Scottish Natural Heritage

Scotland's National Peatland Plan

Working for our future

Foreword

Scotland is a peat-rich nation. This shapes the way we use our land and contributes to our landscapes, culture and heritage. Many of our most iconic views are framed and coloured by peatland habitats.

Although many will rightly associate peat, peatland habitats and products with the Highlands and Islands, most of us, even in our major towns and cities are never far from a peatland. For many these are our local wild areas; places to walk, to play, to enjoy the fresh air, and maybe even to help a local group with its management. However, peatlands are also places of work, where livestock and game are managed and energy produced and places of inspiration for the tourist and leisure industries and the arts.

But these are only some of the benefits of peatlands. They are rich in biodiversity – from the insect-eating sundews to soaring eagles. Much of our drinking water filters through the moss and peat before making its way to rivers, reservoirs and taps. It also adds to the flavour, and perhaps even more so to the mystique, of some of our whiskies.

But it is as a carbon store, and means of moderating our greenhouse gas emissions that peatlands have risen to prominence in recent years. Our peatlands, the scientists who study them and those who manage them, have a major role to play in combating the effects of climate change.

Of course it is only when our peatlands are in a healthy state that all these benefits flow. Many of our peatlands are not in good condition. As a result they produce fewer benefits, while some are releasing peat and carbon rather than storing it. This reduces the quality of the rivers into which they drain and increases the greenhouse gas emissions to the atmosphere.

Scotland's National Peatland Plan provides a framework for recognising, communicating and, where appropriate, quantifying the benefits of healthy peatlands and marshalling the knowledge, skills, incentives and funding to improve the condition of those which are damaged or degraded. It will bring together representatives from a wide range of interests to form the National Peatland Group, chaired by Scottish Natural Heritage to drive forward this important agenda.

Dr Aileen McLeod MSP
Minister for Environment, Climate Change and Land Reform

Ian Ross
Chairman, Scottish Natural Heritage

Contents

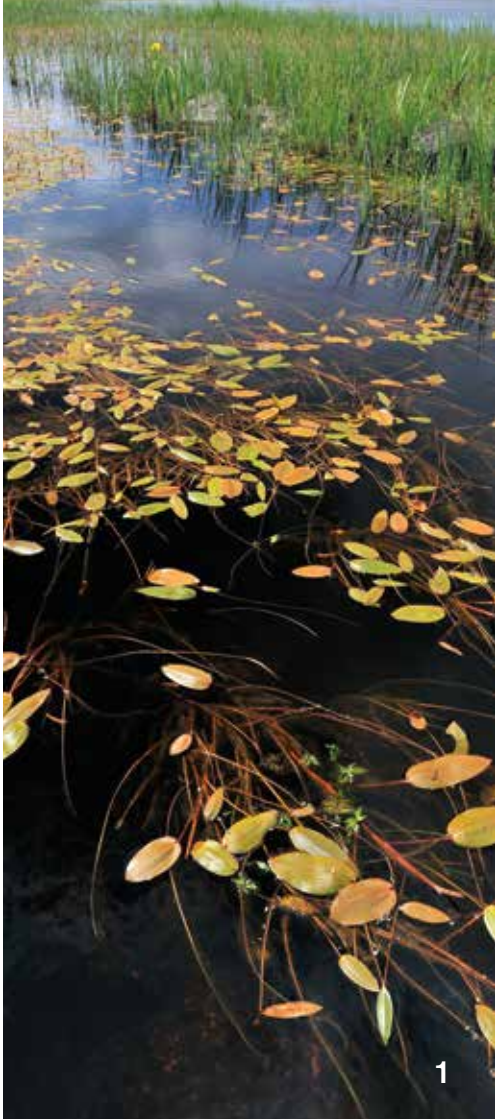
Summary

This is Scotland's first National Peatland Plan. It identifies the wide range of benefits provided by healthy peatlands, including a rich biodiversity, good water quality and carbon storage. We wish to retain such areas. However, much of our peatland is in poor condition and requires suitable management and, in many areas, restoration.

Although large areas of our peatlands are in the relatively remote uplands of the north and west, many of our cities, towns and villages have peatlands on their doorsteps. These can be important areas for exercise and relaxation, as well as providing opportunities for active involvement, education and awareness-raising.

Managing and restoring our peatlands to get the best we can from them requires a joint approach involving land owners and managers, scientific and technical expertise and appropriate levels of funding, together with the necessary policies and guidance to steer activities in the desired direction.

The National Peatland Group, chaired by Scottish Natural Heritage, will lead this work.



1. Why focus on peatlands now?

Our peatland landscape defines the wild character of much of northern and western Scotland. Yet if we look closer we find peatlands throughout the country – in the Central Belt, in many reaches of Galloway and the Borders, and within a short distance of the bounds of most towns and cities. In total, peatlands cover more than 20% of Scotland's land area.

We are coming to realise the great significance and importance of these areas. As stores of carbon they are supremely important in helping to tackle climate warming; as homes for nature they are special and unique; and as the raw ingredient of rural farming, tourism and crofting they are vital. Many other benefits flow from them, especially where they are in good health – clean water, lower flood risk, beautiful landscapes, and other defining characteristics of wild Scotland. Some of the uses are distinctively Scottish – the contributions of peat to the whisky industry and as a domestic fuel in rural parts, to name just two.

However, peatlands are in decline – large areas have been developed over centuries with extensive damage to the mantle of peat and its specialised vegetation. Estimates point to as much as 80% of the UK's peatland landscape having been damaged[1]. Most of that peatland is in Scotland and it is estimated that 70% of our blanket bog[2] and 90% of our raised bog[3] area has been damaged to some degree. Damaged bogs are a source of climate-warming greenhouse gases[4], reduced water quality[5] and deliver a diminished range of other services.

[1] www.iucn-uk-peatlandprogramme.org/sites/all/files/IUCN%20UK%20Commission%20of%20Inquiry%20on%20Peatlands%20Full%20Report%20spv%20web.pdf
[2] www.snh.org.uk/pdfs/publications/commissioned_reports/562.pdf
[3] www.snh.org.uk/pdfs/publications/research/78.pdf

We need to take action to reverse this trend, and to restore and improve our peatlands. The Scottish Government has recently funded a major programme of peatland restoration ('Peatland Action'[6]), with a commitment of future support through the Scottish Rural Development Programme (SRDP)[7]. This is a key feature of our climate change mitigation approach, and we want to build on this to create a far healthier landscape reflecting the multiple benefits of functioning peatlands. This Plan sets out our proposals for their sustainable use, protection, management and restoration. In addition, we set out some proposals for necessary research and awareness-raising activities.

At the heart of this we want to encourage partnerships with and between private land interests, industry, public bodies and environmental NGOs. For some this will be new territory, but the prize is well worth the effort. We want to encourage wise use and action in the wider countryside as well as on protected areas. We also wish to demonstrate to the international community how the numerous benefits provided by peatlands can be understood, valued and secured through cooperation and collaboration in pursuit of a common goal. For example, peatland restoration is one of the priority projects highlighted in the Scottish Biodiversity Strategy Route Map towards meeting the EU biodiversity target[8] of restoring at least 15% of degraded ecosystems.

[4] www.climatexchange.org.uk/files/1913/7339/0087/Research_summary_Potential_Abatement_from_Peatland_Restoration.pdf
[5] www.scotland.gov.uk/Publications/2006/09/21115639/0
[6] www.snh.gov.uk/climate-change/what-snh-is-doing/peatland-action
[7] www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items
[8] http://biodiversity.europa.eu/policy/target-1-and-related-aichi-targets

2. Vision

Scotland is one of the richest countries in Europe for peat[9], and has around 2 million hectares of it. Prized as uniquely important ecosystems and landscapes, peatlands are still viewed by some people as wastelands – bereft of character and use. We urge a change in this stance, for these areas can actually benefit us and the climate. We want to see peatlands valued much more highly and prized for their many benefits. We urge a new focus on positive management, supported by evidence and research, so that these landscapes are revived and healthy – not just in protected areas, but throughout the country. And we want to show leadership, sharing our experience with other countries.

By 2020 we expect to see improvements in the protection and condition of peatlands. They will be valued by government policies, developers, land managers and the wider public and no longer seen just as special interest habitats. The public will embrace peat-free composts. Public funding remains the main source of support for peatland management and restoration, but the level of private funding is increasing. We will have in place a network of demonstration sites for good management, a Peatland Code supporting private funding of peatland conservation and restoration, and peatland management included in national carbon accounting. All of our statutory protected areas should be in, or moving towards, favourable condition – an exemplar of good management in rural Europe. The Flow Country will have moved from the UK Tentative List towards being a fully "inscribed" World Heritage Site[10].

[9] Montanarella, L., Jones R.J.A. and Hiederer, R. (2006): The distribution of peatland in Europe. Mires and Peat 1: Art. 1. (Online: http://www.mires-and-peat.net/pages/volumes/map01/map0101.php)

[10] http://whc.unesco.org/en/nominations

By 2030 we want to see peatlands in a healthy state and widely regarded as resilient. By now there will be global recognition of the multiple benefits of peatlands to society, reflected in the level of support directed at ensuring their management as healthy ecosystems. Funding for stewardship will have extended from public to private sources, with appropriate rewards for the benefits derived from the peatlands' natural capital and the services flowing from their healthy ecosystem functions. By now, peatlands are viewed as essential to the nation's wellbeing and natural capital.

2050 and beyond the rewards of restoration effort undertaken in previous decades should now be evident. The effects of a changing climate will be more apparent, but our peatlands are coping where restoration and sound management have increased their resilience. Restoration work continues and management to secure and maintain multiple benefits is the norm, with the income from this helping to maintain rural skills and employment.

"The primary note is the brown of heather that is always, depending on sunlight or cloud, edging back and forth out of purple. Into this vast plane of sameness were inserted the silver shards from a hundred dubh lochans, fragmented pools that shimmer at the bog's surface."

From Nature Diary in *The Guardian* by Mark Cocker, 5 May 2015.

In meeting this vision, our **principal aim** is to:

– Protect, manage and restore peatlands to maintain their natural functions, biodiversity and benefits.

The **supporting aims** are to:

– Protect those areas of peatland currently in good condition and supporting their potential range of ecosystem functions;
– Enhance ecosystem resilience to climate change through appropriate management;
– Restore peatland ecosystem functions and biodiversity, evaluating and understanding the benefits to help inform future decisions;
– Secure greater peatland restoration capabilities and understanding of these amongst land managers, developers, advisers and the public;
– Ensure peatland values are reflected in the support given to those who manage and restore them; and
– Demonstrate and communicate the wider public benefits of healthy peatland landscapes and peatland restoration.

3. What are peatlands?

Scotland's peatlands embrace a wide range of soil types and habitats, notably blanket bogs, raised bogs and some fens[11]. A large extent of our protected areas support these, with 94 of 219 terrestrial Special Areas of Conservation designated under the EC Habitats Directive for peatland habitats extending over 221,000 ha[12].

We use the Ramsar Convention's[13] definition of peatland: "Peatlands are ecosystems with a peat deposit that may currently support vegetation that is peat-forming, may not, or may lack vegetation entirely". The Soil Survey for Scotland[14] states that peat should have an organic layer or layers that exceed 50 cm deep from the soil surface and an organic matter content of more than 60%.

This Plan encompasses all organic deposits greater than 50 cm deep together with any shallower organic deposits supporting typical peatland vegetation.

Some of the measures in this Plan are relevant to other peaty soils, particularly given their importance as carbon stores.

[11] www.snh.org.uk/pdfs/publications/commissioned_reports/701.pdf
[12] http://jncc.defra.gov.uk/ProtectedSites/SACselection/SAC_list.asp?Country
[13] http://archive.ramsar.org/pdf/res/key_res_viii_11_e.pdf
[14] www.scotland.gov.uk/Resource/Doc/917/0120458.pdf

Protected Areas

In order to protect special places, we have a suite of Sites of Special Scientific Interest (SSSIs) and 'Natura' sites, established under the EC Habitats and Birds Directives (1992 & 2009). National Nature Reserves (NNRs) showcase the best of nature. A range of other designations; National Parks, Geoparcs and Biosphere Reserves promote sustainable development and local community involvement, and Local Nature Reserves reflect nationally as well as locally important priorities. Most people in Scotland live close to protected places and have great opportunities to visit and enjoy them.

Protected places are especially valuable providers of ecosystem services because the ecosystems within them are in the best condition. They integrate conservation with people's enjoyment of nature, provide jobs, particularly in rural Scotland, and offer many other public benefits to health, education, employment, environmental justice and tourism.

They contribute towards many of the Scottish Government's 15 National Outcomes and its overriding purpose of sustainable economic development.

2020 Challenge for Scotland's Biodiversity

In addition to protected areas, there are measures to safeguard peatland interests based on Scottish Planning Policy[15]. Other policies and agreed management practices provide additional safeguards, e.g. The UK Forestry Standard (2011).

Types of peatland habitat

There are four main natural peatland habitat types in Scotland: blanket bog, raised bog, fen and bog woodland. Although all supported by peat, and there are some intermediate forms, generally they are quite distinctive in terms of their vegetation, hydrology, place in the landscape, nutrient status and, to some degree, geographical distribution.

Blanket bog is only found in a few parts of the world with cool, wet and typically oceanic climates. Under these conditions bog mosses and other plants break down very slowly and gradually form a layer of peat. Peat depth varies, with an average between 0.5 and 3 metres deep, but depths of up to 8 metres are not uncommon.

Found throughout the Scottish uplands, blanket bogs are most extensive in the north and west in areas with gentle slopes and poor drainage. They are dominant over the gently undulating moorlands, particularly in the North Highlands and Western and Northern Isles.

Blanket bog covers some 1.8 million hectares, 23% of our land area. Rare globally, Scotland holds a significant proportion of the European and world resource. It also supports some of our rarest and most threatened wildlife, including internationally important breeding bird populations.

[15] www.gov.scot/Resource/0045/00453827.pdf

It is also our largest terrestrial carbon store, holding around 1.6 billion tonnes of carbon. Ensuring that this carbon is secure, and enhancing its capacity to store more even more carbon, are among the highest priorities for this plan.

Raised bogs are found mainly in the lowlands. In their natural state, these appear as domes growing to 10 m or more in height, with the growing dome being 'fed' by rainwater. The surface is waterlogged, acidic and lacking in nutrients. Vast areas have been lost to agricultural, horticultural and forestry practices.

Fens are special places where nature and centuries of human activity combine to produce a rich and ever-changing habitat. Scotland supports a wide variety of different fen types, ranging from tiny fragments to extensive mosaics of wetland habitats at a landscape scale. Once highly valued for their products, their use within social and agricultural systems declined with the advent of intensive agriculture, drainage and mechanisation.

Bog woodland is one of Scotland's rarest habitats, with a limited range. Scots pine is the main tree species present, but other trees such as birch and willow occur. The underlying vegetation is often similar to that of open bog. As these woods can be hard to get into, they are often un-managed and probably represent some of our most "natural" native woods, with a truly wild feel to them.

A range of other semi-natural wet woodland types can occur on peatland and should be recognised for the biodiversity and other benefits they provide.

4. The state of peatlands

The extent and condition of Scotland's peatlands are becoming well documented, and the drivers of change are now well known. Designated sites with peatland features have been mapped and their condition assessed.

The condition of features on Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC) is assessed by SNH on a cyclical basis. Reporting in 2013 on the blanket bog Natura habitat under Article 17 of the Habitats Directive, we have described its Conservation Status as 'Unfavourable declining' – in a poor state.

However, currently 63% of blanket bog, 60% of raised bog, and 72% of fen, marsh and swamp features on designated sites are in 'favourable condition'[16].

Peatland condition is one aspect of 'Natural Capital'[17], which in turn is what provides the many benefits described in Section 5.

[16] www.snh.gov.uk/protecting-scotlands-nature/protected-areas/site-condition-monitoring
[17] www.naturalcapitalforum.com/what-is-natural-capital

Natural Capital

Natural Capital can be thought of as any other capital asset. A factory, the building and the machinery housed within it represent capital assets, allowing the owner to produce goods. Some profit from sale of goods is reinvested in the capital assets to keep them serviceable.

Natural capital assets are soils, trees, grasslands, peatlands, rivers, lochs and so on, and they provide ecosystem goods and services.

Like any capital asset, natural capital needs to remain whole, complete and in good working order to enable it to keep delivering and that requires some reinvestment.

The things that Natural Capital is able to produce, include food and drink, fuel, fibre, clean air and water, climate and flood regulation, pest control and disease resistance, and physical and mental well-being.

Location and extent of peat in Scotland

Several reports identify the extent of various impacts across Scotland, such as erosion, burning and peat extraction[18]. The IUCN Peatland Programme[19] provides substantial background material on peatland condition, management and restoration issues. Considerable survey and restoration work is being undertaken regionally and locally through SWT and RSPB, a variety of LBAP projects[20], by SNH, and by FCS on the National Forest Estate.

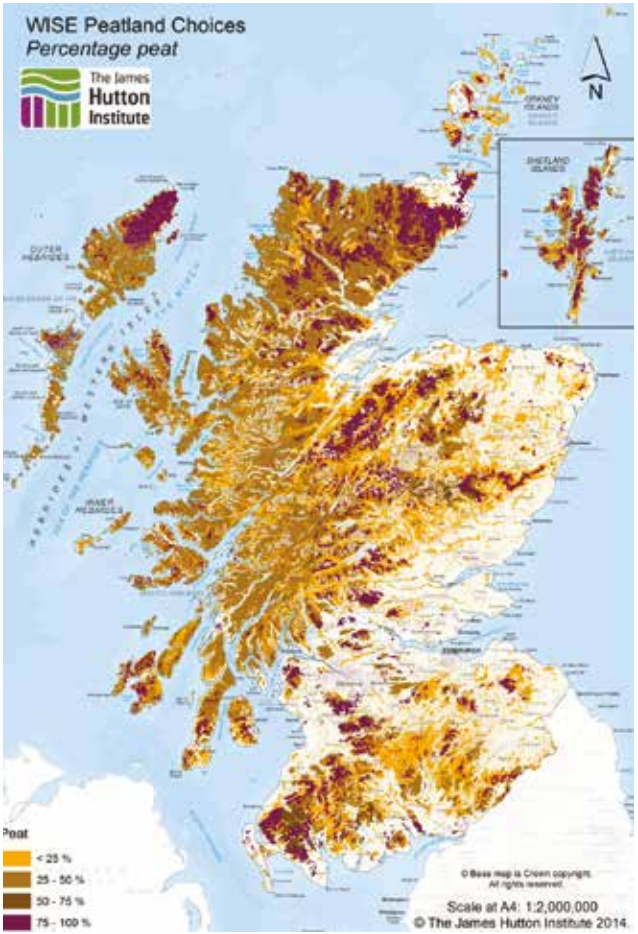


Figure 1: This map shows the proportion of land covered by peat across the country. It was prepared by the James Hutton Institute as part of their 'WISE Peatland Choices' initiative – a tool which indicates the potential of areas for peatland restoration (see Box on Page 24).

[18] www.snh.org.uk/pdfs/publications/commissioned_reports/562.pdf
[19] www.iucn-uk-peatlandprogramme.org/
[20] http://peatland.mccwel.com/peatland-gateway/gateway/uk

5. Benefits of well managed peatlands

The 2020 Challenge for Scotland's Biodiversity[21] includes a key imperative to restore Scotland's peatlands. SNHs Climate Change Action Plan[22] reinforces this and highlights the importance of peatlands for carbon sequestration, and opportunities for making them more resilient to climate change. In the face of climate change we have to improve management measures to make peatlands more resilient. The Scottish Government's Land Use Strategy[23] sets out the policy and operational context for the sustainable management of rural areas, many of which are peatland dominated. Peatlands are also a major component of our moorlands and as such are an integral part of the focus of SNH's recently published Review of Sustainable Moorland Management.

The UK Committee on Climate Change has highlighted that climate change is a further justification for action to protect and restore peatlands. Warmer and drier conditions in future are likely to increase the rate of carbon and biodiversity losses from degraded peatlands. Early action to restore these peatlands will at least slow the rate of carbon loss and potentially allow the bogs to adapt to the new conditions and maintain their peat forming function[24].

Peatlands benefit not only the wider environment but human health and well-being. For example the walk in to many of our mountains is through peaty areas. Community peatlands, mostly raised bogs in the Central Belt, provide areas for walking and enjoyment, but engagement in management and restoration activities also benefits physical health and social cohesion.

[21] www.scotland.gov.uk/Publications/2013/06/5538
[22] www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=1421
[23] www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy
[24] www.theccc.org.uk/publication/managing-the-land-in-a-changing-climate

Recently, there has been concentrated UK work on peatlands, particularly peatland restoration, with much of this led from within Scotland and from which much can be learnt. The IUCN UK Peatlands Programme assembled a substantial amount of practical and research building on international experience[25].

Some specific benefits

Viewed from above, wide expanses of peatlands are studded by lochs and lochans. These areas are revered for their birds and some fascinating plants, notably the insectivorous sundews and butterwort. The *Sphagnum* moss is the special driver of the peat formation processes.

A large body of work clearly demonstrates the multiple benefits of peatlands and the opportunities for peatland restoration, but we still have more to do in quantifying these benefits[26]. As we manage and repair our peatlands it is essential to monitor and study the impacts on carbon, water, biodiversity and other landuses and landuse changes, so that we can assess and report on progress and inform the various funding streams and policies that will secure a healthy peatland future.

Peat bogs provide many benefits:

– **Nature**[27] – uniquely adapted groups of birds, plants, fungi, invertebrates and micro-organisms, some not found together anywhere else in the world, with some birds nesting at the highest densities yet recorded;

[25] www.iucn-uk-peatlandprogramme.org
[26] http://uknea.unep-wcmc.org
[27] www.biodiversityscotland.gov.uk/doing/framework/strategy

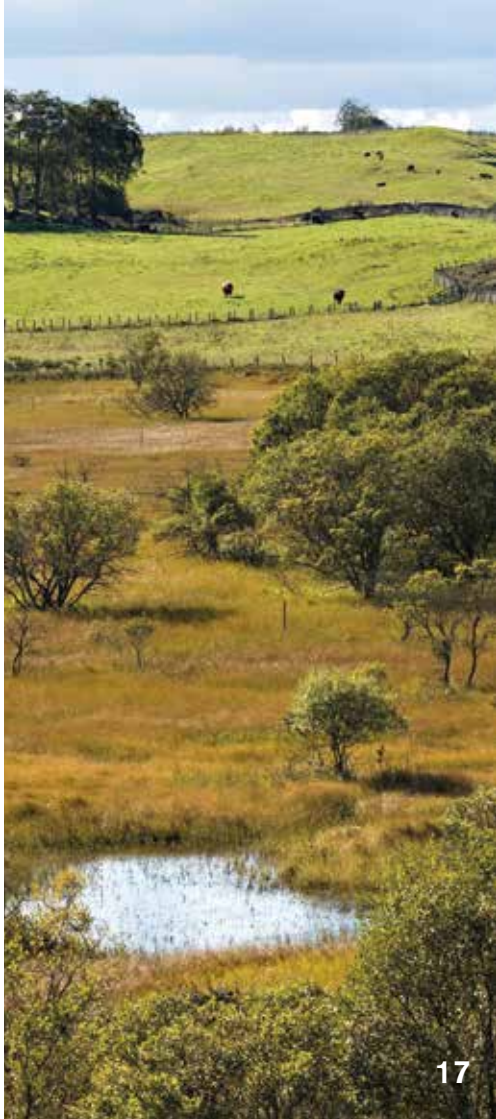
- **Water supply** – much of our drinking water comes from peatland areas and many of our important salmon rivers depend on peaty catchments. Maintaining peatlands in good condition, or restoring them, makes for cleaner water and lower costs to society;
- **Flood management** – intact peat bogs store water and help to maintain steady flow rates on salmon rivers. Natural and restored peatlands provide reduced downstream flood risks compared to damaged peatlands;
- **Historic environment** – the best preserved remains of past peoples have been recovered from and are preserved in peatlands;
- **International image** – peatlands provide the backdrop for Scotland's iconic wild countryside valued by the film and tourism industries and a key part of the brand for much of our food and drink;
- **Fuel** – while commercial exploitation is not sustainable, some domestic peat banks cut for fuel are decades old, and are managed to minimize erosion. Peat stacks are a familiar, if declining, sight in parts of the far north and west, and the reek of peat smoke is distinctively appealing to residents and visitors;
- **Livestock grazing** – many peatland areas support grazing livestock, mostly sheep, but locally cattle. On some sites these can be used to control scrub and tree regeneration;
- **Sporting management** – sustaining much of our deer stalking, grouse shooting and fishing enterprises;
- **Recreation** – whether its hill walking, birdwatching or gazing from a remote road, these remote, rolling peatlands provide an unrivalled and distinctly Scottish experience;

- **Education** – peatlands are widely used as outdoor classrooms providing topics which range from their history and archaeology, through present day interests and uses their role in influencing, and being affected by, future change;
- **Whisky** – Scotch whisky is an iconic product recognised around the globe. It makes a significant contribution to economic growth in Scotland and across the UK. It is uniquely dependent on peat for malting barley, with local supply being critical to the flavour profile of some brands;
- **Harvestable products** – collecting bog myrtle for midge repellent and berries for domestic preserves are small scale, local activities, of practical and social value;
- **Cultural enrichment** – peatlands provide a sense of place for many and have been an inspiration for art, song, poetry and literature down the ages and remain so today. Their colours are also captured in some tweeds and tartans;
- **Health** – walking for its own sake, to reach distant mountains or a remote loch or stream brings the benefits of physical exercise, refreshes the senses and can encourage calm reflection in otherwise busy and crowded lives.

Managing and protecting carbon…

What's more, we now know that peatlands are our largest natural **carbon stock** and that we can make a significant contribution to reducing greenhouse gas emissions by:

- Managing the land to maintain existing peat deposits, and the extent and health of peat-forming habitats; and



– Ensuring that land use and management limits loss of stored carbon and enhances the sequestration of new terrestrial carbon. Restoring peat-forming habitats will be an important part of this.

Where restoration to open, peat forming habitats is not possible, management should still aim to reduce loss of the carbon stock and maximise any potential for carbon sequestration. This may include the establishment of the priority habitat bog woodland, or other woodland options available in accordance with guidance published by Forestry Commission Scotland.

The significance of Scotland's soil carbon stock and the socio-economic and environmental consequences of degradation of this resource have been widely discussed in the State of Scotland's Soil[28]. This identified the loss of soil organic matter as one of the key threats to ecosystems, with climate change as a major driver.

[28] www.soils-scotland.gov.uk/context

6. Promoting healthier peatlands

We now need to draw existing information together in order to take forward a programme which will:

– manage the existing resource; restore degraded areas; and
– ensure that our peatlands are managed long term as a national asset to provide a wide range of public and private services.

Below we consider a number of opportunities for doing more for peatlands.

Managing the existing resource

Managing a healthy bog to maximise the delivery of benefits is relatively straightforward. Achieving appropriate grazing levels by livestock and deer is particularly important to avoiding trampling damage and overgrazing. Scrub invasion of a healthy bog with a shallow water table is unlikely, but where it does occur then this should be controlled through grazing and/or mechanical means.

Burning should be avoided and any necessary vehicle access should be by low ground-pressure vehicles and avoiding the most sensitive areas.

The SRDP's Agri-Environment Climate Scheme and, for landscape-scale projects, the Environmental Co-operation Action Fund[30], provide relevant support.

[29] www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme
[30] www.ruralpayments.org/publicsite/futures/topics/all-schemes/environmental-co-operation-action-fund

SRDP Agri-Environment Climate Scheme 2014–2020

Options relevant to peatland management and restoration include:

Moorland Management Option

- Moorland Management Plan
- Grazing Management Plan
- Deer Management Plan
- Peatland Restoration Plan

Wetland and Bog Options

- Wetland Management
- Lowland Bog Management
- Management of Buffer Areas for Fens and Lowland Bogs

Capital Items

- Control of scrub
- Ditch blocking – peat dams
- Ditch blocking – plastic piling dams
- Stock bridges for fen, bog or wetland management

Restoring degraded peatlands

A continuum of peatland conditions occurs, ranging from 'pristine' habitat through to the total loss of habitat and the underlying peat. The position of a particular peatland along that continuum determines the potential for recovery, through natural processes or management, to good condition and, where management is required, the cost-effectiveness of that intervention.

In very simple terms, the more degraded a site, the longer it will take to restore, the more it will cost and the lower the likelihood of success. In some cases, that cost may not appear to represent good value in the short term, but on the basis of greenhouse gas emissions savings alone it is likely that in most cases it will to be cost-effective in the medium to longer term[31]. This does, however, highlight the merits of intervening at an early stage and ensuring that peatlands already in good condition are managed sustainably.

Some types of damage/degradation are relatively easily reversed. If a site is over-grazed, reduce the level of grazing. If a site is under-grazed, increase the grazing. If a site has been damaged by fire, reduce any grazing and don't burn it. If a site is drained, block the drains.

Other impacts require more intensive intervention to achieve restoration.

Under certain circumstances afforested peatland sites can be felled and not restocked without contravening the national Control of Woodland Removal policy[32]. Forestry Commission Scotland has specific guidance on how to go about seeking approval for this[33].

[31] www.teebweb.org/economic-merits-of-peatlands-restoration-in-scotland
[32] http://scotland.forestry.gov.uk/images/corporate/pdf/fcfc125.pdf
[33] http://scotland.forestry.gov.uk/supporting/strategy-policy-guidance/soil-and-water-management/peatland-habitats

Eroded or former peat-extraction sites may require major gully repair and the establishment of vegetation in addition to other treatments (fertilizer application, stock exclusion etc.).

This combination of activities can apply to any restoration project, and can help scope and cost projects, and indeed larger scale strategic assessments. However, this should not deflect from the importance of site-based assessments and monitoring. All projects need to recognise both generic and the site-specific requirements. The latter may include land use and land managers' and other land users' objectives.

Priorities for restoration[34]

We are refining criteria to help us target resources at particular sites. Much useful work has already been undertaken by staff at the James Hutton Institute through their WISE Peatland Choices tool[35]. There is also guidance available to forest managers to identify priorities for restoration[33].

In the years 2013–2015, 'Peatland Action'[36] targeted over 100 sites varying in size from the Flow Country SPA/SAC to the small Commonhead Moss. Initially much of this work was necessarily opportunistic, and guided by applications from interested parties. However the range of sites, land manager types and restoration activities broaden widely as the programme progressed.

Peatland Action will have supported restoration of around 5,500 hectares

[34] Restoration is defined as 'the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed'. https://portals.iucn.org/library/efiles/edocs/PAG-018.pdf

[35] www.climatexchange.org.uk/files/3913/9022/9698/WISE_Peatland_Choice_booklet.pdf

[36] www.snh.gov.uk/climate-change/what-snh-is-doing/peatland-action

of peatland by 2015. Given an estimated 600,000 hectares of restorable peatland[37], we need a step change in action. The Scottish Government's Second Report on Proposals and Policies for meeting its climate change targets[38] gave the example of the greenhouse gas benefits of "accelerated restoration of degraded peatland, targeting up to 21,000 hectares a year."

These priorities can be applied, working closely with land managers:

- Protected areas with peatland features in unfavourable condition (especially unfavourable declining), focusing first on designated areas;
- Where there are significant impacts, including downstream effects such as on water quality and flood management, arising from degraded peatland;
- Where there are partnership opportunities at the landscape scale e.g. National Parks, National Ecological Network, Living Landscapes. Sites and locations where there are opportunities for significant long term ecosystem benefits through e.g. dams, reduced grazing pressure, improved burning practices; and
- Sites where there are excellent opportunities for communicating 'good practice' and the wider benefits of peatland restoration.

[37] Blanket Bog Habitat Action Plan, UK Biodiversity Group, Tranche 2 Action Plans, Volume VI.
[38] www.scotland.gov.uk/Publications/2013/06/6387

WISE Peatland Choices – a decision support tool for peatland restoration in Scotland

This tool, under development by the James Hutton Institute, is a layered GIS tool, using weighted criteria which indicate the potential for peatland restoration.

The criteria include:

- Current type and condition of vegetation and other species assemblages
- Sustainability of current and historic land use
- Level or rate of current physical degradation
- Geophysical attributes: area/altitude and variation within site

When mapped, areas indicating a higher probability of being suitable for peatland conservation or restoration management can then be distinguished from those of lower potential.

Land Use Strategy

Scotland's first Land Use Strategy was published in 2011, as a key commitment arising from the Climate Change (Scotland) Act 2009[39]. It focuses on integrated land use and management to get the best value from Scotland's land resource, and it recognises that successful management requires the balancing of a number of potentially competing interests. Proposal 9 of the Strategy is to "Develop a methodology to take account of changes in soil carbon for carbon accounting purposes; improve understanding of potential benefits from conservation and management of carbon-rich soils; and deliver measures to help secure long-term management of all land-based carbon stores". The Strategy's Action Plan[40] provides more detail on how this will be achieved, with clear links to work to develop a Peatland Code[41].

Butter sunk under
More than a hundred years
Was recovered salty and white.
The ground itself is kind, black butter

Melting and opening underfoot,
Missing its last definition
By millions of years.
They'll never dig coal here,

From *Bogland* written in the 1960s by Seamus Heaney

[39] www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact
[40] www.scotland.gov.uk/Publications/2011/12/19161736/0
[41] www.iucn-uk-peatlandprogramme.org/peatland-gateway/uk/peatland-code

The Peatland Code

Development of the Peatland Code is managed by the IUCN UK Peatland Programme with support from Scottish Government, SNH, other UK administrations and others.

It is the voluntary standard for peatland restoration projects in the UK that want to be sponsored on the basis of their climate and other benefits.

The UK Peatland Code is designed to provide an open, credible and verifiable basis for business sponsorship of specific pilot projects undertaking UK peatland restoration. The Code assures that restoration delivers tangible climate change mitigation benefits, alongside other environmental benefits. At this stage the Pilot Phase Code is designed to facilitate business sponsorship motivated by corporate social responsibility; it is not currently intended for use in formal offset schemes, corporate carbon reporting or to be traded on international carbon markets.

The current Pilot Phase will be reviewed in summer 2015, following which future direction and activity will be determined.

The Scottish Government published its Second Report on Proposals and Policies setting out how it would attempt to meet its emissions targets[42]. This includes a number of references to the potential role of peatlands in reducing net greenhouse gas emissions. The report notes scientific, partnership and restoration challenges, which are developed in this document.

Other policies and guidance

Several international and national documents guide best practice for having healthy peatlands. The National Planning Framework 3[43] was laid before the Scottish Parliament on 23 June 2014, setting out a spatial framework for Scotland's development. The 2020 Challenge for Scotland's Biodiversity refreshes the 2004 Biodiversity Strategy, and places heavy emphasis on the natural capital value of peatlands, and the importance of adopting the ecosystem approach. The Scottish Forestry Strategy Implementation Plan (2013–16)[44] lays out the strategic and operational direction for forest development.

Several excellent guidelines are given by international organisations which are directly relevant to peatland management. The Ramsar Convention's Wise use of wetlands handbook[45] and the IUCN's Demonstrating Success[46] and Global Peatland Restoration Demonstrating Success[47] provide excellent demonstrations of peatland restoration measures, and develop some wise

[42] www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/meetingthetargets
[43] www.scotland.gov.uk/Topics/Built-Environment/planning/NPF3-SPP-Review/NPF3
[44] www.forestry.gov.uk/sfs
[45] www.iucn-uk-peatlandprogramme.org/peatland-gateway/uk/peatland-code
[46] www.iucn-uk-peatlandprogramme.org/publications/demonstrating-success/uk-peatland-restoration-demonstrating-success
[47] www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf

use principles. The Food and Agriculture Organization of the UN (FAO) and Wetlands International published Peatlands – guidance for climate change mitigation through conservation, rehabilitation and sustainable use[48], giving ten strategic actions to support mitigation measures. The Intergovernmental Panel on Climate Change (IPCC) has formally reported on the importance of peatland restoration for enhancing carbon sinks, but notes remaining research questions[49]. Its technical groups propose default emission factors (EFs) for activities such as peatland restoration[50]. Recent work by the ClimateXChange demonstrates the potentially significant greenhouse gas benefits to be gained from peatland restoration in Scotland[51].

Forestry Commission Scotland has produced a suite of policies and guidance relevant to the relationship between forestry and peatland[52].

Making peatland management and restoration happen

One of the most important features of successful peatland restoration is having in place a restoration chain of action: a) knowledge of what needs to be done; b) practical expertise to carry out the restoration work; c) a willing landowner/ manager; d) sufficient resources to undertake the work; e) the know-how to secure resources and f) the commitment and support to maintain the benefits. Sharing resources and operating at the large scale, which may include across ownerships, can increase cost-effectiveness. We also need a robust monitoring framework to be able to measure and demonstrate benefit.

[48] www.fao.org/docrep/015/an762e/an762e.pdf
[49] www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=274
[50] www.ipcc-nggip.iges.or.jp/home/docs/wetlands/Wetlands_Supplement_precopyedit.pdf
[51] www.climatexchange.org.uk/reducing-emissions/carbon-benefits-peatland-restoration
[52] http://scotland.forestry.gov.uk/supporting/strategy-policy-guidance/soil-and-water-management/peatland-habitats

We need to develop this capability regionally in order to restore sites with maximum efficiency. We need to review where these chains of action exist, and how best we can extend these. Strategically, we have to identify the best means of realising the practical ambition here – possibly through a national advisory team, regional partnerships or smaller teams of local advisers.

Funding mechanisms and levering in partnership funds

Several funding streams are available in Scotland to support peatland restoration:

- **Scottish Rural Development Programme (SRDP)**[53]
- **Heritage Lottery Fund (HLF)**[54]: Landscape Partnership Fund
- **EU LIFE programme**[55]
- **Peatland Code and private sponsorship.** A pilot phase of the Peatland Code is underway to help develop business and other private funding for peatland management[56]

Peatland Action, administered by SNH, provides advice and support for peatland restoration. The variety of potential funding streams reflects that restoration is generally funded for the outcomes that restoration would deliver.

[53] www.scotland.gov.uk/Topics/farmingrural/SRDP/RuralPriorities
[54] www.hlf.org.uk
[55] http://ec.europa.eu/environment/life/about
[56] www.iucn-uk-peatlandprogramme.org/peatland-gateway/uk/peatland-code

Flows to the Future

The 'Flows to the Future' project, co-ordinated by The Peatlands Partnership, is an ambitious plan to protect and restore seven square miles of one of Europe's largest expanses of blanket bog in Caithness and Sutherland. The ancient environment of the Flow Country is a repository for vast amounts of carbon locked into the peat, estimated to be around 400 million tonnes.

The £9.6 million pound project which will make a significant contribution to the UK's climate change targets was awarded more than £4 million from the Heritage Lottery Fund in June 2014. The remaining funding comes from multiple sources.

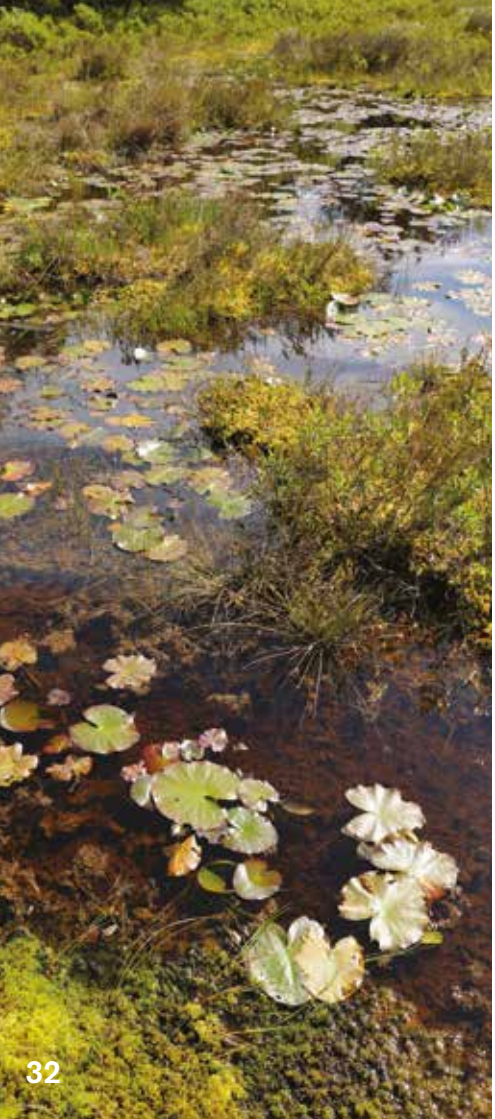
In addition to peatland restoration, the project will develop a range of visitor and education facilities.

An economic study commissioned by Highlands and Islands Enterprise predicts the project will deliver an additional £10.2 million to the Highland economy over a 30 year period – helping to sustain local jobs and support fragile communities.

The Peatlands Partnership includes: SNH, The Highland Council, RSPB, Forestry Commission Scotland, Environmental Research Institute (UHI), Plantlife (Scotland), Highlands and Islands Enterprise and representatives of the private and third sectors. It is independently chaired by John Henderson of Scrabster Farm, Caithness.

Who owns this landscape?
Has owning anything to do with love?
For it and I have a love-affair, so nearly human
we even have quarrels. –
When I intrude too confidently
it rebuffs me with a wind like a hand
or puts in my way
a quaking bog or loch
where no loch should be. Or I turn stonily
away, refusing to notice
the rouged rocks, the mascara
under a dripping ledge, even
the tossed, the stony limbs waiting.

From *A man in Assynt* by Norman MacCaig, published in *A Man in my Position* (1967–68)



Measuring success

Some of the outcomes of restoration are relatively easy to measure; raised water table, *Sphagnum* cover, absence of tree cover (unless bog woodland is target) etc. However, there are no 'off-the-shelf' protocols for these, let alone for more complex issues such as the greenhouse gas balance, economics and the water environment. Agreed protocols are needed to enable the cost-effectiveness of management and restoration to be measured. A few intensively monitored demonstration sites might assist with this. As peatland systems often require long term monitoring to provide useful information, equally long-term funding is required to support this.

The IUCN UK Peatland Programme addressed a lot of key questions regarding peatland management and restoration (e.g. methane emissions from restored bogs, impacts of burning on blanket bog), though some key questions remain. We will form a small Research and Monitoring Group to focus the research and ensure the outputs are translated into good management practices.

Research and Monitoring

Further research, across a range of disciplines, including the social sciences, is needed to help improve on the most cost-effective restoration and management practices to secure the fullest of services from peatlands.

A monitoring programme will audit both habitat losses and restoration work and their outcomes – only through undertaking this systematically can we build on the successes in some sites, and learn from problems in others. We also need

to report on what is being achieved against the funds expended on restoration and management.

Some of the **key issues for researchers to address**[57], building on existing knowledge, are:

- the current state of our peatland;
- the extent of restorable peatland in Scotland and further restoration effort required;
- the impacts on net greenhouse gas emissions of different forms of peatland restoration, and the overall contribution of this restoration to Scotland's carbon reduction targets;
- despite reductions in industrial pollution in recent decades the levels of nitrogen and sulphur in the atmosphere remain a concern for peatlands as even small amounts falling repeatedly can harm the peat forming vegetation. Over much of Scotland the critical load of nitrogen which Sphagnum mosses can tolerate is being exceeded, largely because of agricultural activity. However detecting this in the field is not routine and assessing its significance uncertain;
- the best practices for restoring the various forms of degraded peatland, including areas of erosion and previously afforested areas in order to develop good practice guidance and advice;
- the role of wild and domestic herbivores in sustainable peatland management;
- the role and significance of muirburn on peatlands, noting the proposed revision of the Muirburn Code[58];

[57] www.climatexchange.org.uk/reducing-emissions/workshop-peatland-research-priorities/
[58] www.gov.scot/Resource/Doc/355582/0120117.pdf

- how we maximise the ecosystem benefits across carbon, biodiversity and water through restoring degraded peatlands and maintaining those in a healthy state;
- how we achieve significantly greater levels of annual peatland restoration than at present;
- how the principles of peatland restoration interrelate with policies on the protection of the historic environment; and
- further research into remote sensing techniques used to identify archaeological sites buried in peat.

The Research and Monitoring Group will coordinate this.

7. Supporting land managers

Landowners and managers across Scotland have many diverse objectives. What they wish to do with their land depends on a range of parameters such as the physical capability of the land, what has historically happened with the land, what the personal motivation and finances are of the owner. Most private landowners operate their land holding as a rural business and as such the activity that happens on the land needs to be financially viable. Their income might be derived through for example farming, forestry, sporting interests, tourism and so on. A small number of owners have private incomes and therefore profit from the land may be less important. A number of landowners own their land with the primary aims of delivering conservation benefits (this includes for example conservation charities such as the RSPB, Scottish Wildlife Trust, John Muir Trust, as well as a few landowners with private incomes). The public sector is also a major owner of land with objectives which deliver against a range of public policy outcomes.

The one common factor in seeking to work with any landowner or manager is that the objectives of a proposed project must be a good fit with the owner or manager's own objectives. An understanding of what drives individual owners is therefore necessary in order to establish a successful working relationship.

There is, however, a growing enthusiasm across Scotland for peatland conservation and restoration. We need to work closely with the many land managers who have an appetite for this work[59], to encourage engagement and build capacity. We may need a team of local advisers to support us, or we may

[59] www.iucn-uk-peatlandprogramme.org/news-and-events/news/new-rspb-report-features-peatland-case-study?destination=node%2F278

be best to work with one or a few land manager organisations who can achieve effective on-the-ground work.

Some organisations are better placed than others to provide support here, with SNH, FCS, SEPA, the National Parks, SWT, RSPB, Heather Trust and GWCT operations and advisory staff immediately well placed to support these efforts. Regional partnerships such as Southern Uplands Partnership, Tweed Forum and the Flow Country Peatlands Partnership have a significant role to play given their range of contacts, experience and expertise.

Public Sector responses to the Biodiversity Duty should take account of the importance of protecting local peatland resources; as should plans and policies for sustainability and Carbon management. Local Biodiversity Action Plan Partnerships, usually supported by Local Authority Biodiversity Officers, can help to co-coordinate plans and actions across planning authorities, environmental agencies, land managers, development interests and others with a stake in the management of local peatlands.

8. Development planning

Although there are many activities affecting peatland which require planning permission some industries stand out for the number and extent of developments. Open-cast coal schemes and peat extraction result in considerable land-take, excavation of peat, hydrological disturbance and removal of the overlying vegetation.

Scottish Planning Policy aims to seek benefits for biodiversity from new development where possible, including the restoration of degraded habitats. In all cases where peat and other carbon rich soils are present Scottish Planning Policy is clear that applicants should assess the likely effects of development on carbon dioxide emissions with the aim of minimising the release of carbon dioxide in situations where peatland is drained or disturbed. Renewables developments, particularly wind farms, have increased in number over recent years and require consideration; engagement among power companies, restoration interests and agencies has developed, as have planning requirements and best practice guidance.

In the preparation of spatial frameworks for onshore wind farms, carbon rich soils, deep peat and priority peatland habitat are recognised as nationally important mapped environmental assets. These are afforded significant protection where effects on the qualities of these areas from wind farm development cannot be substantially overcome.

In relation to commercial peat extraction, Scottish Planning Policy[60] (SPP) (2014) makes it clear that "Policies should… only permit commercial extraction

[60] www.gov.scot/Resource/0045/00453827.pdf

in areas suffering historic, significant damage through human activity and where the conservation value is low and restoration is not possible."

Although those same constraints do not apply to the renewables or other industries, other mechanisms, such as the Carbon Calculator for wind farm developments, are in place to reduce impacts and encourage restoration.

Products launched by the retailer B&Q[61], also demonstrate the diminishing role for peat in horticulture – a trend which we would wish to encourage and support.

There are numerous examples of guidance to reduce impacts on peat and peatland habitats, some of which are industry specific and others of a more general nature e.g. 62, 63, 64, 65.

Although there are examples of good restoration practice from industry, this is not universal and the appropriate balance of restoration to impact is not easily determined.

The National Peatland Group will work with these and other industries with the potential to have significant impacts on peatlands, with a view to encouraging and facilitating good practice and proportionate restoration activity and raising awareness of these.

[61] www.youtube.com/watch?v=Ban4-yAGAr8&feature=player_embedded
[62] http://scotland.forestry.gov.uk/supporting/strategy-policy-guidance/soil-and-water-management/peatland-habitats
[63] www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/17852-1/CSavings
[64] www.scotland.gov.uk/Resource/Doc/917/0120462.pdf
[65] www.snh.org.uk/pdfs/publications/commissioned_reports/673.pdf

9. International outreach

Internationally, Scotland has shown significant leadership of peatland restoration and related science. We want to draw on international contacts to promote our work (especially in the Nordic countries, Ireland and elsewhere in Britain) but also to make links with restoration work globally so that we tap into broader experience and expertise. Where possible, we also want to share what we have devised and learnt through hard won practical experience. Maintaining, and where necessary restoring, our peatlands, supported by targeted research and measured benefits is our first priority, but even greater benefits can be achieved if other peatland countries in Europe and beyond share our vision and work together to achieve it.

"I sat and read the glossary that evening by the fire in Finlay's house, fascinated and moved. Many of the terms it contains are notable for their compressive precision: Bugha is 'a green bow-shaped area of moor grass or moss, formed by the winding of a stream'. Moine dhubh are 'the heavier and darker peats which lie deeper and older into the moor'… breunloch is 'dangerous sinking bog that may be bright green and grassy'…''

From *Landmarks* (2015) by Robert Macfarlane describing his initial impression of *Some Lewis Moorland Terms: A Peat Glossary* compiled by Finlay MacLeod and friends to describe the peatlands around three Lewis townships – Shawbost, Bragar and Shander.

10. Making it happen

We will only achieve this ambition if we are clear, realistic and effective with regard to the tasks ahead, and inclusive in working with key partners. We have formed the National Peatland Group (chaired by SNH) to oversee this work.

The National Peatland Group will promote, facilitate and monitor delivery of the National Peatland Plan. Its role will include:

- Implementing this Plan and publishing a work programme by the end of 2015. Some early deliverables are listed in Annex 1
- Developing and supporting a national network of peatland advisers and regional partnerships
- Supporting promotion and awareness amongst land managers
- of the benefits of healthy peatlands, including through the development and use of demonstration sites
- Supporting appropriate consideration of peatlands in land use decisions
- Identifying and considering new and emerging opportunities and challenges, including funding
- Considering the role of peaty soils, the implication of the Plan for these, and opportunities to encourage good practice management of them

In this, the National Peatland Group will be supported by the Research and Monitoring Group, the role of which will be to:

- Ensure research and monitoring focuses on delivering effective restoration and management
- Embed knowledge exchange across stakeholder interests
- Improve wider understanding of the sensitivity and many values of peatlands

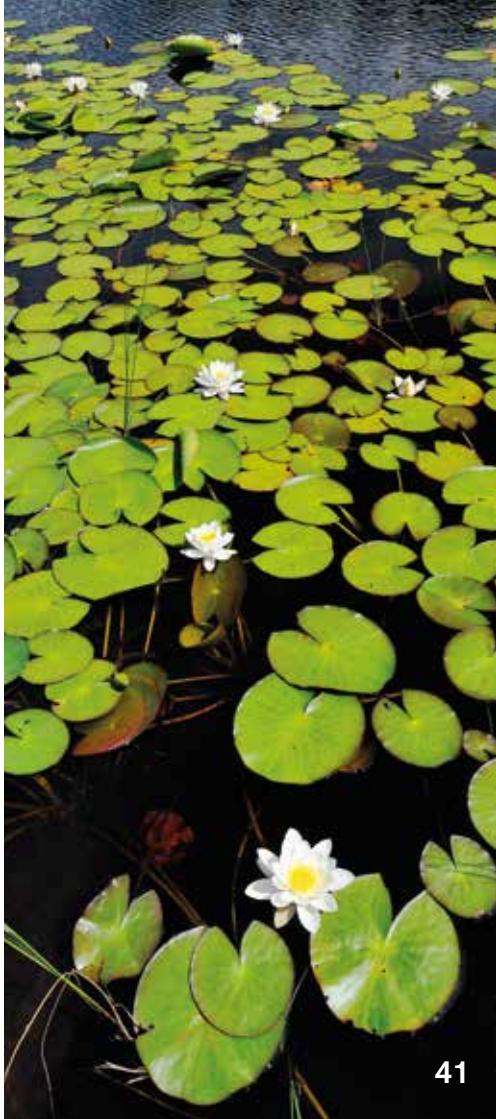
11. Acknowledging support and moving forward

Developing this Plan has been a collaborative effort among: Scottish Natural Heritage, Scottish Government, Scottish Environment Protection Agency, Forestry Commission Scotland, Historic Scotland, Scottish Crofting Federation, Scottish Land & Estates, South Lanarkshire Council, Scotland's Moorland Forum, James Hutton Institute, COSLA, RSPB, Scottish Wildlife Trust, the IUCN UK Peatland Programme, the Scotch Whisky Association and Scottish Renewables.

It has been further informed and influenced by those organisations that contributed to peatland research workshops and those who responded to the public consultation on an earlier draft.

To help with the further development and delivery of the Plan, a National Peatland Group (NPG), chaired by Scottish Natural Heritage and drawn from the above and other interested organisations has been established. This Group will be assisted by a Research and Monitoring Group. Other, time-limited, groups may be established as required.

To recognise and encourage good practice and ambition in peatland management and restoration, the NPG will make an annual award to a project which it considers to be particularly worthy of congratulation and a higher profile. The award will also be in memory of Francis Brewis who, in his latter years as Head of Soil Policy, championed the peatland cause within Scottish Government. He is sorely missed and we hope his family, friends and colleagues will consider this a fitting tribute.



Annex 1

National Peatland Plan deliverables

Delivering the National Peatland Plan is a long term agenda. It will be supported by an ongoing action plan, developed and overseen by the National Peatland Group. This will support delivery by a wide range of partners and interests and will continue to evolve over time. Immediate deliverables under the Plan are set out below. An Action Plan, determined and agreed by the National Peatland Group, in partnership with others, will be published by winter 2015/16.

Milestone	Delivery
FC Scotland guide 'Deciding future management options for afforested deep peatland'	May 2015
Biodiversity route map	June 2015
Inaugural meeting of National Peatland Group (NPG)	Summer 2015
Peatland Code – Phase 1 review	Summer 2015
Publication of 'Carbon rich soils, deep peat and priority peatland habitats map'	Summer 2015
Peatland Action Demonstration events	Summer/Autumn 2015
Next Land Use Strategy – consultation	Summer/Autumn 2015
Inaugural meeting of the NPG Research & Monitoring Group	Autumn 2015
SNH Climate Change Plan	Autumn 2015
Publication of first NPP Action Plan	Winter 2015/16
2016–21 RESAS Strategic Research Portfolio	post 2016

Sphagnum moss remembers. It recalls
the touchdown of each lark that tumbles
down upon its surface, the slightness of that weight
recorded in the tendrils of each stem. It anticipates
the appetites of flock which graze
upon that wasteland when the rare haze
of summer-heat crisps heather.
The constant tide and toll of weather.
Snow concealing peat and turf like surf,
rolling in with weight of dark clouds curving
around the bleak horizon. The persistent smidge of rain
blurring the land's muted shades year upon damp year again.

From *Sphagnum Moss* by Donald S. Murray, opening *The Guga Stone: Lies, Legends and Lunacies from St Kilda* (Luath Press, 2013)

Photography: Lorne Gill/SNH, Laurie Campbell/SNH, P&A Macdonald/SNH, Dougie Barnett/SNH, Ewan Campbell, Peter Wakely/SNH, Laurie Campbell, Sara Green/Butterfly Conservation and Andrew McBride/SNH.

Illustrations: Magi Sinclair www.magisinclair.co.uk

ISBN: 978-1-78391-365-7

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad