

Institution: Nottingham Trent University
Unit of Assessment: C17 Geography, Environmental Studies and Archaeology
Title of case study: Peatland management for biodiversity conservation and water resources
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Impact of peat research at NTU comprises:</p> <ul style="list-style-type: none"> • Conservation of peatland habitats • Sustainable quantity and quality of water resources • Development of alternative growing media <p>Research on peatland hydrology and erosion has been used by stakeholders including Defra, International Union for the Conservation of Nature (IUCN), Natural England, Scottish Natural Heritage, Moors for the Future, RSPB, water companies, horticultural peat producers and Environment Agency to improve policy and practice in the management of peatland habitats. Research into alternative growing media for use in horticulture, pioneered by Carlile in conjunction with William Sinclair Horticulture, contributed to development of market-leading brand New Horizon.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>Labadz and Clutterbuck investigate the functioning, management and restoration of both lowland raised bogs and upland blanket bogs. Research has focused on hydrology of these areas in relation to the impact that erosion, burning and artificial drainage have had on stream flows and human water supplies, and on the potential impact of land management on both biodiversity and on resultant water quality within related catchment areas.</p> <p>Many UK water companies are concerned about water quality from peatland catchments, especially rising levels of water colour (associated with export of dissolved organic carbon). This problem, also observed internationally, brings associated rising costs of water treatment and concerns over health issues from disinfection byproducts. For National Trust (High Peak Estate), Labadz and O'Brien investigated raised water colour associated with moorland degradation in the Ashop and Derwent moors, feeding into the Ladybower reservoir system operated by Severn Trent Water. In 2002 the company funded a major 7 year project at NTU, investigating the effect of land management upon water colour and dissolved organic carbon. It aimed to establish whether changes judged desirable and practicable by land managers would have any measurable benefit for water quality or quantity from the catchment. Management interventions were gully blocking, grazing exclusion and cessation of burning. (O'Brien <i>et al</i> 2007, 2008). This work showed that, whilst there was no major change in dissolved organic carbon concentrations observed within 5 years, there was a significant reduction in stream flow and all three interventions showed significant benefit to water tables and vegetation.</p> <p>Clutterbuck (2012) has focused on land management by prescribed burning and has demonstrated links with increased levels of dissolved organic carbon in heavily burned catchments. He works with partners including Yorkshire Water, the National Trust and the RSPB to assess the impacts of prescribed moorland burning and to inform their policies for future land management.</p> <p>Degradation of upland blanket peats in relation to habitat conservation is another issue receiving greater attention in recent years, and the relationship between blanket peat erosion and sediment yield in upland blanket bogs and water quality in associated reservoir catchment areas was investigated by Yeloff <i>et al</i> (2005, 2006). This work has been cited in reports for the RSPB and by Scottish Natural Heritage in their 2011 report on peat erosion and the management of peatland habitats. On the basis of previous research on erosion and moorland degradation, Labadz and Clutterbuck were invited (2013) to commence a new research project for National Trust, aiming to establish whether restoration techniques demonstrated elsewhere can also be successful on more degraded and steeper peat slopes. This forms part of a wider project worth £2.2million, funded by the Environment Agency under Defra's Catchment Restoration Fund, and is on an area designated as important for both its ecological and geological interest (SSSI and GCR).</p>

Impact case study (REF3b)

The extraction and use of peat for horticulture is now widely perceived as unsustainable and undesirable. Work on **alternatives to peat** as a substrate for horticultural use was pioneered in the Unit by Dickinson and Carlile (1995), working with William Sinclair Horticulture to identify media that would not deteriorate, overcoming major storage problems typical of previous peat-free media. Research was continued by Surrage and Carlile (2009) who identified sources of green (waste) compost that led to development of further commercial formulations for peat-reduced and peat-free media, and further research with the company is on-going.

3. References to the research (indicative maximum of six references)

Holden, J., Chapman, P.J. & Labadz, J.C. (2004) Artificial drainage of peatlands: hydrological and hydrochemical process and wetland restoration. *Progress in Physical Geography*, 28, 95–123. Journal impact factor 3.419, Web of Science® cited 105 times

Labadz, J., Clutterbuck, B., Allott, T., Evans, M., Butcher, D., Billett, M., Stainer, S., Yallop, A., Jones, P., Innerdale, M., Harmon, N., Maher, K., Bradbury, R., Mount, D., O'Brien, H. and Hart, R. (2010) Peatland hydrology. Report to International Union for the Conservation of Nature (IUCN) UK Peatland Programme. Available at <http://www.iucn-uk-peatlandprogramme.org/commission/water> (This peer-reviewed research was commissioned by IUCN in a competitive process and includes review of literature but also original data and stakeholder research. It has been cited in numerous other works including Glaves, D.J., Morecroft, M., Fitzgibbon, C., Lepitt, P., Owen, M. & Phillips, S. 2013. *Natural England Review of Upland Evidence 2012 - The effects of managed burning on upland peatland biodiversity, carbon and water*. Natural England Evidence Review, Number 004).

O'Brien, H., Labadz, J.C., & Butcher, D.P. (2007). *Review of Management and Restoration Options for Blanket Bog (DEFRA project BD1241)*. Nottingham Trent University. Available at <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=13790> (This research resulted from a competitive tendering process by Defra and included literature review but also significant original interview-based stakeholder research. It has been cited by numerous later reports including the National Trust 2012. *High Peak moors vision and plan 2013-2038. Consultation draft*. Hope Valley: National Trust High Peak Estate)

Surrage, V. & Carlile, W.R. (2009). Development and storage properties of a green compost-based peat-free growing medium: *Acta Hort. (ISHS)* 819:395-402). (*Acta Horticulturae* is a peer reviewed series, comprising the proceedings of the International Society for Horticultural Science Symposia and the International Horticultural Congress. It is the primary location for publication of peer-reviewed contemporary horticultural research, pertinent to both researchers and end-users.)

Yeloff, D.E., Labadz, J.C., Hunt, C.O., Higgitt, D.L. & Foster, I.D.L. (2005). Blanket peat erosion and sediment yield in a southern Pennine upland reservoir catchment. *Earth Surface Processes and Landforms* vol 30 pp 717-733. (This paper is in a journal with impact factor 2.49 and was cited in a major report by Lindsay (2010) on peat bogs and carbon for RSPB, available at <http://www.uel.ac.uk/erg/PeatandCarbonReport.htm> and by Scottish Natural Heritage (2011) in a report on peat erosion and the management of peatland habitats: http://www.snh.org.uk/pdfs/publications/commissioned_reports/410.pdf

Yallop, A.R., Thacker, J. and Clutterbuck, B. (2012) Burning on Deep Peat and Bog habitat in England: Reconciliation and re-examination of results from English Nature Research Reports 667, 698 and unpublished data. Submitted to Natural England, March 2012. Available at <http://www.energyroyd.org.uk/wp-content/uploads/2013/02/Cranfieldburningonbog-V3.pdf> (This research was commissioned by Natural England and the report was cited in Glaves, D.J., Morecroft, M., Fitzgibbon, C., Lepitt, P., Owen, M. & Phillips, S. 2013. *Natural England Review of Upland Evidence 2012 - The effects of managed burning on upland peatland biodiversity, carbon and water*. Natural England Evidence Review, Number 004)

Impact case study (REF3b)

Related funding 2008-2013

Labadz - 2008-2009 *Impacts of blanket peat moorland management (restoration) on water quantity and quality of surface water supplies*. Severn Trent Water, £35k

Labadz and Clutterbuck - 2010-2012 *Review of peatland hydrology*. IUCN, £5k

Labadz - 2012-13 *Evidence Review: Upland Restoration*. Natural England, £2.5k

Labadz and Clutterbuck - 2013-2018 *Featherbed Moss peatland restoration project*. National Trust, £40K

Horticulture growing media projects (developing and testing alternatives to peat):

WRAP (Waste Resources and Action Programme) 2008-11 £39K

4. Details of the impact (indicative maximum 750 words)**4.1 Management of water in peatlands**

NTU research on **peatland hydrology and restoration** informs on-going management of large areas of peatland in the UK and overseas. Conducted at catchment scale, it has been readily applicable to conservation of exploited peatland landscapes and has been applied by major landowners, water companies, conservation charities and statutory conservation bodies. Labadz contributed to a consultation day hosted by Severn Trent Water on catchment management for the water company's Price Review 2009 (**PR09**). Research by the Unit has informed the National Trust's **management of its estates**, including its 50 year plan for the High Peak Moors (2013), **catchment management policy** by Yorkshire Water, Severn Trent, the United Utilities sustainable catchment management SCaMP project and Defra's "Making Space for Water" project.

Clutterbuck's work has informed the **Natural England Review of Evidence on Burning in the Uplands** (Glaves *et al*, 2012) and was disseminated via a presentation to the **Upland Hydrology Group**, which brings together stakeholders including water companies, land-owners, conservation agencies and research scientists, aiming to **reach a consensus about how land and water should be managed** in the uplands (<http://www.moorsforthefuture.org.uk/upland-hydrology-group>). Work by NTU is amongst key literature references for the Defra-funded **Peatlands ESUK** (Ecosystem Services UK) project available at

<https://sites.google.com/a/york.ac.uk/peatlandesuk/academic/biography>. The Unit also produced hydrology reports for a suite of internationally designated sites (raised bogs in Cumbria and West Midlands Meres and Mosses) which were part of the **Environment Agency's Wetland Framework for Impact Assessment at Statutory Sites in England and Wales** (published in 2009, as Appendix 4 of Wheeler, Shaw and Tanner, Environment Agency Science Report SC030232/SR1).

In 2010-12 NTU led an assessment of peatland hydrology for the **International Union for the Conservation of Nature (IUCN) Commission on UK Peatlands**. Sponsored by the **North Pennines AONB (Area of Outstanding Natural Beauty)**, this involved reviewing available evidence, coordination of a stakeholder group, organising and hosting a workshop, an invited presentation and attendance at an open inquiry event. Labadz is a named author on the report of the Commission of Inquiry <http://www.iucn-uk-peatlandprogramme.org/resources/188>, where the patrons state that "*it comes at a crucial time, with high level strategic decisions being made at national and international level on climate change, biodiversity, water and agriculture which will impact on the way we manage our peatlands and how we pay to keep them in a healthy state. This assessment draws together the Inquiry's findings and clearly demonstrates the value of peatlands to society, the damage which has been done to them and the huge liability of doing nothing to repair this damage*".

4.2 Conservation of peatland habitats

Work on erosion of blanket bogs by Labadz and Yeloff *et al* (2005, 2006) has been used by organisations including **Natural England** and **Yorkshire Peat Partnership** to inform **management and restoration** of degraded peatlands, and has been cited by **Scottish Natural Heritage** (2011) in a report on peat erosion and the management of peatland habitats (http://www.snh.org.uk/pdfs/publications/commissioned_reports/410.pdf).

Labadz and Clutterbuck contributed to and were cited in the IUCN 2010 assessments on **Peatland Restoration and Burning**. The final report of the IUCN Commission of Enquiry was presented both at the **Scottish Parliament** and at **Westminster**. In February 2013 a letter was received

from the **Ministers responsible for the Environment in England, Scotland, Wales and Northern Ireland** setting out their welcome of the Commission of Enquiry and outlining their **actions and intentions to enhance the natural capital of UK peatlands**. This made a commitment to continued support in land management policies for conservation of peatlands, funding support, engagement with the work of IUCN and further research on the management of peatlands.

In 2012 Labadz was one of two academic experts appointed on the Natural England Evidence Review on Restoration of Uplands (Shepherd *et al*, 2013). Clutterbuck contributed to the Review on Burning (two in a series of five reviews intended to provide a sound evidence base for **future policy and practice in upland management**) <http://publications.naturalengland.org.uk/file/10510011> and <http://www.naturalengland.org.uk/ourwork/uplands/uplandsevidencereviewfeature.aspx>). The Director of Evidence and Chief Scientist stated that more than 1000 downloads of the series were recorded from the Natural England web site in the first week and that “***the conclusions and research recommendations from the five topic reviews have entered the next stage, moving evidence into our guidance***”.

4.3 Changes in commercial practice (Horticultural industry/peat extraction/alternatives)

The group’s research on lowland bogs has contributed to the body of knowledge leading to the **cessation of peat extraction** on many sites and associated targets for a total ban on the use of peat as a horticulture medium. Impacts include the **designation of one of the areas of study as a European Special Area for Conservation (SAC)** (Bolton Fell Moss, proposed 2008), with management guidelines influenced by the research. In 2010 Natural England negotiated a £9million plan for **cessation of peat cutting on this internationally important site** and research is continuing.

The Unit’s research into alternative growing media has led to **changes in commercial practice**. The William Sinclair Horticulture environmental policy now states that they will **actively promote peat alternatives**. In 2010 they used 370,000m³ of peat alternatives and intend to increase this to 600,000m³ by 2020 with 450,000m³ coming from recycled materials. **Which? Gardening** (Jan/Feb 2010) rated New Horizon Organic & Peat Free Growbag (http://www.william-sinclair.co.uk/gardening/products/green_organic_range) as a “best buy growing media for seeds”. The International Peat Society produced a **strategy for responsible peatland management** in 2010 and in January 2013 Defra announced a package of measures to support the horticulture industry in **moving towards more sustainable growing media**.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. RSPB: letter of support from Senior Uplands Policy Officer providing evidence of impact on peatland ecology and peatland processes, shaping future policy and management practices.
2. Natural England: letter of corroboration from Upland Specialist, Landscape and Biodiversity Function, providing evidence that researchers in the Unit have made a considerable contribution to their understanding of the processes on peatlands and how the land management decisions made by Natural England may affect these processes, helping to inform Natural England on the definition and management of designated wetland and peatland sites.
3. Natural England: email from Director of Evidence and Chief Scientist June 2013 confirming involvement of Labadz in authoring the Evidence Review of Uplands and stating that “*the conclusions and research recommendations from the five topic reviews have entered the next stage, moving evidence into our guidance*”.
4. Natural England Evidence Review report by Graves *et al* (2013) on effects of managed burning on upland peat biodiversity, carbon and water, referring to research by Clutterbuck.
5. IUCN International Union for the Conservation of Nature (2011) Commission of Enquiry on Peatlands: full report with Labadz as author showing evidence of impact of peatland hydrology review and previous research.
6. Joint letter from Ministers (Feb 2013) setting out framework for action and providing evidence of impact of IUCN Commission of Enquiry on Peatlands and associated research.