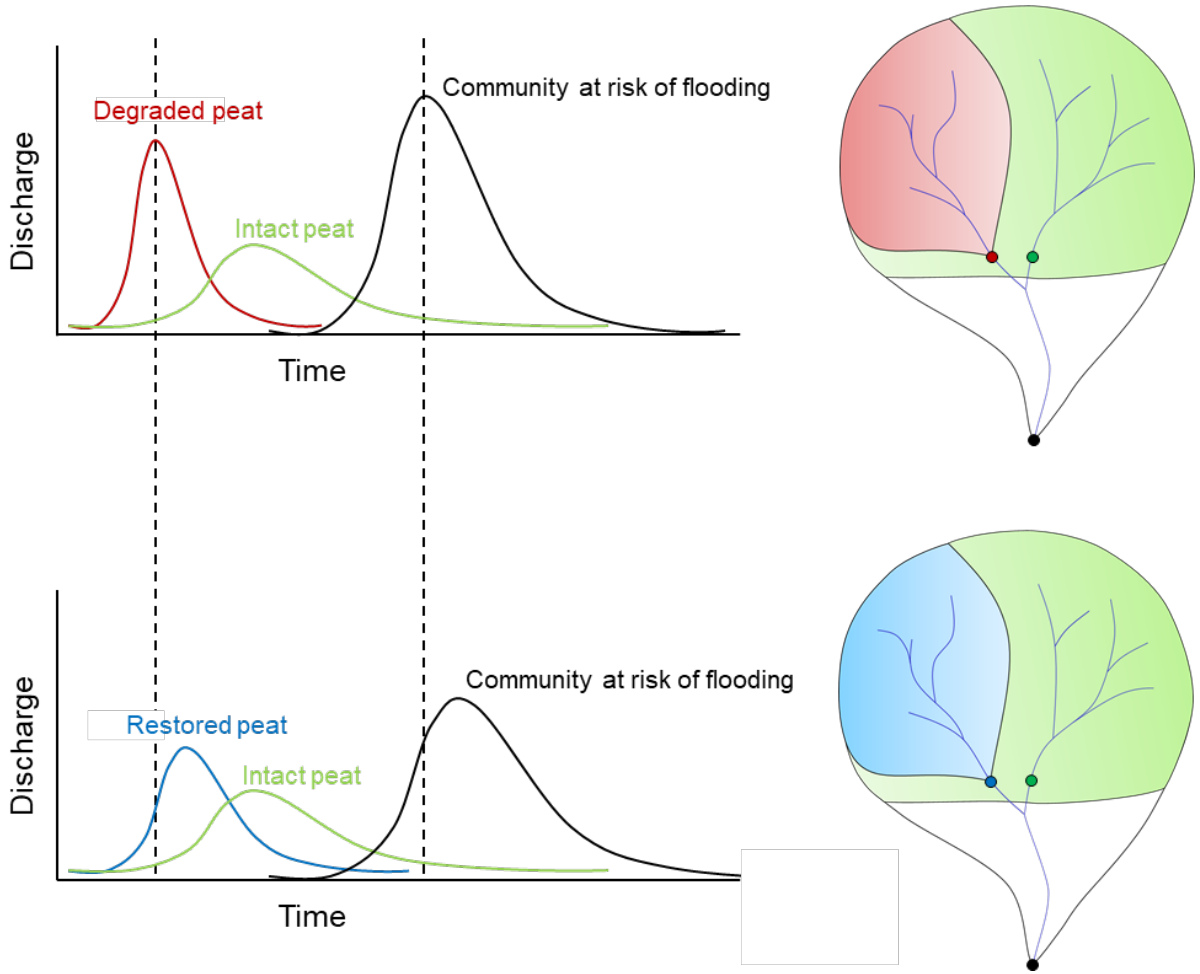
August 2019

Natural flood management (NFM)

Managing flood risk by protecting, restoring and emulating the natural regulating function of catchments and rivers, [with] the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible, and to increase the lifespan of existing flood defence

(NERC, 2017)

Conceptual basis for NFM in peatland catchments



Can peatland restoration and management help reduce downstream flooding?

“ ***We know we can reduce flooding***”
(CEO of a Wildlife Trust, September 2019)

“***Before we can properly invest in upland NFM we need to know just how much reduction there’ll be in the flood peak [for the 1:100 year event] at the downstream communities at risk, and how much the restoration will cost to achieve that***”
(Flood Risk Manager, March 2019)

Glossop catchment, South Pennines

Review contents

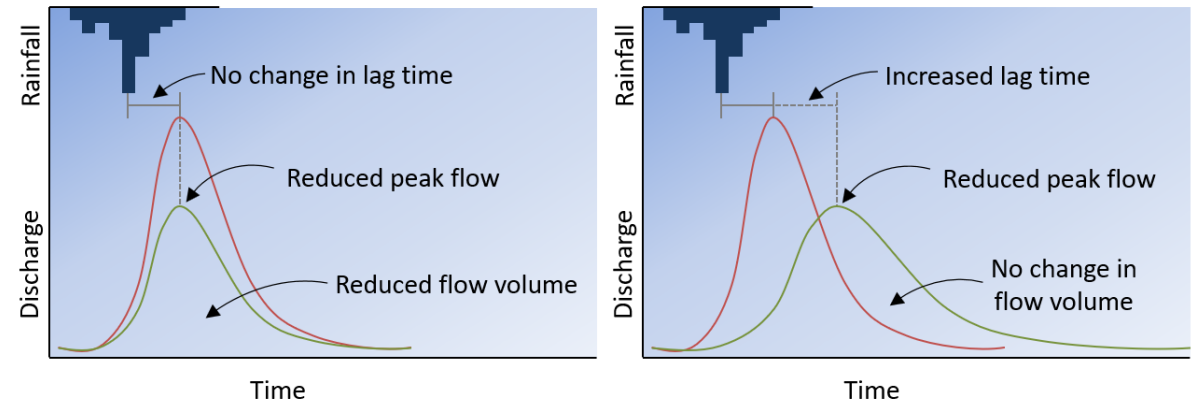
- **Introduction and context for the review**
- **The process-based case for peatland restoration and natural flood management**
  - The potential for NFM in peatland catchments
- **Peatland catchments and communities at risk from flooding**
  - West Pennines case study
- **Peatlands, restoration and NFM: the evidence base**
  - Peatland drainage and drain blocking
  - Restoration of bare peat
  - Gully blocking
  - Sphagnum re-introduction to degraded peatlands
  - Forestry and restoration of afforested peatlands
  - Moorland burning and peat restoration following wildfire
- **Evidence gaps and priorities for future research for policy**
- **Conclusion and recommendations**

Key Findings 1

Peatland surface and vegetation cover represent key controls on storm runoff and peak flows in peatland catchments. Changes in roughness (surface cover) will retard flow and attenuate hydrographs.

Storage effects

Attenuation (roughness) effects



Storage vs attenuation processes

Before intervention

After intervention

Key Findings 2

There is increasing evidence from both field and modelling studies that peatland restoration can alter catchment runoff regimes, reduce peak flows and contribute to NFM at the small (<20 km^2) catchment scale, with some evidence that peak flow reductions could extend into larger catchments.

UNIVERSITY OF EXETER

Mires Monitoring Results Update

March 2017

AGU PUBLICATIONS

Water Resources Research

RESEARCH ARTICLE

10.1002/2015WR017667

The impact of land-cover change on flood peaks in peatland basins

Key Points:
- Land-cover change in headwater peatlands was shown to affect

Jihui Gao[1,2], Joseph Holden[2], and Mike Kirkby[2]

Journal of Hydrology 389 (2010) 336–343

Contents lists available at ScienceDirect

Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

ELSEVIER

Long-term change in storm hydrographs in response to peatland vegetation change

R. Grayson[a,*], J. Holden[a], R. Rose[b]

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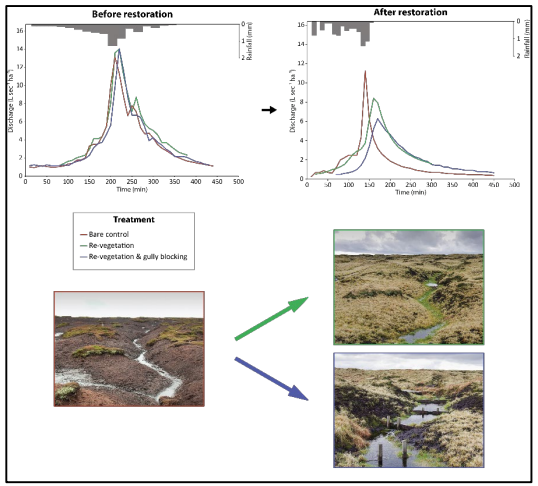

Journal of Hydrology X 2 (2019) 100006

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ELSEVIER

Research papers

Restoration of blanket peat moorland delays stormflow from hillslopes and reduces peak discharge

Emma L. Shuttleworth[a,*], Martin G. Evans[a], Michael Pilkington[b], Thomas Spencer[b], Jonathan Walker[c], David Milledge[d], Timothy E.H. Allott[a]

Key Findings 3
Evidence base for impacts of peatland restoration on peak flows

Restoration Measure	Impact on Peak Flows
Re-vegetation of bare peat	↓
Re-introduction of Sphagnum	↓
Gully blocking	↓
Restoration after severe fire	↓
Ditch blocking	Variable
Commercial forest removal	↑

Key Findings 4

Modelling approaches are now available for upscaling and more comprehensive catchment scale assessments

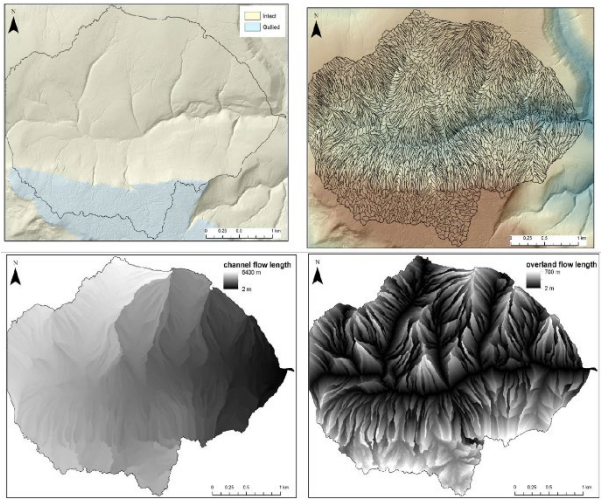
e.g.

Pilkington *et al* 2015

- Restoration of 12% of a 9km^2 catchment associated with a 5% reduction in peak discharge

Gao *et al* 2016

- At c.10km^2 catchment scale, *Sphagnum* planting can reduce peak flow by up to 13% for the 20 mm h^{-1} event



But…

Key findings 5 - Uncertainties

- Lack sufficient (field) data on several types of restoration, and on responses over longer (>5 year) timescales
- Still lack full quantification of the NFM impact of peatland interventions at scale of communities at risk (for flood events and catchments of different types and sizes)
- Catchment geometry matters
  - Sub-catchment synchronisation effects
  - Spatial patterns of intervention
  - Channel orientation effects
    (e.g. ditches)
- Ongoing projects and modelling will help!

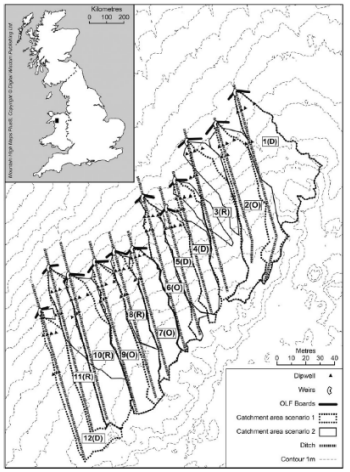


FIGURE 1 Map of the study site showing the 12 ditches and their catchment areas for Scenario 1 and Scenario 2, the treatments (O = open, D = dammed, R = reprofiled), location of each ditch weir and overland flow soffit boards, and the location of the dipwells

Evidence gaps and priorities: outputs from the Inquiry Workshop

- Need to consolidate and expand evidence base, including delivery of ongoing projects
- More effective presentation of the evidence to focus on policy needs
  - Meaningful translation of hydrological impacts to return periods
- **How long does peatland restoration take to deliver NFM benefits?**
  - **e.g *Sphagnum* reintroduction**
- **Establishing cost-benefit of NFM interventions**
  - **Costs available, benefits need more complete quantification**
- More effective management and communication of the uncertainties
  - Presenting levels of uncertainty

Optimising NFM benefits from Upland Restoration

NERC SCIENCE OF THE ENVIRONMENT

Environment Agency

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