
Moors for the Future Partnership

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Moors for the Future's 5th Research Day

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Agricultural Business Centre

Agricultural Way, Bakewell, Derbyshire, DE45 1AH

Peat Compendium

J. Walker, J. Holden, M. Evans, F. Worrall, S. Davison & A. Bonn, Moors for the Future, Universities of Leeds, Manchester & Durham

A key objective of the forthcoming Soil Strategy for England will be the protection of organic soils. The overall objective of DEFRA funded Peat Compendium project was to produce a compendium of peat restoration and management projects. To achieve this overall objective a set of sub-objectives have been devised. These include:

1. Production of a database of past, current and planned peat restoration and management projects.
2. Evaluation of the current state of knowledge of peatland restoration management by reviewing current management practice as well as existing and ongoing research into peat restoration and management projects in the UK.
3. Assessment of the levels of success and failure of current peat restoration and management projects.
4. Assessment of the motivation, long-term goals and plans behind the projects and any adaptation measures in response to these during the project duration.
5. Identification of the technical, logistical, site access, financial and project management difficulties that need to be overcome in the use of successful restoration and management techniques.
6. Collation of details on the costs involved in implementing the restoration and management techniques associated with each project.

These objectives have been met through the compilation of the compendium, a targeted peat restoration and management conference and a review of the results from the compendium and conference.

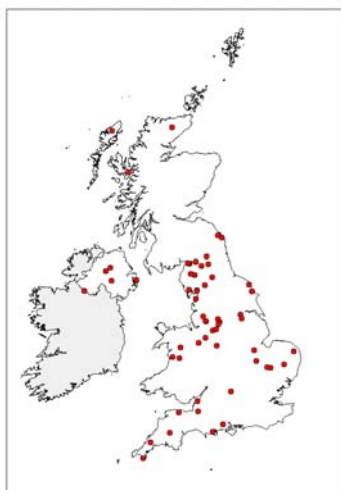


Figure 1. A map showing the location of UK peat restoration and management projects included in the analyses of this report.

Factors affecting the regeneration of *Sphagnum* in the Peak District

J.A. Carroll, P. Eades, P. Anderson, S. Caporn, E. Glen, C. Field, Penny Anderson Associates, Manchester Metropolitan University

The almost total disappearance of *Sphagnum* mosses from the Peak District moorlands over the last 100 years is thought to have been due mainly to the high levels of atmospheric sulphur pollution, although other factors, such as wildfires and over-grazing, are also likely to have been involved. Sulphur dioxide levels have now fallen dramatically, and there is some evidence of return of *Sphagnum* and other bryophytes. Peak District soils however retain high levels of sulphate, acidity and heavy metals, and inputs of other atmospheric pollutants such as nitrogen, remain high.

Results will be presented from a Moors for the Future funded research project examining the factors that may still be limiting *Sphagnum* recovery, using a combination of survey work and environmental sampling and considering the options available for restoration.

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The impact of experience and relation on willingness to pay for conservation of the Peak District National Park: an application of choice experiment techniques.

D. Tinch & N. Hanley, Stirling University

The Environmentally Sensitive Areas program and Countryside Stewardship Scheme, key to recent management decisions in the upland systems of the UK, have been replaced with the Environmental Stewardship Entry and Higher Level schemes (ELS and HLS). These new schemes will have an increased impact when existing agreements expire. The Hill Farm Allowance program was due to end in 2006, but has been rolled over into the Rural Development Programme for England. It is planned to replace the HFA no later than 2010 leaving hill farming communities facing an uncertain future while the format of rural development initiatives is still evolving. Results of research into public preference for different landscape management outcomes may form a key input into new initiatives. The current research aims to identify key determinants of the value individuals associate with environmental resources using case studies based in the Peak District National Park. Further the accuracy of valuation techniques is investigated to identify the best available methodology for deriving accurate measures of the utility associated with differing landscapes management regimes.

Two key results of the research will be presented. Firstly the results of workshops held in the Peak District showing divergence in the relative WTP for conservation of an environmental resource associated with: anticipation; experience; and memory. Secondly an analysis of the impact of an individual's relationship to the Peak District National Park upon associated value are presented. These results are based upon postal and visitor surveys.

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On the brink? How looking to the past can help the future of the Peak District

A. Davies, University of Stirling

The Peak District is often used as an example of severe erosion damage to UK peatlands, with implications for conservation, climate change, productivity and management. However, the severe erosion and debate over what constitutes appropriate levels of burning and grazing in the Peak District are not just current issues: they represent accumulated pressures which have built up over centuries due to climate change, atmospheric pollution, management change and economic incentives. As a result, it is useful to step back, put current issues in their appropriate longer-term context and examine what we can learn from the past about potential future threats. This includes whether critical thresholds have already been crossed and how particular forms of management can exacerbate or ameliorate the sensitivity of the range of valued moorland and farmland habitats, including the feasibility of ongoing peatland restoration. This presentation summarizes evidence for how the current situation arose in the context of ongoing work on carbon storage, peatland conservation, biodiversity, what constitutes appropriate levels of burning and the role of agriculture in this cultural landscape. As the Peak District is in many respects a unique or extreme upland ecosystem, owing to the close proximity of formerly industrial conurbations and its location at the margins of the area suitable for blanket peat formation, the presentation also highlights the need for more information on the history of its unique habitats, some of which my current research hopes to

provide (see picture and caption below).

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Photo: Changing management and economic incentives are some of the factors which have both created and depleted habitat biodiversity in the Peak District: can hindsight help strike the right balance?

Burning in the Peak District

R.H. Marrs, M. Harris & M. Le Duc, University of Liverpool

The aim of this research is to assess the impact of burning on vegetation and carbon stocks in the Peak District. We will describe two inter-linked studies. The first is a chronosequence study on five Moors. On each Moor a series of burned patches have been examined and species composition and biomass measured, along with a range of other variables. The aim here is to assess how burning influences species composition change and measure the biomass accumulation curve post burning (this will inevitably give a measure of Carbon accumulation). The second study is an experimental one where prescribed burns were applied in Marsh 2007. The burn temperatures were measured and the carbon stocks assessed. The amounts lost during burning were measured. Both studies, taken together provide a great deal of information to inform burning practice.

Vegetation and Burning Assessments in the Ashop Catchment, 2003-2007

H. O'Brien, J. Labadz & M. Woods, Nottingham Trent University

The National Trust commissioned Nottingham Trent University to conduct a vegetation and burning survey on Ashop Moor, south Pennines, Derbyshire. The principal aim of the surveys was to identify changes in peat soils and vegetation of blanket peat moorland following modification of management practices, namely blocking of eroded gullies, cessation of burning and removal of grazing. Six sub-catchments were selected as part of the larger High Peak Project (investigating changes in water quality). Four of the sites were subject to prescribed burning, were grazed and drained through a network of naturally eroding gullies. A further two sites were also grazed and similarly drained, but had not been burnt for at least ten years under an ESA agreement.

At each site permanent vegetation quadrats were installed adjacent to dipwells used for monitoring changes in water table levels. The sites were surveyed in summer 2003 and changes to management were then implemented on three of the sites during winter 2003-04 (Within Clough – gullies blocked, Nether Gate Clough – cessation of burning and Doctors Gate Clough - removal of grazing). The sites were then surveyed again post-management changes in summer 2005 and 2007 and the effects of management manipulation compared to those sites where management had remained unaltered.

In summary, changes in management at the three sites are associated with noticeable changes in vegetation composition during the four-year study period. These suggest that all catchments have

re-wet to some degree, most noticeably at Within Clough where the gullies were blocked, but also at Doctors Gate Clough where grazing was removed. At Nether Gate Clough the change in moisture gradient was less obvious.

The burning assessment found extensive burning of the area, which has continued to be burnt on a frequent rotation within a 20 year period. The impact of burning was found to generally have a moderate-high impact on peat soils and vegetation with particularly sensitive areas more vulnerable to erosion and subsequent peat and vegetation loss.

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Practical Grip and Gully blocking - an update

P. Anderson, Penny Anderson Associates

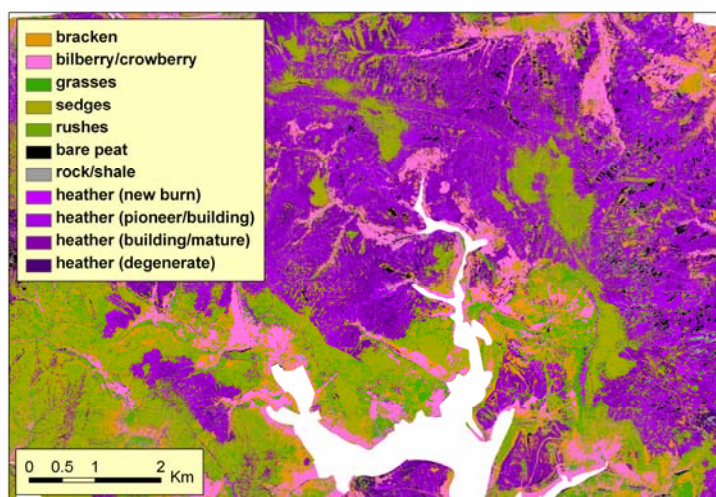
The preparation of the chapter on grip and gully blocking in the Moorland Restoration Guidance Manual for Moors for the Future and Natural England has provided the opportunity to re-assess the different methods and their efficacy. The different aims for grip blocking and gully blocking will be discussed in relation to the techniques that are both economic and effective. A resume of the research findings to date of their efficacy will be presented.

A number of examples will be given of different types and effectiveness of grip and gully blocking using site photographs.

What determines the distribution of moorland vegetation?

D. Chapman, C. Quinn, M. Reed & M. Termansen, University of Leeds

Maps of vegetation cover are an important tool for understanding how landscapes and their biodiversity are maintained. Using colour and infra-red aerial imagery alongside ground truthing data, we produced maps of the dominant vegetation for the Section 3 moorland region of the Peak District. Classification was achieved using machine learning methods and was approximately 95% accurate. Overlaying maps of management and environmental factors allows us to show significant impacts of heather burning, grazing, climate, topography and geology on vegetation distributions. However, to accurately model distributions it is also necessary to consider spatial factors and competition between vegetation types.



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Fluvial carbon flux and runoff from restored peatland catchments on Bleaklow

M. Evans, R. Pawson & F. Worrall, Universities of Manchester & Durham

Work on naturally re-vegetated peatlands has demonstrated a close association between re-vegetation and fluvial carbon flux. The extent to which reductions in carbon loss can be replicated

through managed re-vegetation are unknown. This project aims to assess the effects of moorland restoration on Bleaklow on fluvial carbon fluxes. Six microcatchments on Bleaklow have been monitored including vegetated, bare and restored sites. Results from the first year of the project suggest that POC flux from restored sites is reduced to a level comparable to intact peatlands but that patterns of DOC concentration are highly variable most likely because the restoration approach does not raise water tables. Initial data also shows interesting patterns of water flux suggesting that restoration significantly reduces runoff from eroded sites. This will be followed up in year two of the project.

Carbon benefits of moorland restoration

J.G.Rowson, F.Worrall & M.G.Evans, Universities of Durham & Manchester

Moorland restoration has commonly focused upon restoration of vegetation and improving biodiversity, but given the vital importance of the carbon store represented by peat soils do the present restoration techniques improve carbon storage and have a carbon benefit? This study has focused upon the restoration of Bleaklow after the 2003 fire and examined a wide range of carbon uptake and release pathways across sites that have been restored with: liming, reseeded, brashing and geojute, in comparison to both bare soil and unburnt controls. The study shows that after a year significant differences in carbon exist between restoration and that carbon benefit can be demonstrated, but the study showed that although carbon benefit was observed it was observed as an avoided loss and no sites were transformed from net sources of carbon to net sinks of carbon and as such much of the restoration has achieved stabilisation of the peat mass rather than achieving restoration of growing peat. Furthermore, the study can demonstrate the presence of "dead" peat within the landscape where soil function is absent.

Posters

Holme Moss Restoration Experiment - Two years later

S. Caporn, J. Parker, C. Field & R. Sen, Manchester Metropolitan University

An experiment was established at Holme Moss in summer 2006 in order to investigate the benefits of lime and fertiliser, added alone and together, on the growth of a nurse grass crop and heather. The initial benefits of adding lime and fertiliser to experimental plots at Holme Moss in the summer of 2006 were very obvious. The nurse grass quickly established and grew much better where both lime and nutrients were added. Addition of lime alone was of lesser benefit and fertiliser supplied alone was of virtually no value at all. After one and two winters, we returned to examine the grass growth and the germination and establishment of heather seed that had been added as brash in late winter 2007. While the early benefits of lime and fertiliser addition are still apparent the overall success is not as good as hoped for. The role of timing of restoration treatments in combination with weather events will be discussed.

Heathland Management and Invertebrate Ecology

Simon Yates, University of Leeds

A vast majority of the world's resource of upland heather moorland occurs within the UK. It is a habitat characterised by unique vegetation, breeding bird and invertebrate assemblages and is managed by rotational burning to rejuvenate the heather and provide a patchwork of different age structure. This practice, traditionally carried out for grouse management, has indirect benefits for invertebrates. Carabids (ground beetles) are particularly well represented in this habitat and show certain preferences for different phases of heather growth. Tipulids (craneflies) are an important food source for breeding birds of heather moorland and may also be influenced by the growth phases of heather. Recent changes in management practices from burning to cutting the heather and a shorter burning rotation period has resulted in fewer old senescent heather stands on managed moorland. These management changes may influence the composition of upland invertebrate assemblages. This study will test these hypothesis using pitfall traps to sample carabid species and soil coring to sample tipulids on different management treatments including experimental cuts and burns. The project is supported by a NERC CASE studentship with Moors for the Future and United Utilities as CASE partners.