Peak District Moorland
Gully Blocking in Deep Peat

Moors for the Future Research Note No 2 September 2005

Gully Erosion

- Creation of gullies in blanket peat contributes towards the peat drying out. This results in accelerated peat decomposition, leading to discolouration of local water sources, the release of greenhouse gas emissions into the atmosphere and dissolved organic carbon into the stream network.

Sediment Transport & Water Discolouration

- Substantial sediment transport in streams (up to 300t/km² per year in some catchments) and water discolouration are of increasing concern for water companies. These processes are leading to serious degradation of Peak District moors.

Eroded Gullies on Bleaklow

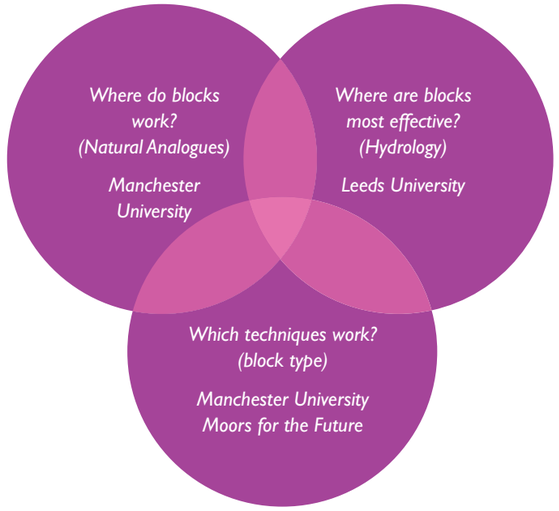
Wooden fence gully blocks

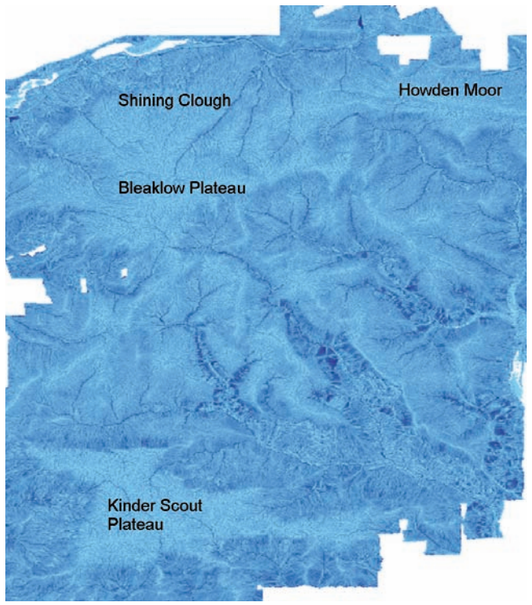
Restoration Works

- The Moors for the Future Partnership plans large-scale restoration works by blocking erosion channels to aid the long-term recovery of the Bleaklow plateau.
- The National Trust has already installed over 1,000 dams on moorlands, helping to protect peatlands into the future.

Aims of Gully Blocking

- Controlling further gully erosion
- Reducing sediment loss from peatlands
- Promoting re-vegetation
- Reducing water discolouration of streams
- Raising local water table to increase saturation of peat domes





Topographic index for the 133km² survey area. Darker areas indicate greater saturation, e.g. on foot of hill slopes. Map derived from digital terrain model (DTM) from LiDAR data (high resolution topographic data).

GIS Decision Tool

- Predictions of potential change after gully blocking were estimated by simulation of a partial blocking (infilling) of gullies. Maps of change in topographic index and flow accumulation provide important information on consequences of blocking. These range from beneficial impacts by enhancing hill slope saturation (blue) to potentially detrimental impacts by redirecting flow through new gully formation (red).

Gully Blocking Research

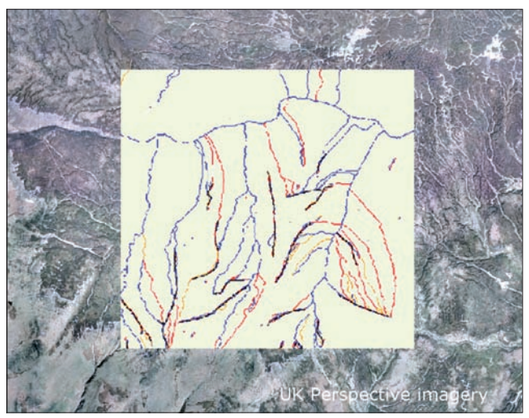
- Little evidence-based research exists to date to aid informed decision-making on where and how to block gullies in deep peat, e.g. on the Bleaklow plateau by the Moors for the Future Partnership. Therefore, this research project was set up to identify best locations for gully blocking and to highlight tools for gully blocking best practise.

Where do Blocks Work? Natural Analogues

- A survey of natural re-vegetated gullies confirmed that natural re-vegetation is widespread in the study area, and provided supporting evidence for mechanisms of colonisation of re-deposited peat surfaces, e.g. by *Eriophorum angustifolium* on peat flats and behind natural gully blockages and on bare peat floored gullies by *Eriophorum vaginatum* (cotton grass).
- Sites where natural re-vegetation has occurred have low local gully floor slopes (slope < 6°), and a thin covering of re-deposited peat sediment (only 12 cm) seems sufficient for re-vegetation.

Where are Blocks Most Effective?

- As the Bleaklow and Kinder Scout plateaus contain vast numbers of gullies efficient priority setting is essential to achieve maximum benefit of restoration works. Therefore, the gully network was mapped using high resolution topographical data (LiDAR) and aerial photographs. As a reliable indicator of how gullies may impact on hill slope saturation, the topographic index was derived. This spatially explicit parameter provides crucial information for management of areas that will be more sensitive to blocking compared to others.



Novel GIS decision tool for identifying strategic locations for gully blocking (see text).

Which Techniques Work?

- The National Trust has pioneered this restoration approach with experimental gully blocking on Within Clough, Kinder Scout, North Grain and Bleaklow Head. Dams of heather, wool, wood, stone and plastic have been employed. After only 12 months, there has been up to 40cm of sediment accumulation behind some dams.
- Combined evidence from naturally re-vegetated sites and analysis of the existing gully blocks leads to the following key recommendations (based on knowledge to-date).

Objectives

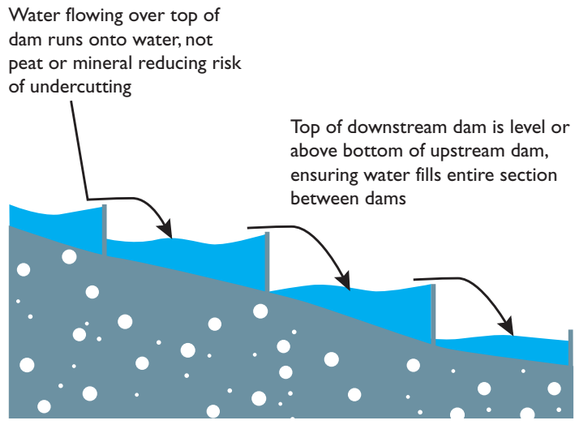
- Gully blocking works need to suit chosen sites and gully types.
- On intact domes of peat on shallow gradients with minimal gullying, focus on water holding techniques to raise water levels, e.g. using plastic piling.
- On heavily degraded moorlands, focus on re-vegetation works and peat stabilisation, e.g. using wooden or stone dams.

Suitable Locations

- Slopes less than 0.11 m/m (6°).
- Headwater region to prevent nick point migration (erosion further upstream).

Costs, Maintenance & Monitoring

- Details of costs and further practical advice provided in full research report.
- Essential to budget for ongoing maintenance and monitoring after block installation.



'Toe-to-toe' installation

Blocking Techniques

- Materials vary in degree of water permeability, sediment trapping and stability.
- Plastic piling: effective water retention, creation of pools.
- Wooden fencing and stone walls: semi-permeable, good sediment traps.
- Heather brash/bales secured with wooden stakes: less stable, good sediment trap where supply is high, progressive method.
- Block spacing not to exceed 4 m.
- Target gully block height at 45 cm (min. 25 cm).
- Maximum block widths < 4 m.
- Peat stabilisation may be aided by planting cotton grass.
- Promotion of sediment deposition and re-vegetation in shallow gullies (Type B gullies, see report) by experimental approaches, e.g. meander enhancing baffles.

Pools form behind plastic gully blocks on Within Clough

Natural re-vegetation of gully floors

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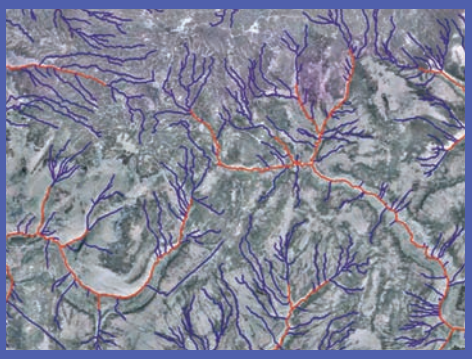

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Acknowledgements / Data availability

- This research is result of a successful collaboration between the Moors for the Future Partnership, the University of Manchester (Martin Evans, Tim Allott and team) and the University of Leeds (Joseph Holden and team). Steve Trotter, National Trust, initiated and steered this research. Funding of the National Trust gully blocking works was aided by a Nature for People Project (NFPP) by English Nature.
- The data presented in this leaflet is available for non-commercial use.
- The full research report is available from the Peak District National Park publication service (Lesley Handley 01629816200). The report and this research note are downloadable from our website www.moorsforthefuture.org.uk.

References / Links

Evans, M, T Allott, J Holden, C Flitcroft and A Bonn (eds.) (2005). Understanding Gully Blocking in Deep Peat, Moors for the Future report no 4, Castleton.

www.sed.manchester.ac.uk/geography/research/uperu/projects.htm
www.geog.leeds.ac.uk/people/j.holden/researchinfo.html

Moors for the Future Research notes

No 1 Breeding Bird Survey of the Peak District Moorlands

No 2 Gully Blocking in Deep Peat

No 3 Peak District Moorland Stream Survey

No 4 Heavy Metal Pollution in Eroding Peak District Moorlands

No 5 Visitors on Peak District Moorlands

No 6 Rapid Assessment Protocol for Monitoring Burning

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The Moors for the Future Partners are:

English Nature, National Trust, Peak District National Park Authority, United Utilities, Severn Trent Water, Yorkshire Water, Sheffield City Council, Peak Park Moorland Owners & Tenants Association, Defra, Country Land and Business Association, National Farmers Union

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