The delivery challenge

Implications of climate change for our peatlands

Even if we achieve the cuts in carbon emissions to which the UK is committed, some changes to our climate in the coming decades are now unavoidable as a result of unchecked emissions over the last 50 years. The potential implications of locked-in climate change for our peatlands and their carbon stores clearly require consideration.

The majority of scientists hold that our peatlands are at risk from climate change. Finding ways in which they can remain waterlogged for much of the year will be the key to limiting the loss of their stored carbon. The latest climate projections (UKCIP, 2009) suggest a future trend of hotter, drier summers and warmer, wetter winters. A drained or eroded peatland will be less able to retain the water it receives in the winter and to store it over the dry summer periods. As a result, the area of peat-forming vegetation may shrink, the peat will dry out and will either decompose or break up and be washed away. Warmer, drier summers are also likely to increase the risk of wildfire destroying the whole peatland and causing a rapid loss of carbon as well as the loss of the other ecosystem services provided by these landscapes.

A recent project funded by the Environment Agency and NERC QUEST programme reported that the area where climate conditions are typically associated with the current distribution of upland peat would shrink significantly by 2050[39]. In most areas of England there is a risk that peat will not form under projected climate change by the end of the 21st century although different areas are not all equally vulnerable to climate change[40]. It is currently unclear what the effect of a loss of suitable climate will mean for peatlands; certainly peat will persist for long periods even where new peat is not forming[41]. We also know from studies of the peat itself that, in undamaged peatlands, carbon accumulation can be remarkably consistent even through wide ranging changes in climate as illustrated by the historical record. A relatively intact peatland may be very resilient to long term vagaries of climate change, owing to the unusual water-holding properties of peat and the plants that generate it[29], and consequently able to continue provision of its ecosystem services to the rest of society. Certainly, intact peat is likely to be less vulnerable to dramatic drying and erosion that could be caused by warmer drier conditions and intense rainfall events.

Lowland raised bogs are outside the climate range of our upland peatlands, but peat is able to form here because their bog mosses and their litter are excellent at retaining water, and so maintain wet conditions. Again, their ability to remain wet will determine their survival and value to society. However, peat extraction, afforestation and agricultural management of our raised bogs all involve drying out the peat. Left high and dry, most of our raised bog peat is being lost through increased oxidation and losing its carbon store under current management. This is likely to be exacerbated by warmer summers which may speed up decomposition. However, decomposition needs water too, and if the peat dries out completely it can be very hard to re-wet. In these situations the peat may be more prone to physical erosion by wind and water, and may then decompose elsewhere.

The current management of our lowland fen peats is already responsible for losing peat carbon faster than from any other kind of England's peat. Even without climate change, many areas will only retain a significant covering of peat for the next fifty years or so, before the soils begin to be influenced by the mineral material underneath and become wasted. Wasted peat has a lower agricultural value than deep fen peat, but cost of pump drainage in these areas is likely to rise. The unabated use of our remaining deep fen peats for agriculture is therefore unlikely to be viable

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Damaged peatlands, like this bare peat hagg at Holme Moss in the Peak District, will be less able to retain their stored carbon during predicted hotter summers and wetter winters. Restoration management could protect more peat carbon, for longer.

in the long term, even in the absence of peatland restoration.

Degraded peatlands are clearly more vulnerable to climate change and will lose carbon at a much faster rate than healthier, more resilient peatlands. While peatland restoration could deliver ecosystems that are resilient to longer term climate change, at worst it could be viewed as an essential stop-gap measure in order to delay potential emissions in the short to medium term. In one recent modelling study, the Peak District has been projected to become a net source of carbon by the early 2030s in its current state whilst, if all restoration occurred today, this would be delayed only until the 2080s.[42]

Restoration is therefore urgently required, not only to deliver clear carbon savings, but also to ensure that our peatlands and the wider services they provide are more resilient to the impacts of unavoidable climate change.

Natural England's vision of future peatlands

In Natural England's view, peatland management needs to be re-balanced to reflect the true costs and benefits of different land use and management. We can no longer approach peatlands as limitless resources to exploit only for food, timber, game or growing media. Instead, peatlands should be recognised as important carbon stores that are vital to help regulate our climate. We should also value our peatlands for their benefits to managing the flow and quality of water, for their contribution to our distinctive and valued landscapes and for their historic environment interest. Integral to all these functions is the recognition of peatlands' current value for wildlife, and of the huge potential to increase this value with more balanced peatland management.

Our vision for peatlands is one where the balance of land management reflects these wider benefits, where the rationale for restoring peatlands is understood and accepted, and where the benefits of conserving peatlands are valued and appreciated by society.

Current policies for peatland protection, management and restoration

There are a number of important policies in place that are contributing to the protection of peat from further degradation, promoting good management practice or delivering direct restoration. The regulatory and cross compliance framework should prevent the most damaging practices, although these often fail to address threats to peat carbon storage. Government schemes and incentives can provide more positive protection or restoration of peatlands. Some of the most effective approaches are those delivered by locally-based partnerships, which make use of these schemes, but also encourage wider engagement and voluntary action to deliver peatland restoration.

Regulation

Some 2,478 km² (36%)of England's deep peatlands are designated within **Sites of Special Scientific Interest (SSSIs)** and of this 2,196 km² are internationally important wildlife or biodiversity interest, as Special Areas of Conservation (SACs) Special Protection Areas (SPAs) or Ramsar Sites. Peatlands are also well represented among our network of National Nature Reserves, and these act as beacons of wildlife interest, environmental management and education.

On SSSIs there is a legal requirement to avoid clearly identified practices which are likely to damage the interest of the site, but this does not require active restoration management from SSSI owners or managers if sites are already damaged and declining. However, the designation of peatlands as SSSI was principally driven by the need to recognise and protect their current wildlife interest. They do not currently reflect carbon storage or potentially restorable habitat. This makes it difficult to object to activities which damage the peat, or which would make future habitat re-creation more difficult, but which have little, or even beneficial, effect on current interest features. Many SSSI boundaries were drawn to reflect the areas of current interest and this makes it more difficult to influence management outside the site that affects the designated area. Fen peatlands, for example, can be affected through the impacts of surrounding management on on the quality of ground water reaching the site, which can frustrate efforts to improve site condition.

Of particular relevance to the uplands, including undesignated peatlands, is the **Heather and Grass (Burning) (England) Regulations 2007**. These limit the size of burns,

The heather and grass burning regulations prevent the most damaging burns, but rotational burning for rearing grouse affects over 1,000 km² of English blanket bog peatlands. A voluntary code of good practice advises land managers not to burn on blanket bog

and state that burns must not smoulder for more than 48 hours to reduce the risk of peat fires or secondary wild fires. However, these regulations do not preclude damaging burns (which can leave up to 98% bare ground) or prevent burning in sensitive bog habitats. More sensitive burning practice is encouraged through an associated voluntary **Heather and Grass Burning Code** (see below).

Over a third of our moorland is **common land**, which comes with complex legal interests involving multiple stakeholders, and may be governed by Commoners Councils with legal powers to control land management practices. The complex nature of common land management, rights and ownerships means that lines of responsibility and reward can be difficult to establish, but peatlands are afforded basic protection against earth moving and tree planting on commons, which must be approved by the Secretary of State.

Cross-compliance requirements apply to anyone who receives payments under the Common Agricultural Policy (CAP). All claimants must meet domestic legal requirements to keep their land in **Good Agricultural and Environmental Condition (GAEC)**. In relation to peat, the **Soil Protection Review** is the most important GAEC. A new version has recently come into force and will remain in place until it is reviewed in 2013. The Soil Protection Review 2010 requires farmers to assess and mitigate degradation threats of compaction, erosion and loss of organic matter. All peaty soils are identified as high risk soils within the SPR and its associated guidance. Appropriate SPR measures on arable peatlands include use of cover crops and minimising the damage to plant cover by restricting trafficking, overgrazing, supplementary feeding and uncontrolled burning. The SPR Guidance also suggests the use of grip blocking and shelter belts. While suggested measures for cultivated peatlands will reduce wind erosion, they will not address the continuing loss of peat organic matter through wastage and oxidation.

In the uplands, suggested measures include avoiding burning on blanket bog or deep peat and preventing overgrazing and trampling by livestock. The guidance also identifies that action should be taken on land with unblocked drainage grips. It is estimated that this approach should deliver a 5% reduction in general soil degradation, and progress towards this aim will be monitored. However, the specific measures to be applied remain the choice of the claimant, and the best options for protecting peat carbon may not be the most attractive. Overall the protection the SPR offers to upland peatlands is greater than that in lowland agricultural peatlands.

Areas of valuable peatland habitat are given some protection from agricultural improvement under the **Environmental Impact Assessment (Agriculture; England; No.2) Regulations 2006**. These require that projects which aim to increase the agricultural productivity of more than 2 hectares of uncultivated land or semi-natural areas must apply for a screening decision under before commencing work. Where there is a strong likelihood that a project will have a significant effect on the environment the applicant may be required to do an Environmental Impact Assessment to test the scale of the environmental effects and examine opportunities for mitigating against them. Where significant environmental impacts are likely to occur, consent for the project will not be given. Uncultivated land is defined as land that has had no physical or chemical cultivation in the past 15 years. The term semi-natural area is not defined by the Regulations but Natural England Guidance states that the term would include moorland, heathland, acid grassland, unimproved grassland, bracken, fen, marsh, swamp and bog. The Regulations are unlikely to prevent drainage or cultivation of peatlands that no longer support BAP habitats or sites which are less than 2 ha in size. The regulations also do not apply to non-agricultural projects, such as drainage for grouse moor management.

The importance of peat soils should also be reflected in the planning system. The **Planning and Climate Change** supplement to **Planning Policy Statement 1** (on 'delivering sustainable development') is clear that regional spatial strategies should 'recognise the potential of, and encourage, those land use and land management practices that help secure carbon sinks.' This document also recognises that development should contribute where possible

to protect and enhance biodiversity and mitigate against climate change. However, peat soils are not specifically identified for their importance as carbon sinks, and planning regulations only apply during specific, development-oriented, land-use changes and often cannot be used to influence general land management.

The regulatory framework goes some way to protect peatlands from the most damaging practices, and affords a degree of statutory protection to a minority of deep peatlands. While good practice for peatlands is encouraged in uplands, measures to preserve lowland peatland soils do not prevent their ongoing wastage.

Incentives and advice

Regulation can only require that a minimum acceptable standard of peatland management is maintained, and cross compliance currently only encourages minor enhancements of this good practice. However, incentives and payments are available through a variety of schemes to encourage land management which delivers more environmental benefits. Furthermore, advice on more sustainable land management is also available from various sources.

Farmers and land managers can be incentivised to sustainably manage and even restore degraded peatlands through agri-environment payments. In England, **Environmental Stewardship** is the key agri-environment scheme. Delivered by Natural England, the scheme provides funding to farmers and other land managers who deliver effective environmental management on their land. A total of £2.9 billion is available to farmers and land managers between 2007–2013 and there are currently 58,000 agri-environment agreements*, covering 67% of the agricultural land in England.

The **Higher Level Stewardship** element of the scheme includes a range of peatland management and restoration options, covering both upland and lowland situations. Some 120,000 ha of the uplands is included in HLS moorland restoration options. HLS delivery is targeted at priority actions in target areas and whilst funding is limited and competitive, peatland restoration will often be a priority as it can help meet biodiversity, climate change and resource protection objectives. Restoring peatlands can help meet biodiversity (including BAP and SSSI), climate change and resource protection objectives, so an agreement achieving these is likely to be considered good value for money.

A range of advice is available to land managers on peatlands, not least through the recently revised **Code of Good Agricultural Practice**. This advises that undrained peatlands are rare, and should be preserved and protected from agricultural pollution. It notes that all peatlands are important stores of carbon and recommends that upland peatlands should be managed to prevent erosion from damaging burns and overgrazing, and suggests that grip blocking may be undertaken, with advice from the Environment Agency. It notes that lowland peatlands under agriculture should maintain water levels as high as practical, and suggests that farmers consider re-wetting peatlands for habitat creation.

In addition to Environmental Stewardship, Natural England and the Environment Agency also deliver the England **Catchment Sensitive Farming** Delivery Initiative (ECSFDI) in 50 catchments in England. These catchments were identified in 2006 as priority areas for action and are targeted under a range of measures (e.g. fencing off watercourses to stop stock access, advice on nutrient planning, advice on soil management) that are recommended to reduce diffuse water pollution from agriculture and are supported by a small capital grants scheme to fund minor works. Several catchments (in Cumbria, the South West, and Yorkshire) include peat soils and some of the measures in place should help to protect peat in these areas. The scheme is due to finish in 2011, and discussions are underway on options for future delivery arrangements.

* Environmental Stewardship and its predecessors, Countryside Stewardship and the Environmentally Sensitive Areas Schemes

The Forestry Commission is responsible for the **UK Forestry Standard** and supporting guidelines, which are currently being revised for publication in 2010. The Guidelines promote specific management practices that protect peat soils from a number of potentially damaging forestry operations, including planting, felling and drainage. They also clearly state that new woodlands should not be created on deep peat soils.

Peat is offered protection under a voluntary **Heather and Grass Burning Code** which describes the minimum standards for environmental good practice in burning, and advises land managers against burning in sensitive areas, including peat bogs and within 5m of watercourses, including grips, and other areas where there is considered to be a high risk of soil erosion. The code is applied to all moorland managed under agri-environment agreements, but individual agreements may be more stringent to protect the peatland interest.

Voluntary partnerships and projects

A more coordinated approach to restoring and managing peatlands has been pioneered by a number of landscape-scale peatland restoration projects and partnerships.

Partnerships such as **Moors for the Future** in the Peak District and **Peatscapes** in the North Pennines have a track record of successfully delivering impressive restoration without alienating those who have managed and lived in these areas for decades. These have effectively engaged with farmers, businesses, water companies, moorland managers, local residents, scientists, conservationists and other interest groups to develop and implement a clear vision for peatland management in their area.

These partnerships have grown from grassroots support among a range of local organisations including **National Park Authorities**, **Areas of Outstanding Natural Beauty (AONB)** bodies, **water and utility companies**, and non-governmenal organisations including **Wildlife Trusts**, the **National Trust** and the **RSPB**. They are often supported with funding and other resources from statutory agencies and/or utilities as well as with EU funding such as through the **LIFE programme**.

Emerging projects such as the Lancashire Mosslands Project, the Yorkshire Peat Project, the Great Fen Project, and the Wicken Fen Vision will doubtless continue these local success stories. During the last year the **Wetland Vision**, a joint initiative of Natural England, RSPB, Environment Agency, the Wildlife Trusts and English Heritage have developed opportunity maps for wetland recreation, and this partnership has now provided £1m in funding to landscape scale projects to recreate, restore and manage wetlands and peatlands.

Information plays an important role in the success. New restoration techniques and collaborative research have been shared with researchers, practitioners, policy makers and the general public though events, conferences and competitions.

In addition, these projects have undertaken exhaustive mapping and data collection to allow them to prioritise their work and develop ambitious restoration plans. The mapping efforts of these projects has contributed considerably to the peat maps in this report, as well as helping these project prioritise and enable restoration.

Such collaborative projects have shown clear advantages as a model for delivering peatland restoration: in developing robust relationships with stakeholders, in agreeing and communicating a vision of future peatland management, in developing and disseminating research and good practice, and in delivering a coordinated approach to peatland restoration and management. Each project, however, works in isolation, and there are no formal national structures or policies to encourage the initiation, development of these projects and cooperation between them. The recently-launched IUCN UK Peatlands Programme has brought representatives of several of these projects together, to cooperate in promoting peatland restoration through advocacy activities, but this three year initiative cannot deliver the long-term support such a network of peatland restoration projects would require.

If we are to seize the climate benefits of peatland restoration, we would do well to embrace and encourage these successful models, and seek to replicate and support them for all our major peatlands.

Potential new policy framework for peat

The **Climate Change Act 2008** has set a statutory target of an 80% reduction in UK greenhouse gas emissions by 2050 (from a 1990 baseline). The Act has established a carbon budgeting system that caps emissions over five year periods, with three budgets set at a time, to create a clear trajectory to 2050. The government's **Low Carbon Transition Plan** (LCTP) sets out the policies and programmes that will deliver the first three carbon budgets.

The LCTP outlines the potential emission reductions by core sectors of the economy and includes a chapter on Agriculture, Forestry and Land Management (AFLM) which refers to the importance of protecting soil carbon, particularly in peatlands. All government departments with policy responsibilities for key sectors have to produce **Climate Change Plans** setting out in more detail how the reductions committed in the LCTP will be achieved. Defra is the lead department for delivering emission reductions from AFLM in England and as such we anticipate that their Climate Change Plan will refer to greenhouse gas emissions from peatlands and set out what measures the Department will take on this issue.

Defra have recognised the importance of peatlands for some time, establishing in 2007 the **Partnership Project on Peat** to co-ordinate efforts to understand, protect and restore peat soils and the habitats that they support in England, Wales and Northern Ireland*. In contrast to previous explorations of the 'peat issue' which have focused much more narrowly on the biodiversity value of peat habitats, this project has sought to take a comprehensive ecosystem approach to ensure that the whole range of services and benefits that peat continues to provide for society are recognised (e.g. carbon storage, biodiversity, food production, water and flood management, recreation).

Since 2007, the Project has made substantial progress in improving our knowledge of the location and current condition of peat soils and has begun to clarify important scientific questions, including the impact of peatland restoration on greenhouse gas emissions. It has also undertaken an initial analysis of the current policy landscape for the protection and enhancement of peat soils and began to identify the most suitable policy levers to deliver widespread restoration.

Defra proposes to consult in 2010 on a new framework for action to protect peatlands, which will explore the potential to strengthen the range of policies on peat protection. This will include proposals for measures to further reduce the horticultural use of peat when the current target expires at the end of 2010.

Natural England welcomes this initiative and will continue to work closely with Defra and other partners to assist with its development. We will advise on the improvements needed to data on peat-related greenhouse gas emissions, with a particular focus on addressing gaps in coverage in the UK inventory. We will continue to advise Defra on how to protect and restore peat soils, including those in high value, lowland agricultural areas such as the Fens.

More generally, we will help Defra consider potential new policy and delivery mechanisms and funding sources that will make restoration an economically viable option for land managers. Our initial assessment of some potential options that, in our view, require further consideration is outlined below.

Private sector investment through the carbon market

Projects that deliver greenhouse gas benefits have the potential to earn 'carbon credits' that

* Partner organisations: Natural England, the Environment Agency, the Forestry Commission, English Heritage, the Welsh Assembly Government and Northern Ireland Environment Agency. The Scottish Government have maintained an observer role throughout.

can be traded on the carbon market. Companies generally decide to purchase credits from carbon reduction projects to help them meet corporate carbon targets, after they have firstly taken action to reduce their own emissions as much as possible.

In theory, peatland restoration projects in England have the potential to generate carbon credits for the greenhouse gas benefits they deliver. This could, therefore, represent a new source of funding for restoration if companies were prepared to purchase credits from domestic peat carbon projects.

For this to be viable, investors would need to have complete confidence that a specific restoration project would deliver additional quantifiable greenhouse gas benefits in order to determine the number of credits (in tonnes CO_2-e) that would be generated.

As discussed earlier in this report, while the available evidence strongly indicates that restoration is generally beneficial from a greenhouse gas perspective, further data and monitoring is required to be able to confidently estimate these benefits at the project scale to the satisfaction of key stakeholders and accrediting bodies. In our assessment, it is highly likely that this level of specificity for UK restoration projects will become available over the next couple of years. As such, from an evidence perspective, there would then be potential for carbon revenues to contribute to restoration in the short to medium term.

There are, however, other important barriers to unlocking potential private sector investment. At present, if a company decides to purchase credits from carbon reduction projects to count towards their voluntary corporate targets, then those projects should be accredited by the Government's Quality Assurance Scheme for Carbon Offsetting[43].

The Quality Assurance scheme only currently allows for carbon credits that are generated from projects occurring in countries that do not have mandatory emission reduction targets. This is to avoid the risk of 'double-counting', where the benefits from a project would effectively be 'sold' twice. Therefore, carbon reduction projects delivered in the UK cannot earn tradable carbon credits on the voluntary offset market. Companies are, however, free to invest in carbon reduction projects in the UK as long as they are not described as 'offsets' or used to generate tradable carbon credits.

Market research undertaken by the BRE Trust[44] indicates that there is a substantial potential demand from companies to finance carbon reduction projects in the UK without the need to take ownership of a tradable carbon credit. Many of the companies interviewed said they would place a high value on supporting local carbon projects rather than (or as well as) investing in tradable carbon credits from international offset schemes.

Companies may therefore welcome the opportunity to invest in peatland restoration projects in England if they can be confident that they will deliver quantifiable greenhouse gas benefits and as long as it is made clear that they will not be able to earn tradable carbon credits from their investment.

Payment for Ecosystem Services

Although this report has focussed on the carbon and greenhouse benefits of peatland restoration, we have made clear throughout that restoration also delivers a wide range of other benefits through safeguarding vital ecosystem services and biodiversity. If a market value can also be developed for these wider benefits in addition to carbon, then restoration will become an even more attractive option for investment.

A promising area under the general banner of market mechanisms is the 'payment for ecosystem services' (PES) approach. PES schemes can enable a greater emphasis on the provision of ecosystem services, linking them to specific groups of beneficiaries who are willing and able to pay for them.

By effectively linking beneficiaries with service providers (i.e land managers), they have the potential to incentivise truly 'integrated land management' where multiple ecosystem

services (for example, biodiversity provisions, flood risk management, water quality benefits and carbon storage) are delivered on a piece of land. This could greatly increase the potential returns to land managers because earnings from a wider bundle of ecosystem services are likely to be more commercially viable than the provision of individual services, such as carbon, in isolation.

Natural England is developing three ecosystem service pilots in Cumbria, Yorkshire and the South-West that aim to revolutionise the way in which upland land managers are able to generate income. Land-use in the uplands is currently dominated by livestock production and grouse moor management. Agricultural profitability tends to be low, which is a general characteristic of these marginal farming areas. The farming sector is, therefore, heavily dependent on subsidies to be viable.

Through sound science, financial innovation and new partnerships, the pilot projects will seek to transform the economics of upland land management and demonstrate how the provision of a broader range of ecosystem services can be turned into genuine business opportunities. By doing this, it is envisaged that multiple problems of water quality, flooding, carbon loss and wildlife decline will be addressed in an integrated and cost-effective way.

Throughout the pilots we will seek to develop new institutions and partnerships that will link land managers, as providers of ecosystem services, with those that benefit from them. The aspiration is to demonstrate to local beneficiaries the benefits they are receiving and encourage them to enter into tailored local agreements with land managers to supply them.

CAP Reform Post 2013

As reported elsewhere in this document, CAP is already helping to secure and restore peatlands in England, through the Agri-environment Measure under Pillar 2 of the CAP. It should be a priority for CAP to ensure continuity of management for these peatlands post 2013, since failure to do so could result in a large-scale release of stored carbon.

Under the Agri-environment Measure, land managers can access annual management payments to help defray the cost of managing peatland sites. These payments are calculated on the basis of income foregone plus costs. Land managers can also receive support for items of 'non productive' capital investment associated with this management. Under Higher Level Stewardship, which is the main vehicle for supporting peatland management and restoration in England, agreements normally last for ten years at a time.

The current system has proved to be capable of bringing some kinds of peatland into agreements on a large scale, particularly in the uplands. However, the current level and structure of payments limit uptake for other kinds of peatland. These limitations are most acute in the case of lowland, cultivated peat, where nationally averaged income foregone payments have proved unattractive compared to the returns that can be achieved through agriculture and horticulture. For these peatlands, annual management payments based on income foregone, rather than services delivered, are probably not the best way of bringing about the required 'step change' in land management.

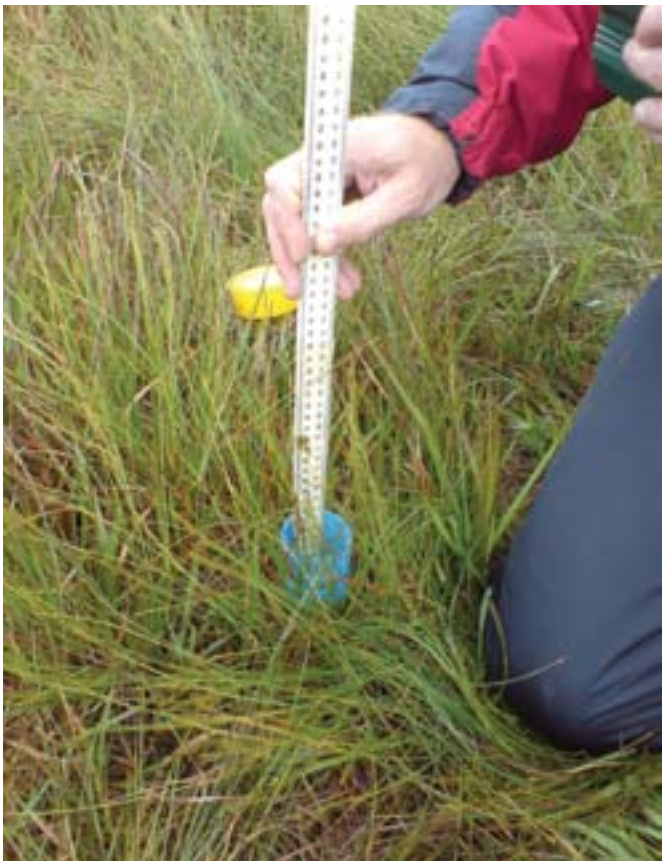
The current round of CAP reform provides an opportunity to explore whether the current basis on which payment rates are calculated should be re-visited, and even whether annual payments could be capitalised to pay for step changes in land management, perhaps by buying a restrictive covenant over the future use of land. These changes could extend the role of CAP in lowland peatland restoration, if it was concluded that this was desirable. It is, however, worth cautioning that in highly productive lowland peat areas CAP would probably still need to work in conjunction with other policy levers to achieve a large scale switch to more sustainable peatland management.

Improving the evidence base

The greenhouse gas emissions factors used in this report indicate the type of peatland management that deliver the greatest greenhouse gas benefits. As acknowledged earlier in the report, the factors used do not

adequately reflect all UK peatlands, owing to the scarcity of data reflecting peatland types and management in the UK. A more in-depth understanding of how management affects greenhouse gas emissions from UK peatlands is required to refine and improve estimates of greenhouse gas benefits from restoration at the project scale.

Natural England has been active in gathering evidence to improve understanding in this area. Jointly with Northumbrian Water, we are funding research into carbon and greenhouse gases at a restored site (Cronkley Fell) in the North Pennines. A range of measurements are being taken by the University of Durham to enable full greenhouse gas and carbon budgets to be calculated. Data collected from this site, as well as from a bare peat site in the Peak District, is being used to refine a model to predict likely greenhouse benefits from the restoration of upland blanket bog. Initial results from the first 18 months of monitoring indicate that restoration at both sites is delivering net greenhouse gas benefits. Natural England is not acting alone in building the evidence base on peatland greenhouse gases. For example, the Centre for Ecology and Hydrology are attempting to calculate full greenhouse gas and carbon budgets at four 'carbon catchments' representing blanket and raised bog across the UK. The UKPoPnet programme is taking measurements from a landscape-scale restoration programme being delivered by the RSPB at Lake Vyrnwy in mid-Wales. Defra-funded research is also underway which aims to determine how best to restore peatlands to minimise methane emissions, and is exploring techniques including careful manipulation of the water table and vegetation management to reduce methane emissions.



Natural England and partners are already monitoring the impacts of peatland restoration on greenhouse gas and carbon flux, but a wider JNCC-led project is now underway that aims to increase the number of measurements across the UK

More knowledge is also needed to implement peatland management which helps prevent flooding, and which reduces water coloration. To help deliver this knowledge, Natural England is supporting a joint project to monitor the water quality and flow impact of an ambitious programme of grip blocking on Stean Moor, Nidderdale. We are also working with the Environment Agency in a project with the University of Durham to model how water moves through drained and restored peatlands, to help us predict and optimise the flood prevention benefits of upland peatland restoration.

This effort is not enough, however, to provide a comprehensive understanding of greenhouse gas emissions and carbon budgets from a range of degraded and restored peatlands across the UK. To address this, Natural England are working with the JNCC, along with Defra, DECC, Scottish Natural Heritage, the Scottish Government, Countryside Council for Wales, the Welsh Assembly Government, Forestry Commission and the Scottish Environment Protection Agency on a project to design and cost a research programme which will aim to fill these gaps. A consortium of high-profile peatland researchers from Durham University, CEH, the Macaulay Institute, Leeds University, and Aberdeen University are developing this programme, and a coordinated national approach to measuring and monitoring greenhouse gas and carbon flux from peatlands should be in place by summer 2010.

Conclusions

This work has shown that most of our peatlands are in a degraded state. Our current management and use of these damaged peatlands delivers a lucrative, but limited, range of benefits including food, game, and growing media. The wider services provided by our peatlands are being eroded, particularly their important store of carbon as well as their ability to support wildlife, regulate our water supply and provide a range of cultural services. Unavoidable climate change will exacerbate the adverse impacts of our current management on the ability of peatlands to store carbon and deliver wider services.

This report has, for the first time, estimated the carbon and greenhouse gas consequences of the degraded state of our peatlands. Our initial estimate is that over 3 million tonnes of CO_2-e is currently being lost to the atmosphere every year from England's peatlands.

Our analysis suggests that most types of peatland restoration will deliver greenhouse gas benefits and that these benefits also represent good value for money. The greatest benefits, and best value for money, appear to be from restoration of deep fen peatlands under agricultural use. However, restoration of our upland peatlands should also deliver widespread carbon savings at an acceptable cost to society.

In our view, the evidence we have provided in this report demonstrates that peatland restoration is a valid climate change mitigation measure. To a large extent, restoring peatlands for greenhouse gas mitigation will also have beneficial impacts on their conservation status, and other ecosystem services such as drinking water provision.

We have presented evidence which justifies a more balanced approach to future peatland management where full recognition is given to carbon storage and the other benefits of healthy, resilient peatlands. We propose that the best way to meet this challenge is to support and establish landscape-scale delivery projects, involving a wide range of stakeholders, to pull together a coherent approach to peatland management which fully understands the importance of peatlands to climate change and the other benefits of more active peatlands.

Significant improvements in the policy framework for peatlands have been made by Government over the last two years with the pace of development increasing markedly in recent months. We will continue to work closely with Defra and other partners during 2010 to develop a new policy framework, so that the policy and delivery landscape is in a position to deliver our vision for peatlands. This will require the strengthening of existing levers and the full consideration of new mechanisms, including the potential role of private sector investment and the role of CAP post-2013.

Finally, we need more information to make an adequate valuation of the benefits of an active, restored peatland. Also, an improved understanding of greenhouse gas flux from peatland will help to inform future calculations of the kind presented in this report. This understanding should be provided by a research programme currently being designed by Natural England, the JNCC and a range of other UK organisations.

Recommendations

- A research programme for a UK peatland greenhouse gas monitoring programme should be implemented that will refine our understanding of greenhouse gas emissions from degraded and restored peatlands.

- More detailed and comprehensive data is required on peat depth and quality to inform our understanding of the carbon stored in our remaining peatlands, and the possibility of coordinating a national peat survey should be explored with a range of partners.

- The Land Use, Land Use Change & Forestry section of the UK GHG Inventory should be updated to incorporate our improved area data and to provide a more complete picture of current emissions from degraded peatlands.

- Defra's development of a new policy framework for peatlands should include a clear aspiration to reduce emissions from degraded peatlands and seek to build upon the successes of existing restoration projects.

- More detailed market research is needed to gain a better understanding of the level of investment which the private sector might be prepared to make to invest in peat restoration projects.

- The post 2013 CAP should usefully build on the important contribution already being made by agri-environment schemes to protecting and enhancing peatlands.

Next steps

March 2010

- Defra Climate Change Plan (incorporating their Departmental Carbon Reduction Plan) launched.
- Act on CO_2 campaign launched on horticultural peat.

Summer 2010

- Scoping for UK peatland GHG monitoring programme completed.

Autumn 2010

- Defra development of a new policy framework for peat protection.

2011

- UK peatland GHG monitoring programme launched.

2012

- Three years of GHG measurements completed from Cronkley Fell (North Pennines)

2013

- New CAP agreement in place.

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Front cover image: Peat restoration has enabled common cotton-grass to colonise this former peat extraction site at Thorne Moors, Yorkshire.

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ISBN 978-1-84754-208-3

Catalogue Code: NE257

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