IUCN UK Peatland Programme Commission of Inquiry

Written evidence submitted to the Open Inquiry

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University of Edinburgh

The following evidence was submitted to the Core Expert Panel in advance of the Open Inquiry event.

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Section One
Peatland Restoration – A Land Management Perspective

1.1 Simon Thorp - The Heather Trust; Scotland's Moorland Forum & **Tim Baynes** - SRPBA
With input from Martin Gillibrand - The Moorland Association

1 It must not be assumed that those who manage the land:
1.1 Understand the issues about management for carbon, or
1.2 Will take any action.
1.3 In spite of:
- 1.3.1 National concerns about climate change
- 1.3.2 Government imperatives
- 1.3.3 Enthusiasm of the Research community
- 1.3.4 The free flow of documents, and media

2 So what?
2.1 Resources must be allocated to provide guidance to those who own and/or manage the land about the management of peatland areas to avoid damage.
2.2 To achieve change, suitable incentives must either be provided, or the benefit of introducing different management practices must be explained.

3 Define target audience
3.1 Politicians understand the issue, but are not aware of its extent in Scotland
3.2 Researchers – have differing views about the cause/effect etc
3.3 Land management community must be engaged if anything is to happen on the ground.
3.4 General public need to understand the issues so that they will support the land management changes and any impact on access and landscape.

4 Provide Incentives
4.1 The benefits for land managers must be explained.
4.2 Grants may be necessary to provide the carrot for action.
4.3 Other financial benefits may come through Environmental markets / carbon trading.
4.4 Carbon management should be promoted as a positive success story
- 4.4.1 Scotland has massive carbon reserves and generally Scotland's peatlands are in great shape.

5 Knowledge Exchange options
5.1 Scientific papers are important to enhance the evidence base but they have very limited audience
5.2 The establishment of demonstration sites would be valuable and the holding of demonstration events could reach out to a wide audience.
5.3 Conferences could be used to debate high level issues and as a means to raise the profile of carbon management issues.
5.4 Presentations could be given at group meetings organised by relevant organisations
5.5 Newspaper and magazine articles should be produced to raise public awareness of the issues.

6 Specific issues
6.1 Heather Burning / Muirburn / Swaling
- 6.1.1 Many scientists and landowners believe that burning carried out employing best practice techniques is good for regeneration, limiting wildfire risk etc.

6.1.2 Bad burning practice will always be a problem. This should be addressed by training and by raising awareness of best practice techniques and the damage that can be caused by bad practice.

6.1.3 Burning on active wet blanket bog is largely unnecessary; a high water table limits vegetation growth, but burning should not be banned completely and where it can be justified, it should only take place on a very long rotation (~30+ years).

- Large blocks of even-aged heather sometimes need breaking up to reduce the wildfire risk and introduce age-diversity for biodiversity.

6.1.4 On "dry" blanket bog, which often consists of deep peat, heather grow very fast and should be managed to reduce wildfire risk to protect the carbon stored in the peat.

- The worst case scenario is an uncontrollable summer fire that burns into the peat. This would produce another 'Bleaklow'.
- It has to be accepted that not all 'dry' blanket bog can be returned to an active state. Even if techniques are available to achieve this, resources will limit the places that work can be carried out. An alternative strategy to manage and protect these areas is required.

6.2 Water management / grip blocking

6.2.1 Some landowners in Northern England are grip blocking. They have understood the water quality problems caused by eroding drains.

6.2.2 The benefits of keeping moors wet are understood, especially with warmer drier weather being the expected outcome of climate change.

6.2.3 Contour drains to hold water have long been used on grouse moors to provide additional water resources on dry ground; this technique is being returned to.

6.2.4 Grant scheme support for grip blocking (at different rates in different parts of the UK) is available and this adds to the incentive to carry out grip blocking.

1.2 Jonathan Hall – National Farmers Union Scotland

NFU Scotland welcomes the opportunity to contribute to the Open Inquiry of the IUCN UK Commission of Inquiry on Peatlands, albeit very briefly. Clearly, NFU Scotland offers a view from the farming perspective, focusing on the real drivers of change in a peatland (upland) farming context.

The peatlands of the UK can be directly, although not exclusively, associated with the uplands – particularly in Scotland. These significant (dominat) areas are nationally and internationally important for primary production, most notably farming and forestry, and at the same time vitally important for biodiversity, landscape, cultural heritage, recreation, and natural resource management.

They also play a key role in climate change mitigation and adaptation. The peatlands of the uplands and their associated climate make farming difficult to say the least. Yet these peatlands remain both influenced and dependent on continued agricultural activity in the form of extensive grazing management.

Moreover, it is the agricultural infrastructure of farms and crofts that enables the delivery of much of the management now required to sustain and enhance peatland environments.

Over time, the uplands have been subject to a range of pressures, including inappropriate grazing, burning, drainage and eutrophication/acidification with intensification of agriculture, changing land use and farm practices implicated.

There continues to be many drivers of change in peatland area which include the decoupling of direct (Pillar 1) support in 2005 following the 2003 CAP reforms, volatility in input and output prices, changes to Pillar 2 measures (notbly LFA support and agri-environment measures), and Water Framework Directive (WFD) measures. Decoupling was expected to be a key driver for change and several studies in Scotland at least have highlighted the declines in livestock production and their consequences – many of which have had a range of environmental implications.

Appropriate grazing is important for maintaining peatlands as well as upland habitats. Overgrazing was seen as one of the most common reasons for damaged peatlands and unfavourable of upland habitats. However, livestock numbers are now falling and there have been greater reductions in grazing in upland/peatland areas than on better quality grassland.

A reduction in grazing may benefit overgrazed areas allowing vegetation to regenerate and reducing negative effects on peatland. However, if too little grazing occurs then undergrazing could become an issue.

Livestock farming contributes to the maintenance of peatlands, and the upland landscape and its mosaic of semi-natural habitats. Previous agricultural intensification in the uplands, influenced by headage based subsidy payments, lead to a range of environmental pressures on habitats, species, soils and water.

Farming in such 'less favoured areas' remains heavily dependent on Single Farm Payments (Pillar 1) and LFA and agri-environment (Pillar 2) payments.

Significant uptake of appropriately designed and adequately funded Pillar 2 measures are required such that LFA support ensures adequate grazing levels on peatlands and specific agri-environment measures are taken up to specifically tackle peatland restoration.

The economic and environmental impacts of potential changes in future support (from 2014) are likely to have a profound effect on peatlands and their management.

Farming in peatland areas, particularly in the uplands, continues to face a range of challenges. While widespread abandonment appears unlikely, it will occur at a local scale and have a lasting and damaging impoact – economically, environmentally and socially.

1.3 Tim Thom –Yorkshire Peat Partnership

1. Background

The Yorkshire Peat Partnership (YPP) is a new organisation (set up in July 2009) funded by Yorkshire Wildlife Trust (YWT), Yorkshire Dales National Park Authority (YDNPA), Environment Agency (EA), North York Moors National Park Authority (NYMNPA), National Trust (NT) and Natural England (NE). The primary aim is to restore approximately 21000ha of peatland in the Yorkshire Region of England by 2013 through a programme of grip blocking (2000km), gully restoration (1000km) and bare peat restoration (250ha). This will result in the restoration of half of the peatland in the region. So far, the project has been successful in blocking approximately 230km of grip. In this document we highlight some of the positive and negative aspects of delivery we have experienced since the YPP began.

2. Positives

2.1. Funding

YPP was primarily set up to assist Natural England to use funds allocated to the Higher Level Stewardship Scheme (HLS) capital works programme for peatland restoration. This funding provides 100% grants to individual agreement holders to develop and implement a programme of peatland restoration works on their land. Peatland restoration is costly and the HLS, if properly funded, provides one of the best sources of funding for peatland restoration works in England

2.2. Landowner attitudes

So far we have found all of the landowners we have been working with very receptive to proposals for peatland restoration. What reasons do the landowners have for supporting restoration? These vary from one landowner to the next but can be summarised as follows:

i. a genuine view that draining the peatlands was a mistake for rearing grouse and this is a chance to rectify things.
ii. the need to bring in outside expertise to help restore heavily eroding gullies and bare peat areas which are beyond the abilities of the landowners themselves.
iii. the belief that by blocking grips (which are classed as watercourses in England) they will be able to begin burning again in areas where they are prevented from doing so by regulation.
iv. in a small number of cases a definite desire to support conservation of blanket bog.

2.3. Exchange Networks

Our sister restoration programmes to the north and south (Peatscapes and Moors for the Future respectively) have been very supportive and we are able to learn from and develop their techniques in our restoration programmes. We have established an informal exchange network which is proving to be very effective in ensuring the most appropriate techniques are used. One of the primary skills of this network is to understand and translate the often ambiguous results of research into practical actions we can take on the ground.

3. Negatives

3.1. Restoration season

Currently peatland restoration programmes have a very narrow window for carrying out surveys and works. No surveys or works can take place between mid-March and mid-July due to the bird breeding season and grouse moor owners and their keepers are wary about allowing surveys or works to take place during the shooting season even though shoots may be infrequent through the season (which can finish as late as mid-December). This means that restoration works are largely restricted to December to mid-March which, as last winter proved, are the most difficult months to be restoring upland peat. We need to find a way of persuading landowners to allow surveys and works to take place during the shooting season if we are to achieve the level of restoration work needed.

3.2. Funding

As of the election and the announcement of government spending cuts YPP was unable to carry out its full planned programme of works for this financial year. Our core funds are partially dependent on the management fees we could charge through HLS which means we are currently short of staff to work with landowners on their restoration plans. Natural England have provided limited funds to allow us to survey and draw up plans for sites to be worked on next year and we now have a fully costed £10million programme of works which we originally planned to achieve in three seasons and has now been truncated into two. We are currently still waiting to hear if this programme will be funded. If it isn't YPP will have to stop until it can secure funding from other sources.

3.3. HLS admin and logistics

HLS is currently the best funding source for peat restoration in the YPP area but this means that all restoration plans are negotiated individually with each agreement holder. In addition HLS auditing requirements require that all restoration plans go out to tender to obtain 3 quotes. In many situations we are having to go through the same process for pretty much the same restoration plans on several neighbouring holdings within a single peatland area where it would be more efficient and cost-effective to restore these sites together.

3.4. Inconsistencies in Natural England advice on burning

The IUCN reviews, the Burning Code and many advisors within NE advocate no burning on blanket bog (and this is probably the ecologically correct view). However, in reality most HLS agreements in our area are likely to require (and pay a supplement for) burning plans that will include a burning rotation on blanket peat. In fact, grip blocking is being promoted as a measure to enable burning once the grips are no longer classed as watercourses. Many frontline NE advisors are trying to negotiate very long rotations (20+ years) but are being undermined by others in other areas allowing shorter rotations and the land agents know this. A consistent line is needed by NE so that the frontline staff are confident in their message. .

3.5. Ambiguous research

As practitioners on the frontline of peatland restoration we have to make a convincing argument to the land management community that what we are doing makes sense. There is an urgent need for the research community to improve its ability to provide consensus views on the benefits or otherwise of peatland restoration on the full range of ecosystem services. We understand that there is always scientific uncertainty but other research communities (eg IPCC) are able to synthesise their research and provide guidance to policy makers and practitioners. We had hoped that the research reviews carried out as part of the IUCN peat programme would have achieved this and were rather disappointed that they have not. In fact, in terms of burning, carbon-cycle and climate change very little clarity has been achieved. It is essential that this is overcome very soon in order for us to make convincing arguments to policy makers and land managers to fund and support peatland restoration in the English uplands.

1.4 Norrie Russell – RSPB Scotland

The RSPB has a long standing interest in blanket bog. In the 1980's the RSPB fought a major campaign[1] to halt the blanket afforestation of the *flow country*. The *flow country* comprises some 400,000 ha of blanket bog that supports an internationally important assemblage of breeding birds. Tens of thousands of hectares of blanket bog were ploughed up with the loss of bog habitat and associated internationally important bird species[2]. In 1988 the Scottish Secretary of State announced the establishment of a network of Sites of Special Scientific Interest to protect the best remaining areas. Later that year, the Chancellor of the Exchequer removed the tax breaks effectively bringing an end to landscape scale planting. A total of 39 SSSIs were subsequently designated with a large area designated as the Caithness and Sutherland Peatlands Special Area of Conservation (144,000 ha) and Special Protection Area (146,000 ha). Designation came too late to save many of the best areas of habitat and much of the protected area and associated birds is now affected by adjacent blocks of forestry[3]. In the flow country and elsewhere, the RSPB are committed to *restoring* priority areas of damaged blanket bog. Today, the RSPB owns/manages over 33,000ha of blanket bog across the UK including a major land holding acquired in the Flow Country (19,250ha blanket bog) in 1994.

Blanket bog has been forming in the UK for 6,000 to 8,000 years. In recent years, blanket bogs have been damaged by atmospheric pollution (particularly northern England), inappropriate levels of livestock grazing, drainage, burning, re-seeding, afforestation and peat extraction. Despite site designations and considerable public investment, many areas of blanket bog remain in poor condition with declining populations of internationally important birds. Of particular concern are the negative edge effects on key bird species in the SPA, well beyond the remaining forest edges, which have been demonstrated by research progressed by the Flows Science Group (RSPB, SNH, FCS under peer review)

In **1992**, Scottish Natural Heritage (SNH) launched a Peatland Management Scheme to support positive land management across the network of designated sites in the *flow country*. In **1994**, the RSPB, SNH and Caithness & Sutherland Enterprise received co-funding from the EC Life Nature Programme for a project to promote awareness of the importance of the Caithness & Sutherland Peatlands, to support positive land management activities and to trial restoration of areas of drained and afforested blanket bog. These initiatives heralded the beginning of a more progressive conservation approach. In **2001**, a **partnership** of RSPB, Scottish Natural Heritage, Forestry Commission and Plantlife were awarded further funding under the EC Life Nature programme (total budget £2.8 million). This represented a major breakthrough bringing conservationists and foresters together to jointly address the challenge of restoring damaged blanket bog in the flow country at a landscape scale. Since acquiring Forsinard Reserve in the *flow country*, the RSPB (and partners) have blocked drains across 15,600 ha of blanket bog, and felled trees over 2,200 ha of former blanket bog making this one of the largest peatland restoration projects in the UK. In 2005, the Life partnership published a management strategy for the Peatlands of Caithness and Sutherland drawing together a wide range of partners including NGOs, Government bodies, forestry companies and private individuals to help take forward conservation of the *flow country*[4].

In 2006, the RSPB received 5-years Life funding to achieve significant and sustained improvement in the condition of blanket bogs in key areas of two Special Areas of Conservation in North Wales. Through this project, over 90km of drains were blocked and 300 ha of trees removed. In England, the RSPB has commenced restoration of blanket bog on Geltsdale reserve in the North Pennines. Here we have blocked drains, reduced livestock numbers and cut heather to facilitate the recovery of peatland vegetation. Elsewhere in England, the RSPB are working closely with United Utilities plc (Sustainable Catchment Management Programme) to deliver improvements in raw water quality by *restoring* degraded blanket bog through blocking drains, re-vegetating bare peat and reducing livestock numbers. This work is funded by water customers and via Rural Development Programme funding.

Efforts to *restore* damaged blanket bog require major capital investment. The RSPB has used a broad range of funding streams to capitalise work including: EC Life Nature funding, HLF, Charitable Trust Funds, grants from public bodies, Rural Development Programme funds, public donations (e.g. direct from RSPB members). Despite a proven track record in fund-raising, we recognise that future fund-raising will be challenging. At Forsinard Flows we hope to acquire over 1,200ha of forest and bog from the FCS in 2011/12 and other key forest blocks are for sale at present which will have significant acquisition and management costs. We look to Government(s) to recognise the range of multiple benefits that peatlands deliver[5] and to support future restoration activity. Whilst biodiversity must remain a key driver for restoration, we recognise the importance of peatlands as the major terrestrial store of organic carbon in the UK. Future management must seek to secure the existing carbon store whilst enabling further sequestration of carbon to occur. The ecological restoration of damaged blanket bog at a landscape scale, represents the best way of securing the full range ecosystem services that blanket bogs deliver.

References
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2. Birds, bogs and forestry. The peatlands of Caitness and Sutherland. Stroud et al. 1987. Nature Conservancy Council
3. Associations between distance to forest and spatial and temporal variation in abundance of key peatland breeding bird species. Hancock, Grant & Wilson. 2009. Bird Study 56, 53-64
4. The Peatlands of Caithness & Sutherland. Management Strategy 2005-2015. 2005. SNH
5. Ecosystem Services of Peat. Phase 1. 2009. Defra project SP0572

1.5 Roger Mitchell - Corrour Lands Limited

1. Corrour is a private estate in the West Highlands of Scotland. Its 23000 ha is comprised of some 18,500 ha of upland heath and blanket bog, 4000 ha of commercial forests and woodland, and 500ha of lochs and burns.
2. The estate lies between Ben Nevis SAC to the west and Ben Alder and Aonach Beag SAC to the east and, though outside the site boundaries, shares many of the habitat types and management issues. Some lochs and lochans on Corrour are notified as an SSSI for black-throated diver, and a large area of the forests is notified as a SSSI for geomorphological features.
3. The present owner acquired most of the estate in 1995 and continued its management as a sporting estate. Then in 2005, a Biodiversity Action Plan for the estate was commissioned which was adopted as the framework document for managing the estate from 2007. A review of the progress with the BAP after 3 years shows that of the 180 actions, 55% have been started and 40% completed.
4. The stated aims of the owner of the estate are to:-
    a. protect the wild land now and for future generations;
    b. adopt a holistic approach to protecting the land and addressing the social and environmental impacts of all its activities;
    c. promote biodiversity and beauty, and responsible use of resources; and
    d. enhance the experience of all who work on, live in, and visit Corrour.
5. It is estimated that some 15,000 visit the estate annually; many making use of the estate's holiday cottages and the accommodation and restaurant leased to the SYHA. Corrour's full and part-time staff numbers have risen from 12 in 2008 to 17 in 2010.
6. Recent surveys indicate that Corrour has a number of BAP Priority and Habitats Directive mire habitats. The vast expanses of blanket bog outside the forests appear generally in good condition. A SCM type assessment at 28 waypoints on open ground passed all targets at all but 3 points – these were largely due to local hagging and high deer trampling impacts. The southern part of the estate is really a northern extension of Rannoch Moor. However, parts of the bogs in the forests are not in such good shape, impacted by both inappropriate commercial non-native conifer planting and regeneration of conifers.
7. The owner of Corrour from 1891 to 1966 was Sir John Maxwell Stirling and heirs. Sir John pioneered the planting of conifers, especially Sitka spruce on peat soils on high moorland; he was Chairman of the Forestry Commission from 1929-32. His legacy of planting conifers on peat soils was continued by the Forestry Commission to the north of the estate who planted both Sitka spruce and especially lodgepole pine on deep peat soils when establishing the Corrour Forest in the 1970s. Corrour estate acquired the southern Corrour Forest in 2007 and the northern part, together with Inverlair Forest in 2009. A principle objective in managing these forests will be, alongside a portion of commercial forestry, to restore native woodland, peatland and riparian habitats. One of the challenges faced by the estate is how to determine the best techniques to remove or otherwise dispose of the stunted, valueless trees from the deep peat areas to restore the habitat. Another challenge is how to afford the work required, though certainly some profits from the commercial forestry will be invested in habitat restoration.
8. The most resource intensive piece of environmental management on Corrour at present is, undoubtedly, the control of the deer population to a level where they no longer damage the habitats but are a positive asset as a major shaper of the landscape. There

have been no sheep on the estate since 2007, and no intentional muirburn. As an environmentally driven estate we recognise that it is incumbent upon us to manage both the numbers and distribution of deer to make sure that their impact on habitats is acceptable, especially on the peatlands, new plantings and natural woodland regeneration areas. Reducing the impact of deer is usually through a combination of individual tree protection, fencing and culling. On Corrour culling is seen as the primary, preferred method in order to minimise fencing. In the last three years our reduction cull has halved the population to a density of about 8 per square kilometre, and we intend to take this down to 5 per square kilometre over the next two years as our vegetation monitoring is not yet recording a significant positive response. We are also taking steps to reduce the habitat and visual impact on peat soils of ATV usage for the deer cull.

9. In managing our deer with environmental objectives in mind, including the minimal use of fencing in habitat restoration, we are at odds with some of our neighbouring sporting estates which tend to favour higher numbers of deer which are generally fenced out of the forests. Whilst we recognise that the value of sporting estates is influenced by the number of sporting stags, we hope in due course that the value of estates will be more concerned with the ecosystem services such as carbon sequestration and storage, biodiversity, hydro-power etc.
10. As part of our push towards, at least, economic sustainability we have plans to develop around 5mW of hydro-power on Corrour. Although the water-courses that are presently targeted have virtually no riparian vegetation and run through a treeless, overgrazed landscape, often with peat hagging, SEPA reckon they are of high quality and have indicated that this will constrain our plans. Our view, supported by our own commissioned biodiversity surveys, is that our streams are rather dull but will eventually be much improved over the whole estate as we get deer numbers down and the peatland and other habitats in the catchments are restored.
11. In all of the above, another challenge is to where to get the best evidence based advice on the management interventions necessary to restore the peatland (and other) habitats on Corrour. And where the hard, scientific evidence is lacking, how best to determine effective, sustainable, management solution.

Section Two
Peatland Restoration for Climate Change

2.1 Mike Billet & Peter Levy – Centre for Ecology & Hydrology

1. The approach currently used for accounting GHG from peatlands in the national inventory and potential of the new LULUCF proposals.

CEH reports emissions and removals of CO_2 and other GHGs from the Land Use, Land Use Change and Forestry sector (LULUCF) for the UK. Reporting of emissions from this sector is based on land use categories and follows guidance produced by the Intergovernmental Panel on Climate Change (IPCC). Carbon stock changes on peatland soils can be reported under the Organic Soils part of the major land use categories (Forest Land, Cropland and Grassland) and GHG emissions from drainage, cropland conversion and biomass burning. There is also a Wetlands category but, because categorisation is based on land-use, this only covers peatlands that are managed for peat extraction or land flooded in reservoirs.

Reporting of UK peatland emissions until now has been based on the 2003 IPCC guidance. Carbon stock changes in soils are estimated using a dynamic land-use change model (IPCC Tier 3 approach) which treats all soils as being on a continuum from mineral to organic (average soil carbon stocks, rates of change and transition times vary accordingly). Organic soils in the Forest Land category are treated using the C-Flow forest carbon model. Emissions due to drainage of English lowland peats are reported under the Cropland category and off-site emissions from horticultural peat extraction are reported under the Grassland category.

A lack of activity data which cover 1990-present and all of the UK, along with country-specific emission factors, has hampered reporting of emissions/removals from peatlands to date. In the 1990-2009 inventory (currently in preparation) we will report on-site and off-site emissions of CO_2, CH_4 and N_2O from peat extraction under the Wetlands category using the IPCC 2006 guidance. CEH, University of Aberdeen and North Wyke Research have a Defra-funded project (SP1105) which is scoping data availability for improved reporting of the impact of land management on soil carbon emissions/removals with an emphasis on peatlands. This will report by April 2011 and the results will be used to improve inventory reporting in the coming years.

There is a proposal to include wetland re-wetting/restoration as an elective activity under Article 3.4 of the Kyoto Protocol. It is not yet clear what the scope of this will be (i.e. which gases, what types of restoration) and guidance and methods will have to be agreed by the IPCC. If the UK were to elect to account for this activity then we will need to agree definitions (similar to the forest definition used for current KP Article 3.3 reporting) and develop activity data and region-specific emission factors that can be used to estimate emissions across the whole of the UK. At present, there are very few pertinent UK data to base emission factors on. Ideally, we require long-term monitoring of the GHG budget before and after restoration practices, and we know of only three sites in the UK where this is ongoing, and all of these are on a small scale.

2. Evidence from Auchencorth Moss and other CEH study sites on GHG fluxes.

CEH measures carbon and GHG (CO_2, CH_4 and N_2O) fluxes at several peatland sites in the UK; the most comprehensive and longest term measurements are from Auchencorth Moss, an ombrotrophic bog in southern Scotland. The CEH Carbon Catchments, which in addition to Auchencorth Moss include peatland sites at Forsinard (N Scotland), Moor House (N England) and Conwy (N Wales), aim to fully account for all the different flux pathways in and

out of the peatland. Our objective is to produce a complete carbon and GHG budget each year, by combining tower, chamber and aquatic flux measurements.

Auchencorth Moss in the period 2007-08 functioned as a net and significant sink for GHGs and carbon, with the greatest flux for both the GHGs and carbon budget being net ecosystem exchange (NEE). Terrestrial emissions of CH_4 and N_2O collectively returned only 4% of CO_2 equivalents captured by NEE to the atmosphere, whereas evasion (degassing) of GHGs from the stream surface returned 12%. Downstream export of dissolved organic carbon (DOC) represented a loss of 24% of NEE carbon uptake, which if processed outside the catchment in the fluvial system and lost to the atmosphere as GHGs, may lead to significant under-estimation of the actual catchment-derived GHG loss.

The results from Auchencorth Moss for the period 2007-08 showed a significantly greater NEE and drawdown of carbon from the atmosphere compared with the period 1996-98. While the differences can be partly ascribed to improvements in NEE flux measurement protocols and methods, it is well known that year-on-year climatic variation causes significant inter-annual variation in NEE. In 2011 we will reach five years of continuous and combined (atmospheric and aquatic) flux measurements at Auchencorth Moss – at that stage the long-term carbon and GHG sink/source relationships of the peatland, as opposed to the year-on-year variability, will be much clearer.

3. Views on the steps needed to secure peatland research of use to policy delivery.

It is vital to emphasise the importance of the peatland resource in the UK (and particularly Scotland) with respect to the cost of degradation (in terms of carbon and GHG loss), as well as the “gains” in restoring peatland.

The potential gain in carbon from restoration of degraded systems to intact peat bog can only be quantified if we know what the C and GHG balance (and the individual flux terms) of a fully functioning, intact peatland are. Although we currently lack this information for UK peatlands, the sites do exist (e.g. Flow Country) where the appropriate measurements could be made. Fixing this end-point will allow peatland restoration to be considered against other offsetting measures in terms of cost and economic benefit.

Peatland research is poorly represented in Scotland, Northern Ireland and many lowland peatlands. Much of the science that drives policy is from heavily impacted sites in the Pennines; this is a weakness in terms of delivering UK-wide policy.

Peatland researchers should be providing policy advice on “Targeted Restoration”. Specifically what peatland sites are the most suitable for rapid restoration (quick wins) and where will restoration be most cost effective? The most important landscape drivers to successful restoration are likely to be hydrology/topography.

If peatland restoration is to be included within the GHG inventory, better data are required on which to base emission factors. Ideally, we require long-term monitoring of the GHG budget before and after restoration practices, and we know of only three sites in the UK where this is ongoing, and all of these are on a small scale. The effects of peatland restoration on biodiversity and GHG emissions/C storage need to be integrated to provide policy makers with “joined-up science” for “joined-up policy”.

Peatland research needs to consider “off-site” effects of restoration on carbon and GHG fluxes. Specifically what is the fate of fluvial organic carbon lost from peatlands and are there feedbacks in terms of GHG emissions?

Section Three
Peatland Restoration for Water

3.1 Andrew Walker – Yorkshire Water

Around 70% of the water sources used for public water supply, derive from the uplands of Britain. They are an invaluable resource, and there would be insufficient water in the rivers and groundwaters to make up that deficit. At Yorkshire Water we supply 4.7million customers with water and sewerage services. As one of the largest landowners in Yorkshire we own and manage some 25,000 hectares of which 11,500 are designated SSSI, and most of it is upland water catchment. We take a positive and proactive stance towards all forms of agriculture and sport, and aspire to be the best landowner, as well as the best water company. Our ethos is to work in partnership with our tenants and all land managers to discuss issues affecting us both, and work on ways in which we can resolve those issues to mutual benefit. This is not always the easiest choice, but it is the right, socially responsible approach.

Upland reservoir water is more discoloured than lowland river water, but gravity weighs in its favour. Water is heavy stuff, and costs a vast amount to pump round the region, so the more we can use gravity, the better. Apart from colour, upland water is often less polluted in terms of sediments and pesticides, and this makes it less expensive to treat too. We optimise water treatment and distribution on a 15 minute rolling cycle to ensure we achieve the best value possible. YWS is amongst the biggest consumer of electricity in the region, with a bill running into millions each year. Pumping water is a significant part of that bill.

Colour, or dissolved organic carbon (DOC) as we know it, comes from the degradation of peat. Various influences impact on the scale and rate of that degradation, from climatic changes to how the land is managed. Colour has been increasing steadily over the last 20 years or more, and is getting so bad that our current WTW processes are being stretched in their ability to treat water to the highest standards required under European and UK law. The latest technology, MIEX, is capable of pre-treating the raw water to a level where the existing processes can cope, but MIEX is a very expensive process to install, and run. MIEX plants typically cost £5m upwards, depending on the works throughput, and add a significant percentage cost on the unit rate for treatment. We have 17 WTW which have to remove colour from the raw water, so the implications for having to install MIEX on all of them is huge. A potential solution as we see it, is to address the causes of colour, not just treat the symptoms, through catchment management interventions.

Failure to remove all the organic (DOC) matter from raw water can cause the formation of TriHaloMethanes (THM's which are thought to be carcinogenic). The UK's potable water is among the best in the world, and our customers trust it to be safe to consume day in day out. Some may say that a bit of colour in the water doesn't do you any harm, and it would be easier to relax the standards. This cannot and will not happen, as the population must be in no doubt that their water is safe to drink.

YWS will be investing around £9m in upland catchments over the next 5 years in order to stabilise and improve the hydrology of these deep peat systems. Keeping the peat wet and anaerobic, and seeking to encourage the vegetation assemblages that formed the peat in the first place, should prevent further deterioration in water quality. Shallow peats, dominated by dry heath vegetation do not generate significant levels of colour; they are valuable habitats in their own right, and an instantly recognisable and intrinsic part of upland Britain. Our work is focused on physical interventions to raise the water table, together with influencing future management and policy, to make sure that investment is not compromised or damaged. We are only looking at deep peat systems, or bogs which have become

degraded for a number of reasons. Drainage; inappropriate burning; wildfire damage, and overgrazing are the key causes. Whilst the climate may well have an impact, and may continue to do so, we cannot change that.

We can implement physical changes on the moors, and indeed many of these activities are relatively straight forward to do. The really hard bit is persuading landowners to change. Many of those we are dealing with recognise that their moors – or investment assets if you will – are eroding, in some cases, very quickly. If we can encourage landowners to build resilience to big summer storms for example, into their landholdings, they are more likely to have a moor left in 10 years. There are long term benefits to a multitude of beneficiaries, including moorland owners, but the first domino has to be prepared to tip. Ecological potential of downstream systems; water quality in terms of colour and reduced sedimentary pollution, and perhaps flooding could all benefit from adjustments to management in key sensitive areas, helping to maintain that functioning peatland habitat. In turn, an acceptance that changes in management need to happen now, could protect the moors from further damage, and ensure the grouse moor industry has a future in 50 years. The benefits of carbon sequestration and ecological improvements of functioning peat bog systems are covered extensively elsewhere by experts who know more about it than us.

If we are successful over the coming 5 years, we would seek to securing similar levels of funding in AMP6 (2015-20), again for catchment interventions. These are very significant sums, and demonstrate YWS commitment to addressing colour at source.

Various regulatory drivers are also focussing the Industry on catchment solutions to water quality problems. OFWAT our financial regulator and the Drinking Water Inspectorate (DWI) want us to prove that catchment solutions wouldn't work before sanctioning the more traditional end of pipe solutions. This is a significant shift in Regulation, and encourages us to work in partnership with other stakeholders to derive solutions which can benefit us all.

Under Article 7 of the Water Framework Directive, the Environment Agency is charged with protecting water used for public consumption. Drinking Water Protected Areas (DWPA's) have now been designated and failing waters will be targeted through the development of Safeguard Zones, where voluntary measures to improve water quality will be introduced. Failure to meet the target, or an unwillingness to participate and change the management causing the pollution, can ultimately allow for the introduction of a Statutory Water Protection Zone (WPZ), in which the polluting activity can be banned.

This legislation is a useful tool for the Water Industry, but sticks are not a positive and engaging way to engender change. Reasoned debate, backed up by considered, trusted and integrated research must be the best approach. Sticking your head in an eroding peat pipe isn't going to solve anything; recognising there is a problem and wanting to do something about it is, and we must all try and park our differences and look towards the bigger goal. We need our peatlands, and they need us.

3.2 Robert Stewart – Scottish Water

1. Purpose of Paper

The IUCN UK Commission of Inquiry on Peatlands are holding an Open Inquiry event on 3 November 2010 in Edinburgh. Scottish Water has been asked to provide it's views on:

- the headline issues and implications of damaged peatland for the water companies; and
- possible steps towards peatland restoration.

2. Scottish Water Context

Scottish Water abstracts from nearly 500 sources of water including lochs, reservoirs, rivers and groundwater (boreholes and springs). Water is treated at 280 Water Treatment Works. Due to the remote geographical dispersal of our rural communities, we have a high number of very small water treatment and supply systems (75% of our total number of WTW produce approx 1% of the treated water).

Scottish Water owns approx 70,000 acres of catchment but we have typically leased out this land for agricultural or forestry and hence do not currently carry out land management activities ourselves. Our abstraction regime is regulated by Controlled Activity Regulations (CAR) Water Use Licences (managed by SEPA) and Landowner Agreements.

Peat is found to a greater or lesser extent in the vast majority of catchments across Scotland with particular predominance in the north and west of the country.

"Peaty catchments" can have a major impact on the quality of water being abstracted for drinking water purposes in the form of high organics and colour (from Humic Acid) which if not treated can result in colour, taste and odour complaints. Poor raw water quality events tend to be driven by:

- extreme weather events; and / or
- activity in the catchment (eg land use, agricultural activity, developments altering land use, and forestry management activities etc)

With Climate Change effects we believe the trend of more variable weather conditions may result in more frequent extremes in the untreated water quality conditions putting more pressure on existing treatment processes and risking drinking water quality compliance during extreme events.

Over the years, European legislation has driven ever-tightening drinking water quality standards and the water industry has typically responded by increasing the sophistication and robustness of the treatment processes to deal with a whole range of raw water issues. So we have developed treatment over the years to deal with the full raw water quality envelope each catchment delivers to the WTW and we have therefore ended up with robust sophisticated processes. So the direct effects of peatland are currently considered to be relatively low in terms of their impact on SW's ability to maintain adequate and wholesome potable water supplies.

Article 7 of Water Framework Directive aims to protect catchments designated as Drinking Water Protected Areas against deterioration in raw water quality due to anthropogenic activities (eg further peatland drainage etc) to ensure Scottish Water do not have to increase levels of treatment for this reason.

3. Benefits of Peatland Restoration

Restoring or preventing further damage to the fabric of peatland within SW catchments could lead to improved raw water quality and result in a range of benefits.

Carbon and Cost:

Reduced power and chemical costs for treatment processes resulting from extending the cleaning / replacement cycles – but the scale of savings has not been determined. This could benefit both carbon and cost considerations. Extending the asset life of membrane processes could result in reduction in capital maintenance spend.

Water Quality:

If peatland restoration activities deliver an improvement to (or reduce the risk of further deterioration of) the raw water quality envelope especially preventing peak conditions for

colour, turbidity and TOC it is also likely to improve stability of disinfection. These benefits would result in improvements to overall performance and potentially lower the numbers of customer contacts.

Partial restoration may provide some marginal improvement – but what scale of activity can be undertaken? It is assumed to be unlikely that a whole catchment could be restored to the point of reducing the level of treatment provided to ensure legislative compliance with drinking water standards.

4. What Can Scottish Water Do?

Support and Promote Peatland Restoration and Prevent further deterioration:

Scottish Water is keen to work in partnership with SEPA to ensure the protection measures within WFD are understood, monitored and enforced. Scottish Water is also keen to support and promote peatland restoration wherever possible.

Investigate Cost Benefit of Peatland Restoration to Scottish Water

Scottish Water is part-funding a WRc Portfolio Research Project (CP416 Quantifying the Benefits of Catchment Management). Through close collaboration with this project we hope to further understand the long-term cost benefit of undertaking a range of catchment management activities. The scope is currently being finalised and we will request that peatland restoration is considered in this project.

Sustainable Land Management

During the 2010 – 2015 investment period, SW will be developing and implementing Sustainable Land Management (SLM) in 5 water catchments. It is also our intention that we work with third parties where we have common interests to increase the net gains to both our customers and the environment.

5. Summary

Scottish Water is keen to work with other stakeholders and agencies in Scotland to support and promote the understanding of the benefits of peatland restoration.

3.3 Simon Drew – CLAD

Who we are: CLAD (Carbon landscapes and Drainage) is a knowledge exchange (KE) network funded by the Natural Environment Research Council (NERC). The Principle Investigators are Prof. Susan Waldron (U. of Glasgow), Prof. Dave Gilvear (U. of Stirling) and Dr Ian Grieve (U. of Stirling). Dr Simon Drew is the Network Coordinator.

What we do: CLAD works with peatland stakeholders (developers, environmental consultants, academics, conservationists and regulators) to facilitate knowledge exchange regarding areas of human activity such as development, which might affect the carbon balance and hydrology of peatland habitats. Further information regarding our work can be found on our website (http://www.clad.ac.uk).

CLAD KE is active in several areas relevant to the IUCN commission of inquiry: drainage, policy, carbon (relevant to climate change), restoration and sustainable management. These topics fall within a key focus of CLAD activity, which is KE of the effect of development in peatlands. The largest (but not exclusive) current development activity is that of windfarm construction and operation on peatlands. Such development may alter aquatic carbon export (e.g. Grieve and Gilvear, 2008; Waldron et al., 2009) but the longevity of this impact is not documented.

CLAD PIs currently supervise three PhD students conducting research on questions relevant to the effect of windfarm developments on peatland. This research will be crucial in beginning to understand the longer-term effects of development on peatland hydrology and carbon balance. As yet their theses are not submitted, so their unpublished findings cannot form part of this submission.

What we have found: Windfarm developers and other CLAD member stakeholders with an interest in windfarms have been open, communicative and interested in our work and the interests we exist to promote. We have worked closely with them to promote knowledge exchange in this area and address some to the issues highlighted below.

Developer Obligations: Peat management associated with development has been discussed as a matter of priority ever since the submission of planning permission for the proposed windfarm on the Isle of Lewis. Most groups associated with windfarm developments are aware of the importance of peat and some of the key technical areas such as the impact of drainage. However, in our experience this knowledge is not universal and we are aware of situations (outside of Scotland) where contractors are unaware of some of these key issues or their importance.

There are a number of environmental obligations which developers are required to fulfil. Some of these obligations are site specific and may stipulate actions which will have positive impacts on hydrological export of carbon e.g. drain blocking. However, as far as we are aware, there are no statutory obligations in effect with the specific intention of conserving peat carbon sequestration or hydrological functions.

Much of the debate surrounding the effect of windfarm developments on peatland carbon balance and hydrology has taken place within the framework of a new technical development known as 'The Carbon Payback Calculator for Windfarms on Peatland'. This Scottish Government funded model, available online, was developed by Dr Nayak and Dr Smith of Aberdeen University. It calculates the carbon released to the atmosphere during windfarm construction and operation and balances this against the reduction in carbon released to the atmosphere by energy generation from wind. The suggestion to use the model is generally flagged up at the scoping stage and discussion of the results will take place at various stages of the consultation process. This kind of dialogue in the planning process acts as *de facto* regulation of peatland carbon balance.

Outstanding research questions: Windfarm development has progressed faster than the capacity to make evidence-based management decisions with respect to hydrology and carbon balance. There are a number of components of windfarm development relevant to carbon export in drainage systems that remain almost completely unquantified. They are:

Disposal of peat excavated for turbine bases and other infrastructure. At present the standard (but not exclusive) approach to this problem is to house this peat in the borrow pits created for aggregate production. These features can contain thousands of tonnes of peat and the surfaces are subject to vegetation rehabilitation. However, their carbon balance and long term sustainability are unknown.

Trenching for cabling is dug to connect the turbines to the main electrical grid. The peat removed is left on trench side (often for several weeks) until it is backfilled after cable emplacement. Relatively large areas are affected yet effects are not understood.

Roadbuilding to allow turbine placement and maintenance. Roads may be emplaced on the substrate underlying the peat following peat excavation. Alternatively, roads can be 'floated' on geotextile aimed at reducing effects on hydrological flow and damage to underlying peat.

We are not aware of any published research on the effects of these roads on the water and carbon balance of peatlands.

Effects of reduced wind resource. Wind turbines necessarily reduce wind speeds as they transform wind energy into electrical energy. Monitoring of peatland vegetation post construction has recorded increased growth of sphagnum moss (a key component in peat formation), with a feasible interpretation that wetness has increased due to reduced evapotranspiration resulting from reduced windspeed (Dargie 2008). Should this situation be common to windfarm developments it may have a significant positive effect on carbon payback calculations. The effect is currently being investigated as part of a three year research project funded by the NERC.

In addition, there is little understanding of the monitoring required with an urgent need for monitoring protocols to be developed for contractors to determine key inputs for the carbon calculator and post-construction consent condition monitoring.

How can we work with developers to address these outstanding issues? There are a number of outstanding planning applications for windfarm developments on peatlands and the expansion of this industry suggests there will be more to come. Given the current reduction in government spending it seems highly unlikely that funds (via statutory interest groups and/or research councils) will be made available to delineate the effect of developments on peatland carbon cycling and hydrological function.

CLAD advocate the solution to this problem may lie with industry, in that they address these questions and fund correspondingly appropriate research. Examples of such good practice exists e.g. in conjunction with CLAD, whereby SSE have funded doctoral research (utilising Gordonbush windfarm, near Brora) that will better inform the payback calculator and assess changes in C export as a result of the habitat management plan. This is progress, but not the best funding model: there is a disincentive for an individual company to progress the required research as all (financial) risk associated with funding lies with the developer, while the rewards are enjoyed by other non-contributory parties. An improved approach requires i) a contributory fund designated to enable applied research, administered via an independent group of representative stakeholders which consults relevant bodies and individuals on research priorities and ii) effort invested into a common research site to maximise return (this was advocated at the first annual CLAD meeting). Results should be published in an appropriate peer-reviewed forum and disseminated via representative bodies such as the Scottish Renewables Forum or the British Wind Energy Association. This approach would spread the risk, allow informed management decisions to be made and allow the possibility of matching funds from other sources. The Aggregates Levy Sustainability Fund which is supported by aggregate extraction companies to address the environmental costs associated with the industry may be an example of a possible model for this type of mechanism. Ultimately this approach will provide a better understanding of landscape resilience and adaptation and inform conservation needs.

Dargie T (2008) Windfarms in Scotland's larges carbon landscape: habitat monitoring and its implications for ecological impact assessment and mitigation. Proceedings of the 29th IEEM conference.Glasgow 18th- 20th Nov 2008. Conference title 'Smoke and mirrors or biodiversity enhancement'. Pages 126-146

Grieve, I and Gilvear, D. (2008) Effects of wind farm construction on concentrations and fluxes of dissolved organic carbon and suspended sediment from peat catchments at Braes of Doune, central Scotland. *Mires and Peat* 4, Art. 3. (Online: http://www.mires-and-peat.net/map04/map_04_03.htm).

Waldron S, Flowers H, Arlaud C, Bryant C & McFarlane S. (2009) The significance of organic carbon and nutrient export from peatland-dominated landscapes subject to disturbance: a stoichiometric perspective. Biogeosciences, 6, 363-374, 2009.

3.4 Dave Gorman & Johan Schutten - SEPA

Why are peatlands important for Scotland, and what is SEPA's role in protecting the range of ecosystem services provided by peatlands?

Scotland has a considerable peatland resource delivering a range of ecosystem services such as carbon storage and sequestration, agriculture, biodiversity, recreation, and water quality and quantity management.

'SEPA aims to protect Scottish peatlands using the statutory instruments we have available whilst optimising the ecosystem services they deliver. This is often delivered in partnership.'

What categories of peatlands is SEPA involved with, and how do we manage impacts?

- Organo mineral soils. The soils with surface peat layers (horizons) of less than 50cm thick are important for farming, but also contain considerable quantities of carbon and the needs of both ecosystem services needs to be balanced. The Scottish Land Use strategy, which is available for consultation, recognises the importance of the multiple functions of land and identifies the need for a strategic approach. SRDP already supports some of those functions. How this land is managed strongly affects its role in combating diffuse pollution, which SEPA regulates via the Water Environment and Water Services Act (2003).
- Fen, reedbed and wet woodland. The soils of these habitats frequently contain significant quantities of peat, and their waterlogged nature often results in peat formation. Fen, reedbed and wet woodland adjoining or adjacent to rivers and lochs fulfil important hydro morphological functions. These wetlands can purify moderately enriched water, regulate water flow and temporarily store flood water. Fens are also used for grazing. SEPA considers fen and reedbed to be part of the surface and ground water environment and we use WEWS (2003) to protect them.
- Blanket bog. Blanket bogs contain large quantities of peat and can, under proper management, effectively sequester carbon. SEPA does not regulate water related activities on blanket bog directly, but manages impacts on the downstream water environment and associated wetlands through WEWS (2003). Blanket bog is often a mosaic of wetland types including those dependent on groundwater such as springs, seepages and flushes. Impacts on groundwater dependent wetlands are managed by SEPA through WEWS (2003). SEPA provides technical advice to the Scottish government on the carbon savings calculator used for windfarms covered by section 36 of the Electricity Act (over 50MW). Excess peat material (that cannot be re-used) that is generated during construction activities on peatlands is considered to be waste and is managed through PPC (http://www.sepa.org.uk/waste/waste_regulation/guidance_position_statements.aspx). Blanket bog is a frequent habitat in the head waters of our rivers and the management of water migration through this can be important for Natural flood management under FRM Act (2009)
- Raised bog. Raised bogs contain large quantities of peat and can, under proper management, effectively sequester carbon. SEPA does not regulate water related activities on raised bogs directly, but manages impacts on the downstream water environment and associated wetlands through WEWS (2003). Excess peat material (that

cannot be re-used) that is generated during construction activities on peatlands is considered to be waste and is managed through PPC.

What instruments does SEPA use to protect or contribute to the protection of peatlands?

SEPA uses a combination of planning and regulation (licensing) to influence the management of peatlands.

- We advise planning authorities to steer development away from peatlands, particularly areas of deep peat and wetlands dependent on surface or groundwater (SEPA Planning guidance available at http://www.sepa.org.uk/planning.aspx)
- Where applicable (see above under the peatland categories) we directly manage impacts on peatlands via our regulatory role.
- We influence and shape Scotland's biodiversity agenda via the Scotland Biodiversity forum and its various groups
- We have worked in partnership with SNH (project lead), FCS, and industry to develop 'Good practice during wind farm construction guidance' (http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/good-practice-during-windfarm-const/)
  '*Early inclusion of the good practice guidance can greatly reduce impacts from developments on peatlands'*

- We have worked in partnership with SNH (project lead), EA, NIEA, NE, CCW and RSPB to develop the 'Fen Management Handbook' which advises on the best management of fen habitat. (http://www.snh.gov.uk/about-scotlands-nature/habitats-and-ecosystems/lochs-rivers-and-wetlands/fen/)
- SEPA is currently working with Scottish Government and relevant partners to ensure carbon assessment of windfarms in peat is appropriately understood and assessed
- SEPA considers peatlands to be an important component of the Flood Risk Management Act (2009). '*Peatlands are important components in catchment wide flood generation and the storage, state and management of them can be an important tool for sustainable natural flood management*'.
- SEPA participates in catchment based incentives, such as the Clyde Valley Green Network (http://www.gcvgreennetwork.gov.uk/)

What can be improved to protect peatlands from damage?

- The assessment of soil carbon, its state and management is currently fragmented across several authorities. '*SEPA advises that soil carbon is assessed, monitored, regulated and protected via the planning and environmental protection systems in a coordinated way*.'
- SEPA advises that the policy agenda for protection of peatlands in Scotland is better co-ordinated, including drivers such as Climate Change Act, FRM Act, WEWS, NCSA.
- Our experience and the evidence in the IUCN reports indicates that further research on the impacts of developments and management practices (e.g. grazing and burning) on peatlands is required.
- SEPA recognises the large benefit of good practice guidance and suggest development of good practice guidance for a range of construction activities on peatlands, for example a greater understanding of best practice for decommissioning (e.g. wind farms) developments on peatland

What can be improved to facilitate conservation and restoration of peatlands?

- Long term sustainable restoration of peatlands needs to include and optimise **all** ecosystem services (environmental social and economic) that the peatland provides, both of the actual area and its functioning in the wider catchment
- Agricultural and other land management subsidies need adjusting to optimise ‘peatland management’ for all its ecosystem services, and needs a countrywide strategic approach.
- The peatland protection agenda needs to be synergistic with the climate change agenda.